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1.0 PROJECT OBJECTIVES

1.0.1 The project objective is to design and construct facilities for the military that are consistent with the design and construction practices used for civilian sector projects that perform similar functions to the military projects. For example, a Company Operations Facility has the similar function as an office/warehouse in the civilian sector; therefore the design and construction practices for a company operations facility should be consistent with the design and construction of an office/warehouse building.

Comparison of Military Facilities to Civilian Facilities

Military Facility	Civilian Facility
Unaccompanied Enlisted Personnel Housing (UEPH)	Apartment

1.0.2 It is the Army's objective that these buildings will have a 50 year useful life. The design and construction should provide an appropriate level of quality to ensure the continued use of the facility over that time period with the application of reasonable preventive maintenance and repairs that would be industry-acceptable to a major civilian sector project OWNER. The facility design should consider that the Army may repurpose the use of the facility over the 50 year life. The Army's intent is to install products and materials of good quality that meet industry standard average life that corresponds with the period of performance expected before a major renovation or repurpose. The design should be flexible and adaptable to possible future uses different than the current to the extent practical while still meeting the operational and functional requirements defined within. Flexibility is achieved through design of more flexible structural load-bearing wall and column system arrangements. The site infrastructure will have at least a 50-year life expectancy with industry-accepted maintenance and repair cycles. Develop the project site for efficiency and to convey a sense of unity or connectivity with the adjacent buildings and with the Installation as a whole.

1.0.3 Requirements stated in this contract are minimums. Innovative, creative, and life cycle cost effective solutions, which meet or exceed these requirements are encouraged. Further, the OFFEROR is encouraged to seek solutions that will expedite construction (panelization, pre-engineered, etc.) and shorten the schedule. **The intent of the Government is to emphasize the placement of funds into functional/operational requirements. Materials and methods should reflect this by choosing the most economical Type of Construction allowed by code for this occupancy/project allowing the funding to be reflected in the quality of interior/exterior finishes and systems selected.**

1.1. SECTION ORGANIZATION

This Section is organized under 6 major “paragraphs”.

(1) Paragraph 1 is intended to define the project objectives and to provide a comparison between the military facility(ies) and comparable “civilian” type buildings.

(2) Paragraph 2 describes the scope of the project.

(3) Paragraph 3 provides the functional, operational and facility specific design criteria for the specific facility type(s) included in this contract or task order.

(4) Paragraph 4 lists applicable industry and government design criteria, generally applicable to all facility types, unless otherwise indicated in the Section. It is not intended to be all-inclusive. Other industry and government standards may also be used, where necessary to produce professional designs, unless they conflict with those listed.

(5) Paragraph 5 contains Army Standard Design Criteria, generally applicable to all facility types, unless otherwise indicated in the Section.

(6) Paragraph 6 contains installation and project specific criteria supplementing the other 5 paragraphs.

2.0 SCOPE

2.1. UNACCOMPANIED ENLISTED PERSONNEL HOUSING (UEPH)

Provide Unaccompanied Enlisted Personnel Housing (UEPH) facilities. This project type is to house single soldiers and is intended to be similar both functionally and technically to similar housing in the private sector community surrounding the Installation.

Number of single personnel to be housed is 240

Maximum gross area 87,840 square feet.

2.2. SITE:

Provide all site improvements necessary to support the new building facilities. Refer to Paragraph 6.

Approximate area available 19.00 acres

2.3. GOVERNMENT-FURNISHED GOVERNMENT-INSTALLED EQUIPMENT (GFGI)

Coordinate with Government on GFGI item requirements and provide suitable structural support, brackets for projectors/VCRs/TVs, all utility connections and space with required clearances for all GFGI items. Fire extinguishers are GF/GI personal property, while fire extinguisher brackets and cabinets are Contractor furnished and installed CF/CI. All Computers and related hardware, copiers, faxes, printers, video projectors, VCRs and TVs are GFGI.

The following are also GFGI items: For each apartment the government will provide; electric range, refrigerator, stacked washer/dryer unit, and bedroom furniture.

2.4. FURNITURE REQUIREMENTS

A Furniture, Fixtures & Equip design and package is NOT required for this project. However, Structural Interior Design (SID) is required for all facility types regardless of the requirements for the FF&E design and package. The basic space planning for the anticipated FF&E requirements in conjunction with the functional layout of the building and design issues such as life safety, privacy, acoustics, lighting, ventilation, and accessibility is still required as part of the SID submittal.

2.5. NOT USED

3.0 UNACCOMPANIED ENLISTED PERSONNEL HOUSING (UEPH)

3.1. GENERAL REQUIREMENTS

The Army requires an apartment complex of two-bedroom, one-bath dwelling units with kitchen (1+1E module) similar in features, standards and layout to apartment complexes in the surrounding community. Maximize the space inside the individual dwelling units versus providing additional spaces not listed in the functional requirements in this section. Building circulation is required to be through the use of interior corridors/breezeways or garden style apartments, where circulation is minimized. Exterior egress balconies are prohibited; this does not preclude apartments designed with exterior entry landings. Choice of breezeways and exterior entry landings shall be predicated upon the weather criteria of the specific geographic area. Breezeways and exterior entry landings shall be designed to preclude snow and ice infiltration/accumulation. Building spaces and areas are as indicated in the text below. Coordinate the site design with the building described in this Section. Specific site requirements that affect the design and construction of the site appear in 01 10 00-6.0.

3.2. FUNCTIONAL AND AREA REQUIREMENTS

The overall building gross area is based on allocating each occupant 366 gross square feet for buildings up to three stories or 388 gross square feet for buildings over three stories. For Installations in Alaska the overall building gross area is based on allocating each occupant 388 gross square feet for all barracks building, irrespective of building height. The gross square feet per occupant includes the total area of all functional areas required in the building, including all dwelling units, common areas, canopies, and support areas, e.g. stairways, elevators, foyers, corridors, public toilets, janitor's closets, utility room spaces.

(a) Elevators: Provide elevators for buildings that exceed three stories. Provide elevator system that complies with the most current editions of ASME A17.1 and ASME A17.2 in their entirety, and additional requirements specified herein. The first elevator shall be centrally located and shall have a minimum rated load-capacity of 3500 lb (1588 kg), with center opening doors and interior dimensions sized to accommodate a fully extended Emergency Medical Services (EMS) gurney and four average size adults. Gurney size shall be based on the "STRYKER Power-PRO XT" gurney. An additional elevator as specified above shall be provided for every additional one hundred (100) persons or fraction thereof, over the first two hundred (200) persons the building is designed to accommodate, unless a traffic analysis determines otherwise. Such traffic analysis shall be included in the Design Analysis. Elevator interior walls, ceiling, doors and fixtures shall have a satin No. 4 stainless steel finish. Floor finish shall be vinyl composition tile as specified in Paragraph 3.4.5.2. (b). All elevators shall be furnished with removable hanging protective pads and fixed hooks to facilitate conversion to use for moving freight.

Elevator Inspector: The Elevator Inspector shall be certified in accordance with the requirements of the most current editions of ASME A17.1 and ASME QEI-1 and licensed in elevator inspection by the State where project is located. The Certified Elevator Inspector shall inspect the installation of the elevator(s) to assure that the installation conforms with all contract requirements. The Elevator Inspector shall be directly employed by the Prime Contractor and shall be independent of the Elevator System Manufacturer and the Elevator System Installer. The Elevator Inspector shall witness the acceptance inspections and tests, approve all results and sign and certify the successful results. The Elevator Inspector, after completion of the acceptance inspections and tests, shall certify in writing that the installation is in accordance with the contract requirements. The Elevator Inspector shall bring any discrepancy, including any safety related deficiencies, to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.

(b) Gross building area definition: Gross building area is measured to the outside face of exterior enclosure walls. Gross area includes floor areas, penthouses, mezzanines, and other spaces as follows:

(1) Areas calculated as half space. Gross building area shall be calculated in accordance with Appendix Q, with the following exceptions in accordance with TI 800-01 Design Criteria – Appendix B, UEPH:

i. All stairs and elevator shafts count as half space for each floor they serve.

ii. Interior public corridors/breezeways will be calculated as half space.

(2) Excluded space: The following spaces are excluded from gross area calculations: Attic areas where average clear height does not exceed 7 feet; crawl spaces; exterior uncovered loading platforms; open courtyards; normal roof overhangs and soffits for weather protection; uncovered ramps and steps; utility tunnels; raceways; mechanical equipment platforms and catwalks.

(3) Gross area limitations: Maximum authorized gross building areas for each facility is included in this paragraph. Proposals that exceed authorized gross area limitations may be considered non-conforming.

(c) Net area definition: Net area is measured to the inside face of the room or finish walls.

(d) Net Area Requirements: Net area requirements for programmed spaces are included in this chapter. If net area requirements are not specified, the space shall be sized to accommodate the required function and to comply with code requirements, overall gross area limitations, and any other requirement of this RFP (for example, area requirements for corridors, stairs, and mechanical rooms will typically be left to the discretion of the offeror).

3.2.1. ACCESSIBILITY REQUIREMENTS

Able-bodied soldiers occupy and manage UEPH facilities. The Architectural Barriers Act (ABA) requirements do not apply to UEPH facilities, except as follows:

3.2.1.1. Site Plan Design and Construction:

(a) Provide ABA compliant access from the parking lot to the building.

(b) Provide two (2) ABA compliant vehicle parking stalls for each barracks building for visitor parking.

(c) Provide handicapped vehicle parking signage and pavement markings.

3.2.1.2. Facility Design and Construction:

(a) The main building entrance on the ground level and at least one emergency egress, designed per applicable code, shall be handicapped accessible. Electronic exterior door openers with push button control are required for handicapped accessibility.

(b) Provide ABA clearances and door accesses in the building main entry/vestibule being used by visitors.

(c) If a lobby is required by the RFP, provide a handicapped accessible drinking fountain in the lobby.

(d) If a lobby is required by the RFP, provide handicapped accessible public toilet(s), which may be unisex, in the lobby area.

3.2.2. Dwelling Units:

3.2.2.1. Bedrooms: Each dwelling unit shall have two bedrooms, each with a minimum net area of 140 square feet and a maximum net area of 183 square feet. Bedrooms shall be equal in size and similar in configuration. Each bedroom shall have a walk-in closet directly adjacent. Each walk-in closet shall have a net area of 32 square feet, and shall be furnished with hanger rods and shelves. Closet shelf shall be capable of supporting a minimum of 30 pounds per linear foot. Closet shelf shall be 15 inches deep and top of shelf shall be set at 70 inches above closet finish floor. Closet rod and bracket system shall be capable of supporting a minimum of 30 pounds per linear foot. Provide a minimum of 78 linear inches of rod and shelf with no rod and shelf being less than 48 inches long. Each closet door shall have a

Function (F75), Grade 1 closet latch, and be equipped with padlock eyes so the occupant can provide his/her own padlock. One padlock eye shall be mortised into and screw attached flush with door edge on the latch side of the door and the second padlock eye shall be mortised and welded flush into the inside face of the door frame jamb. Padlock eye shall be fabricated to accommodate padlock shackle up to 1/4" diameter. Padlock eye color shall match door frame color. Locate padlock eye at between 4'-6"' and 5'-6" AFF. Location of padlock eyes shall be at the same height in all modules. Each closet door shall have a Type 304 satin finished, stainless steel, robe hook mounted on the closet side of the door. Each closet door shall have a 16 inches wide by 70 inches high by ¼ inch thick, select float glass, full length mirror, in a one piece ½ inch by ½ inch by ½ inch Type 304 satin finished, stainless steel frame, with mitered corners, mounted on the bedroom side of the door. Bottom of mirror shall be located at 6 inches above finish floor. Bedroom shall be able to accommodate the following furniture with adequate circulation for one occupant:

- One twin bed with headboard and footboard 40" wide x 85 long".
- One entertainment center 36" wide x 25" deep x 76" high.
- One chest of drawers 36" wide x 20" deep.
- One nightstand 26" wide x 20" deep.
- One desk 60" wide x 26" deep with retractable keyboard tray and overhead study carrel.
- One desk chair 19 ½" wide by 18" deep.

3.2.2.2. Kitchen: Each dwelling unit shall have a full kitchen with adequate space and circulation to accommodate a full size refrigerator 28 inches wide, a GFGI electric oven/range 30 inches wide, with a CFCI built-in combination 30 inch wide vent hood and microwave oven, centered over the space provided for the electric range, with standard height base cabinet system, wall cabinet system and countertops for food storage and preparation. Provide a minimum of two 18 inches wide drawer units in the kitchen base cabinet system. Provide utility connections and casework to accommodate appliances listed above. Provide area for recyclables receptacle and kitchen waste receptacle. Furnish and install a single bowl stainless steel kitchen sink. Provide utility connections and casework to accommodate future installation of a dishwasher. Future dishwasher space shall be furnished with a removable built-in full width shelf dividing it into two equal spaces, and a pair of removable swing doors matching the rest of the kitchen cabinetry. Provided a minimum of twelve (12) linear feet of base cabinet systems with twelve (12) linear feet of standard height counter and twelve (12) linear feet of wall cabinet systems. Twelve (12) linear feet of standard height counter includes required sink. In addition to the twelve (12) linear feet of standard height counter, kitchen layout shall accommodate a minimum of 36 linear inches of counter style seating and dining for two people, or provide space for a 36 inch diameter dining table with two chairs outside of the kitchen area. Furnish and install a garbage disposer at the kitchen sink.

3.2.2.3. Bathroom: Each dwelling unit shall have one full bath, with an elongated floor mounted flush tank type vitreous china water closet, porcelain enameled cast-iron or enameled steel tub/shower, fixed shower head, lavatory/vanity with storage cabinets below, two minimum 16-inches wide by 24 inches high recessed mirrored medicine cabinet, with adjustable shelves, mounted on the backwall of the vanity. Medicine cabinet construction shall be heavy gauge steel, all welded, with a powder-coated finish. Mirror shall be ¼ inch thick select float glass in a one piece ½ inch by ½ inch by ½ inch Type 304 satin finished, stainless steel frame, with mitered corners. Provide one combination tumbler holder/tooth brush holder and one soap dish at each medicine cabinet. Install each set of tooth brush/tumbler holder and soap dish in a stack, with bottom of tooth brush/tumbler holder 6-inches above top of soap dish. Provide a minimum of two towel bars. Spray end of shower head shall be set at 78 inches above finish height of tub drain. Fiberglass or acrylic tub-surround units are required. Lavatory/vanity shall be separated from the tub/shower-water closet enclosure.

3.2.2.4. Laundry area shall be in the kitchen area and shall be sized to accommodate GFGI full size Heavy Duty residential washer and dryer placed side by side, or GFGI stackable washer/dryer units in each dwelling unit. Provide required power, water, drain, and ventilation connections.

3.2.3. Common Areas:

3.2.3.1. Not Used

3.2.3.2. Not Used

3.2.3.3. Not Used

3.2.3.4. Not Used

3.2.3.5. Not Used

3.2.3.6. Recyclables Storage: Provide one Recyclables Storage per building. Locate the Recyclables Storage on the first floor with access to the complex trash/recyclables dumpster area. Recyclables Storage shall be fully enclosed and ventilated. Recyclables Storage shall be sized to accommodate a minimum of six (6) fifty-gallon barrel sized recyclable containers, with adequate circulation space to allow access to move each container in and out of the Recyclable Storage with a dolly, without having to move the other containers.

3.2.3.7. Janitor's Closet: Provide a minimum of one Janitor's Closet per floor. Each Janitor's Closet shall have a minimum area of 30 square feet. Each Janitor closet shall have a mop sink, mop rack, and space for buckets, vacuum and storage for janitorial supplies. Provide a minimum of six linear feet of 18 inch deep, heavy duty, stainless steel shelving for storage of janitorial supplies.

3.2.3.8. Mechanical, Electrical, and Telecommunications Rooms: Mechanical rooms shall accommodate space for equipment maintenance/repair access without having to remove other equipment. Mechanical, electrical and telecommunications rooms shall be keyed separately for access by Installation maintenance personnel. Filter changes and preventative maintenance shall be performed without requiring access to the dwelling units. First floor exterior access is required for centralized mechanical and electrical rooms. Telecommunications rooms shall comply with the requirements of ANSI/TIA/EIA-569-B. Refer to Mechanical and Electrical Sections for additional information.

3.2.3.9. Mail Access Area: A mail access area shall be designed and constructed as a part of this project. Mail access area shall include one USPS-approved combination lock type mailbox per resident, and a minimum of one USPS-approved two-key parcel locker per 40 residents. The numbering sequence shall be coordinated with the user. Mail access area shall be a mail kiosk separated from the main building with box access on outside, and rear (or front) loading. Location of mail kiosk shall conform to the requirements of ATFP UFC 4-010-01. Mail kiosk shall be protected from the elements and shall be architecturally compatible with the associated barracks building.

3.2.3.10. Boot Wash:

Provide outdoor areas for soldiers to rinse mud off field gear, boots and clothing before laundering. Provide one rinsing station per 30 persons, or a minimum of one boot wash area close to each entrance, whichever is greater. Each rinsing station shall be furnished with a pedestal mounted, hosed cold water faucet or hydrant. Faucet or hydrant shall be non-freeze type.

3.2.3.11. Not Used

3.2.3.12. Vestibule: Provide an enclosed transition space between the exterior and the lobby or building interior. Provide a minimum of 7 feet clearance between interior and exterior doors.

3.3. SITE REQUIREMENTS

3.3.1. Walks: Construct pedestrian walks within the designated construction area and connect to existing sidewalks, where applicable.

(a) Sidewalks shall be a minimum of 6 feet wide. Sidewalks designed to support emergency vehicle traffic shall be a minimum of 20 feet wide per NFPA requirements. Sidewalks designed to support service vehicle traffic shall be a minimum of 10 feet wide. Construct walks paralleling buildings beyond the eave drip line and at least 5 feet from the foundation. Restrict vehicular access to the sidewalks, as required by UFC 4-010-01.

(b) Construct non-vehicular pedestrian sidewalks of Portland Cement Concrete having a minimum nominal thickness of 4 inches. Design joint patterns uniformly, symmetrical, and in accordance with the American Association of State Highway and Transportation Officials (AASHTO) standards. For joints, do not exceed the length to width ratio of 1.25 for non-reinforced pavements.

(c) Sidewalks designed to support emergency and service vehicle traffic will be considered roadway pavements and shall be designed to meet the AASHTO standards. Construct vehicular supported walks of Portland Cement Concrete having a minimum nominal thickness of 7 inches. Design joints uniformly, symmetrical, and in accordance with AASHTO standards. Do not exceed the length to width ratio of 1.25 for non-reinforced pavements.

3.3.2. Site Structures and Amenities

Dumpster Area: The Contractor shall locate, design, and construct the dumpster enclosure area(s) and screening. Dumpster screening shall be aesthetically and architecturally compatible with the building it serves and shall be designed in accordance with the Installation’s guidelines. Locate the dumpster areas in accordance with UFC 4-010-01 “DoD Minimum Antiterrorism Standards for Buildings”. Position the GFGI dumpsters outside of restricted areas to allow for servicing activities.

3.3.3. Site Functional Requirements

(a) Privately Owned Vehicle (POV) Parking: The Contractor shall design and construct the POV parking, within the designated construction area. Base the location and design of the POV parking area(s) on the Installation's site constraints. The Contractor shall ensure that the location of parking complies with UFC 4-010-01. See paragraph 5.2.3, “VEHICLE PAVEMENTS”, for additional information. Provide POV parking spaces for 70 percent of the personnel.

(b) Service Drives: The Contractor shall provide service drives to each building. Locate the drives in accordance with UFC 4-010-01. Restrict access to the drives, where applicable, as required by UFC 4-010-01. Design the pavements as required by paragraph 5.2.3, “VEHICLE PAVEMENTS”. The minimum service drive width shall be 10 feet. The Contractor shall design and construct drives with curb and gutter when necessary for drainage purposes.

(c) Fire Access Lanes: The Contractor shall provide fire access lanes. Access must be provided to three sides, minimum. Access must be within 33 feet of a building’s entrance. Design the fire access lanes in accordance with NFPA 1, UFC-3-600-01, and the installation’s requirements.

3.4. ARCHITECTURAL REQUIREMENTS

3.4.1. Hardware

3.4.1.1. Non-Destructive Emergency Access System: Knox Box: Furnish and install a Knox-Vault 4400 Series (single Lock Model) mounted at each building exterior adjacent to the Main Entry. Required keys for each core: 4 per each BEST core.

3.4.1.2. Finish Hardware: All hardware shall be consistent and shall conform to ANSI/BMHA standards for Grade 1. All requirements for hardware keying shall be coordinated with the Contracting Officer.

Extension of the existing Installation keying system shall be provided, the Installation keying system is Seven pin system , Best Lock or compatible.. Cores shall have not less than seven pins; cylinders shall have key-removable type cores. Disassembly of knob or lockset shall not be required to remove core from lockset. Locksets for mechanical, electrical and communications rooms only shall be keyed to the existing Installation Master Keying System. HVAC terminal units that are accessed from a central corridor shall have a deadbolt to minimize protrusion into corridor. Plastic cores are unacceptable. Provide closers for all exterior doors, all doors opening to corridors and as required by codes. Exit devices shall be installed on all building egress doors.

3.4.1.3. Auxiliary Hardware: Provide wall or floor stops for all exterior doors that do not have overhead holder/stops. Provide other hardware as necessary for a complete installation.

3.4.1.4. Hardware For Fire Doors: Hardware for fire doors shall be installed in accordance with the requirements of applicable codes. Exit devices installed on fire doors shall have a visible label bearing the marking "Fire Exit Hardware". Other hardware installed on fire doors, such as locksets, closers, and hinges shall have a visible label or stamp indicating that the hardware items have been approved by an approved testing agency for installation on fire-rated doors. Hardware for smoke-control door assemblies shall be installed in accordance with applicable codes.

3.4.1.5. Key Card Access System: A Programmable Electronic Key Card Access System shall be provided on all exterior entry/egress doors, dwelling unit doors, bedroom doors and centralized laundry doors (if centralized laundries are required by RFP). Extension of the existing Installation key card access system shall be provided, the existing Installation key card access system is B.A.S.I.S. V. The minimum operability requirement is a key card access system that provides a single key card for the individual soldier, programmable to open all exterior entry/egress doors, the laundry room (if a centralized laundry is provided), the soldier’s dwelling unit door, and the soldier’s bedroom door. A Programmable Electronic Key Card Access System Manufacturer’s Representative shall install all hardware and software necessary for the operation of the Electronic Key Card Access System and program all locksets. Provide six (6) blank key cards for each personnel each building is designed to accommodate. All blank key cards shall be serially numbered and each key card shall have its number permanently inscribed on it. The Design-Build Contractor shall furnish in three-ring binders, one full set of the system manufacturer’s system training manual, system maintenance manual, and one training video (in format provided by the system manufacturer), with each system installed. The Programmable Electronic Key Card Access System Manufacturer’s Representative shall provide two (2) separate 4-hour classes of training for the user on software use, programming locks, encoding cards and printing reports. Each building shall be furnished with a complete stand-alone key card system package. System shall be capable of being compartmentalized so that each building has only the capability to produce key cards for that building. Provide a two (2) year warranty on the system and all components and locksets. All special tools, software, connecting cables and proprietary equipment necessary for the maintenance, testing, and reprogramming of the system shall be furnished to the Contracting Officer Representative.

3.4.1.6. Key Card Access System Accessories: Key Card computer program shall be B.A.S.I.S. V or compatible. The hard key must meet the standard keying convention for Fort Leonard Wood.

3.4.2. Special Acoustical Requirements

3.4.2.1. Exterior walls and roof/floor/ceiling assemblies, doors, windows and interior partitions shall be designed to provide for attenuation of external noise sources such as airfields in accordance with applicable criteria, but no less than the following:

(a) Interior partitions – STC 49

(b) Exterior walls – STC 49

(c) Floors separating sleeping spaces – STC 50 / IIC 55

(d) Module entry, bedroom and bathroom doors – STC 25

3.4.2.2. Sound conditions (and levels) for interior spaces, due to the operation of mechanical and electrical systems and devices, shall not exceed levels as recommended by ASHRAE handbook criteria. Provide acoustical treatment for drain lines and other utilities to prevent noise transmission into the interior of dwelling units

3.4.3. Exterior Design Objectives

Provide durable and easily maintainable materials. Do not use exterior materials that require periodic repainting or similar refinishing processes. Material exposed to weather shall be factory pre-finished, integrally colored or provided with intrinsic weathering finish.

3.4.3.1. Exterior Walls: Where Exterior Insulation and Finish Systems (EIFS), or any other material except CMU or other Masonry material is used as exterior finish material, it shall be in conjunction with a Masonry wainscot. EIFS shall be “high-impact” type and shall be “drainable” type. Masonry units shall be tested for efflorescence. Efflorescence testing shall conform to the provisions of ASTM C 67. CMU construction shall comply with the provisions of ASTM C 1400.

3.4.3.2. Roof System: Minimum roof slope for membrane roof systems shall be 1/4 inch per foot. Minimum roof slope for pitched roof systems shall be 3 inches per foot. Membrane roof systems shall be fully adhered. Structural standing seam metal roofs shall comply with the requirements of ASTM E 1592. Roof system shall be Underwriters Laboratory (UL 580 Class 90) rated or Factory Mutual Global (FM) I-90 rated. Roof system shall comply with applicable criteria for fire rating.

(a) Roof Mounted Equipment: For roof mounted equipment, provide permanent access walkways and platforms to protect roof. Roof mounted equipment on pitched roof systems is unacceptable. Roof mounted equipment on membrane roof systems shall be completely screened by the roof parapet.

(b) Roof access from building exterior is prohibited.

3.4.3.3. Trim and Flashing: Gutters, downspouts, and fascias shall be factory pre-finished metal and shall comply with SMACNA Architectural Sheet Metal Manual.

3.4.3.4. Bird Habitat Mitigation: The Contractor shall provide details in the design necessary to eliminate the congregating and nesting of birds at, on, and in the facility.

3.4.3.5. Exterior Doors and Frames:

(a) Main Entrance Doors: Provide aluminum storefront doors and frames with Architectural Class 1 anodized finish, fully glazed, with medium or wide stile for entry into lobbies or corridors. Provide doors complete with frames, framing members, subframes, transoms, sidelights, trim, applied muntins, and accessories. Framing systems shall have thermal-break design. Storefront systems shall be capable of withstanding area wind loads, thermal and structural movement required by location and project requirements, and shall comply with applicable codes and criteria

(b) Other Exterior Doors: Provide insulated hollow metal exterior doors for entry to all spaces other than corridors, lobbies, or reception/waiting rooms. Doors and frames shall comply with applicable codes and criteria. Doors shall be minimum Level 3, physical performance Level A, Model 2. Frames shall be minimum 12-gauge, with continuously welded mitered corners and seamless face joints. Doors and frames shall be A60 galvannealed, shall comply with ASTM A653 and shall be factory primed. Fire-rated openings shall comply with applicable codes, and the requirements of the labeling authority. Door and frame installation shall comply with applicable codes and criteria.

(c) Stair Exit Doors: Each stair exit door on the first floor shall be furnished with a hard-wired contact switch connected to an alarm system. Alarm system shall sound an alarm at the door location and the CQ Desk when a stair exit door is opened. Switching OFF activated alarm shall be by key at the specific door and remotely at the CQ Desk. The inside face of each stair exit door on the first floor shall be furnished with a photo-luminescent sign. Photo-luminescent signs shall be manufactured and tested in accordance with the most current versions of ASTM E 2072 and ASTM E 2073. Sign shall be minimum 14-inches

wide by 10-inches high, and shall be made of anodized aluminum. Lettering shall be red text on a yellow background. Lettering shall be upper case, and shall read as follows: “EMERGENCY EXIT ONLY” (minimum 4-inches high letters) “SECURITY ALARM WILL SOUND IF DOOR IS OPENED” (minimum 3-inches high letters). Signs shall be mounted centered on interior face of door above exit device.

3.4.3.6. Exterior Windows: Provide insulated, high efficiency window systems, with thermally broken frames complying with applicable codes and criteria. Each bedroom shall have at least one exterior window. Window shall meet egress requirements of NFPA 101 and International Building Code. All bedroom windows shall be operable windows. Operable windows shall be furnished with locks, and fiberglass or aluminum insect screens removable from the inside. Windows shall not open to corridor, balcony or landing. Curtain wall systems shall be capable of withstanding area wind loads, thermal and structural movement required by location and project requirements, and shall comply with applicable codes and criteria. Window sills shall be designed to discourage bird nesting.

3.4.3.7. Exterior Glass and Glazing: Material and installation shall comply with applicable codes and criteria.

3.4.3.8. Thermal Insulation: Provide exterior wall, floor, and roof/ceiling assemblies with thermal transmittance (U-values) required to comply with the proposed energy calculations for the facilities. Insulation shall not be installed directly on top of suspended acoustical panel ceiling systems.

3.4.3.9. Exterior Louvers: Exterior louvers shall have bird screens and shall be designed to exclude wind-driven rain. Exterior louvers shall be made to withstand wind loads in accordance with the applicable codes. Wall louvers shall bear the Air Movement & Control Association (AMCA) International certified ratings program seal for air performance and water penetration in accordance with AMCA 500-D and AMCA 511. Louver finish shall be factory applied.

3.4.4. Interior Design Objectives

General: Provide sustainable materials and furnishings that are easily maintained and replaced. Maximize use of daylighting. Provide interior surfaces that are easy to clean and light in color. Design barracks interior with a residential ambience.

3.4.4.1. Signage: Room signage shall conform to the Housing Automated Management System, (HOMES4). At each dwelling unit, provide two (one on each side of entry door) dwelling unit/room number and changeable two-line message strip signage. Dwelling units shall be sequentially numbered. For example, the first unit on the first floor shall be “101”, first unit on the second floor shall be “201”. Rooms shall be designated using the letters “A and B”. The room designation is determined by standing in the corridor facing the entry door of the dwelling unit, the bedroom on the left is “A” and the one on the right is “B”. The complete dwelling unit/room numbering shall be as in this example, first unit on the second floor “201A and 201B”. Changeable message strip signs shall be of same construction as standard room signs to include a clear sleeve that will accept a paper or plastic insert with identifying changeable text. The insert shall be prepared typeset message photographically enlarged to size and mounted on paper card stock.

3.4.4.2. Bulletin Boards: Provide one bulletin board centrally located on all floors. Bulletin board shall be 4’-0” high and 6’-0” wide. Bulletin boards shall have a header panel and shall have lockable, glazed doors. Glazing shall be laminated glass.

3.4.4.3. Corner Guards: Provide surface mounted, high impact resistant, integral color, snap-on type resilient corner guards, extending from floor to ceiling for wall/column outside corners in high traffic areas. Factory fabricated end closure caps shall be furnished for top and bottom of surface mounted corner guards.

3.4.4.4. Chair Rail: Chair rails shall be installed in areas prone to hi-impact use, such as corridors and lobby.

3.4.4.5. Casework: Provide cabinets complying with AWI Quality Standards. Countertops shall have waterfall front edge. Bathroom, kitchen and public toilet countertops shall have integral coved backsplash. Bathroom and public toilet (if required by RFP) vanity countertop shall be minimum ½ inch thick cast 100 percent acrylic polymer solid surfacing material with waterfall front edge and integral coved backsplash.

3.4.4.6. Fire Extinguisher Cabinets and Fire Extinguisher Mounting Brackets: Furnish and install fire extinguisher cabinets and fire extinguisher mounting brackets as required by applicable codes and criteria. Furnish a list of installed fire extinguisher cabinets and mounting brackets (including location, size and type) to the Contracting Office Representative.

3.4.4.7. Interior Doors and Frames:

(a) Wood Doors: Provide flush solid core wood doors with Grade A hardwood face veneer for transparent finish. Stile edges shall be non-finger jointed hardwood compatible with face veneer. Provide flush solid core wood doors at doors within dwelling unit. Provide solid core insulated hollow metal doors as stated in item (b) below, with a wood grain finish at dwelling unit entry.

(b) Insulated Metal Doors: Comply with applicable codes and criteria. Doors shall be minimum Level 3, physical performance Level A, Model 2; factory primed. Provide insulated metal doors at utility rooms, janitor closets, module entry (if solid core insulated hollow metal door is required), and stairwell doors.

(c) Hollow Metal Frames: Comply with ANSI A250.8/SDI 100. Frames shall be minimum Level 3, 16 gauge, and shall be continuously welded, with mitered corners and seamless face joints; factory primed.

- Contractor's Option – Contractors have the option to furnish knockdown frames for closet and bathroom doors in the dwelling units. Continuously welded frames with mitered corners and seamless face joints at closets and bathroom doors in the dwelling units shall be considered betterments.

(d) Fire-rated and Smoke Control Doors and Frames: Comply with applicable codes, criteria and requirements of labeling authority.

(e) STC ratings shall be of the sound classification required and shall include the entire door and frame assembly.

(f) Each dwelling unit entry door shall be furnished with a brass peep hole door viewer with a viewing angle of 200 degrees minimum.

3.4.4.8. Window Treatment: Provide horizontal mini blinds at all exterior windows. Uniformity of window covering color and material shall be maintained to the maximum extent possible throughout each building. Blinds in barracks bedrooms shall be room darkening mini blinds. Window stools shall be minimum ½ inch thick cast 100 percent acrylic polymer solid surfacing material.

3.4.4.9. Mold and Mildew Mitigation: The Designer of Record shall provide details in the design analysis and design showing steps taken to mitigate the potential growth of mold and mildew in the facility.

3.4.4.10. Toilet Accessories: Furnish and install the items listed below and all other toilet accessories necessary for a complete and usable facility. All toilet accessories except soap dishes at tub/shower shall be Type 304 stainless steel with satin finish.

(a) Public Toilets (IF REQUIRED BY THE RFP): Toilet accessories shall conform to the requirements of the ABA and shall include, but are not limited to the following:

(1) Glass mirrors on stainless steel frame and shelf – at each lavatory

(2) Liquid soap dispenser – at each lavatory

(3) Combination recessed mounted paper-towel dispenser/waste receptacle

(4) Sanitary napkin disposal at each female\unisex toilet

(5) Recessed mounted lockable double toilet paper holder – at each water closet.

(6) Sanitary toilet seat cover dispenser – a minimum of one per toilet room

(7) Grab bars – as required by ABA

(b) Dwelling unit bathroom accessories shall at a minimum include:

(1) Two heavy duty towel bars – minimum 24 inches wide each

(2) Two recessed mounted mirrored medicine cabinets – at each lavatory. (See Section 01 10 00 Paragraph 3.2.2.3.)

(3) Two soap dish - at tub/shower. Soap dishes shall be molded into fiberglass or acrylic tub surround.

(4) One wall mounted retractable clothesline – across tub/shower

(5) Two combination tumbler holder/toothbrush holder – one at each medicine cabinet

(6) Double robe hook - on inside face of bathroom door

(7) Toilet paper holder – at each water closet.

(8) Curved shower curtain rod - extra heavy duty.

(9) Shower curtain – white anti-bacterial nylon/vinyl fabric shower curtain.

(10) Two soap dish – one at each medicine cabinet.

3.4.5. Finishes

Designers are not limited to the minimum finishes listed in this paragraph and are encouraged to offer higher quality finishes.

3.4.5.1. Minimum Paint Finish Requirements

(a) All paints used shall be listed on the "Approved product list" of the Master Painters Institute, (MPI). Application criteria shall be as recommended by Master Painters Institute (MPI) guide specifications for the substrate to be painted and the environmental conditions existing at the project site.

(b) Exterior surfaces, except factory pre-finished material or exterior surfaces receiving other finishes shall be painted a minimum of one prime coat and two finish coats. Paints having a lead content over 0.06 percent by weight of nonvolatile content are unacceptable. Paints containing zinc-chromate, strontium-chromate, mercury or mercury compounds, confirmed or suspected human carcinogens shall not be used on this project. Exterior paints and coating products shall be classified as containing low volatile organic compounds (VOCs) in accordance with MPI criteria. Application criteria shall be as recommended by MPI guide specifications. Provide an MPI Gloss Level 5 Finish (Semi-gloss), unless otherwise specified.

(c) Interior surfaces, except factory pre-finished material or interior surfaces receiving other finishes shall be painted a minimum of one prime coat and two finish coats. Paints having a lead content over 0.06 percent by weight of nonvolatile content are unacceptable. Paints containing zinc-chromate, strontium-chromate, mercury or mercury compounds, confirmed or suspected human carcinogens shall not be used on this project. Interior paints and coating products shall contain a maximum level of 150 g/l (grams per liter) of volatile organic compounds (VOCs) for non-flat coatings and 50 g/l of VOCs for flat coatings. Provide an MPI Gloss Level 5 Finish (Semi-gloss) in wet areas and a flat finish in all other areas.

3.4.5.2. Minimum Interior Finish Requirements

(a) Wall, ceiling and floor finishes shall conform to the requirements of the IBC, NFPA and UFC 3-600-01. Where code requirements conflict, the most stringent code requirement shall apply.

(b) Carpet shall not be used as a floor finish on this project. Vinyl composition tile (VCT) shall be a minimum 1/8 inch thick, conforming to ASTM F 1066, Class 2, through-pattern tile, Composition 1, asbestos free, with color and pattern uniformly distributed throughout the thickness of the tile.

(c) Walls: All wall finish shall be minimum 5/8" painted gypsum board, except where stated otherwise. All gypsum board shall achieve a score of 10, the highest level of performance for mold resistance under the ASTM D 3273 test method. All gypsum board shall be transported, handled, stored and installed in accordance with the GYPSUM ASSOCIATION – Guidelines For Prevention Of Mold Growth On Gypsum Board (GA-238-03). Use impact resistant gypsum board in corridors, storage rooms, stairwells and activity rooms and centralized laundries (if centralized laundries are required by RFP).

(d) All ceiling finishes shall be minimum 5/8" painted gypsum board, except where stated otherwise. All gypsum board shall achieve a score of 10, the highest level of performance for mold resistance under the ASTM D 3273 test method. All gypsum board shall be transported, handled, stored and installed in accordance with the GYPSUM ASSOCIATION – Guidelines For Prevention Of Mold Growth On Gypsum Board (GA-238-03).

MINIMUM INTERIOR FINISHES

	FLOORS					BASE			WALLS		CEILING			REMARKS
	RESILIENT FLOORING	PORCELAIN OR QUARRY TILE	CERAMIC TILE	RECESSED ENTRY MAT	SEALED CONCRETE	RESILIENT BASE	SANITARY COVE CERAMIC BASE	PORCELAIN OR QUARRY TILE	GYPSUM BOARD PAINT	CERAMIC	GYPSUM BOARD PAINT	ACOUSTICAL CEILING TILE	MINIMUM HEIGHT	
COMMON AREAS														
LOBBY (IF REQUIRED BY RFP)		●						●	●		●	●	9'-0"	SEE NOTE 6
PUBLIC TOILET			●				●		●	●	●		8'-0"	SEE NOTES 2, 3 AND 5
VESTIBULES		●		●				●	●		●		9'-0"	
MUDROOM (IF REQUIRED BY RFP)			●				●		●	●	●		8'-0"	SEE NOTES 2 AND 5
BOOT WASH (IF REQUIRED BY RFP)					●								-	
ACTIVITY ROOM (IF REQUIRED BY RFP)		●						●	●		●	●	9'-0"	SEE NOTE 6
MAIL ACCESS AREA		●						●	●		●		8'-0"	IF LOCATED WITHIN BUILDING
MAIL ACCESS AREA					●								8'-0"	IF LOCATED OUTSIDE BUILDING SEE NOTE 10
STAIRS	●				●	●			●		●		8'-0"	SEE NOTE 4
CORRIDORS	●					●			●		●	●	9'-0"	SEE NOTE 6
VENDING											●		8'-0"	SEE NOTE 1

RECYCLABLES STORAGE	●					●			●		●		8’-0”	SEE NOTE 1
JANITOR CLOSETS			●				●		●	●	●		8’-0”	SEE NOTES 2 AND 5
MECHANICAL					●	●			●		●		-	SEE NOTES 5 AND 7
ELECTRICAL					●	●			●		●		-“	
TELECOMMUNICATIONS					●	●			●		●			SEE NOTE 8
CENTRALIZED LAUNDRY (IF REQUIRED BY RFP)		●						●	●		●		8’-0”	SEE NOTE 5
DWELLING UNITS														
KITCHEN	●					●			●		●		8’-0”	SEE NOTE 3
BATHROOM			●				●		●	●	●		8'-0"	SEE NOTES 2 AND 3
BEDROOM	●					●			●		●		9'-0"	SEE NOTE 9
CLOSET	●					●			●		●		8’-0”	

1. FINISHES IN VENDING OR RECYCLABLES STORAGE AREA SHALL MATCH FINISHES IN ADJACENT SPACE.

2. ALL WET WALLS SHALL HAVE A 4'-0" HIGH CERAMIC TILE WAINSCOT. BATHTUB SURROUND SHALL BE AS SPECIFIED IN PARAGRAPH 3.2.2.3.

3. ALL KITCHEN AND BATHROOM COUNTERS SHALL HAVE A MINIMUM OF 4" HIGH BACKSPLASH.

4. STAIR LANDING SHALL BE RESILIENT FLOORING OR SEALED CONCRETE. TREADS SHALL BE RESILIENT FLOORING OR SEALED CONCRETE, PROVIDE SLIP RESISTANT NOSING. RISERS SHALL BE PAINTED STEEL OR RESILIENT FINISH AS REQUIRED FOR STAIR CONSTRUCTION TYPE.

5. PROVIDE FLOOR DRAIN IN CENTER OF ROOM. SLOPE FLOOR TO DRAIN IN ALL ROOMS WITH FLOOR DRAIN

6. UP TO 50% OF CEILING AREA MAY BE ACOUSTICAL CEILING TILE. ALL ACOUSTICAL CEILING TILE SHALL BE INSTALLED WITH HOLD DOWN CLIPS TO PREVENT UPWARD MOVEMENT. CEILING LAYOUT SHALL BE A BALANCED MIX OF GYPSUM BOARD AND ACOUSTICAL CEILING TILE, SUCH THAT ONE FINSH MATERIAL IS NOT CONENTRATED IN OR RESTRICTED TO ONE AREA OF THE CEILING.

7. PROVIDE FLOOR DRAIN IN CENTER OF ROOM. CEILING MAYBE PAINTED EXPOSED STRUCTURE IF ALLOWED BY APPLICABLE CODE AND CRITERIA. THIS NOTE DOES NOT APPLY TO DWELLING UNIT MECHANICAL CLOSETS.

8. COMPLY WITH THE REQUIREMENTS OF ANSI/TIA/EIA-569-B

9. WHERE MASONRY WALLS ARE PROPOSED AS THE BEDROOM WALL FINISH SYSTEM, THE LONGEST WALL IN EACH BEDROOM SHALL BE FINISHED WITH A TACKABLE MATERIAL. TACKABLE MATERIAL SHALL BE GYPSUM BOARD AND SHALL COMPLY WITH THE REQUIREMENTS OF PARAGRAPH 3.4.5.2.(c)

10. CEILING SHALL BE PAINTED EXPOSED STRUCTURE

3.5. STRUCTURAL REQUIREMENTS

Design and construct as a complete system in accordance with APPLICABLE CRITERIA.

3.5.1. Design live loads shall be per the IBC but not lower than the following minimums.

(Note that the minimum live loads indicated do not include partition loads. Partition live loads of 15 pounds per square foot (psf) shall be added to all areas with a live load of 80 psf or less)

(a) Elevated floors — 60 pounds per square foot (psf) minimum

(b) Slab on grade — 150 psf minimum

(c) Centralized laundry area (if required by RFP) 150 psf, (but not less than actual equipment loads)

3.5.2. Wood frame construction is prohibited from use in all facilities 5-stories or greater

3.6. ENERGY CONSERVATION

3.6.1. Energy Compliance

The building, including the building envelope, HVAC systems, service water heating, power, and lighting systems shall be designed to achieve a non-plug load energy consumption that is at least 40% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1-2007 (see paragraph 5.9 Energy Conservation). (Note: Plug loads shall be included in building energy modeling but are subtracted in the final calculation of Energy Performance. See section "Design After Award" for additional guidance.)

3.6.2. Required Energy Conservation Features

All items listed in the required energy conservation features table shall be provided as a minimum. Additional energy conservation features may be required to meet the above energy performance. The contractor is responsible for determining and providing additional energy conservation features to meet the energy performance requirement.

3.6.3. Compliance Documentation

The required energy conservation features shown in the following tables contribute to the achievement of the above energy performance and are life cycle cost effective for a UEPH facility. Use of the required energy conservation features does not eliminate the requirement for energy analysis calculations documenting compliance. The D-B contractor must document compliance with the above energy performance utilizing the methodology described in ASHRAE 90.1, Appendix G as discussed in section 01 33 16 Design After Award.

Climate Zone 4A, Energy Conservation Features Table

Item	Component	Minimum Requirements
Roof	Attic	R-50
	Surface reflectance	0.27
Walls	Light Weight Construction	R-20
Exposed Floors	Mass	R-20
Slabs	Unheated	NR (2)
Doors	Swinging	U-0.70
	Non-Swinging	U-1.45
Infiltration		0.25 cfm/ft^2 @ 75 Pa (3)
Vertical Glazing	Window to Wall Ratio (WWR)	10% - 20%
	Thermal transmittance	U-0.45
	Solar heat gain coefficient (SHGC)	0.31
Interior Lighting	Lighting Power Density (LPD)	

		0.9 W/ft^2
	Ballast	Electronic ballast
HVAC	Air Conditioner	Energy Efficient Heating and Cooling System with Associated Heating and Reheat Coil DOAS with 14 SEER DX coil (3.52 COP), Hot Gas Reheat and Auxiliary Heat/ Reheat Coil
	Gas Furnace	none
	ERV	70% - 75% sensible effectiveness
Economizer		no
Ventilation	Outdoor Air Damper	Motorized control
	Demand Control	NR
	Laundry Room	Decoupled (5)
Ducts	Friction Rate	0.08 in. w.c./100 feet
	Sealing	Seal class B
	Location	Interior only
	Insulation level	R-6 (6)
Service Water Heating	Gas storage	90% E_t

Notes for Energy Conservation Features Table:

(1) NOT USED

(2) NR means there is no requirement or recommendation for a component in this climate.

(3) Increased Building Air tightness. Building air leakage (measured in cfm/ft2) is the average volume of air(measured in cubic feet per minute) that passes through a unit area of the building envelope (measured in square feet) when the building is maintained at a specified internal pressure (measured in Pascals). Testing requirements are specified in Chapter 5..

(4) Dedicated Outdoor Air System. A central dedicated outdoor air system (DOAS) providing the following:

(a) Outside air for building indoor air quality and humidity control

(b) Make-up air for bathroom and kitchen exhausts

(c) Building pressurization to prevent infiltration which allows for reduction of heating/cooling and moisture loads on the system.

NOTE: The Central DOAS does not provide sensible heating or cooling. Sensible loads are provided by a complementing heating and cooling system

(5) **Decoupling exhaust and supply systems for laundry rooms**. To reduce unneeded energy use for heating and cooling of the make-up air and for air transportation of supply and exhausted air from the dryers, laundry exhaust and supply systems are separated in the efficient building model from the rest of the building exhaust and supply systems. Laundry exhaust system and corresponding make-up systems operate only when dryers are operating.

(6) The duct and pipe insulation values are from the ASHRAE Advanced Energy Design Guide for Small Offices.

All design features not described above will be in accordance with the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1-2007. including conformance with paragraph 5.9.2, which requires purchase of Energy Star and FEMP designated products.

3.6.4. Schedules

The following facility schedules must be used in all facility energy simulations for purposes of documenting compliance with energy performance requirement. The peak values indicated for each schedule shall be used for the baseline energy calculation. The hourly peak fraction values for various load components for each schedule shall be used for both the baseline and proposed design energy calculations.

UEPH Common Area Internal Load Schedules

Hr	Occupancy			Lighting			Washer/Dryer Use			Washer SHW		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1-6	0.00	0.00	0.00	0.30	0.30	0.30	0.00	0.00	0.00	0.00	0.00	0.00
7-10	0.20	0.20	0.20	0.30	0.30	0.30	0.00	0.00	0.00	0.00	0.00	0.00
11-18	0.00	0.00	0.00	0.30	0.30	0.30	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.80	0.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00
20-21	0.20	0.20	0.20	0.80	0.80	0.80	0.50	0.50	0.50	0.50	0.50	0.50
22-23	0.40	0.40	0.40	0.80	0.80	0.80	1.00	1.00	1.00	1.00	1.00	1.00
24	0.20	0.20	0.20	0.80	0.80	0.80	0.50	0.50	0.50	0.50	0.50	0.50
Peak	5 occ/floor			1.0 W/ft^2 (10.8 W/m^2)			8.4 kW/floor			53.3 gal/hr/flr (202 L/hr/flr)		

UEPH Apartment Unit Internal Load Schedules

Hr	Occupancy			Lighting			Plug Loads			Service Hot Water		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1-5	0.80	0.75	0.75	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.00	0.00
6	0.70	0.65	0.75	0.40	0.30	0.20	0.20	0.20	0.20	0.10	0.10	0.10
7	0.60	0.60	0.70	0.70	0.50	0.30	0.40	0.35	0.20	0.40	0.40	0.40
8	0.50	0.50	1.00	0.50	0.50	0.50	0.40	0.40	0.40	0.20	0.20	0.20
9	0.25	0.25	0.00	0.20	0.20	0.20	0.30	0.40	0.40	0.00	0.00	0.00
10-17	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.30	0.00	0.00	0.00
18	0.30	0.30	0.30	0.50	0.50	0.50	0.50	0.50	0.50	0.10	0.10	0.10
19	0.50	0.30	0.30	0.70	0.70	0.70	0.50	0.50	0.50	0.10	0.10	0.10
20	0.50	0.50	0.50	0.70	0.70	0.70	0.60	0.50	0.50	0.10	0.10	0.10
21	0.70	0.50	0.50	0.70	0.70	0.70	0.60	0.50	0.50	0.00	0.00	0.00
22	0.70	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00
23	0.80	0.75	0.75	0.40	0.40	0.40	0.40	0.50	0.50	0.00	0.00	0.00
24	0.80	0.75	0.75	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.00	0.00
Peak	2 occ/unit			1.1 W/ft^2 (10.8 W/m^2)			1.7 W/ft^2 (18 W/m^2)			40 gal/hr/person (114 L/hr/person)		

UEPH Apartment Unit Internal Load Schedules

Hr	Refrigerator	Range and Oven

Hr	Refrigerator			Range and Oven		
	Wk	Sat	Sun	Wk	Sat	Sun
1-6	1.00	1.00	1.00	0.01	0. 01	0. 01
7-16	1.00	1.00	1.00	0.04	0.04	0.04
17-18	1.00	1.00	1.00	0.05	0.05	0.05
19-20	1.00	1.00	1.00	0.11	0.11	0.11
21-23	1.00	1.00	1.00	0.10	0.10	0.10
24	1.00	1.00	1.00	0.03	0.03	0.03
Peak	76.36 W/unit			68.95 W/unit		

UEPH Apartment Unit Thermostat Set-Point Schedules

Hr	Heating (°F)			Heating (°C)			Cooling (°F)			Cooling (°C)		
□	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1-24	68	68	68	20	20	20	75	75	75	24	24	24

UEPH Unoccupied Zones (ie stairwells, mechanical rooms) Thermostat Set-Point Schedules

Hr	Heating (°F)			Heating (°C)		
□	Wk	Sat	Sun	Wk	Sat	Sun
1-24	55	55	55	12.8	12.8	12.8

3.7. MECHANICAL REQUIREMENTS

3.7.1. Plumbing

3.7.1.1. Water Heating: Domestic water heating system shall be sized based on 20 gallons of 110 deg. F hot water consumption per occupant during morning peak period. Peak period duration shall be 30 minutes (10 minute duration for shower and lavatory use per occupant per dwelling unit plus a 10 minute transition period). Hot water storage capacity shall be based on 75% usable storage and a storage temperature of 140 deg F. For domestic hot water pipe sizing, peak hot water flow rate shall be based on all showers flowing simultaneously at a rate of 2.0 gpm per shower. Waste stacks, building waste drains, and lift stations (if required) shall be sized with consideration of increased flow rates as well. Domestic hot water distribution shall be at 120 deg F from a central system mixing valve. Domestic hot water distribution piping shall be designed to handle up to 180 deg F water temperatures.

3.7.1.2. Maximum plumbing fixture flow rates:

Water closets: 1.28 gallons per flush or dual flush with an equivalent average flush volume of 1.28 gallons per flush.
Showers: 1.5 gpm
Bathroom sinks: 0.5 gpm
Kitchen sinks: 1.0 gpm
Janitor sinks: 2.0 gpm

3.7.1.3. Boot Wash: Provide sand interceptors in drains from Boot Wash areas.

3.7.1.4. Not Used

3.7.2. Heating, Ventilating and Air-Conditioning

3.7.2.1. All room/dwelling unit HVAC units shall be located in equipment closets accessible only through a corridor access door with keyed deadbolt. Corridor HVAC access doors shall be sized for ease of service and maintenance of HVAC units. Access for maintenance shall not require entry into the dwelling unit. Air filters shall be located in the equipment closet. All dwelling unit HVAC units shall have piping and duct connections that allow quick and easy removal and replacement of individual units.

3.7.2.2. Each dwelling unit shall be positively ventilated using dedicated outdoor air units. Dedicated outdoor air units (DOAUs) shall continuously supply dehumidified, tempered air ducted directly to each bedroom from DOAU. DOAU supply air ductwork shall not connect to dwelling unit heating/cooling unit. Supply air conditions from DOAU shall be between 68 and 75 degree F dry bulb and no greater than 48 degree F dew point. Supply quantity shall be 30 cfm per bedroom for a total of 60 cfm per dwelling unit. Dwelling unit exhaust shall be 45 cfm continuous through a bathroom exhaust. (Note: This exceeds ASHRAE 62.1 but provides compliance with IMC chapter 4 and maintains slight building positive pressurization with respect to dwelling unit exhaust rate of 45 cfm). DOAU unit shall be direct expansion (DX) type and cooling/dehumidification shall be available 24/7/365. Refer to chapter 6 for site specific constraints. The number of exhaust fans and DOAUs shall be the same, and exhaust fans and DOAUs shall be arranged for and shall include exhaust air energy recovery. Exhaust and DOAU systems shall be provided with variable frequency drives (VFDs) and shall be provided with a control logic that provides reduced ventilation rates during periods of low interior humidity and still meet minimum ASHRAE 62.1 requirements.

3.7.2.3. Corridors shall be ventilated per ASHRAE 62.1 by supply from the dedicated outdoor air unit.

3.7.2.4. Dwelling unit room temperature control shall be through the direct digital control (DDC) system. Each dwelling unit shall have a heating/cooling unit with thermostat/temperature control sensor located in common area. Occupant control will include fan selection (on/off) and an occupant temperature setpoint adjustment mechanism that allows +/- 2 deg F of adjustment from the DDC programmed set points (70 deg F heating, 75 deg F cooling). Additionally, the DDC controls shall monitor each dwelling unit for sub-cooling. The DDC system shall record an alarm event if the space temperature drops below 71 degree F (adjustable) when the outside air is greater than 85 degree F (adjustable). Occupant control shall also include ability to select heating or cooling mode. HVAC system shall be able to provide for year round heating or cooling in individual dwelling units as selected by the occupants. Occupant controller shall not have any provisions for occupant adjustment beyond that stated in this paragraph. Any further adjustments beyond as described shall be by authorized personnel only.

3.7.2.5. Kitchen range hoods shall be the U.L. listed ducted to building exterior type.

3.8. ELECTRICAL REQUIREMENTS

Select electrical characteristics of the power system to provide a safe, efficient, and economical distribution of power based upon the size and types of loads to be served. Use distribution and utilization voltages of the highest level that is practical for the load to be served. The effect of nonlinear loads such as computers, other electronic equipment and electronic ballasts shall be considered and accommodated as necessary. Voltage drop shall not exceed the maximum allowed per ASHRAE 90.1. Transient voltage surge protection shall be provided on service equipment. Bedrooms shall be considered to be living and sleeping rooms, therefore they are to be considered to be part of a dwelling unit per NFPA 70.

3.8.1. Interior Lighting

Interior lighting controls shall be provided in accordance with ASHRAE 90.1. Electronic ballasts for linear florescent lamps shall be the high efficiency programmed start type. Provided lighting levels shall be within +/- 10% of required lighting levels.

3.8.1.1. Lighting level in bedrooms shall be 15 foot-candles. Lighting shall utilize compact fluorescent fixtures with automatic occupancy sensor detection switching. Switching shall be manual-ON/Automatic OFF.

3.8.1.2. Lighting level in laundry room(s) shall be 30 foot-candles. Lighting shall have automatic occupancy sensor detection switching.

3.8.1.3. Lighting level in lobbies (if required by the RFP) shall be 10 foot-candles. Lighting in common areas such as corridors and lobbies shall have automatic occupancy sensor detection switching. Sensors in corridors shall be wired such that only the lighting fixtures within the activation range of a particular sensor shall turn on

3.8.1.4. Lighting level in kitchen areas shall be 30 foot-candles with automatic occupancy sensor detection switching. Switching shall be manual-ON/Automatic OFF. Counter top task lighting shall be installed under cabinets utilizing fixtures with 2 foot linear T8 fluorescent lamps with manual on/off switching. Task lighting switching shall be separate from general lighting switching.

3.8.1.5. Lighting level in mechanical and electrical rooms shall be 30 foot-candles. Lighting shall utilize fixtures with T8 fluorescent lamps with manual on/off switching.

3.8.1.6. Provide an illuminance level of 20-footcandles and automatic occupancy sensor detection switching to control fixture(s) in the mudroom (if mudroom is provided).

3.8.1.7. If mail is distributed from an exterior kiosk or through an exterior wall provide a minimum illuminance level of 5-footcandles.

3.8.1.8. Provide compact fluorescent light fixture with automatic occupancy sensor detection switching in each walk-in closet. Switching shall be manual-ON/Automatic OFF.

3.8.1.9. Provide automatic occupancy sensor detection switching in each walk-in closet. Switching shall be manual-ON/Automatic OFF.

3.8.2. Interior Power

Power shall be provided for all installed equipment requiring power to include convenience receptacles and government furnished government installed equipment. Panelboards located in accessible areas, shall be lockable and keyed to one master key.

3.8.2.1. In addition to the requirements of NFPA 70 for dwelling units, a duplex receptacle shall be mounted adjacent to the CATV outlet.

3.8.2.2. Provide a minimum of one 125 volt duplex receptacle on each wall within the lobby (if lobby is provided) for housekeeping purposes.

3.8.2.3. Provide a minimum of one 125 volt duplex receptacle per corridor for housekeeping. No point along a corridor wall at 18” above finished floor shall be more than 25 feet from a receptacle.

3.8.2.4. Provide a minimum of two 125 volt duplex receptacles in mechanical rooms in addition to those required by NFPA 70. This requirement does not apply to the small mechanical rooms used for individual dwelling units. In addition, provide a minimum of one 125 volt duplex receptacle in each electrical room.

3.8.2.5. Electrical service shall be provided for electric dryers regardless of whether or not electric dryers are to be used.

3.8.3. Mass Notification System (MNS)

MNS shall be integrated into the installation's area wide MNS (Giant Voice). See Paragraph 6 for possible additional requirements.

3.9. TELECOMMUNICATIONS REQUIREMENTS

Telecommunications outlets shall be provided per the applicable criteria based on functional purpose of the space within the building.

3.10. CABLE TV (CATV) REQUIREMENTS

All CATV outlet boxes, connectors, cabling, and cabinets shall conform to applicable criteria unless noted otherwise. All horizontal cabling shall be homerun from the CATV outlet to the nearest telecommunications room unless indicated otherwise. See paragraph 6 for possible additional requirements.

3.11. FIRE ALARM REQUIREMENTS

3.11.1.1. All software, software locks, special tools and any other proprietary equipment required to maintain, add devices to or delete devices from the system, or test the Fire Alarm system shall become property of the Government and be furnished to the Contracting Officer's Representative prior to final inspection of the system.

3.11.1.2. The fire alarm system installation shall be supervised by a National Institute for Certification of Engineering Technologies (NICET) Level 3 (minimum) technician.

3.11.1.3. Smoke detectors shall be provided in all bedrooms. Smoke detectors in bedrooms shall be monitored. Tampering with a smoke detector shall send a trouble signal. Trouble signals shall be transmitted to the fire department.

4.0 APPLICABLE CRITERIA

Unless a specific document version or date is indicated, use criteria from the most current references, including any applicable addenda, unless otherwise stated in the contract or task order, as of the date of the Contractor's latest accepted proposal or date of issue of the contract or task order solicitation, whichever is later. In the event of conflict between References and/or Applicable Military Criteria, apply the most stringent requirement, unless otherwise specifically noted in the contract or task order.

4.1. INDUSTRY CRITERIA

Applicable design and construction criteria references are listed in Table 1 below. This list is not intended to include all criteria that may apply or to restrict design and construction to only those references listed. See also Paragraph 3 for additional facility-specific applicable criteria.

Table 1: Industry Criteria

Air Conditioning and Refrigeration Institute (ARI)	
ARI 310/380	Packaged Terminal Air-Conditioners and Heat Pumps
ARI 440	Room Fan-Coil and Unit Ventilator
ANSI/ARI 430-99	Central Station Air Handling Units
ARI 445	Room Air-Induction Units
ARI 880	Air Terminals
Air Movement and Control Association (AMCA)	
AMCA 210	Laboratory Methods of Testing Fans for Rating
American Architectural Manufacturers Association (AAMA)	
AAMA 605	Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
AAMA 607.1	Voluntary Guide Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum
AAMA 1503	Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections
American Association of State Highway and Transportation Officials (AASHTO)	

	Roadside Design Guide [guardrails, roadside safety devices]
	Standard Specifications for Transportation Materials and Methods of Sampling and Testing [Road Construction Materials]
	Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals
	Guide for Design of Pavement Structures, Volumes 1 and 2 [pavement design guide]
	A Policy of Geometric Design of Highways and Streets
American Bearing Manufacturers Association (AFBMA)	
AFBMA Std. 9	Load Ratings and Fatigue Life for Ball Bearings
AFBMA Std. 11	Load Ratings and Fatigue Life for Roller Bearings
American Boiler Manufacturers Association (ABMA)	
ABMA ISEI	Industry Standards and Engineering Information
American Concrete Institute	
ACI 302.2R	Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials
ACI 318	Building Code Requirements for Structural Concrete
ACI SP-66	ACI Detailing Manual
ACI 530	Building Code Requirements for Masonry Structures
ADA Standards for Accessible Design	
See US Access Board	ADA and ABA Accessibility Guidelines for Buildings and Facilities, Chapters 3-10.
American Institute of Steel Construction (AISC)	
	Manual of Steel Construction – 13th Edition (or latest version)

American Iron and Steel Institute	
AISI S100	North American Specification for the Design of Cold-Formed Steel Structural Members
American National Standards Institute 11 (ANSI)	
ANSI Z21.10.1	Gas Water Heaters Vol. 1, Storage water Heaters with Input Ratings of 75,000 Btu per Hour or less
ANSI Z124.3	American National Standard for Plastic Lavatories
ANSI Z124.6	Plastic Sinks
ANSI Z21.45	Flexible Connectors of Other Than All-Metal Construction for Gas Appliances
ANSI/IEEE C2	National Electrical Safety Code
ANSI/AF&PA NDS	National Design Specification for Wood Construction
American Society of Civil Engineers (ASCE)	
ASCE 7	Minimum Design Loads for Buildings and Other Structures
ASCE 37	Design and Construction of Sanitary and Storm Sewers, Manuals and Reports on Engineering Practice [sanitary sewer and storm drain design criteria]
ASCE/SEI 31-03	Seismic Evaluation of Existing Buildings [Existing Building Alteration/Renovation]
ASCE/SEI 41-06	Seismic Rehabilitation of Existing Buildings [Existing Building Alteration/Renovation]
American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)	
ASHRAE 90.1	ANSI/ASHRAE/IESNA 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE Guideline 0	The Commissioning Process
ASHRAE Guideline 1.1	The HVAC Commissioning Process

ASHRAE Handbooks	Fundamentals, HVAC Applications, Systems and Equipment, Refrigeration (Applicable, except as otherwise specified)
ASHRAE Standard 15	Safety Standard for Refrigeration Systems
ASHRAE Standard 62.1	Ventilation for Acceptable Indoor Air Quality
ASHRAE Standard 55	Thermal Environmental Conditions for Human Occupancy (Design portion is applicable, except where precluded by other project requirements.)
ASHRAE Standard 189.1	Standard for the Design of High-Performance Green Buildings (ANSI Approved; USGBC and IES Co-sponsored), - (APPLICABLE TO THE EXTENT SPECIFICALLY CALLED OUT IN THE CONTRACT)
American Society of Mechanical Engineers International (ASME)	
ASME BPVC SEC VII	Boiler and Pressure Vessel Code: Section VII Recommended Guidelines for the Care of Power Boilers
ASME A17.1	Safety Code for Elevators and Escalators
ASME B 31 (Series)	Piping Codes
American Water Works Association (AWWA)	
	Standards [standards for water line materials and construction]
American Welding Society	
	Welding Handbook
	Welding Codes and Specifications (as applicable to application, see International Building Code for example)
Architectural Woodwork Institute (AWI)	
Latest Version	AWI Quality Standards
Associated Air Balance Council (AABC)	
AABC MN-1	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems

	AABC Associated Air Balance Council Testing and Balance Procedures
ASTM International	
ASTM C1060-90(	Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings
ASTM E 779	Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
ASTM E1827-96	Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
Builders Hardware Manufacturers Association (BHMA)	
ANSI/BHMA	The Various BHMA American National Standards
Building Industry Consulting Service International	
	Telecommunications Distribution Methods Manual (TDMM)
	Customer-Owned Outside Plant Design Manual (CO-OSP)
Code of Federal Regulations (CFR)	
49 CFR 192	Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards
10 CFR 430	Energy Conservation Program for Consumer Products
Consumer Electronics Association	
CEA 709.1B	Control Network Protocol Specification
CEA 709.3	Free-Topology Twisted-Pair Channel Specification
CEA 852	Tunneling Component Network Protocols Over Internet Protocol Channels
Electronic Industries Association (EIA)	
ANSI/EIA/TIA 568	Structured Cabling Series

ANSI/EIA/TIA 569	Commercial Building Standard for Telecommunications Pathways and Spaces (includes ADDENDA)
ANSI/TIA/EIA-606	Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings
J-STD EIA/TIA 607	Commercial Building Grounding and Bonding Requirements for Telecommunications
Federal Highway Administration (FHWA)	
	Manual on Uniform Traffic Control Devices for Streets and Highways [signage and pavement markings for streets and highways]
FHWA-NHI-01-021	Hydraulic Engineering Circular No. 22, Second Edition, URBAN DRAINAGE DESIGN MANUAL
Illuminating Engineering Society of North America (IESNA)	
IESNA RP-1	Office Lighting
IESNA RP-8	Roadway Lighting
IESNA Lighting Handbook	Reference and Application
Institute of Electrical and Electronics Engineers Inc. (IEEE)	
	Standard for Use of the International System of Units (SI): the Modern Metric System
Standard 1100	Recommended Practice for Powering and Grounding Sensitive Electronic Equipment
International Code Council (ICC)	
IBC	International Building Code Note: All references in the International Building Code to the International Electrical Code shall be considered to be references to NFPA 70. All references in the International Building Code to the International Fuel Gas Code shall be considered to be references to NFPA 54 and NFPA 58. All references in the International Building Code to the International Fire

	Code and Chapter 9 shall be considered to be references to Unified Facilities Criteria (UFC) 3-600-01.
IMC	International Mechanical Code – Note: For all references to “HEATING AND COOLING LOAD CALCULATIONS”, follow ASHRAE 90.1 Note: For all references to “VENTILATION”, follow ASHRAE 62.1
IRC	International Residential Code
IPC	International Plumbing Code
IEC	Energy Conservation Code (IEC) –Applicable only to the extent specifically referenced herein. Refer to Paragraph 5, ENERGY CONSERVATION requirements.
IGC	International Gas Code - not applicable. Follow NFPA 54, National Fuel Gas Code and NFPA 58, Liquified Petroleum Gas Code.
International Organization for Standardization (ISO)	
ISO 6781:1983	Qualitative detection of thermal irregularities in building envelopes – infrared method
LonMark International (LonMark)	
LonMark Interoperability Guidelines	(available at www.lonmark.org), including: Application Layer Guidelines, Layer 1-6 Guidelines, and External Interface File (XIF) Reference Guide
LonMark Resource Files	(available at www.lonmark.org), including Standard Network Variable Type (SNVT) definitions
Metal Building Manufacturers Association (MBMA)	
	Metal Building Systems Manual
Midwest Insulation Contractors Association (MICA)	
	National Commercial and Industrial Insulation Standards Manual
National Association of Corrosion Engineers International (NACE)	

NACE RP0169	Control of External Corrosion on Underground or Submerged Metallic Piping Systems
NACE RP0185	Extruded, Polyolefin Resin Coating Systems with Adhesives for Underground or Submerged Pipe
NACE RP0285	Corrosion Control of Underground Storage Tank Systems by Cathodic Protection
NACE RP0286	Electrical Isolation of Cathodically Protected Pipelines
National Electrical Manufacturers Association (NEMA)	
National Environmental Balancing Bureau (NEBB)	
	Procedural Standards Procedural Standards for Testing Adjusting Balancing of Environmental Systems
National Fire Protection Association (NFPA)	
NFPA 10	Standard for Portable Fire Extinguishers
NFPA 13	Installation of Sprinkler Systems
NFPA 13R	Residential Occupancies up to and Including Four Stories in Height Sprinkler Systems
NFPA 14	Standard for the Installation of Standpipes and Hose Systems
NFPA 20	Installation of Centrifugal Fire Pumps
NFPA 24 NFPA 25	Standard for the Installation of Private Fire Service Mains and Their Appurtenances [underground fire protection system design] Inspection, Testing And Maintenance Of Water-Based Fire Protection Systems
NFPA 30	Flammable and Combustible Liquids Code
NFPA 30A	Motor Fuel Dispensing Facilities and Repair Garages
NFPA 31	Installation of Oil Burning Equipment
NFPA 54	National Fuel Gas Code

NFPA 58	Liquefied Petroleum Gas Code
NFPA 70	National Electrical Code
NFPA 70E	Standard for Electrical Safety in the Workplace
NFPA 72	National Fire Alarm Code
NFPA 76	Fire Protection of Telecommunications Facilities
NFPA 80	Standard for Fire Doors and Fire Windows
NFPA 90a	Installation of Air Conditioning and Ventilating Systems
NFPA 96	Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
NFPA 101	Life Safety Code
NFPA 780	Standard for the Installation of Lightning Protection Systems
National Roofing Contractor's Association (NRCA)	
	Roofing and Waterproofing Manual
National Sanitation Foundation, International	
NSF/ANSI Std. 2, 3, 4, 5, 6, 7, 8, 12, 13, 18, 20, 21, 25, 29, 35, 36, 37, 51, 52, 59, 169	Food Equipment Standards
ANSI/UL Std. 73, 197, 471, 621, 763	Food Equipment Standards
CSA Std. C22.2 No. 109, 120, 195	Food Equipment Standards
Occupational Safety and Health Administration (OSHA)	
Title 29, Part 1926	OSHA Construction Industry Standards, Title 29, Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction

Plumbing and Drainage Institute (PDI)	
PDI G 101	Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data
PDI WH201	Water Hammer Arrestors
Precast Concrete Institute	
PCI Design Handbook	Precast and Prestressed Concrete
Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)	
SMACNA HVAC Duct Construction Standards	HVAC Duct Construction Standards - Metal and Flexible
SMACNA Architectural Manual	Architectural Sheet Metal Manual
SMACNA HVAC TAB	HVAC Systems - Testing, Adjusting and Balancing
State/Local Regulations	
	State Department of Transportation Standard Specifications for Highway and Bridge Construction
	Sedimentation and Erosion Control Design Requirements
	Environmental Control Requirements
	Storm Water Management Requirements
Steel Door Institute (SDI)	
ANSI A250.8/SDI 100	Standard Steel Doors and Frames
Steel Deck Institute	
	SDI Diaphragm Design Manual
Steel Joist Institute	
	Catalog of Standard Specifications and Load Tables for Steel Joists and

	Joist Girders
Underwriters Laboratories (UL)	
UL 96A	Installation Requirements for Lightning Protection Systems
UL 300	Standard for Safety for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas
UNITED STATES ACCESS BOARD: U.S. ARCHITECTURAL AND TRANSPORTATION BARRIERS COMPLIANCE BOARD	
ADA and ABA Accessibility Guidelines for Buildings and Facilities	ABA Accessibility Standard for DoD Facilities Derived from the ADA and ABA Accessibility Guidelines: Specifically includes: ABA Chapters 1 and 2 and Chapters 3 through 10. Use this reference in lieu of IBC Chapter 11. Excluded are: (a) Facilities, or portions of facilities, on a military installation that are designed and constructed for use exclusively by able-bodied military personnel (See Paragraph 3 for any reference to this exclusion). (b) Reserve and National Guard facilities, or portions of such facilities, owned by or under the control of the Department of Defense, that are designed and constructed for use exclusively by able-bodied military personnel. (See paragraph 3 for any reference to this exclusion).
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES	
	FDA National Food Code
U.S. GREEN BUILDING COUNCIL (USGBC)	
LEED-NC	Green Building Rating System for New Construction & Major Renovations
	Application Guide for Multiple Buildings and On-Campus Building Projects

4.2. MILITARY CRITERIA

The project shall conform to the following criteria. Certain design impacts and features due to these criteria are noted for the benefit of the offeror. However, all requirements of the referenced criteria will be applicable, whether noted or not, unless otherwise specified herein.

4.2.1. Energy Policy Act of 2005 (Public Law 109-58) (applies only to the extent specifically implemented in the contract, which may or may not directly cite or reference EPACT)

4.2.2. Executive Order 12770: Metric Usage In Federal Government

(a) Metric design and construction is required except when it increases construction cost. Offeror to determine most cost efficient system of measurement to be used for the project.

4.2.3. TB MED 530: Occupational and Environmental Health Food Sanitation

4.2.4. Unified Facilities Criteria (UFC) 3-410-01FA: Heating, Ventilating, and Air Conditioning - applicable only to the extent specified in paragraph 5, herein.

4.2.5. Deleted.

4.2.6. UFC 3-600-01 Design: Fire Protection Engineering for Facilities. Use the latest edition of the IBC in coordination with this UFC. Use Chapters 3, 6, 7, 33 and UFC 3-600-01. If any conflict occurs between these Chapters and UFC 3-600-01, the requirements of UFC 3-600-01 take precedence. Use UFC 3-600-01 in lieu of IBC Chapters 4, 8,9,10.

4.2.7. UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings

4.2.8. UFC 4-023-03 Design of Buildings to Resist Progressive Collapse (Use most recent version, regardless of references thereto in other publications)

(a) Note the option to use tie force method or alternate path design for Occupancy Category II.

4.2.9. UFC 4-021-01 Design and O&M: Mass Notification Systems

4.2.10. Technical Criteria for Installation Information Infrastructure Architecture (I3A)

(a) Email: DetrickISECI3Aguide@conus.army.mil

4.2.11. U.S. Army Information Systems Engineering Command (USAISEC) SECRET Internet Protocol (IP) Router Network (SIPRNET) Technical Implementation Criteria (STIC).. See Paragraph 3 for applicability to specific facility type. May not apply to every facility. This is mandatory criteria for those facilities with SIPRNET.

4.2.11.1. Draft Guide Specification for Section 27 05 28 PROTECTIVE DISTRIBUTION SYSTEM (PDS) FOR SIPRNET COMMUNICATIONS SYSTEMS, found at http://mrsi.usace.army.mil/rfp/Shared%20Documents/SECTION_270528-v3.pdf

5.0 GENERAL TECHNICAL REQUIREMENTS

This paragraph contains technical requirements with general applicability to Army facilities. See also Paragraph 3 for facility type-specific operational, functional and technical requirements. Residential or similar grade finishes and materials are not acceptable for inclusion in these buildings, unless otherwise specifically allowed.

5.1. SITE PLANNING AND DESIGN

5.1.1. STANDARDS AND CODES: The site planning and design shall conform to APPLICABLE CRITERIA and to paragraph 6, PROJECT SPECIFIC REQUIREMENTS.

5.1.2. SITE PLANNING OBJECTIVES: Group buildings in configurations that create a sense of community and promote pedestrian use. See paragraph 3 for additional site planning requirements relating to building functions.

5.1.2.1. Provide enclosures and or visual screening devices for Outdoor Utility such as dumpsters, emergency generators, transformers, heating, ventilation, and air conditioning units from streetscape and courtyard views to limit visual impact. Enclosures shall be compatible with the building they serve and accessible by vehicle. The location of dumpsters can have a significant visual impact and should be addressed as part of an overall building design and incorporated in site planning.

5.1.2.2. Where included in the project, dumpster pads shall be concrete (minimum of 8 inches thick on 4 inch base course, unless site conditions dictate more conservative requirements) and directly accessible by way of a paved service drive or parking lot with adequate overhead clearance for collection vehicles. Provide space at dumpster areas for recycling receptacles. Coordinate with Installation on recycling receptacle types, sizes and access requirements and provide space at dumpster areas to accommodate them.

5.1.2.3. Vehicular Circulation. Apply design vehicle templates provided by the American Association of State Highway and Transportation Officials (AASHTO) to the site design. The passenger car class includes passenger cars and light trucks, such as vans and pick-ups. The passenger car template is equivalent to the non-organizational – privately owned vehicle (POV). The truck class template includes single-unit trucks, recreation vehicles, buses, truck tractor-semi-trailer combinations, and trucks or truck tractors with semi-trailers in combination with full trailers. Provide vehicle clearances required to meet traffic safety for emergency vehicles, service vehicles, and moving vans. Provide required traffic control signage Site entrances and site drive aisles shall maximize spacing between drives, incorporate right-angle turns, and limit points of conflict between traffic. Design Services Drives to restrict access to unauthorized vehicles by removable bollards, gates, or other barriers to meet Anti-Terrorism/Force Protection (ATFP) requirements. Orient service drives to building entrances other than the primary pedestrian entry at the front of the building.

5.1.2.4. Provide Emergency Vehicle Access around the facility and shall be in accordance with AT/FP requirements. Maintain a 33-foot clear zone buffer for emergency vehicles, designed to prevent other vehicles from entering the AT/FP standoff to the building.

5.1.2.5. Clear and grub all trees and vegetation necessary for construction; but, save as many trees as possible. Protect trees to be saved during the construction process from equipment.

5.1.2.6. Stormwater Management. Employ design and construction strategies (Best Management Practices) that reduce stormwater runoff, reduce discharges of polluted water offsite and maintain or restore predevelopment hydrology with respect to temperature, rate, volume and duration of flow to the maximum extent practicable. See paragraph 6, PROJECT SPECIFIC requirements for additional information.

5.1.3. EXTERIOR SIGNAGE: Provide exterior signage in accordance with Appendix H, Exterior Signage. Provide exterior NO SMOKING signage that conveys building and grounds smoking policy.

5.1.4. EXISTING UTILITIES: Base utilities maps and capacities for this site are included as part of this RFP. See paragraph 6 for more detailed information.

5.2. SITE ENGINEERING

5.2.1. STANDARDS AND CODES: The site engineering shall conform to APPLICABLE CRITERIA.

5.2.2. SOILS:

5.2.2.1. A report has been prepared to characterize the subsurface conditions at the project site and is **appended to these specifications.** The report provides a general overview of the soil and geologic conditions with detailed descriptions at discrete boring locations. The Contractor's team shall include a licensed geotechnical engineer to interpret the report and develop earthwork and foundation recommendations and design parameters in which to base the contractor's design. If any additional subsurface investigation or laboratory analysis is required to better characterize the site or develop the final design, the Contractor shall perform it under the direction of a licensed geotechnical engineer. There will be no separate payment for the cost of additional tests. If differences between the Contractor's additional subsurface investigation and the government provided soils report or the reasonably expected conditions require material revisions in the design, an equitable adjustment may be made, in accordance with the provisions of the Differing Site Conditions clause. The basis for the adjustment would be the design and construction appropriate for the conditions described in the Government furnished report or the reasonably expected conditions, in comparison with any changes required by material differences in the actual conditions encountered, in accordance with the terms of contract clause Differing Site Conditions.

5.2.2.2. The contractor's licensed geotechnical engineer shall prepare a final geotechnical evaluation report, to be submitted along with the first foundation design submittal, as described in Section 01 33 16, *Design After Award*.

5.2.3. VEHICLE PAVEMENTS: (as applicable to the project)

5.2.3.1. Design procedures and materials shall conform to one of the following: 1) the USACE Pavement Transportation Computer Assisted Structural Engineering (PCASE) program, 2) American Association of State Highway and Transportation Officials (AASHTO) or, 3) the applicable state Department of Transportation standards in which the project is located. See paragraph 5.2.2.2 and Section 01 33 16 for required information for the Contractor's geotechnical evaluation report. Provide underdrain systems for pavement designs over cohesive soil subgrades. The minimum flexible pavement section shall consist of 2 inches of asphalt and 6 inches of base or as required by the pavement design, whichever is greater, unless specifically identified by the Government to be a gravel road. Design roads and parking areas for a life expectance of 25 years with normal maintenance. Parking area for tactical vehicles (as applicable to the project) shall be Portland Cement Concrete (PCC) rigid pavement design. For concrete pavements, submit joint layout plan for review and concurrence. Design pavements for military tracked vehicles (as applicable to the project) IAW USACE PCASE. Traffic estimates for each roadway area will be as shown on the drawings or listed in Section 01 10 00 Paragraph 6.4.4. Pavement markings and traffic signage shall comply with the Installation requirements and with the Manual on Uniform Traffic Control Devices.

5.2.3.2. Parking Requirements.

(a) All handicap POV parking lots (where applicable in the facility specific requirements) shall meet the ADA and ABA Accessibility Guidelines for accessible parking spaces.

(b) Design POV parking spaces for the type of vehicles anticipated, but shall be a minimum of 9 ft by 18 ft for POVs, except for two wheel vehicles.

5.2.3.3. Sidewalks. Design the network of walks throughout the complex (where applicable) to facilitate pedestrian traffic among facilities, and minimize the need to use vehicles. Incorporate sidewalks to enhance the appearance of the site development, while creating a sense of entry at the primary patron entrances to the buildings. Minimum sidewalk requirements are in Paragraph 3, where applicable and/or paragraph 6 and/or site plans, where applicable..

5.2.4. CATHODIC PROTECTION: Provide cathodic protection systems for all underground metallic systems and metallic fittings/portions of non-metallic, underground systems, both inside and outside the building 5 foot line that are subject to corrosion. Coordinate final solutions with the installation to insure an approach that is consistent with installation cathodic protection programs.

5.2.5. UTILITIES: See paragraph 6.4.6 for specific information on ownership of utilities and utility requirements. Meter all utilities (gas, water, and electric, as applicable) to each facility. For Government owned utilities, install meters that are wireless data transmission capable as well as have a continuous manual reading option. All meters will be capable of at least hourly data logging and transmission and provide consumption data for gas, water, and electricity. Gas and electric meters will also provide demand readings based on consumption over a maximum of any 15 minute period. Configure all meters to transmit at least daily even if no receiver for the data is currently available at the time of project acceptance. For privatized utilities, coordinate with the privatization utility(ies) for the proper meter base and meter installation.

5.2.6. PERMITS: The CONTRACTOR shall be responsible for obtaining all permits (local, state and federal) required for design and construction of all site features and utilities.

5.2.7. IRRIGATION. Landscape irrigation systems, if provided, shall comply with the following:

5.2.7.1. Irrigation Potable Water Use Reduction. Reduce irrigation potable water use by 100 percent using LEED credit WE1.1 baseline (no potable water used for irrigation), except where precluded by other project requirements.

5.2.8. EPA WATERSENSE PRODUCTS AND CONTRACTORS. Except where precluded by other project requirements, use EPA WaterSense labeled products and irrigation contractors that are certified through a WaterSense labeled program where available.

5.3. ARCHITECTURE AND INTERIOR DESIGN:

This element will be evaluated per APPLICABLE CRITERIA under the quality focus.

5.3.1. STANDARDS AND CODES: The architecture and interior design shall conform to APPLICABLE CRITERIA.

5.3.2. GENERAL: Overall architectural goal is to provide a functional, quality, visually appealing facility that is a source of pride for the installation and delivered within the available budget and schedule.

5.3.3. COMPUTATION OF AREAS: See APPENDIX Q for how to compute gross and net areas of the facility(ies).

5.3.4. BUILDING EXTERIOR: Design buildings to enhance or compliment the visual environment of the Installation. Where appropriate, reflect a human scale to the facility. Building entrance should be architecturally defined and easily seen. When practical, exterior materials, roof forms, and detailing shall be compatible with the surrounding development and adjacent buildings on the Installation and follow

locally established architectural themes. Use durable materials that are easy to maintain. Exterior colors shall conform to the Installation requirements. See paragraph 6.

5.3.4.1. Building Numbers: Permanently attach exterior signage on two faces of each building indicating the assigned building number or address. Building number signage details and locations shall conform to Appendix H, Exterior Signage.

5.3.5. BUILDING INTERIOR

5.3.5.1. Space Configuration: Arrange spaces in an efficient and functional manner in accordance with area adjacency matrices.

5.3.5.2. Surfaces: Appearance retention is the top priority for building and furniture related finishes. Provide low maintenance, easily cleaned room finishes that are commercially standard for the facility occupancy specified, unless noted otherwise.

5.3.5.3. Color: The color, texture and pattern selections for the finishes of the building shall provide an aesthetically pleasing, comfortable, easily maintainable and functional environment for the occupants. Coordinate the building colors and finishes for a cohesive design. Select colors appropriate for the building type. Use color, texture and pattern to path or way find through the building. Trendy colors that will become dated shall be limited to non-permanent finishes such as carpet and paint. Select finisheswith regards to aesthetics, maintenance, durability, life safety and image. Limit the number of similar colors for each material. Use medium range colors for ceramic and porcelain tile groutto help hide soiling. Plastic laminate and solid surface materials shall have patterns that are mottled, flecked or speckled. Coordinate finish colors of fire extinguisher cabinets, receptacle bodies and plates, fire alarms / warning lights, emergency lighting, and other miscellaneous items with the building interior. Match color of equipment items on ceilings (speakers, smoke detectors, grills, etc.) the ceiling color.

5.3.5.4. Circulation: Circulation schemes must support easy way finding within the building.

5.3.5.5. Signage: Provide interior signage for overall way finding and life safety requirements. A comprehensive interior plan shall be from one manufacturer. Include the following sign types: (1) Lobby Directory, (2) Directional Signs; (3) Room Identification Signs; (4) Building Service Signs; (5) Regulatory Signs; (6) Official and Unofficial Signs (7) Visual Communication Boards (8) NO SMOKING signage that conveys building smoking policy. Use of emblems or logos may also be incorporated into the signage plan.

5.3.5.6. Window Treatment: Provide interior window treatments with adjustable control in all exterior window locations for control of day light coming in windows or privacy at night. Maintain uniformity of treatment color and material to the maximum extent possible within a building.

5.3.5.7. Casework: Unless, otherwise specified, all casework for Cabinetry and cases shall be “custom grade”, as described in the AWI Quality Standards.

5.3.6. COMPREHENSIVE INTERIOR DESIGN

5.3.6.1. Comprehensive Interior Design includes the integration of a Structural Interior Design (SID) and a Furniture, Fixtures and Equipment (FF&E) design and package. SID requires the design, selection and coordination of interior finish materials that are integral to or attached to the building structure. Completion of a SID involves the selection and specification of applied finishes for the building’s interior features including, but not limited to, walls, floors, ceilings, trims, doors, windows, window treatments, built-in furnishings and installed equipment, lighting, and signage. The SID package includes finish schedules, finish samples and any supporting interior elevations, details or plans necessary to communicate the building finish design and build out. The SID also provides basic space planning for the anticipated FF&E requirements in conjunction with the functional layout of the building and design issues

such as life safety, privacy, acoustics, lighting, ventilation, and accessibility. See Section 01 33 16 for SID design procedures.

5.3.6.2. The FF&E design and package includes the design, selection, color coordination and of the required furnishing items necessary to meet the functional, operational, sustainability, and aesthetic needs of the facility coordinated with the interior finish materials in the SID. The FF&E package includes the specification, procurement documentation, placement plans, ordering and finish information on all freestanding furnishings and accessories, and a cost estimate. Coordinate the selection of furniture style, function and configuration with the defined requirements. Examples of FF&E items include, but are not limited to workstations, seating, files, tables, beds, wardrobes, draperies and accessories as well as marker boards, tack boards, and presentation screens. Criteria for furniture selection include function and ergonomics, maintenance, durability, sustainability, comfort and cost.

5.4. STRUCTURAL DESIGN

5.4.1. STANDARDS AND CODES: The structural design shall conform to APPLICABLE CRITERIA.

5.4.2. GENERAL: The structural system must be compatible with the intended functions and components that allows for future flexibility and reconfigurations of the interior space. Do not locate columns, for instance, in rooms requiring visibility, circulation or open space, including, but not limited to entries, hallways, common areas, classrooms, etc. Select an economical structural system based upon facility size, projected load requirements and local availability of materials and labor. Base the structural design on accurate, site specific geotechnical information and anticipated loads for the building types and geographical location. Consider climate conditions, high humidity, industrial atmosphere, saltwater exposure, or other adverse conditions when selecting the type of cement and admixtures used in concrete, the concrete cover on reinforcing steel, the coatings on structural members, expansion joints, the level of corrosion protection, and the structural systems. Analyze, design and detail each building as a complete structural system. Design structural elements to preclude damage to finishes, partitions and other frangible, non-structural elements to prevent impaired operability of moveable components; and to prevent cladding leakage and roof ponding. Limit deflections of structural members to the allowable of the applicable material standard, e.g., ACI, AISC, Brick Industry Association, etc. When modular units or other pre-fabricated construction is used or combined with stick-built construction, fully coordinate and integrate the overall structural design between the two different or interfacing construction types. If the state that the project is located in requires separate, specific licensing for structural engineers (for instance, such as in Florida, California and others), then the structural engineer designer of record must be registered in that state.

5.4.3. LOADS: See paragraph 3 for facility specific (if applicable) and paragraph 6 for site and project specific structural loading criteria. Unless otherwise specified in paragraph 6, use Exposure Category C for wind. If not specified, use Category C unless the Designer of Record can satisfactorily justify another Exposure Category in its design analysis based on the facility Master Plan. Submit such exceptions for approval as early as possible and prior to the Interim Design Submittal in Section “Design After Award”. Design the ancillary building items, e.g. doors, window jambs and connections, overhead architectural features, systems and equipment bracing, ducting, piping, etc. for gravity, seismic, lateral loads and for the requirements of UFC 4-010-01, DOD Minimum Antiterrorism Standards for Buildings. Ensure and document that the design of glazed items includes, but is not limited to, the following items under the design loads prescribed in UFC 4-010-01:

(a) Supporting members of glazed elements, e.g. window jamb, sill, header

(b) Connections of glazed element to supporting members, e.g. window to header

(c) Connections of supporting members to each other, e.g. header to jamb

(d) Connections of supporting members to structural system, e.g. jamb to foundation.

5.4.4. TERMITE TREATMENT: (Except Alaska) Provide termite prevention treatment in accordance with Installation and local building code requirements, using licensed chemicals and licensed applicator firm.

5.5. THERMAL PERFORMANCE

5.5.1. STANDARDS AND CODES: Building construction and thermal insulation for mechanical systems shall conform to APPLICABLE CRITERIA.

5.5.2. BUILDING ENVELOPE SEALING PERFORMANCE REQUIREMENT. Design and construct the building envelope for office buildings, office portions of mixed office and open space (e.g., company operations facilities), dining, barracks and instructional/training facilities with a continuous air barrier to control air leakage into, or out of, the conditioned space. Clearly identify all air barrier components of each envelope assembly on construction documents and detail the joints, interconnections and penetrations of the air barrier components. Clearly identify the boundary limits of the building air barriers, and of the zone or zones to be tested for building air tightness on the drawings. The use of painted interior walls is not an acceptable air barrier method.

5.5.2.1. Trace a continuous plane of air-tightness throughout the building envelope and make flexible and seal all moving joints.

5.5.2.2. The air barrier material(s) must have an air permeance not to exceed 0.004 cfm / sf at 0.3” wg (0.02 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2178

5.5.2.3. Join and seal the air barrier material of each assembly in a flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of these assemblies and components.

5.5.2.4. Support the air barrier so as to withstand the maximum positive and negative air pressure to be placed on the building without displacement, or damage, and transfer the load to the structure.

5.5.2.5. Seal all penetrations of the air barrier. If any unavoidable penetrations of the air barrier by electrical boxes, plumbing fixture boxes, and other assemblies are not airtight, make them airtight by sealing the assembly and the interface between the assembly and the air barrier or by extending the air barrier over the assembly.

5.5.2.6. The air barrier must be durable to last the anticipated service life of the assembly.

5.5.2.7. Do not install lighting fixtures with ventilation holes through the air barrier

5.5.2.8. Provide a motorized damper in the closed position and connected to the fire alarm system to open on call and fail in the open position for any fixed open louvers at elevator shafts. Coordinate the motorized elevator hoistway vent damper(s) with the Fire Protection System design in paragraph 5.10. Ensure that the damper(s) is accessible to facilitate regular inspection and maintenance.

5.5.2.9. Damper and control to close all ventilation or make-up air intakes and exhausts, , etc., when leakage can occur during inactive periods. Atrium smoke exhaust and intakes shall only open when activated per IBC and other applicable Fire Code requirements.

5.5.2.10. Compartmentalize garages under buildings by providing air-tight vestibules at building access points.

5.5.2.11. Compartmentalize spaces under negative pressure such as boiler rooms and provide make-up air for combustion.

5.5.2.12. Performance Criteria and Substantiation: Submit the qualifications and experience of the testing entity for approval. Demonstrate performance of the continuous air barrier for the opaque building envelope by the following tests:

(a) Develop an Air Barrier Quality Control plan to assure that a competent air barrier inspector/specialist inspects the critical components prior to them being concealed. At a minimum, three onsite inspections are required during construction to assure the completeness of the construction and design.

(b) Test the completed building and demonstrate that the air leakage rate of the building envelope does not exceed 0.25cfm/ft2 at a pressure differential of 0.3" w.g.(75 Pa) in accordance with ASTM's E 779 (2003) or E-1827-96 (2002). Accomplish tests using both pressurization and depressurization.. Divide the volume of air leakage in cfm @ 0.3" w.g. (L/s @ 75 Pa) by the area of the pressure boundary of the building, including roof or ceiling, walls and floor to produce the air leakage rate in cfm/ft2 @ 0.3" w.g. (L/s.m2 @ 75 Pa). Do not test the building until verifying that the continuous air barrier is in place and installed without failures in accordance with installation instructions so that repairs to the continuous air barrier, if needed to comply with the required air leakage rate, can be done in a timely manner.

(c) Test the completed building using Infrared Thermography testing. Use infrared cameras with a resolution of 0.1deg C or better. Perform testing on the building envelope in accordance with ISO 6781:1983 and ASTM C1060-90(1997). Determine air leakage pathways using ASTM E 1186-03 Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems, and perform corrective work as necessary to achieve the whole building air leakage rate specified in (a) above.

(d) Notify the Government at least three working days prior to the tests to provide the Government the opportunity to witness the tests. Provide the Government written test results confirming the results of all tests.

5.6. PLUMBING

5.6.1. STANDARDS AND CODES: The plumbing system shall conform to APPLICABLE CRITERIA.

5.6.2. PRECAUTIONS FOR EXPANSIVE SOILS: Where expansive soils are present, include design features for underslab piping systems and underground piping serving chillers, cooling towers, etc, to control forces resulting from soil heave. Some possible solutions include, but are not necessarily limited to, features such as flexible expansion joints, slip joints, horizontal offsets with ball joints, or multiple bell and spigot gasketed fittings. For structurally supported slabs, suspend piping from the structure with adequate space provided below the pipe for the anticipated soil movement.

5.6.3. HOT WATER SYSTEMS: For Hot Water heating and supply, provide a minimum temp of 140 Deg F in the storage tank and a maximum of 110 Deg F at the fixture, unless specific appliances or equipment specifically require higher temperature water supply.

5.6.4. SIZING HOT WATER SYSTEMS: Unless otherwise specified or directed in paragraph 3, design in accordance with ASHRAE Handbook Series (appropriate Chapters), ASHRAE Standard 90.1, and the energy conservation requirements of the contract. Size and place equipment so that it is easily accessible and removable for repair or replacement.

5.6.5. JANITOR CLOSETS: In janitor spaces/room/closets, provide at minimum, a service sink with heavy duty shelf and wall hung mop and broom rack(s).

5.6.6. FLOOR DRAINS: As a minimum, provide floor drains in mechanical rooms and areas, janitor spaces/rooms/closets and any other area that requires drainage from fixtures or equipment, drain downs, condensate, as necessary.

5.6.7. URINALS: Urinals shall be non-water type or water-type, conforming to ASHRAE Standard 189.1 (0.5 gpf/1.9 lpf). Non-Water type shall include sealed replaceable cartridge or integral liquid seal trap. Either non-water type urinal shall use a biodegradable liquid to provide the seal and maintain a sanitary and odor-free environment. Install, test and maintain in accordance with manufacturer's recommendations. Slope the sanitary sewer branch line for non-water use urinals a minimum of 1/4 inch per foot. Do not use copper tube or pipe for drain lines that connect to the urinal. Manufacturer shall provide an operating manual and on-site training to installation operations personnel for the proper care and maintenance of the urinal. Do not provide non-water type urinals for barracks type or other living spaces.

5.6.8. BUILDING WATER USE REDUCTION. Reduce building potable water use in each building 30 percent from the Baseline, using the Manufacturing Performance Requirements for .Plumbing Fixtures from the Energy Policy Act of 1992 (Public Law 102-486), except as modified by LEED. See Appendix S. Public lavatory faucets shall deliver a maximum flow rate of 0.5 gallons per minute, when tested in accordance with ASME A 112.18/CSA B125 and use that flowrate as the Baseline figure for calculating the 30 percent reduction requirement from the Baseline.

5.6.9. Do not use engineered vent or Sovent® type drainage systems.

5.6.10. Where the seasonal design temperature of the cold water entering a building is below the seasonal design dew point of the indoor ambient air, and where condensate drip will cause damage or create a hazard, insulate plumbing piping with a vapor barrier type of insulation to prevent condensation. Do not locate water or drainage piping over electrical wiring or equipment unless adequate protection against water (including condensation) damage is provided. Insulation alone is not adequate protection against condensation. Follow ASHRAE Fundamentals Chapter 23, Insulation for Mechanical Systems, IMC paragraph 1107 and International Energy Conservation Code for pipe insulation requirements.

5.6.11. Cover all drain, waste and vent piping to prevent mortar or other debris from being flushed down and blocking pipes during such construction activities.

5.7. ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

5.7.1. STANDARDS AND CODES: The electrical systems for all facilities shall conform to APPLICABLE CRITERIA.

5.7.2. MATERIALS AND EQUIPMENT: Materials, equipment and devices shall, as a minimum, meet the requirements of Underwriters Laboratories (UL) where UL standards are established for those items. Wiring for branch circuits shall be copper. Motors larger than one-half horsepower shall be three phase. All electrical systems shall be pre-wired and fully operational unless otherwise indicated. Wall mounted electrical devices (power receptacles, communication outlets and CATV outlets) shall have matching colors, mounting heights and faceplates.

5.7.3. POWER SERVICE: Primary service from the base electrical distribution system to the pad-mounted transformer and secondary service from the transformer to the building service electrical equipment room shall be underground. See paragraph 6 for additional site electrical requirements.

5.7.3.1. Spare Capacity: Provide 10% space for future circuit breakers in all panelboards serving residential areas of buildings and 15% spaces in all other panelboards.

5.7.4. TELECOMMUNICATION SERVICE: Connect the project's facilities to the Installation telecommunications (voice and data) system through the outside plant (OSP) telecommunications underground infrastructure cabling system per the I3A Criteria. Connect to the OSP cabling system from each facility main cross connect located in the telecommunications room.

5.7.5. LIGHTING: Comply with the recommendations of the Illumination Engineering Society of North America (IESNA), the National Energy Policy Act and Energy Star requirements for lighting products..

5.7.5.1. Interior Lighting:

(a) Reflective Surfaces: Coordinate interior architectural space surfaces and colors with the lighting systems to provide the most energy-efficient workable combinations.

(b) High Efficiency Fluorescent Lighting: Utilize NEMA premium electronic ballasts and energy efficient fluorescent lamps with a Correlated Color Temperature (CCT) of 4100K. Linear fluorescent and compact fluorescent fixtures shall have a Color Rendering Index of (CRI) of 87 or higher. Fluorescent lamps shall be the low mercury type qualifying as non-hazardous waste upon disposal. Do not use surface mounted fixtures on acoustical tile ceilings. Provide an un-switched fixture with emergency ballast at each entrance to the building.

(c) Solid State Lighting: Fixtures shall provide lighting with a minimum Correlated Color Temperature (CCT) of 4100K and shall have a Color Rendering Index of (CRI) of 75 or higher. Verify performance of the light producing solid state components by a test report in compliance with the requirements of IESNA LM 80. Verify performance of the solid state light fixtures by a test report in compliance with the requirements of IESNA LM 79. Provide lab results by a NVLAP certified laboratory. The light producing solid state components and drivers shall have a life expectancy of 50,000 operating hours while maintaining at least 70% of original illumination level. Provide a complete five year warranty for fixtures.

(d) Metal Halide Lighting (where applicable): Metal Halide lamp fixtures in the range of 150-500 Watts shall be pulse start type and have a minimum efficiency rating of 88%.

(e) Lighting Controls: ANSI/ASHRAE/IESNA 90.1 has specific lighting controls requirements. See Also Appendix T, ***Functional Area Lighting Control Strategy.***

(f) Exterior Lighting: See paragraph 6.9 for site specific information, if any, on exterior lighting systems. Minimize light pollution and light trespass by not over lighting and use cut-off type exterior luminaries.

5.7.6. TELECOMMUNICATION SYSTEM: Building telecommunications cabling systems (BCS) and OSP telecommunications cabling system shall conform to APPLICABLE CRITERIA, including but not limited to I3A Technical Criteria. An acceptable BCS encompasses, but is not limited to, copper and fiber optic (FO) entrance cable, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, workstation outlets, racks, cable management, patch panels, cable tray, cable ladder, conduits, grounding, and labeling.. Items included under OSP infrastructure encompass, but are not limited to, manhole and duct infrastructure, copper cable, fiber optic cable, cross connects, terminations, cable vaults, and copper and FO entrance cable.

5.7.6.1. Design, install, label and test all telecommunications systems in accordance with the I3A Criteria and ANSI/TIA/EIA 568, 569, and 606 standards. A Building Industry Consulting Services International (BICSI) Registered Communications Distribution Designer (RCDD) with at least 2 yrs related experience shall develop and stamp telecommunications design, and prepare the test plan. See paragraph 5.8.2.5 for design of environmental systems for Telecommunications Rooms.

5.7.6.2. The installers assigned to the installation of the telecommunications system or any of its components shall be regularly and professionally engaged in the business of the application, installation and testing of the specified telecommunications systems and equipment. Key personnel; i.e., supervisors and lead installers assigned to the installation of this system or any of its components shall be BICSI Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification for each of the key personnel. In lieu of BICSI certification, supervisors and installers shall have a minimum of 5 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products.

5.7.6.3. Perform a comprehensive end to end test of all circuits to include all copper and fiber optic cables upon completion of the BCS and prior to acceptance of the facility. Provide adequate advanced notification to the COR to allow COR and Installation personnel attendance The BCS circuits include but are not limited to all copper and fiber optic(FO) entrance cables, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, and workstation outlets. Test in accordance with ANSI/EIA/TIA 568 standards. Use test instrumentation that meets or exceeds the standard. Submit the official test report to include test procedures, parameters tested, values, discrepancies and corrective actions in electronic format. Test and accomplish all necessary corrective actions to ensure that the government receives a fully operational, standards based, code compliant telecommunications system.

5.7.7. LIGHTNING PROTECTION SYSTEM: Provide a lightning protection system where recommended by the Lightning Risk Assessment of NFPA 780, Annex L.

5.8. HEATING, VENTILATING, AND AIR CONDITIONING

5.8.1. STANDARDS AND CODES: The HVAC system shall conform to APPLICABLE CRITERIA.

5.8.2. DESIGN CONDITIONS.

5.8.2.1. Outdoor and indoor design conditions shall be in accordance with UFC 3-410-01FA. Outdoor air and exhaust ventilation requirements for indoor air quality shall be in accordance with ASHRAE 62.1. All Buildings with minimum LEED Silver requirement (or better) will earn LEED Credit EQ 7.1, Thermal Comfort-Design., except where precluded by other project requirements. Where the contract specifies indoor design temperature , airflow, humidity conditions, etc., use those parameters.

5.8.2.2. High Humidity Areas: Design HVAC systems in geographical areas meeting the definition for high humidity in UFC 3-410-01FA to comply with the special criteria therein for humid areas.

5.8.2.3. Cooling equipment may be oversized by up to 15 percent to account for recovery from night setforward. Heating equipment may be oversized by up to 30 percent to account for recovery from night setback. Design single zone systems and multi-zone systems to maintain an indoor design condition of 50% relative humidity for cooling only. For heating only where the indoor relative humidity is expected to fall below 20% for extended periods, add humidification to increase the indoor relative humidity to 30%. Provide ventilation air from a separate dedicated air handling unit (DOAU) for facilities using multiple single zone fan-coil type HVAC systems. Do not condition outside air through fan coil units. In Air handlers that handle outdoor air and have fans that run continuously during the occupied mode, direct expansion cooling coils may be used only if the controls and compressor technology is provided that allows the compressor to operate down to 10% of full load without utilizing hot gas bypass to minimize the potential of delivering unconditioned outdoor air to the space.

5.8.2.4. Locate all equipment so that service, adjustment and replacement of controls or internal components are readily accessible for easy maintenance.

5.8.2.5. Environmental Requirements for Telecommunications Rooms and Telecommunications Equipment Rooms, (including SIPRNET ROOMS, where applicable for specific facility type). Comply with ANSI/EIA/TIA 569 (including applicable Addenda**)**. Maintain environmental conditions at the Class 1 and 2 Recommended Operating Environment. Before being introduced into the room, filter and pre-condition outside air to remove particles with the minimum MERV filtration quality shown in the ASHRAE HVAC Applications, Chapter 17. Maintain rooms under positive pressure relative to surrounding spaces. Design computer room air conditioning units specifically for telecommunications room applications. Build and test units in accordance with the requirements of ANSI/ASHRAE Standard 127. A complete air handling system shall provide ventilation, air filtration, cooling and dehumidification, humidification (as determined during the design phase), and heating. The system shall be independent of other facility HVAC systems and shall be required year round.

5.8.2.6. Fire dampers: dynamic type with a dynamic rating suitable for the maximum air velocity and pressure differential to which the damper is subjected. Test each fire damper with the air handling and distribution system running.

5.8.3. BUILDING AUTOMATION SYSTEM. Provide a Building Automation System (BAS), consisting of a building control network and a building management interface to provide a building-level graphical user interface as specified.

The building control networkshall be a single complete non-proprietary Direct Digital Control (DDC) system for control of all the heating, ventilating and air conditioning (HVAC) systems and for control of other building systems. The building control network shall be an Open implementation of LONWORKS® technology using ANSI/EIA 709.1B as the only communications protocol and use only LonMark Standard Network Variable Types (SNVTs), as defined in the LonMark® Resource Files, for communication between DDC Hardware devices to allow multi-vendor interoperability.

5.8.3.1. The building automation system shall be open in that it is designed and installed such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without further dependence on the original Contractor. This includes, but is not limited to the following:

(a) Install hardware such that individual control equipment can be replaced by similar control equipment from other equipment manufacturers with no loss of system functionality.

(b) Necessary documentation (including rights to documentation and data), configuration information, configuration tools, programs, drivers, and other software shall be licensed to and otherwise remain with the Government such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without subsequent or future dependence on the Contractor.

5.8.3.2. All DDC Hardware shall:

(a) Be connected to a TP/FT-10 ANSI/EIA 709.3 control network.

(b) Communicate over the control network via ANSI/EIA 709.1B exclusively.

(c) Communicate with other DDC hardware using only SNVTs

(d) Conform to the LonMark® Interoperability Guidelines.

(e) Be locally powered; link power (over the control network) is not acceptable.

(f) Be fully configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (*nci*), or hardware settings on the controller itself to support the application. All settings and parameters used by the application shall be configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (*nci*), or hardware settings on the controller itself

(g) Provide input and output SNVTs required to support monitoring and control (including but not limited to scheduling, alarming, trending and overrides) of the application. Required SNVTs include but are not limited to: SNVT outputs for all hardware I/O, SNVT outputs for all setpoints and SNVT inputs for override of setpoints.

(h) To the greatest extent practical, not rely on the control network to perform the application.

(i) Provide on board nonvolatile memory for devices accumulating energy consumption.

5.8.3.3. Controllers shall be Application Specific Controllers whenever an ASC suitable for the application exists. When an ASC suitable for the application does not exist use programmable controllers or multiple application specific controllers.

5.8.3.4. Application Specific Controllers shall be LonMark Certified whenever a LonMark Certified ASC suitable for the application exists. For example, VAV controllers must be LonMark certified.

5.8.3.5. Application Specific Controllers (ASCs) shall be configurable via an LNS plug-in whenever t an ASC with an LNS plug-in suitable for the application exists.

5.8.3.6. Each scheduled system shall accept a network variable of type SNVT_occupancy and shall use this network variable to determine the occupancy mode. If the system has not received a value to this network variable for more than 60 minutes it shall default to a configured occupancy schedule.

5.8.3.7. Gateways may be used provided that each gateway communicates with and performs protocol translation for control hardware controlling one and only one package unit.

5.8.3.8. Not Used

5.8.3.9. Not Used

5.8.3.10. Provide the following to the Government for review prior to acceptance of the system:

- The latest version of all software and user manuals required to program, configure and operate the system.
- Points Schedule drawing that shows every DDC Hardware device. The Points Schedule shall contain the following information as a minimum:
    - Device address and NodeID.
    - Input and Output SNVTs including SNVT Name, Type and Description.
    - Hardware I/O, including Type (AI, AO, BI, BO) and Description.
    - Alarm information including alarm limits and SNVT information.
    - Supervisory control information including SNVTs for trending and overrides.
    - Configuration parameters (for devices without LNS plug-ins) Example Points Schedules are available at https://eko.usace.army.mil/fa/besc/
- Riser diagram of the network showing all network cabling and hardware. Label hardware with ANSI.CEA-709.1 addresses.
- Control System Schematic diagram and Sequence of Operation for each HVAC system.
- Operation and Maintenance Instructions including procedures for system start-up, operation and shut-down, a routine maintenance checklist, and a qualified service organization list.
- LONWORKS® Network Services (LNS®) database for the completed system.
- Quality Control (QC) checklist (below) completed by the Contractor's Chief Quality Control (QC) Representative

Table 5-1: QC Checklist

Instructions: Initial each item, sign and date verifying that the requirements have been met.		
#	Description	Initials
1	All DDC Hardware is installed on a TP/FT-10 local control bus.	
2	Communication between DDC Hardware is only via EIA 709.1B using SNVTs. Other protocols and network variables other than SNVTs have not been used.	
3	All sequences are performed using DDC Hardware.	
4	LNS Database is up-to-date and accurately represents the final installed system	
5	All software has been licensed to the Government	
6	M&C software monitoring displays have been created for all building systems, including all override and display points indicated on Points Schedule drawings.	
7	Final As-built Drawings accurately represent the final installed system.	
8	O&M Instructions have been completed and submitted.	
By signing below I verify that all requirements of the contract, including but not limited to the above, been met. Signature:_____ Date:_____		

5.8.3.11. Perform a Performance Verification Test (PVT) under Government supervision prior to system acceptance. During the PVT demonstrate that the system performs as specified, including but not limited to demonstrating that the system is Open and correctly performs the Sequences of Operation.

5.8.3.12. Provide a 1 year unconditional warranty on the installed system and on all service call work. The warranty shall include labor and material necessary to restore the equipment involved in the initial service call to a fully operable condition.

5.8.3.13. Provide training at the project site on the installed building system Upon completion of this training each student, using appropriate documentation, should be able to start the system, operate the system, recover the system after a failure, perform routine maintenance and describe the specific hardware, architecture and operation of the system.

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5.8.4. TESTING, ADJUSTING AND BALANCING. Test and balance air and hydronic systems, using a firm certified for testing and balancing by the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), or the Testing Adjusting, and Balancing Bureau (TABB). The prime contractor shall hire the TAB firm directly, not through a subcontractor. Perform TAB in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-1, NEBB TABES, or SMACNA HVACTAB unless otherwise specified herein. All recommendations and suggested practices contained in the TAB Standard shall be considered mandatory. Use the provisions of the TAB Standard, including checklists, report forms, etc., as nearly as practicable to satisfy the Contract requirements. Use the TAB Standard for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, adhere to the manufacturer's recommendations. All quality assurance provisions of the TAB Standard such as performance guarantees shall be part of this contract. For systems or system components not covered in the TAB Standard, the TAB Specialist shall develop TAB procedures. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the TAB Standard used (AABC, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements are mandatory.

5.8.5. COMMISSIONING: Commission all HVAC systems and equipment, including controls, and all systems requiring commissioning for LEED Enhanced commissioning, in accordance with ASHRAE Guideline 1.1, ASHRAE Guideline 0 and LEED. Do not use the sampling techniques discussed in ASHRAE Guideline 1.1 and in ASHRAE Guideline 0. Commission 100% of the HVAC controls and

equipment. Hire the Commissioning Authority (CxA), certified as a CxA by AABC, NEBB, or TABB, as described in Guideline 1.1. The CxA will be an independent subcontractor and not an employee of the Contractor nor an employee or subcontractor of any other subcontractor on this project, including the design professionals (i.e., the DOR or their firm(s)). The CxA will communicate and report directly to the Government in execution of commissioning activities. The Contracting Officer's Representative will act as the Owner's representative in performance of duties spelled out under OWNER in Annex F of ASHRAE Guideline 0. Because required CxA contractual relationship may not be acceptable to GBCI for LEED certification, the project cannot earn LEED Credit EA3 Enhanced Commissioning. However, still complete, maintain and provide copies of all necessary LEED documentation for Credit EA 3. This LEED Credit cannot be included to meet the required LEED rating for this project. Contractor may attempt this as an additional credit for GBCI certification but the Government will not accept it until GBCI accepts it.

5.9. ENERGY CONSERVATION

5.9.1. The building including the building envelope, HVAC systems, service water heating, power, and lighting systems shall meet the Mandatory Provisions and the Prescriptive Path requirements of ASHRAE 90.1. Substantiation requirements are defined in Section 01 33 16, Design After Award.

5.9.2. Design all building systems and elements to meet the minimum requirements of ANSI/ASHRAE/IESNA 90.1. Design the buildings, including the building envelope, HVAC systems, service water heating, power, and lighting systems to achieve an energy consumption that is at least 40% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1. Energy calculation methodologies and substantiation requirements are defined in Section 01 33 16, Design After Award.

5.9.3. Purchase Energy Star products, except use FEMP designated products where FEMP is applicable to the type product. The term "Energy Star product" means a product that is rated for energy efficiency under an Energy Star program. The term "FEMP designated product" means a product that is designated under the Federal Energy Management Program of the Department of Energy as being among the highest 25 percent of equivalent products for energy efficiency. When selecting integral sized electric motors, choose NEMA PREMIUM type motors that conform to NEMA MG 1, minimum Class F insulation system. Motors with efficiencies lower than the NEMA PREMIUM standard may only be used in unique applications that require a high constant torque speed ratio (e.g., inverter duty or vector duty type motors that conform to NEMA MG 1, Part 30 or Part 31).

5.9.4. Solar Hot Water Heating. Provide at least 30% of the domestic hot water requirements through solar heating methodologies, unless the results of a Life Cycle Cost Analysis (LCCA) developed utilizing the Building Life Cycle Cost Program (BLCC) which demonstrates that the solar hot water system is not life cycle cost effective in comparison with other hot water heating systems. The type of system will be established during the contract or task order competition and award phase, including submission of an LCCA for government evaluation to justify non-selection of solar hot water heating. The LCCA uses a study period of 25 years and the Appendix K utility cost information. The LCCA shall include life cycle cost comparisons to a baseline system to provide domestic hot water without solar components, analyzing at least two different methodologies for providing solar hot water to compare against the baseline system.

5.9.5. Process Water Conservation. When potable water is used to improve a building's energy efficiency, employ lifecycle cost effective water conservation measures, except where precluded by other project requirements.

5.9.6. Renewable Energy Features. The Government's goal is to implement on-site renewable energy generation for Government use when lifecycle cost effective. See Paragraph 6, PROJECT SPECIFIC REQUIREMENTS for renewable energy requirements for this project.

5.10. FIRE PROTECTION

5.10.1. STANDARDS AND CODES Provide the fire protection system conforming to APPLICABLE CRITERIA.

5.10.2. Inspect and test all fire suppression equipment and systems, fire pumps, fire alarm and detection systems and mass notification systems in accordance with the applicable NFPA standards. The fire protection engineer of record shall witness final tests. The fire protection engineer of record shall certify that the equipment and systems are fully operational and meet the contract requirements. Two weeks prior to each final test, the contractor shall notify, in writing, the installation fire department and the installation public work representative of the test and invite them to witness the test.

5.10.3. Fire Extinguisher Cabinets: Provide fire extinguisher cabinets and locations for hanging portable fire extinguishers in accordance with NFPA 10 Standard for Portable Fire Extinguishers. The Government will furnish and install portable fire extinguishers, which are personal property, not real property installed equipment.

5.10.4. Fire alarm and detection system: Required fire alarm and detection systems shall be the addressable type. Fire alarm initiating devices, such as smoke detectors, heat detectors and manual pull stations shall be addressable. When the system is in alarm condition, the system shall annunciate the type and location of each alarm initiating device. Sprinkler water flow alarms shall be zoned by building and by floor. Supervisory alarm initiating devices, such as valve supervisory switches, fire pump running alarm, low-air pressure on dry sprinkler system, etc. shall be zoned by type and by room location.

5.10.5. Roof Access: Paragraph 2-9 of UFC 3-600-01 Fire Protection for Facilities will be modified in the next update to that UFC. Pending revision, comply with roof access and stairway requirements in accordance with the International Building Code. Where roof access is required by the IBC or other criteria, comply with UFC 4-010-01, Anti-Terrorist Force Protection, Standard 14. "Roof Access".

5.10.6. Fire Protection Engineer Qualifications: In accordance with UFC 3-600-01, FIRE PROTECTION ENGINEERING FOR FACILITIES**,** the fire protection engineer of record shall be a registered professional engineer (P.E.) who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES), or a registered P.E. in a related engineering discipline with a minimum of 5 years experience, dedicated to fire protection engineering that can be verified with documentation.

5.11. SUSTAINABLE DESIGN

5.11.1. STANDARDS AND CODES: Sustainable design shall conform to APPLICABLE CRITERIA. See paragraph 6, PROJECT-SPECIFIC REQUIREMENTS for which version of LEED applies to this project. The LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects (AGMBC) applies to all projects. Averaging may be used for LEED compliance as permitted by the AGMBC but is restricted to only those buildings included in this project. Each building must individually comply with the requirements of paragraphs ENERGY CONSERVATION and BUILDING WATER USE REDUCTION.

5.11.2. LEED RATING, REGISTRATION, VALIDATION AND CERTIFICATION: See Paragraph PROJECT-SPECIFIC REQUIREMENTS for project minimum LEED rating/achievement level, for facilities that are exempt from the minimum LEED rating, for LEED registration and LEED certification requirements and for other project-specific information and requirements.

5.11.2.1. Innovation and Design Credits. LEED Innovation and Design (ID) credits are acceptable only if they are supported by formal written approval by GBCI (either published in USGBC Innovation and Design Credit Catalog or accompanied by a formal ruling from GBCI). LEED ID credits that require any Owner actions or commitments are acceptable only when Owner commitment is indicated in paragraph PROJECT-SPECIFIC REQUIREMENTS or Appendix LEED Project Credit Guidance

5.11.3. OPTIMIZE ENERGY PERFORMANCE. : Project must earn, as a minimum, the points associated with compliance with paragraph ENERGY CONSERVATION. LEED documentation differs from documentation requirements for paragraph ENERGY CONSERVATION and both must be provided. For LEED-NC v2.2 projects you may substitute ASHRAE 90.1 2007 Appendix G in its entirety for ASHRAE 90.1 2004 in accordance with USGBC Credit Interpretation Ruling dated 4/23/2008.

5.11.4. COMMISSIONING. See paragraph 5.8.5 COMMISSIONING for commissioning requirements. USACE templates for the required Basis of Design document and Commissioning Plan documents are available at http://en.sas.usace.army.mil (click on USACE LEED Commissioning Plan Template) and may be used at Contractor's option.

5.11.5. DAYLIGHTING. Except where precluded by other project requirements, do the following in at least 75 percent of all spaces occupied for critical visual tasks: achieve a 2 percent glazing factor (calculated in accordance with LEED credit EQ8.1) OR earn LEED Daylighting credit, provide appropriate glare control and provide either automatic dimming controls or occupant-accessible manual lighting controls.

5.11.6. LOW-EMITTING MATERIALS. Except where precluded by other project requirements, use materials with low pollutant emissions, including but not limited to composite wood products, adhesives, sealants, interior paints and finishes, carpet systems and furnishings,

5.11.7. CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT. Except where precluded by other project requirements, earn LEED credit EQ 3.1 Construction IAQ Management Plan, During Construction and credit EQ 3.2 Construction IAQ Management Plan, Before Occupancy.

5.11.8. RECYCLED CONTENT. In addition to complying with section RECYCLED/RECOVERED MATERIALS, earn LEED credit MR4.1, Recycled Content, 10 percent except where precluded by other project requirements.

5.11.9. BIOBASED AND ENVIRONMENTALLY PREFERABLE PRODUCTS. Except where precluded by other project requirements, use materials with biobased content, materials with rapidly renewable content, FSC certified wood products and products that have a lesser or reduced effect on human health and the environment over their lifecycle to the maximum extent practicable.

5.11.10. FEDERAL BIOBASED PRODUCTS PREFERRED PROCUREMENT PROGRAM (FB4P). The Farm Security and Rural Investment Act (FSRIA) of 2002 required the U.S. Department of Agriculture (USDA) to create procurement preferences for biobased products that are applicable to all federal procurement (to designate products for biobased content). For all designated products that are used in this project, meet USDA biobased content rules for them except use of a designated product with USDA biobased content is not required if the biobased product (a) is not available within a reasonable time, (b) fails to meet performance standard or (c) is available only at an unreasonable price. For biobased content product designations, see http://www.biopreferred.gov/ProposedAndFinalItemDesignations.aspx.

5.12. CONSTRUCTION AND DEMOLITION (C&D) WASTE MANAGEMENT: Achievement of 50% diversion, by weight, of all non-hazardous C&D waste debris is required. Reuse of excess soils, recycling of vegetation, alternative daily cover, and wood to energy are not considered diversion in this context, however the Contractor must tracked and report it. A waste management plan and waste diversion reports are required, as detailed in Section 01 57 20.00 10, ENVIRONMENTAL PROTECTION.

5.13. SECURITY (ANTI-TERRORISM STANDARDS): Unless otherwise specified in Project Specific Requirements, only the minimum protective measures as specified by the current Department of Defense Minimum Antiterrorism Standards for Buildings, UFC 4-010-01, are required for this project. The element of those standards that has the most significant impact on project planning is providing protection against explosives effects. That protection can either be achieved using conventional construction (including

specific window requirements) in conjunction with establishing relatively large standoff distances to parking, roadways, and installation perimeters or through building hardening, which will allow lesser standoff distances. Even with the latter, the minimum standoff distances cannot be encroached upon. These setbacks will establish the maximum buildable area. All standards in Appendix B of UFC 4-010-01 must be followed and as many of the recommendations in Appendix C that can reasonably be accommodated should be included. The facility requirements listed in these specifications assume that the minimum standoff distances can be met, permitting conventional construction. Lesser standoff distances (with specific minimums) are not desired, however can be provided, but will require structural hardening for the building. See Project Specific Requirements for project specific siting constraints. The following list highlights the major points but the detailed requirements as presented in Appendix B of UFC 4-010-01 must be followed.

(a) Standoff distance from roads, parking and installation perimeter; and/or structural blast mitigation

(b) Blast resistant windows and skylights, including glazing, frames, anchors, and supports

(c) Progressive collapse resistance for all facilities 3 stories or higher. Unless determined otherwise by the Installation and noted in paragraphs 3 or 6, the building shall be considered to have areas of uncontrolled public access when designing for progressive collapse.

(d) Mass notification system (shall also conform to UFC 4-021-01, Mass Notification Systems)

(e) For facilities with mailrooms (see paragraph 3 for applicability) – mailrooms have separate HVAC systems and are sealed from rest of building

6.0 PROJECT SPECIFIC REQUIREMENTS

6.1. GENERAL

The requirements of this paragraph augment the requirements indicated in Paragraphs 3 through 5.

6.2. APPROVED DEVIATIONS

The following are approved deviations from the requirements stated in Paragraphs 3 through 5 that only apply to this project.

6.2.1 Reference Section 01 10 00 Paragraph 3.5.1. Insert the following note between the Live Loads title and the Elevated Floor loads: 3.5.1. Live Loads: Design live loads shall be per the IBC but not less than the following minimums. Note that the minimum live loads indicated do not include partition loads. Partition live loads of 15 pounds per square foot (psf) shall be added to all areas with a live load of 80 psf or less.(a) Elevated floors 40 psf.

6.2.2 Reference Section 01 57 20.00 10. Add the following paragraph: 1.2.3.18 Submit Environmental self certification reprots through the Resident Engineer Office. The Resident Engineer Office will submit them to DPW-ENV.

6.2.3 Reference Section 01 78 02.00 10. Add the following paragraph: 1.2.7 Submit one copy of full size as-built drawings on mylar to DPW.

6.2.4 Reference Section 01 10 00 paragraph 3.2.2.2 Furnish and install a double bowl stainless steel kitchen sink.

6.3. SITE PLANNING AND DESIGN

6.3.1. General:

Note to Offerors: The following functional requirements located in 01 10 00 of the RFP do not apply and will not be required for the townhouse style of UEPH.

3.2.1.2 Facility Design and Construction: (a), (b), (c), (d).

3.2.3.6 Recyclables Storage

3.2.3.9 Mail Access Area

3.2.3.10 Boot Wash

3.3.1 (a)

3.3.3 (b) Service Drives.

3.4.4.2 Bulletin Boards

3.4.4.3 Corner Guards

5.3.2 (a) Parking Requirements.

5.6.7 Urinals

5.13 Security (Anti-Terrorism Standards)

Note to Offerors: The following functional requirements located in 01 33 16 of the RFP do not apply and will not be required for the townhouse style of UEPH.

3.5.2.4 For Security (Anti-Terrorism)

Note to Offerors: This project shall comply with the requirements of LEED 2009.

6.3.2. Site Structures and Amenities

The following additional functional requirements shall apply when townhouse style of UEPH is proposed by the Offeror:

A. The site shall provide curb cuts where possible such as site side walks meeting streets. No ADA compliance shall be required. Provide POV parking for each soldier (this overrides 70 percent requirement). Provide one additional parking stall for each 10 soldiers for visitor parking or 11 parking stalls per building. Minimum parking spaces provided will be 267 or the minimum required per Section 3.3.3 (a), whichever is greater. Parking spaces shall be distributed evenly throughout the development with the number of parking spaces corresponding to the number of soldiers per building.

B. For townhouse style UEPH, the following supersedes Sec 01 10 00 3.2.3.9. Provide Mail box kiosks. Provide a parcel box for each occupant. Mail access area shall be designed and constructed as part of this project. Provide 1 USPS approved kiosk for every 9 - 10 buildings, key lock type, with a minimum of one USPS approved two key parcel lockers per kiosk. The number sequence shall be coordinated with the user.

C. Provide an equipment storage shed for each 20 soldiers. These structures shall be co-located with dumpster, provide at least 40 square feet of storage per equipment storage shed for lawn maintenance equipment.

D. Provide dumpster pad & screens, one for every two buildings. Concrete dumpster pads shall include a concrete apron to extend a minimum of 20 feet to accommodate the trash truck front wheels. The screen wall enclosures shall visually match the installation design guide or be constructed of materials to match the new facility exterior walls. The color shall be coordinated with the installation. A gate keeper, capable of holding the gates in an open position, and a latching mechanism shall be integrated into the gate design.

E. Site Signage: Provide a community identification sign for overall way finding and life safety requirements (nearest Tornado shelter, ext.). Space must be left open to insert additional phases of the Permanent Party Barracks program. Location shall be determined by DOR and COR prior to construction. Additionally the signage shall have a bulletin board (2 feet by 3 feet minimum) and shall be protected from the elements. This shall be a display and information center for the area. Refer to Appendix H, Exterior Signage for additional information and requirements.

6.3.3 Provide a site plan of the entire project area showing any changes made during proposal and design. Show all the buildings, including future, proposed and any additions for the purpose of validating building relationships, setbacks (including AT/FP) and avoiding utility conflicts and rework. Edits to the file provided by the government is acceptable. Submit electronic files in accordance with Section 01 33 16 Design After Award.

6.3.4 Provide running trail to connect housing, parking, courts and a looped circuit for physical training. This running trail must connect to the existing trail and be of similar material and construction, which was constructed in previous phases. These items are identified as CLINS in the Bid Schedule.

6.3.5 Termite Treatment: The successful Offeror shall provide termite treatment with a 5 year warranty. The Contractor shall comply with 7 USC Section 136 for requirements on contractor's licensing, certification, and record keeping. The Contractor shall maintain daily records using Pest Management Maintenance Record, DD Form 1532-1 and submit copies of records when requested by the Contracting Officer. These forms may be obtained from the main web site:

HYPERLINK "http://www.dtic.mil/whs/directives/infomgt/forms/ddforms1500-1999.htm"http://www.dtic.mil/whs/directives/infomgt/forms/ddforms1500-1999.htm

Upon completion of this work, submit Pest Management Report, DD Form 1532, identifying target pest, type of operation, brand name and manufacturer of pesticide, formulation, concentration or rate of application used. Foundation Exterior: The Contractor shall provide written verification that final grading and landscape planting operations will not disturb treatment of the soil on the exterior sides of foundation wails, grade beams, and similar structures.

6.3.6 Recyclables Storage: Recyclable storage shall be a concrete pad to include 20 ft concrete apron with privacy fencing and gates sized to fit one 30CY recycling container with access for large trucks to load and unload container, with additional room for people to walk around container.

6.3.7 Sidewalks shall match previous UEPH width of 5'-0" construction.

6.3.3. Site Functional Requirements:

6.3.3.1. Stormwater Management (SWM) Systems.

Stormwater Management (SWM) shall comply with UFC 3-210-10 Low Impact Development, 15 November 2010 and EPA Publication 84-B-09-001 Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act, December 2009.

6.3.3.1.1 The Permanent Party Barracks requires construction of a storm water managment system. Existing storm drainage information shall be shown on the topographical survey and coordinated with the Base Information Maps. Design of the SWM system shall be based on the 95th percentile storm event as detailed in EPA Publication 84-B-09-001. Culverts shall have a minimum diameter of 18 inches. Storm drain systems shall be designed to provide a minimum flow velocity of 2.5 feet per second when the drains are one-third or more full. Designer must use local rainfall database information when developing the SWM system design.

6.3.3.1.2 The design shall be accomplished under the direction of a Registered Professional Engineer qualified in the field of stormwater design. The design shall be based on land use in the tributary area to be developed and includes adopted future land use plans. This design criterion shall apply to all development, which alters the surface of the land to create additional impervious surfaces, including, but not limited to, pavement, buildings, and structures.

6.3.3.1.3 New development shall incorporate stormwater management measures to control runoff from the site. Allowable runoff from the site must minimize downstream flood damage, prevent erosion, and minimize impacts to the ecology and water quality of the downstream drainage system. For site-level runoff controls to be effective, consistent application across a watershed are required to have measurable benefits along the downstream system.

6.3.3.1.4 Stormwater management for site development may include structural facilities or nonstructural solutions.

6.3.3.2. Erosion and Sediment Control

Erosion and Sediment Control drawings and written narrative shall be the first design package submitted, and no earthwork will be permitted prior to approval of the Erosion and Sediment Control plans. The design and plan preparation for erosion control drawings and written sequence shall be completed by, or under the direct supervision of, a professional engineer who also meets one of the following minimum continuing education requirements:

A. 7 hours within the last 24 months of classroom instruction in sediment and erosion control taught by a qualified instructor.

B. 21 hours lifetime of classroom instruction in sediment and erosion control taught by a qualified instructor.

C. 14 hours lifetime of web-based or classroom instruction, which includes specific instruction on the general permit requirements and SWPPP preparation, when retention of the material is measured by an exam.

6.3.3.2.1 Innovative Products and Methods

Erosion control is an evolving field and new products and methods are emerging. Obtain approval from the installation DPW prior to using a new product or method in the design. The protocol for proposing innovative products and methods includes:

A. Submit research based evaluation: A proposal for an innovative product or method shall include quantitative research of the performance of the product or method evaluated against a control. Research may be sponsored by the manufacturer. Submit the research paper.

B. Research paper shall include a summary indicating the value range under which the product or method was evaluated and found to be effective. Information shall contain sufficient detail to determine whether the proposed application is indicated.

C. Information shall include the removal efficiency of the product or method.

6.3.3.2.2 Erosion and Sediment Control Performance Goals

A. Protect Undisturbed Areas: Areas planned to remain undisturbed throughout construction may include stream corridors, wetlands, and native areas to be used as amenities or post-construction BMPs. Other areas to avoid include zones where grading is complete and the ground has been reseeded. These areas should be fenced to avoid damage by construction traffic.

B. Divert Flow Away from Exposed Ground: There are two distinct applications of diversion. First, clean water from off-site or restored areas can be diverted away from disturbed areas. Second, steep slopes should have water diverted away from the top of slope until the vegetation is established.

C. Treat Runoff to Remove Sediment: There are two general locations for sediment treatment. First, flow should be treated at the down-slope limit of construction prior to release from the site. Some combination of linear sediment control or a settlement pool with an associated conveyance system should be used. Second, runoff from steep slopes should be treated at the toe of the slope; generally some linear sediment control device is used. Steep slopes that have more than 10 foot change in elevation from toe to top should have intermediate linear sediment control that will interrupt and redistribute the flow.

D. Provide Effective Cover: Timely placement of erosion resistant cover reduces erosion on areas where grading has ceased. Approved nonliving cover is effective immediately. Seeded areas need protection during the establishment period. Mulches provide immediate erosion protection and a hospitable micro-environment for seed germination. If the slopes are long, then seeded areas need devices that will interrupt and redistribute the flow across the slope.

E. Limit Duration of Exposure: Control the sequence in which clearing, grading and restoration activities are scheduled. Examples:

1. If portions of the work can be completed before mass grading, delay clearing the rest of the site until grading is actually needed.

2. Progressive clearing – on sites over 10 acres clear only a portion of the site at a time. Grade and stabilize a portion of that before clearing more land. Maintain the active work area at less than 10 acres whenever possible. If progressive clearing is infeasible for the project, negotiate with the reviewing municipality for how to provide substantial limitation of duration, such as a defined maximum exposure time.

3. Whenever there is a pause or change in the location of grading or excavation, stabilize the parts of the site just vacated.

4. Some crossings of a stream or swale can be completed in a few days. Coordinate that work with the weather forecast so it can be finished before the next predicted rainfall.

5. Some post-construction BMPs are sensitive to sediment accumulation. Do not install these until the remainder of the site is stabilized.

F. Provide Erosion Resistant Conveyances: Bare earth should be protected from concentrated flows. Check dams can be used to reduce velocity and lower shear stress. Erosion resistant linings provide a high level of shear resistance. Use of pipes eliminates soil exposure to running water – either permanent storm sewer or temporary pipes may be used.

G. Protect Steep Slopes: Steep slopes are especially prone to erosion. Steep, seeded slopes benefit from the use of highly effective mulch, slope interrupts, diversion of water at the top of slope, and sediment treatment adjacent to the toe of the slope.

6.3.3.3. Vehicular Circulation.

Traffic Circulation Design: The Contractor shall be responsible for determining the specific traffic requirements for streets and parking lots required to support passenger vehicle and standard truck traffic. The Contractor shall be responsible for determining the specific vehicles, traffic loads, and traffic volumes for each street and parking lot, except as otherwise specified.

6.4. SITE ENGINEERING

6.4.1. Existing Topographical Conditions

A preliminary topographic survey was performed on this site. It is for planning purposes only. The preliminary topographic information is found in Appendix J. Preliminary topographic survey information will be provided to the winning offeror in electronic format. The Contractor shall prepare a topographic survey with one foot contour data of the proposed site utilizing the latest approved version of A/E/C CAD Standard, found at HYPERLINK "https://cadbim.usace.army.mil/CAD"https://cadbim.usace.army.mil/CAD and Appendix G, “Spatial Data Standard for Facilities, Infrastructure and Environment (SDSFIE), Guide for GIS Deliverables Created as Part of Military Design and Construction Projects at Fort Leonard Wood, MO.”

6.4.1.1 Existing sewer lines are present on and adjacent to the site. The information included is for planning level purposes only. It is the responsibility of the Contractor to obtain and verify all sewer survey information.

6.4.1.2 Replace existing water and sewer lines within the boundaries of this project site new, connecting to facilities, to provide a complete and usable system.

6.4.2. Existing Geotechnical conditions: See Appendix A for a preliminary geotechnical report.

Geotechnical Reports for the surrounding area are provided in Appendix A. These are for informational purposes only. The provisions of Section 01 33 16 Paragraph 3.5.3.1 apply.

6.4.3. Fire Flow Tests See Appendix D for results of fire flow tests to use for basis of design for fire flow and domestic water supply requirements.

Fire flow Tests for this site have been completed. Fire flow information is found in Appendix D.

6.4.4. Pavement Engineering and Traffic Estimates:

Pavement Design: Non-Organizational Vehicle Traffic Areas: Non organizational vehicle traffic areas include streets and parking lots for privately owned passenger vehicles and standard truck traffic as identified in 5.1.2.3.

6.4.4.1 Pavements for non organizational traffic areas, such as streets and parking lots subject to passenger vehicles and standard truck traffic shall be designed in accordance with the American Association of State Highway and Transportation Officials (AASHTO).

A. Pavement designs over cohesive soil subgrades require underdrain systems. It shall be the responsibility of the Contractor to develop specific pavement design sections based on the criteria specified herein.

B. In no case shall the pavement sections be less than the minimum requirements per paragraph 5.2.3. All parking areas shall be constructed of flexible pavement.

C. The use of pervious and / or porous pavement in parking areas will be considered provided that they are properly drained using drainage layers and subdrains designed to meet industry standards or UFC 3-230-06A and subject to government review and approval. Porous asphalt shall not be designed in areas where tracked vehicles or large truck traffic will be used.

6.4.4.2 The Contractor’s geotechnical report shall contain designs for flexible and rigid pavements including design CBR and modulus of subgrade reaction and the required compaction effort for subgrades. Information shall be offered on the types of base course materials available in the area and design strengths.

6.4.4.3 Pavement Grades

A.Transverse POV Parking Grades Maximum of 4%.

B. Absolute minimum of 1.5 percent for flexible pavement and 1 percent for rigid pavement.

C. Road and Street Longitudinal Grades: Desirable and absolute maximum grades shall be in accordance with AASHTO Policy on Geometrics of Highways and Streets.

6.4.5. Traffic Signage and Pavement Markings

Traffic Signage and striping: shall be provided for all new roads and parking areas. Signage and striping shall be designed in accordance with MUTCD Manual on Uniform Traffic Control Devices for Streets and Highways. Parking areas shall be striped with non-reflectorized paint. Roads and streets shall be striped with reflectorized paint. Parking stalls shall be delineated with 4-inch wide white stripes.

6.4.6. Base Utility Information

Any utilities that may be encountered on site require coodination with DPW. This does not relieve the contractor from conducting utilities location through Dig-Rite.

6.4.6.1 Boring & Trenching: For placement of utilities, boring shall be used for placement across Nebraska, Minnesota, Michigan, 5th Street, all new roads placed in adjacent construction (areas such as Permanent Party Barracks phases I, II, & III), and Replacement Avenues.

6.4.6.2 Tracer Wire: All non-metallic utilities, including sanitary sewer system, storm drain lines, and ground source heat pump lines shall have a tracer wire with detect-ability to last for the life of the utility. Marking tape shall be placed in trench 6 inches below finish grade.

6.4.6.3 Gas, electrical, phone, and cable TV services are privatized. The Gas service provider is Omega Gas. Omega will provide primary lines to the gas regulators. Contractor shall provide meter and building connections. The phone service provider is Sprint. The Electrical service in the development area is owned and maintained by Laclede Electric Cooperative of Lebanon, Missouri. Refer to 6.9 Site Electrical and Telecommunications Systems. The TV service provider is Cable America. It is the responsibility of the contractor to coordinate.

6.4.6.4 Sanitary Sewer System: The Permanent Party Barracks requires a sanitary sewer system. The contractor’s design will provide for the scope identified in the RFP, including considerations identified in the contractor’s revised site master plan. The contractor shall analyze the existing sanitary system for capacity prior to construction. Provide analysis to include current and proposed flows with the first utility design submittal (refer to the Utility Studies in the Appendices).

6.4.6.6 Water System: The Permanent Party Barracks requires a potable water system. Water system design must conform to the publication by the Missouri Department of Natural Resources title "MDNR Design Guide for Community Water Systems." Guide may be found at HYPERLINK "www.dnr.mo.gov"www.dnr.mo.gov. For existing utility information, refer to the information provided in the Appendices. Metallic pipes, valves and fittings shall be cathodically protected in addition to coatings or wrappings. A cathodic protection system, if needed shall include test stations. All waterlines shall comply with applicable Local, State MoDNR and Federal standards. Local and State standards shall dictate unless the Federal standards are more stringent. Water distribution systems and service lines shall be designed and constructed in accordance with applicable State criteria and applicable UFGS guide specifications. The successful Offeror shall be responsible for the protection of existing waterlines. If any potable waterlines are damaged during construction, the successful Offeror must immediately notify the Contracting Officer. The successful Offeror shall disinfect all new water lines and any remaining lines which do not remain fully pressurized during construction or connection. The successful Offeror shall notify the Contracting Officer prior to disinfection of the water lines. The disinfection shall be in accordance with the American Water Works Association Standard AWWA C651 and shall not be considered complete until two consecutive days of bacteriological samples show no contamination. All lead and copper tests shall be performed by Environmental Protections Agency (EPA) certified laboratories. All tests shall be performed by the Contractor and QA tests may be performed by the Government.. Copies of results of the analyses shall be forwarded by the successful Offeror, upon receipt to the Contracting Officer (CO). The successful Offeror shall provide calculations including water pressures in his/her after award design to the COR. The Contractor shall be responsible for the fire flow test used in his design and construction.

6.4.6.7 Fire Hydrants: provide and locate per UFC, NFPA, and other applicable codes listed in paragraph 4. Painting of fire hydrants shall be in accordance with Apendix AA.

6.4.6.8 Survey of As-Built Utility Lines: All proposed underground utility lines (including electrical power and communications, gas, water, sanitary sewer, storm drains, roof drains and culverts) shall be located by the successful Offeror during installation using surveying equipment. The successful Offeror shall survey pipe invert of gas, water, sanitary sewer, storm drains, roof drains and culverts and top of duct bank of electrical power and communications lines. Storm drains and sanitary sewer lines shall be surveyed where pipes enter manholes and inlets and at 100-foot maximum intervals along the line. The inverts of all cleanouts and tees shall be surveyed. Inverts at each end of culverts shall be surveyed. Electrical power, communications, gas and water lines shall be surveyed at all manholes, tees, valves, corners, changes in direction and at intervals along the line which will accurately depict the location of the line in both horizontal and vertical directions (50-foot maximum interval). Survey accuracy shall meet or exceed National Map Standards for 1" = 50' mapping. Survey shall be in Missouri State Plane Coordinate System North Zone. The horizontal and vertical control reference datum's shall be NAD 83 and NAVD 88 respectively.

[Not Supplied - PS_SiteEngineering_BaseUtility : SITE_ELEC]

[Not Supplied - PS_SiteEngineering_BaseUtility : SITE_WATER]

[Not Supplied - PS_SiteEngineering_BaseUtility : SITE_SEWER]

[Not Supplied - PS_SiteEngineering_BaseUtility : SITE_GAS]

[Not Supplied - PS_SiteEngineering_BaseUtility : SITE_CABLE_TV]

6.4.7. Cut and Fill

6.4.7.1 Contractor is encouraged to produce a balanced earthwork site deisgn.

6.4.7.2 Contractor shall remove excess spoils and unacceptable material from the installation. There are no disposal areas available on Fort Leonard Wood.

6.4.7.3 Waste Management, Clearing, Demolition, Disposal: A waste menagement plan is required to achieve fifty percent construction waste diversion from landfills.

6.4.8. Borrow Material

No borrow material is available on Fort Leonard Wood. Additional borrow material shall be provided by the Contractor from an off post site.

6.4.9. Haul Routes and Staging Areas

N/A.

6.4.10. Clearing and Grubbing:

N/A.

6.4.11. Landscaping:

Additional landscaping and retaining walls may be used in the design to allow for site slopes and sitting structures, courts and facilities, their use shall be minimized. Wall heights shall be minimized and fall protection provided for walls exceeding 30 inches. A minimum of 20 trees per acre of disturbed land shall be planted throughout the site. When practical, existing trees shall be protected and saved and may be used as part of the site landscaping. The minimum number (20 trees per acre x 17 acres) of trees to be planted on this site is 340.

6.4.11.1 Landscape Plan: The successful Offeror shall provide a Landscape Plan as part of the design package. The successful Offeror shall provide landscape improvements complying with UFC 4-010-01. The Landscape plan shall be designed to visually enhance the new facilities with color, form and screening, while providing shade and windbreak for the building. The use of berms to accent the building and plant beds is encouraged. All landscaping plans should include coordination with Fort Leonard Wood Directorate of Public Works (DPW) Environmental Division.

6.4.11.2 Fort Leonard Wood has specific requirements for trees, seeds and grasses found in the Installation Design Guide. An extract of the IDG is provided in Appendix I provides the plant palette for this site. Plant material furnished for this project shall meet ANSI 60.1-2004 (or most current edition) standards for nursery stock, and shall be guaranteed to be in a vigorous growing condition for a minimum period of 12 months regardless of contract time period.

6.4.11.3 Plant establishment period shall continue until 12 months from the BOD of the last building. Plants shall be considered unhealthy or dead when the main leader has died back or 25% of the crown is dead. Unhealthy or dead plants shall be removed immediately and replaced as soon as seasonal conditions permit.

6.4.11.4 Areas and plants damaged or destroyed by construction operations or designated to be preserved shall be replaced by equal size and type materials.

6.4.12. Turf:

All areas disturbed by construction and not otherwise landscaped shall be seeded.

6.4.12.1 Grass seed shall consist of an equal blend of 5 fine leaf tall fescue varieties evaluated under southern Missouri conditions and determined to be hardy to zone 6. Three of the five shall be listed in the top 20 based on performance by the most recent turf trials conducted by the University of Missouri Extension Research. There shall also be a temporary seed (such as annual rye) that will germinate quickly to help stabilize the soil preventing erosion.

6.4.12.2 Prior to seeding, all surface soils shall be loosened to a minimum depth of four inches and broken up to fine working textures with no debris or rock greater than ¾". A minimum of 4" of topsoil shall be placed on all disturbed areas.

6.4.12.3 The selected seed mix shall be sowed at a rate of 8 pounds per 1,000 square feet. Weed seed shall not exceed 1% by weight of the total mixture. Wet, moldy or otherwise damaged seed will be rejected.

6.4.12.4 All newly planted areas shall have starter fertilizer applied. Seeded areas shall be protected from erosion and loss of seed. Seed shall be watered at a rate that will keep the soil moist to a depth of 6 inches without runoff. Once the seed has germinated it shall be maintained by watering, weeding, fertilizing and mowing as required to establish a healthy, viable lawn.

6.5. ARCHITECTURE

6.5.1. General: To the maximum extent possible within the contract cost limitation, the buildings shall conform to the look and feel of the architectural style and shall use the same colors as adjacent facilities as expressed herein . The Government will evaluate the extent to which the proposal is compatible with the architectural theme expressed in the RFP during the contract or task order competition. The first priority in order of importance is that the design provides comparable building mass, size, height, and configuration compared to the architectural theme expressed herein. The second priority is that design is providing compatible exterior skin appearance based upon façade, architectural character (period or style), exterior detailing, matching nearby and installation material/color pallets, as described herein.

6.5.2. **Design**

6.5.2.1. Appendix F is provided “For Information Only”, to establish the desired site and architectural themes for the area. Appendix F identifies the desired project look and feel based on Fort Leonard Wood**’s** Installation Architectural Theme from existing and proposed adjacent building forms; i.e. building exterior skin, roof lines, delineation of entrances, proportions of fenestration in relation to elevations, shade and shadow effects, materials, textures, exterior color schemes, and organizational layout.

6.5.2.2. The design should address Fort Leonard Wood’s identified preferences. Implement these preferences considering the following:

(a) Achievable within the Construction Contract Cost Limitation (CCL)

(b) Meets Milestones within Maximum Performance Duration.

(c) Achieves Full Scope identified in this Solicitation

(d) Best Life-Cycle Cost Design

(e) Meets the Specified Sustainable Design and LEED requirements

(f) Complies with Energy Conservation Requirements Specified in this RFP.

6.5.2.3. Priority #1. Visual Compatibility: Facility Massing (Size, Height, Spacing, Architectural Theme, etc.) Exterior Aesthetic Considerations: The buildings massing, exterior functional aesthetics, and character shall create a comprehensive and harmonious blend of design features that are sympathetic to the style and context of the Installation. The Installation’s intent for this area is:

6.5.2.3.1 Note to Offerors: The following functional requirements located in 01 10 00 of the RFP do not apply and will not be required for the townhouse style of UEPH.

3.2.2.1 Closet door latch and all associated padlock eye details.

3.2.3.7 Janitor Closets.

3.2.3.10 Boot Wash.

3.2.3.12 Vestibule.

3.4.3.5 (a) Main Entrance Doors.

3.4.4 Interior Design Objectives (3.4.4.1-3.4.4.4).

3.4.4.10 (a) Public Toilets.

3.7.1.2 Boot Wash

3.7.2.3 Corridors.

5.3.5.5 Signage (1) Lobby Direction, (2) Directional Signs, (4) Building Service Signs, (5) Regulatory Signs, (6) Official and Unofficial Signs, (7) Visual Communication Boards.

6.5.2.3.2 The following additional functional requirements shall apply when townhouse style of UEPH is proposed by the Offeror:

(a) Each occupant shall be provided a vanity and mirror.

(b) Stacked washer dryer units will be used for space planning purposes instead of of full sized side by side washer and dryer units. Refer to Setion 01 10 00 Paragraph 2.3

(c) Provide exterior signage as follows: One building number sign on front of building (face of elevated landing/stairs) and Unit number sign over each exterior door.

(d) Provide dead bolts on bathroom doors.

(e) Minimum Ceiling heights: Minimum ceiling heights shall be minimum 8’-0" for all ceilings and 7’-0" minimum for closet ceilings.

6.5.2.3.3 Architectural Theme should follow Ft. Leonard Wood existing permanent party barrack facilities completed, or the color and palette as described in the IDG. Design should be similar in scale and form, use Appendix F as a reference for surrounding context.

6.5.2.4. Priority #2. Architectural Compatibility: Exterior Design Elements (Materials, Style, Construction Details, etc.) Roofs, Exterior Skin, and Windows & Door Fenestrations should promote a visually appealing compatibility with the desired character while not sacrificing the integrity and technical competency of building systems.

6.5.2.5. See Appendix F for exterior colors that apply to Architectural character at Fort Leonard Wood. The manufacturers and materials referenced are intended to establish color only, and are not intended to limit manufacturers and material selections.

6.5.2.6. Additional architectural requirements:

(a) Install fall protection anchor points on all roofs with a slope greater than 2:12

(b) Roof cover for exterior stairs to the 2nd floor where town house type construction is proposed.

6.5.3. Not Used

6.5.4. INTERIOR DESIGN

6.5.4.1 All interior finishes shall be non-combustible and have a fire hazard classification in accordance with ASTM E 84. Flame spread shall not be more than 25. Final colors shall be submitted by the Contractor and approved by the Contracting Officer.

6.5.4.2 Do not furnish sprayed-on acoustical ceiling finish in any area of this project.

6.5.4.3 All receptacle boxes and electrical switches shall be masked prior to gypsum wallboard taping to prevent gypsum wallboard cement from entering electrical boxes or touching sheathing on electrical sheathed cable.

6.5.4.5 General Hardware Requirements

a) All doors to receive a wall or floor stop where applicable. Provide solid blocking behind all wall stop locations. Hinges shall conform to BHMA 101, 4” x 4” at exterior doors, and 3-1/2” x 3-1/2” at interior doors. Locks and latches shall conform to BHMA 601. Auxiliary locks shall conform to BHMA 501. Provide hardware and matching trim in brushed stainless steel.

b) Exterior Doors: All exterior doors shall have weather stripping, drips, aluminum thresholds and additional hardware as required for a complete installation. At exterior entry doors, provide door viewer mounted at eye level and installed per manufacturer’s standard. Provide keyed maintenance locksets at all maintenance doors, to match current keying system at Fort Leonard Wood (BEST type “K” keyway, 7-pin I/C core). Provide a standard key override to match current keying system at Fort Leonard Wood

(BEST type “K” keyway, 7-pin I/C core). Override key schedule shall match programmable key card key schedule (bedroom key opens entry door and bedroom door, etc).

c) Door Bells: Entry door of each unit shall be provided with low voltage door chimes. Provide illuminated push button mounted on exterior wall near latch side of entrance door.

d) Other Interior Doors: At bathroom doors, provide Privacy lockset lever (function F76) with push button locking that can be opened from the bedroom side with a small tool, and turning inside lever or closing door releases push button on separate deadbolt – deadbolt thrown or retracted from inside bedroom ONLY by inside thumb-turn (function W2191) and shall meet the requirement of 6.5.2.3.2 d. At bedroom closet doors provide Passage set.

6.5.4.6 Bedroom Closets - Bedroom closets shall maximize closet space with shelving and organizers. As a minimum provide 2 rods and 2 shelves in 50 percent of the hanging space with shelves at approximately 3’-8” and 6’-0” above the floor. The remainder of the hanging space shall have one rod and one shelf for hanging items such as dresses and coats. Reserve enough space within closet below single rod and shelf for 3’ chest of drawers. Closet shelving and rods 3’-0” to 3’-8” in length shall have one intermediate support, and 3’-9” to 5’-6” in length shall have two intermediate supports. Shelves and rods longer than 5’-6” shall have at least three intermediate supports. Shelves and supports shall be capable of carrying 35 lbs/ft. Closet shelving construction shall be adjustable. Shelving construction may be double smoothing melamine (low pressure laminate) at ALL surfaces (including edges) or coated wire shelving.

Interior building signage requirements:

6.5.4.4 Interior Room Number signs shall be provided to match the previous permanent party townhome projects

6.6. STRUCTURAL DESIGN

The structural design shall fully comply with the following listed criteria. Additional, refer to UFC 3-310-01 STRUCTURAL LOAD DATA dated May 2005 and to Table B-1 of the UFC. This UFC contains DOD uniform and concentrated live load minimum requirements.

6.6.1 Provide a thermal break between interior and exterior conditions in the floor slab. Concrete interior slabs shall be thermally isolated from exterior conditions, foundation walls, or adjoining slabs.

6.6.2 Change 3.5.1 (a) Structural Elements of elevated floors from 60 pounds per square foot minimum to 40 pounds per square foot.

6.6.3 Change 5.4.3 The last part of this paragraph references UFC 4-010-01 (DOD Minimum Antiterrorism Standards for Buildings) as does parts a), b), c), and d). This portion of 5.4.3 does not apply.
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6.7. THERMAL PERFORMANCE

Moisture protection shall be considered by the offeror. Protection from damage to flooring and wall finishes shall be taken into consideration when designing floor slabs and walls. This could be as simple as placing a vapor barrier under the floor slab, building wrap, or moisture barrier with a vapor barrier on the walls.

6.8. PLUMBING

A plumbing system shall be extended from connections within the structure to the site systems. The design of all plumbing systems shall, unless otherwise stated herein, comply with the most current criteria

listed in 4.0 Applicable Criteria. Ft. Leonard Wood has a history of erosion corrosion due to very hard water and heavy usage. Buildings designed strictly in accordance with code have developed erosion corrosion within a five year span. The design shall address this problem through material selection and / or limited velocities, etc beyond what is required by the IPC to provide a plumbing system with a 25 year life span. The plumbing system shall use water reduction use measures that earn 2 WEc3 LEED credits.

6.8.1 The plumbing system shall include the drain waste and vent system (DWV), the domestic hot and cold water distribution system and the domestic water heating equipment.

6.8.2 Piping Runs: Piping runs shall be arranged so as not to interfere with movement of personnel and equipment.

All piping shall be installed concealed, run parallel with the lines of the building, be properly supported with allowances for expansion and contraction and insulated per specifications.

Water and waste piping shall not be located in exterior walls or other spaces where there is possibility of freezing. Where piping is to be concealed in wall spaces or pipe chases, such spaces shall be checked to ensure that clearances are adequate to properly accommodate the piping and insulation.

6.8.3 Piping Invert Elevations
All building under slab piping elevations shall be coordinated with civil engineers connection points. Verify that the pipe elevations do not conflict with building structural footings and foundations walls.

6.8.4 Plumbing Vents
The offeror shall minimize penetrations in the roof and terminate above the roof on the back side of the building (opposite street entrance).

6.8.5 Domestic Potable Water System
Distribution water piping shall be designed not to exceed a velocity of 8 feet per second at full flow. Domestic hot water piping shall be designed not to exceed 4 feet per second at full flow. All materials used for piping, valves, and miscellaneous equipment shall meet or exceed the calculated design pressures, loads, and stresses for each system. During design of the piping system, consideration shall be given to access and maintenance activities. All systems shall be capable of being maintained with a minimal amount of disassembly of all assemblies and sub-assemblies. Service hot water distribution piping shall be installed in each unit to serve fixtures requiring hot water. Supply temperature shall be maintained between a minimum of 120 degrees and a maximum of 125 degrees Fahrenheit. Paragraph 5.6.3 requirement to heat water to 140 degrees F does not apply.

6.8.6 Water Service Entrances
A single water service entrance shall be provided at each building with a water meter, isolation valve and a double check type backflow preventer. The service assembly shall be located in a conditioned space and/or protected from freezing with electric heat tape. Coordinate water service piping installation to maintain clearances above and in front of electric panels.

6.8.7 Protection of Water Supplies
Cross connections between water supply piping and waste, drain, vent, or sewer piping are prohibited. Double check type backflow preventers shall be provided at each building service entrance. All backflow preventers shall be installed for accessibility per International Plumbing Code and have floor drain in close proximity.

6.8.8 Plumbing Equipment
Water heater(s) shall be sized in accordance with Section 3.4.1.1, Hot Water Heaters.
Water heater shall be located in the mechanical room and strapped to provide seismic support. T & P relief valve shall be piped within 6” of floor to discharge over a sloped floor to floor drain or be piped to discharge with air gap over floor drain. A pressure expansion tank is required with air charging valve,

flexible butyl diaphragm bladder and charge pressure to match existing water system pressure, when a backflow preventer is installed at the water service entrance.

6.8.9 Plumbing Fixtures: Domestic water supply to plumbing fixtures shall be provided with supply stops.

6.8.9.1 Bath Tub and Valves
Shower Enclosures: Provide pre-manufactured tub-shower enclosure.
Provide wall mounted, single control pressure equalizing bathtub and shower valve with threaded connections, trip lever pop-up drain with overflow and diverter valve. Provide ball joint self cleaning shower heads that deliver a 2.0 gpm flow rate.

6.8.9.2 Lavatory
Lavatories shall be integral with the countertop.

6.8.9.3 Floor Drains
A floor drain shall be installed in the mechanical room to receive discharge from the T and P relief valve at the water heater, HVAC condensate and drain down of equipment. A floor drain shall be installed in the laundry room for laundry overflow. Each building will have a domestic water service entrance with a floor drain for backflow preventer testing and discharge. Floor drains shall be nickel bronze flush strainer type with deep seal traps.

6.8.9.4 Wall Hydrants
Two exterior freeze-proof wall hydrant with vacuum-breaker shall be provided on the exterior of each building. Provide a 3/4”, non-freeze, hydrant with external hose threaded outlet and removable valve stem. Install one hydrant in accessible location with valve stem located in conditioned space and mount 2 feet above finished grade. A second non-freeze wall hydrant will be placed on the exterior of the building nearest to the parking.

6.8.9.5 Faucets
Kitchen sink faucet shall be single lever, washerless, faucet with 10” swing arm spout, with cover plate and hand spray. Lavatory faucet shall be top mounted, single lever, washerless, faucet with cover plate. Provide aerators to sustain a 2.0 gpm flow rate.

6.8.9.6 Garbage Disposal
Provide UL rated, 1/2hp garbage disposal.

6.9. SITE ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.9.1 The primary power distribution infrastructure at Fort Leonard Wood is privatized and contracted to Laclede Electric. This includes exterior primary distribution, transformer pads, and service transformers. The final design of the primary distribution system will be the responsibility of Laclede Electric with design coordination and guidance from the Offeror. Submit all loads and final desired routing of the secondary voltage distribution system to the DPW, through the COR. The DPW will then provide all pertinent information to Laclede Electric in order to obtain pricing. All electrical utility work by Laclede Electric will be performed by a separate Government contract.

6.9.2 Provide underground secondary service conductors from the main service equipment of each facility to the pad mounted transformer secondary section. Laclede Electric will make the secondary service terminations to the secondary spades of the transformers. LaClede Electric will provide conduits from the secondary section of the transformer, to 1-2 feet beyond the service transformer pad. The Offeror shall provide the desired conduit quantity and sizes as part of submitting the loads. Laclede Electric will size the transformer to serve the load of the facility. Underground secondary duct bank will consist of buried conduits below frost line but no shallower than 36” below grade.

6.9.2.1 One spare conduit same size shall be provided. Due to the long lead time of service transformers delivery, Offeror shall provide connected load summary (utility breakdown of NFPA 70 connected loads) of all building that require service transformer to the privatized utility through COR one (1) year before delivery of the utility transformer to the site for early placement of the order.

6.9.2.2 All exterior power and communication service conduits shall be 4" or larger PVC. Conduits installed above grade shall be rigid galvanized steel (RGS). Fittings for steel conduit shall be steel threaded or compression type. Screw, Clamp or other type fittings are not acceptable.

6.9.3 Exterior Lighting: Lighting will comply with the recommendations of the Illumination Society of North America (IESNA). Provide exterior lighting in compliance with the recommendations of the Illumination Engineering Society of North America (IESNA). Exterior site and area lighting shall be metal halide HID type to meet Base standards. Exterior lighting shall include parking areas, hardstands, roadways, training areas, exercise areas, facility, and walkways. Design of lighting shall include 0.72 LLF maximum and 0.5 foot-candle minimum values. Calculations for parking lot lighting shall be to obtain an IESNA Figure 22-21 recommended foot-candle and ratios. Provide calculations for NFPA 101 foot-candel requirements to public way for compliance review. In line fusing will be installed in each ungrounded conductor at the pole base. All poles will have access door in the base to allow access to fuses. Buried junction boxes are prohibited.

6.9.3.1 Street Lighting: All street lighting will be provided by and maintained by the electrical utility company. Coordinate exact requirements with Laclede Electric to determine extent of coverage in order to properly light the remaining parking lot areas. All street lighting work by Laclede Electric will be performed by a separate Government Contract.

6.9.3.2 Parking Lighting: Provide all lighting for off street parking areas, and any additional lighting that is required to comply with the recommended lighting levels for the on-street parking areas. Parking lot lighting appearance shall match existing adjacent lighting in area. Areas not covered by street lighting and adjacent to that lighting shall match mounting height. Pole height and design is the responsibility of the Offeror. The poles and fixtures shall meet the recommendations of the IESNA for the type of space and usage.

6.9.3.3 Walkways: Walkway lighting will generally be MH shoe box type, square poles. All poles will be provided with helix base with top of the base at ground level & crash box base in high traffic areas.

6.9.3.4 Provide poles designed for wind loading of 100 miles per hour determined in accordance with AASHTO LTS-4 while supporting luminaries and all other appurtenances indicated. The effective projected areas of luminaries' and appurtenances used in calculations shall be specific for the actual products provided on each pole.

6.9.3.5 Aluminum Poles manufactured of corrosion resistant aluminum alloys conforming to AASHTO LTS-4 for Alloy 6063-T6 or Alloy 6005-T5 for wrought alloys and Alloy 356-T4 (3, 5) for cast alloys. Poles shall be seamless extruded or spun seamless type with minimum 0.188 inch wall thickness. Provide a pole grounding connection designed to prevent electrolysis when used with copper ground wire. Tops of shafts shall be fitted with a cover. Base shall be anchor bolt mounted, made of cast 356-T6 aluminum alloy in accordance with ASTM B 108 and shall be machined to receive the lower end of shaft. Joint between shaft and base shall be welded. Base cover shall be cast 356-T6 aluminum alloy in accordance with ASTM B 108. Hardware, except anchor bolts, shall be either 2024-T4 anodized aluminum alloy or stainless steel. Aluminum poles and brackets for lightings shall have a dark anodic bronze finish to match fixtures and shall not be field painted. Manufacturer's standard provision shall be made for protecting the finish during shipment and installation. Minimum protection shall consist of spirally wrapping each pole shaft with protective paper secured with tape, and shipping small parts in boxes. Brackets and Supports shall comply with IEEE C136.3, IEEE C136.13 and IEEE C136.21 as applicable. Pole brackets shall be not less than 1¼-inch aluminum secured to pole. Slip-fitter or pipe-threaded brackets may be used, but brackets shall be coordinated to luminaries' provided, and brackets for use with one type of luminary shall be identical. Brackets for pole-mounted parking lights shall correctly position luminary no lower than

mounting height indicated. Pole Foundations Anchor bolts shall be steel rod having a minimum yield strength of 50,000 psi; the top 12 inches of the rod shall be galvanized in accordance with ASTM A 153/A 153M. 6.9.4.4b. Provide ground rod at each pole location and bond equipment ground conductor to all metal parts and this rod.

6.9.4 Exterior electric branch conductors shall be installed in a minimum of 1" conduit. Provide a green insulated, safety ground wire for all non-service feeders and branch circuits.

6.9.4.1 Provide exterior power, data, and control circuits as required for sump pumps, irrigation pumps, electrical and mechanical equipment, etc for this Contract.

6.9.4.2 Provide horizontally drilled (bored) cables with ridgid galvanized steel (RGS) sleeve under roads. Roads may not be cut for utility installation without specific acceptance of the COE.

6.9.6 Telephone Service: Telephone service shall be by local service provider.. This includes exterior distribution, manholes, handholes, pedestals, etc. The final design of the system will be the responsibility of the service provider with design coordination and guidance from the Offeror.

6.9.7 Cable Television Service: Service shall be by local service provider. This includes exterior distribution, manholes, handholes, pedestals, etc. The final design of the system will be the responsibility of the service provider with design coordination and guidance from the Offeror.

6.9.8 Coordinate with DPW & Network Enterprise Center (formerly DOIM) respectively through COR to locate and mark the existing underground system duct banks for the duration of the construction. New utilities provided by service providers shall also be coordinated by this means.

6.10. FACILITY ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.10.1 Note to Offerors: The following functional requirements located in 01 10 00 of the RFP do not apply and will not be required for the townhouse style of UEPH.

> 3.6.1.4 The following sentence: “Lighting shall have automatic motion detection switching. Counter top task lighting shall be installed under cabinets utilizing fixtures with 2 foot linear T8 fluorescent lamps with manual on/off switching.”
>
> 3.7 Telecommunications Requirements (3.7.1-3.7.7)
>
> 5.7.4 Telecommunication service
>
> 5.7.6 Telecommunication System: Fiber and connection to NEC is not required. All references to fiber are deleted. I3A shall be followed.

6.10.2 The following additional functional requirements shall apply when townhouse style of UEPH is proposed by the Offeror:

a. Provide a load center panel board in each residence served from a circuit breaker in the meter center.

b. Provide exterior, wall mounted lantern type light fixtures near the exterior entry to each residence compatible with theme of the building. Lighting shall be routed through a photoelectric cell with no resident switch provided. Lamp shall have a minimum life of 2000 hours.

6.10.3 Electrical Distribution Equipment:
Provide a meter center for each building. Meter center and bank shall include meters. Locate the meter center on the side of building in a location not visible from the street. The meter center shall have a main

service rated circuit breaker. Each residence panel and the panel in the utility space shall have its own meter and circuit breaker.

Provide a minimum of 200A, 240/120V, 1-Phase, 3-Wire, 24- circuit main lug only (MLO) panel board in building utility space. This panel board shall serve building exterior and parking lot lighting loads, common use exterior receptacles, and service provider branch circuits.

Interior power shall be provided for all installed equipment requiring power to include convenience receptacles and all government furnished equipment.

6.10.4 Lighting: Coordinate all finishes of light fixtures throughout the building with the final architectural finishes. The interior use of HID lighting shall not be considered.

Provide all exterior light fixtures, routed through a photoelectric cell, mounted to the front side of each building for general lighting. Provide for safe night visibility at all drives, parking lots, porches, and walks according to IESNA with minimums to meet 0.5 foot-candle and NFPA 101 requirements.

6.10.5 Provide interior telephone and cable television services in each building.
For telephone service provide CAT 6 cabling, conduits, and RJ-45 outlets complying with I3A. Lines shall run from outlets/jacks through interior SOHO junction boxes and through exterior junction boxes (where service provider terminations will be made) all the way back to the pedestals.

For cable television service provide RG-6 cabling, conduits, and type F outlets complying with I3A. Lines shall run from outlets/jacks through interior SOHO junction boxes and through exterior junction boxes (where service provider terminations will be made) all the way back to the pedestals.

Provide a separate telephone and cable television outlet in each bedroom for resident use. Additional outlets are required in the common space (i.e.: living room) if included in design.

As a minimum each outlet shall have a double gang junction box with a single gang ring and cover plate. Provide cabling with permanently marked labels at both ends. Provide a minimum of 12 inches of additional cable length at the outlet end.

6.11. HEATING, VENTILATING, AND AIR CONDITIONING

6.11.1 Note to Offerors: The following functional requirements located in 01 10 00 of the RFP do not apply and will not be required for the townhouse style of UEPH.

3.6.3 Note (c)

3.6.3 Compliance Documentation, Climate Zone 4A, Energy Conservation Features Table: The numbers and systems listed in the Climate Zone 4A Energy Conservation Features Table are not necessarily equal to those shown in ASHRAE 90.1 Appendix G, but are an example of one possible solution to achieve 40% energy reduction requirements of the RFP. HVAC requirements are more completely spelled out in Paragraph 6.11.

3.7.2.4 DDC System

3.7.2.2 Continuous Exhaust requirements shall be replaced with Switched residential grade/ bathroom exhaust fans.

5.8.3 Building Automation System

6.11.2 All ventilation shall be provided per ASHRAE 62.2.

6.11.3 All equipment shall be matched components, all by the same manufacturer, all with a minimum manufacturer's 5-year extended warranty. Compressors shall be hermetically sealed scroll type.

a. Provide fan and coil (hail) guards. 16 SEER minimum.

b. Systems with DOAU should provide the heat / cooling (conditioned air) required by Paragraph 3.7.2.2

6.11. 4 Condensate drain lines shall be one size larger than the drain pan connection, be properly trapped, and piped to the exterior of the unit. Provide a rodent and insect screen at the exterior terminus. Refrigerant lines running between the condensing unit and the evaporator shall be concealed, except in the furnace room.

6.11.5 Thermostat: Thermostats shall be located on interior wall/partitions, approximately 5 feet above the finished floor. Locating a thermostat on exterior wall or where it is subject to unrepresentative temperature is unacceptable. The thermostat shall be a 7-day programmable style thermostat, equipped with "ON-OFF-Auto" fan status. The programmable style thermostat shall be capable of receiving an input signal from an outside air sensor to disable the heat pump cycle reversing valve below 20-degree F. The thermostat shall be capable of automatic changeover from cooling mode to auxiliary heating mode and from auxiliary heating mode to cooling mode.

6.11.6 The air distribution system shall be equipped with manual volume dampers located at each branch take-off, unless townhouse style barracks are constructed and system can be balanced through design. Permanent access to dampers shall be provided.

6.11.7 Ductwork Insulation: External thermal insulation shall be provided for all supply and outside air ductwork. The return and exhaust air ductwork shall be insulated only in case of possible sweating. The back of all supply diffusers shall be insulated.

6.11.8 Louvers: Louvers shall be designed to prevent the entry of rain or snow. Intakes shall be a minimum 25 feet from the nearest exhaust outlet and exterior mechanical equipment. Bird screens shall be provided at all exterior louvers.

6.11.9 Enclosures located in mechanical or electrical rooms shall meet NEMA 250 type 12 requirements, with a continuous hinged and gasketed exterior door with 3-point latch kit handle, enclosure manufacture provided integral hasp and staple for padlocking, door clamps and a data pocket in the door. One enclosure for the BPOC per mechanical room, and one enclosure for the CPU with UPS and Cooling Fan. Only one of the CPU's is required for the entire area up to 30 buildings.

6.11.10 HVAC: LNS SERVER Requirements Contractor provided CPU and OS to be used for LNS Server and installed in an enclosure as outlined in Section 2.2. To include LonMaker and Lon DDE Server. a. Windows XP Professional License (Army Gold Version to be loaded by NEC prior to Contractor Loading Software), P4 Processor 2 GHz Minimum, Min 2 Gig Ram, CD-ROM Drive, Graphics card capable of 1280x1024 True color, 1 DVI, VGA & 1 S-Video (with add-in PCI-Express video card); Mouse & Keybord XP Compatible (USB); 80 Gig STA Hard Drive Minimum free space, not taking into account the size of the LNS applications for LNS network interface driver requirements; 1 Gig/100 MB Network Interface Card NIC10/100/1000 LAN, J45); SLTA-10 Serial LonTalk Adapter installed, configured; LNS Server Installed and Configured; LNS Database Resides on PC b. Domain shall be set to Facility Building Number. c. LNS Server and Database shall be connected to the Lonworks TCPIP 852 Lon Network running under the Lonworks IP852 configuration server as a full client. d. Contractor shall provide 1 Copy Echelon LNS DDE Server Software License (Model 37200-20 LNS DDE Server OEM Edition) to Directorate of Public Works (DPW) Systems Manager. e. LNS Server shall NOT be connected to the Installation LAN without the approval of the DPW Systems Manager. f. Uninterruptible Power Supply(UPS) shall power CPU for 30 minutes, UPS shall have automatic shutdown and restart feature.

6.12. ENERGY CONSERVATION

6.12.1. General

None.

6.12.2. Inclusion of Renewable Energy Features. The following renewable energy features have been determined lifecycle cost effective, are included in the project budget and shall be provided:

None.

6.13. FIRE PROTECTION

6.13.1 Note to Offerors: The following functional requirements located in 01 10 00 of the RFP do not apply and will not be required for the townhouse style of UEPH.

3.6.3 Mass Notification

6.13.2 Note to Offerors: The following functional requirements for fire suppression and fire alarm systems changed with the adoption of NFPA 101 Life Safety Code 2009 Edition

Insert additional paragraph: 5.10.7 Apartment style living quarters with kitchens require sprinklers and fire alarms with no exceptions.

6.13.2 Design fire protection system, including fire suppression and fire alarm systems, per UFC 3-600-01, except as follows. Design mass notification per UFC 4-021-01.

6.13.3 Fire alarm systems shall be installed in accordance with Appendix AA - FLW FD Design Guide. The Fire Alarm Control Panel (FACP) may be located in a cover location on the exterior of each building. The FACP shall be keyed, with key code C415.A, the same as the Monaco BT2-3 transceiver. Provide a Knox box, that is keyed to the Ft. Leonard Wood fire and emergency services account. Provide a graphic annunciator, which is a wall mounted architectural plan of the building with LED lamps, located at the fire department entry.

6.13.4 Provide 5# Fire extinguishers class ABC in Kitchen area of each apartment. Provide either semi-recessed extinguisher cabinet or hook inside of lower cabinet. Section 01 10 00, paragraph 2.3 does not apply.

6.13.5 Define and Coordinate final system requirements with the post fire chief prior to construction.

6.14. SUSTAINABLE DESIGN

6.14.1. LEED Rating Tool Version. This project shall be executed using LEED-NC Version 3.

6.14.2. The minimum requirement for this project is to achieve LEED Silver level. Each non-exempt facility (building plus sitework) must achieve this level. In addition to any facilities indicated as exempt in paragraph 3, the following facilities are exempt from the minimum LEED achievement requirement: Gazebos (if provided)..

6.14.3. Credit Validation: LEED registration, compiling of documentation at LEED OnLine and use of the LEED Letter Templates is required. Registration and payment of registration fees will be by the Contractor. Administration/team management of the online project will be by the Contractor. Validation of credits will be accomplished by the Government. LEED certification of the project by the Contractor is required. The Contractor will obtain LEED certification prior to project closeout. Application, payment of certification of fees and all coordination with USGBC during the certification process will be by the

Contractor. GBCI interim review of design phase data is not required by the Government but is recommended. Government validation during project execution does not relieve or modify in any way the Contractor's responsibility to satisfy all requirements for certification as defined by LEED and GBCI. Contractor is not responsible for design phase LEED documentation of any unaltered portion of the design that is accomplished by others. If the project includes unaltered complete design by others, during the certification process Contractor will coordinate all GBCI comments on LEED credits that fall outside Contractor's scope of responsibility with the Government for coordination with the Designer of Record, and Contractor will not be penalized if project fails to achieve certification at the minimum required level due to loss of credits that are the responsibility of others.

6.14.4. Commissioning: See Appendix M for Owner's Project Requirements document(s).

6.14.5. LEED Credits Coordination. The following information is provided relative to Sustainable Sites and other credits.

SS Credit 1 Site Selection:

Project site IS NOT considered prime farmland.

Delineation of 100-year flood elevation is shown on site drawings provided in this CONTRACT.

Delineation of threatened or endangered species habitat is shown on site drawings provided in this CONTRACT.

Delineation of water, wetlands and areas of special concern is shown on site drawings provided in this CONTRACT.

Project site WAS NOT previously used as public parkland.

SS Credit 2 Development Density & Community Connectivity.

Project site DOES meets the criteria for this credit.

SS Credit 3 Brownfield Redevelopment.

Project site DOES NOT meets the criteria for this credit.

SS Credit 4.1 Public Transportation Access.

Project site DOES meets the criteria for this credit.

EA Credit 6 Green Power.

35% of the project's electricity WILL NOT be provided through an Installation renewable energy contract. Do not purchase Renewable Energy Credits (REC's) to earn this credit.

MR Credit 2 Construction Waste Management.

The Installation does not have an on-post recycling facility available for Contractor's use.

Regional Priority Credits (Version 3 only)

The project zip code is 65473.

6.14.6. LEED Credit Preferences, Guidance and Resources. See Appendix L LEED Project Credit Guidance for supplemental information relating to individual credits.

6.14.7. Not Used

6.14.8. Additional Information

Contractor shall verify and document all identified LEED credits in 6.14.5

The following LEED NC credits shall be included in this project::

SS6.1 Stormwater Design, Quantity Control

SS6.2 Stormwater Design Quality Control

EA 5 Measurement and Verification

MR 2 Construction Waste Management

IEQ 3.1 Construction IAQ Management Plans

IEQ 3.2 Construction IAQ Management Plans

IEQ 7.1 Thermal Comfort Design

6.15. ENVIRONMENTAL

6.15.1 Refer to Sec 00 73 00 Special Contract Requirements, 01 57 20.00 10 Environmental Protection and Appendix E, Environmental information.

6.15.2 All facilities must have backflow preventers on service line plus possible cross contamination sources.

6.15.3 Tree Removal

6.15.3.1 Trees to be removed shall be an agenda item for discussion and decision at the initial design conference with the installation stakeholders.

6.15.3.2 The contractor shall conduct a site visit to verify all trees are shown and flag those trees to be removed. The contractor is responsible for coordinating this site visit with the FLW Resident Office and the FLW DPW.

6.15.3.4 Prior to site plan approval, a plan in hand shall be conducted by the contractor to verify trees to be preserved and trees designated for removal with DPW staff.

6.15.4. In addition to the requirements of 01 57 20.00 10 all petroleum, oil, lubricants, hazardous materials, and hazardous waste in 55-gallon containers or larger must have secondary containment capable of holding at least 110% of the capacity of the largest container. This includes animal-based and vegetable-based grease commonly associated with dining facilities.

6.15.5. In addition to the requirements of 01 57 20.00 10, resins or discharges from cement trucks shall be contained on site and not allowed to run over the surface of the ground or to discharge to waters of the State.

6.15.6 In addition to the requirements of 01 57 20.00 10, the Contractor shall submit the SWPP to the Fort Leonard Wood DPW Environmental Office for approval with their land disturbance application.

6.15.7 In addition to the requirements of 01 57 20.00 10, Paragraph 1.2.3.10,“The Spill Control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, 40 CFR 112, and/or regulated under State or Local laws and regulations.

6.15.8 In addition to the requirements of 01 57 20.00 10 , 1.2.3.10.1, The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Contracting Officer, the local Fire Department (911), and the Fort Leonard Wood Environmental Office (573/596-0882) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.”

6.15.9 In addition to the requirements of 01 57 20.00 10, 3.3.1 Particulates: The additional shall apply. The contractor shall maintain excavations, haul routes, fill sites, and all working sites free from particulates which would cause visible emissions to escape the immediate work site, or cause one-half of the federal, state, and local air pollution standards to be exceeded. The air quality will be measured by the Fort Leonard Wood air monitoring system. Such readings will be made available to the Contracting Officer as needed by the DPW Environmental Office.

6.15.10 In addition to the requirement of 01 57 20.00 10, 3.4.2: Wastes shall be characterized using laboratory analysis when necessary, then managed, stored and disposed as stated to include Fort Leonard Wood DPW environmental guidance documents.

6.15.11 In addition to the requirement of 01 57 20.00 10, 3.4.3: The contractor shall dispose hazardous waste in compliance with all federal, state, and local laws and regulations to include Fort Leonard Wood DPW environmental guidance documents.

6.16. PERMITS

Refer to Section 00 73 20 and Appendix E of this request for proposal for permit requirements.

6.17. DEMOLITION

6.17.1 Notify Contracting Officer of demolition of any site items such as roads, parking, or associated lighting within the proposed site should be identified and will be subject to government approval.

6.18. ADDITIONAL FACILITIES

The following additional facilities are identified in the contract as additional line items - CLIN's.

6.18.1 Design and Construct 2 Basketball Courts. Courts shall be located within the development. Provide flexible pavement and court striping/markings. Provide a minimum of two Basketball goals with nets for each court.

6.18.2 Design and construct 2 Volley ball Courts. Courts shall be sand contained within appropriate edging. Courts shall be located within the development. Provide as a minimum one pair of removable poles and netting for each court.

6.18.3 Design and construct a running/jogging trail. Trail shall be of similar construction and width to existing adjacent trails. Trail shall connect to existing trails.

6.18.4 Enhanced Energy Efficiency Option - Provide 50% energy consumption savings compared to ASHRAE Standard 90.1

End of Section 01 10 00

SECTION 01 32 01.00 10
PROJECT SCHEDULE

1.0 GENERAL

1.1. REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE) ER 1-1-11 (1995) Progress, Schedules, and Network Analysis Systems (Available through the Publications page of the US Army Corps of Engineers TECHINFO Website at http://www.hnd.usace.army.mil/techinfo/. See link for Engineer Regulation ER 1-1-11).

1.2. QUALIFICATIONS

Designate an authorized representative who shall be responsible for the preparation of the schedule and all required updating (statusing) and preparation of reports. The authorized representative shall be experienced in scheduling projects similar in nature to this project and shall be experienced in the use of the scheduling software that meets the requirements of this specification.

2.0 PRODUCTS (Not Applicable)

3.0 EXECUTION

3.1. GENERAL REQUIREMENTS

3.1.1. Submit a project schedule as specified herein for approval showing the sequence in which the Contractor proposes to perform the work and dates on which the Contractor contemplates starting and completing all schedule activities. The scheduling of the entire project, including the design and construction sequences is required. Contractor management personnel shall actively participate in its development. Designers, subcontractors and suppliers working on the project shall also contribute in developing an accurate project schedule. The schedule must be a forward planning as well as a project monitoring tool. The approved project schedule shall be used to measure the progress of the work and to aid in evaluating requests for excusable time extensions. The schedule shall be cost loaded and activity coded as specified herein. The schedule will provide the basis for all progress payments. If the Contractor fails to submit any schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule

3.1.2. Status the schedule on at least a monthly basis, as specified herein. If in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained. See paragraph 3.7.4.

3.1.3. Failure of the Contractor to comply with the requirements of the Contracting Officer shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor’s right to proceed with the work, or any separable part of it, in accordance with the default terms of the contract.

3.2. BASIS FOR PAYMENT AND COST LOADING

The schedule shall be the basis for determining contract earnings during each update period and therefore the amount of each progress payment. Lack of an approved schedule update or qualified

scheduling personnel will result in an inability of the Contracting Officer to evaluate contract earned value for the purposes of payment. Failure of the Contractor to provide all information, as specified herein will result in the disapproval of the preliminary, initial and subsequent schedule updates. In the event schedule revisions are directed by the Contracting Officer and those revisions have not been included in subsequent revisions or updates, the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until such revisions to the project schedule have been made. Activity cost loading shall be reasonable as determined by the Contracting Officer. The aggregate value of all activities coded to a contract CLIN as specified herein shall equal the value of the CLIN on the Schedule.

3.3. PROJECT SCHEDULE DETAILED REQUIREMENTS

The computer software system utilized to produce and update the project schedule shall be capable of meeting all requirements of this specification. Failure of the Contractor to meet the requirements of this specification will result in the disapproval of the schedule. Scheduling software that meets the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER-1-1-11(1995) referenced herein are Primavera Project Planner (P3) by Primavera, and Open Plan by Deltek.

3.3.1. Use of the Critical Path Method

Use the Critical Path Method (CPM) of network calculation to generate the project schedule. Prepare the project schedule using the Precedence Diagram Method (PDM).

3.3.2. Level of Detail Required

Develop the project schedule to an appropriate level of detail. Failure to develop the project schedule to an appropriate level of detail, as determined by the Contracting Officer, will result in its disapproval. The Contracting Officer will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

3.3.2.1. Activity Durations

Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. Less than 2 percent of all non-procurement activities shall have Original Durations (OD) greater than 20 work days or 30 calendar days. Procurement activities are defined herein.

3.3.2.2. Design and Permit Activities

Include design and permit activities, including necessary conferences and follow-up actions and design package submission activities. Include the design schedule in the project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific contract period. This shall be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. Include review and correction periods associated with each item.

3.3.2.3. Procurement Activities

Include activities associated with the submittal, approval, procurement, fabrication and delivery of long lead materials, equipment, fabricated assemblies and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days. A typical procurement sequence includes the string of activities: submit, approve/review, procure, fabricate, and deliver.

3.3.2.4. Mandatory Tasks

Include and properly schedule the following tasks (See also the Sample Preliminary Submittal Register Input Form):

(a) Submission, review and acceptance of design packages, including BIM

(b) Submission of mechanical/electrical/information systems layout drawings

(c) Submission and approval of O & M manuals

(d) Submission and approval of as-built drawings

(e) Submission and approval of 1354 data and installed equipment lists

(f) Submission and approval of testing and air balance (TAB)

(g) Submission of TAB specialist design review report

(h) Submission and approval of fire protection specialist

(i) Submission and approval of testing and balancing of HVAC plus commissioning plans and data. Develop the schedule logic associated with testing and commissioning of mechanical systems to a level of detail consistent with the contract commissioning requirements.

(j) Air and water balancing

(k) HVAC commissioning

(l) Controls testing plan submission

(m) Controls testing

(n) Performance Verification testing

(o) Other systems testing, if required

(p) Contractor's pre-final inspection

(q) Correction of punch list from Contractor's pre-final inspection

(r) Government's pre-final inspection

(s) Correction of punch list from Government's pre-final inspection

(t) Final Inspection

3.3.2.5. Government Activities. Show Government and other agency activities that could impact progress. These activities include but are not limited to: approvals, design reviews, review conferences, release for construction of design package(s), environmental permit approvals by State regulators, inspections, utility tie-ins, Government Furnished Property/Equipment (GFP) and Notice to Proceed for phasing requirements, if any.

3.3.2.6. Activity Responsibility Coding (RESP)

Assign Responsibility Code for all activities to the Prime Contractor, Subcontractor or Government agency responsible for performing the activity. Activities coded with a Government Responsibility code include, but are not limited to: Government approvals, Government design reviews, environmental permit approvals by State regulators, Government Furnished Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements. Code all activities not coded with a Government Responsibility Code to the Prime Contractor or Subcontractor responsible to perform the work. Activities shall not have more than one Responsibility Code. Examples of acceptable activity code values are: DOR (for the designer of record); ELEC (for the electrical subcontractor); MECH (for the mechanical subcontractor); and GOVT (for USACE). Unacceptable code values are abbreviations of the names of subcontractors.

3.3.2.7. Activity Work Area Coding (AREA)

Assign Work Area code to activities based upon the work area in which the activity occurs. Define work areas based on resource constraints or space constraints that would preclude a resource, such as a particular trade or craft work crew from working in more than one work area at a time due to restraints on

resources or space. Examples of Work Area Coding include different areas within a floor of a building, different floors within a building, and different buildings within a complex of buildings. Activities shall not have more than one Work Area Code. Not all activities are required to be Work Area coded. A lack of Work Area coding will indicate the activity is not resource or space constrained.

3.3.2.8. Contract Changes/Requests for Equitable Adjustment (REA) Coding (MODF)

Assign Activity code to any activity or sequence of activities added to the schedule as a result of a Contract Modification, when approved by Contracting Officer, with a Contract Changes/REA Code. Key all Code values to the Government's modification numbering system. Any activity or sequence of activities added to the schedule as a result of alleged constructive changes made by the Government may be added to a copy of the current schedule, subject to the approval of the Contracting Officer. Assign Activity codes for these activities with a Contract Changes/REA Code. Key the code values to the Contractor's numbering system. Approval to add these activities does not necessarily mean the Government accepts responsibility and therefore liability for such activities and any associated impacts to the schedule, but rather the Government recognizes such activities are appropriately added to the schedule for the purposes of maintaining a realistic and meaningful schedule. Such activities shall not be Responsibility Coded to the Government unless approved. An activity shall not have more than one Contract Changes/REA Code

3.3.2.9. Contract Line Item (CLIN) Coding (BIDI)

Code all activities to the CLIN on the Contract Line Item Schedule to which the activity belongs. An activity shall not contain more than one CLIN Item Code. CLIN Item code all activities, even when an activity is not cost loaded.

3.3.2.10. Phase of Work Coding (PHAS)

Assign Phase of Work Code to all activities, based upon the phase of work in which the activity occurs. Code activities to either a Design Phase or a Construction Phase. Code fast track design and construction phases proposed by the Contractor to allow filtering and organizing the schedule by fast track design and construction packages. If the contract specifies construction phasing with separately defined performance periods, identify a Construction Phase Code to allow filtering and organizing the schedule accordingly. Each activity shall have only one Phase of Work code.

3.3.2.11. Category of Work Coding (CATW)

Assign Category of Work code to all Activities based upon the category of work which the activity belongs. Category of Work Code must include, but is not limited to: Design, Design Submittal, design reviews, review conferences, Construction Submittal, Approvals (if any), Acceptance, Procurement, Fabrication, Delivery, Weather Sensitive Installation, Non-Weather Sensitive Installation, Start Up, Test, and Turnover. Assign a Category of Work code to each activity. Each activity shall have only one Category of Work Code.

3.3.2.12. Definable Features of Work Coding (FOW1, FOW2, FOW3)

Assign a Definable Feature of Work Code to appropriate activities based on the definable feature of work to which the activity belongs. Definable Feature of Work is defined in Specification Section 01 45 04.00 10, Contractor Quality Control. An activity shall not have more than one Definable Feature of Work Code. Not all activities are required to be Definable Feature of Work Coded.

3.3.3. Scheduled Project Completion and Activity Calendars

The schedule interval shall extend from NTP date to the required contract completion date. The contract completion activity (End Project) shall finish based on the required contract duration, as adjusted for any

approved contract time extensions. The first scheduled work period shall be the day after NTP is acknowledged by the Contractor. Schedule activities on a calendar to which the activity logically belongs. Activities may be assigned to a 7 day calendar when the contract assigns calendar day durations for the activity such as a Government Acceptance activity. If the Contractor intends to perform physical work less than seven days per week, schedule the associated activities on a calendar with non-work periods identified including weekends and holidays. Assign the Category of Work Code - Weather Sensitive Installation to those activities that are weather sensitive. Original durations must account for anticipated normal adverse weather. The Government will interpret all work periods not identified as non-work periods on each calendar as meaning the Contractor intends to perform work during those periods.

3.3.3.1. Project Start Date

The schedule shall start no earlier than the date on which the NTP was acknowledged. Include as the first activity in the project schedule an activity called "Start Project" or “NTP”. The "Start Project" activity shall have an "ES" constraint date equal to the date that the NTP was acknowledged, with a zero day duration.

3.3.3.2. Schedule Constraints and Open Ended Logic

Constrain completion of the last activity in the schedule by the contract completion date. Schedule calculations shall result in negative float when the calculated early finish date of the last activity is later than the contract completion date. Include as the last activity in the project schedule an activity called "End Project". The "End Project" activity shall have an "LF" constraint date equal to the contract completion date for the project, and with a zero day duration or by using the “project must finish by” date in the scheduling software. The schedule shall have no constrained dates other than those specified in the contract. The use of artificial float constraints such as “zero fee float” or “zero total float” are typically prohibited. There shall only be 2 open ended activities: Start Project (or NTP) with no predecessor logic and End Project with no successor logic.

3.3.3.3. Early Project Completion

In the event the Preliminary or Initial project schedule calculates an early completion date of the last activity prior to the contract completion date, the Contractor shall identify those activities that it intends to accelerate and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. The last activity shall have a late finish constraint equal to the contract completion date and the schedule will calculate positive float. The Government will not approve an early completion schedule with zero float on the longest path. The Government is under no obligation to accelerate activities for which it is responsible to support a proposed early contract completion.

3.3.4. Interim Completion Dates

Constrain contractually specified interim completion dates to show negative float when the calculated early finish date of the last activity in that phase is later than the specified interim completion date.

3.3.4.1. Start Phase

Include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The “Start Phase X" activity shall have an "ES" constraint date equal to the date on which the NTP was acknowledged, and a zero day duration.

3.3.4.2. End Phase

Include as the last activity for a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have an "LF" constraint date equal to the specified completion date for that phase and a zero day duration.

3.3.4.3. Phase “X” Hammock

Include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" hammock activity shall be logically tied to the earliest and latest activities in the phase.

3.3.5. Default Progress Data Disallowed

Do not automatically update Actual Start and Finish dates with default mechanisms that may be included in the scheduling software. Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the AS and AF dates on the Daily Quality Control report for every in-progress or completed activity, and failure to ensure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's updated schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. Updating of the percent complete and the remaining duration of any activity shall be independent functions. Disable program features which calculate one of these parameters from the other.

3.3.6. Out-of-Sequence Progress

Activities that have progressed before all preceding logic has been satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case basis subject to approval by the Contracting Officer. Propose logic corrections to eliminate all out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule..

3.3.7. Negative Lags and Start to Finish Relationships

Lag durations contained in the project schedule shall not have a negative value. Do not use Start to Finish relationships (SF).

3.3.8. Calculation Mode

Schedule calculations shall retain the logic between predecessors and successors even when the successor activity starts and the predecessor activity has not finished. Software features that in effect sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied (“progress override”) will not be allowed.

3.3.9. Milestones

Include milestone activities for each significant project event including but not limited to: milestone activities for each fast track design package released for construction; design complete; foundation/substructure construction complete; superstructure construction complete; building dry-in or enclosure complete to allow the initiation of finish activities; permanent power complete; and building systems commissioning complete.

3.3.10. Use of Primavera “P6”

If P6 is being used, the following settings are mandatory in the Preliminary Project Schedule, Initial Project Schedule and all schedule submissions to the Government:

3.3.10.1. Activity Codes shall be Project Level not Global or EPS level.

3.3.10.2. Calendars shall be Project Level not Global or Resource level.

3.3.10.3. Set Activity Duration Types to "Fixed Duration & Units".

3.3.10.4. Set Percent Complete Types to "Physical".

3.3.10.5. Use Default Time Period Admin Preferences "8.0 hr/day, 40 hr/week, 172 hr/month, 2000 hr/year". Set Calendar Work Hours/Day to 8.0 Hour days. This is not to mandate the Contractor's work week. Alternate workweeks may be set up in "Calendar Settings".

3.3.10.6. Set Schedule Option for defining Critical Activities "Longest Path".

3.3.10.7. Set Schedule Option for defining progressed activities "Retained Logic".

3.3.10.8. Set up Cost loading a single lump sum Resource. The Price/Unit shall be $1/hr, Default Units/Time shall be "8h/d", and select settings "Auto Compute Actuals" and "Calculate costs from units".

3.3.10.9. Activity ID's shall not exceed 10 characters.

3.3.10.10. Activity Names shall have the most defining and detailed description within the first 30 characters.

3.4. PROJECT SCHEDULE SUBMISSIONS

Provide the submissions as described below. The data CD, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.4.1. Preliminary Project Schedule Submission

Submit the Preliminary Project Schedule, defining the Contractor's planned operations for the first 90 calendar days for approval within 15 calendar days after the NTP is acknowledged. The approved Preliminary Project Schedule will be used for payment purposes not to exceed 90 calendar days after NTP. Completely cost load the Preliminary Project Schedule to balance the contract award CLINS shown on the Price Schedule. Detail it for the first 90 calendar days. It may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as previously specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and must include all of the required Plan and Program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as design activities, the planned submissions of all early design packages, permitting activities, design review conference activities and other non-construction activities intended to occur within the first 90 calendar days. Schedule any construction activities planned for the first 90 calendar days after NTP. Constrain planned construction activities by Government acceptance of the associated design package(s) and all other specified Program and Plan approvals. Activity code any activities that are summary in nature after the first 90 calendar days with Responsibility Code (RESP) and Feature of Work code (FOW1, FOW2, FOW3)

3.4.2. Initial Project Schedule Submission

Submit the Initial Project Schedule for approval within 42 calendar days after NTP. The schedule shall demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. The Initial Schedule shall be at a reasonable level of detail as determined by the Contracting Officer. Include detailed design and permitting activities, including but not limited to identification of individual design packages, design submission, reviews and conferences; permit submissions and any required Government actions; and long lead procurement activities required prior to design completion. The Initial Project Schedule shall include the entire construction sequence and all fast track construction activities, with as much detail as is known at the time but, as a minimum, shall include all construction start and completion milestone activities, and detailed construction activities through the dry-in milestone, including all activity coding and cost loading. Include the remaining construction, including cost loading, but it may be scheduled summary in nature. As the design proceeds and design

packages are developed, fully detail the remaining construction activities concurrent with the monthly schedule updating process. Constrain construction activities by Government acceptance of associated designs. When the design is complete, incorporate into the then approved schedule update all remaining detailed construction activities that are planned to occur after the dry-in milestone.

3.4.3. Design Package Schedule Submission:

With each design package submitted to the Government, submit a frag-net schedule extracted from the then current Preliminary, Initial or Updated schedule which covers the activities associated with that Design Package including construction, procurement and permitting activities.

3.4.4. Periodic Schedule Updates

Based on the result of the meeting specified in PERIODIC SCHEDULE UPDATE MEETINGS, submit periodic schedule updates. These submissions shall enable the Contracting Officer to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgment of the Contracting Officer or authorized representative is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made. Update the schedule to include detailed lower WBS activities procurement and construction activities as the design progresses, but not later than the submission of the final, un-reviewed design submission for each separate design package. The Contracting Officer may require submission of detailed schedule activities for any distinct construction that is started prior to submission of a final design submission, if such activity is authorized.

3.4.5. Standard Activity Coding Dictionary

Use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11, Appendix A. This exact structure is mandatory, even if some fields are not used. A template SDEF compatible schedule backup file (sdef.prx) is available on the QCS website: http://rms.usace.army.mil .

The SDEF format is as follows:

Field	Activity Code	Length	Description
1	WRKP	3	Workers per Day
2	RESP	4	Responsible Party (e.g. GC, subcontractor, USACE)
3	AREA	4	Area of Work
4	MODF	6	Modification or REA number
5	BIDI	6	Bid Item (CLIN)
6	PHAS	2	Phase of Work
7	CATW	1	Category of Work
8	FOW1	10	Feature of Work (used up to 10 characters in length)

9	FOW2	10	Feature of Work (used up to 20 characters in length)
10	FOW3	10	Feature of Work (used up to 30 characters in length)

3.5. SUBMISSION REQUIREMENTS

Submit the following items for the Preliminary Schedule, Initial Schedule, and every Periodic Schedule Update throughout the life of the project:

3.5.1. Data CD's

Provide two sets of data CD's containing the project schedule in the backup format. Each CD shall also contain all previous update backup files. File medium shall be CD. Label each CD, indicating the type of schedule (Preliminary, Initial, Update), full contract number, Data Date and file names. Each schedule shall have a unique file name as determined by the Contractor.

3.5.2. Narrative Report

Provide a Narrative Report with the Preliminary, Initial, and each Periodic Update of the project schedule, as the basis of the progress payment request. The Narrative Report shall include: a description of activities along the 2 most critical paths where the total float is less than or equal to 20 work days, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. The narrative report is expected to communicate to the Government, the Contractor's thorough analysis of the schedule output and its plans to compensate for any problems, either current or potential, which are revealed through its analysis. Identify and explain why any activities that, based their calculated late dates, should have either started or finished during the update period but did not.

3.5.3. Approved Changes Verification

Include only those project schedule changes in the schedule submission that have been previously approved by the Contracting Officer. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

3.5.4. Schedule Reports

The format, filtering, organizing and sorting for each schedule report shall be as directed by the Contracting Officer. Typically reports shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date Total Float, Actual Start Date, Actual Finish Date, and Percent Complete. The following lists typical reports that will be requested. One or all of these reports may be requested for each schedule submission.

3.5.4.1. Activity Report

A list of all activities sorted according to activity number.

3.5.4.2. Logic Report

A list of detailed predecessor and successor activities for every activity in ascending order sorted by activity number.

3.5.4.3. Total Float Report

A list of all incomplete activities sorted in ascending order of total float. List activities which have the same amount of total float in ascending order of Early Start Dates. Do not show completed activities on this report.

3.5.4.4. Earnings Report by CLIN

A compilation of the Contractor's Total Earnings on the project from the NTP to the data date. This report shall reflect the earnings of specific activities based on the agreements made in the schedule update meeting defined herein. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining progress payments. Group activities by CLIN Item number and sort by activity number. This report shall: sum all activities coded to a particular CLIN and provide a CLIN Item percent earned value; and complete and sum CLIN items to provide a total project percent complete. The printed report shall contain, for each activity: the Activity Number, Activity Description, Original Budgeted Amount, Quantity to Date, Percent Complete (based on cost), and Earnings to Date.

3.5.5. Network Diagram

The network diagram is required for the Preliminary, Initial and Periodic Updates. Depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.5.1. Continuous Flow

Show a continuous flow from left to right with no arrows from right to left. Show the activity number, description, duration, and estimated earned value on the diagram.

3.5.5.2. Project Milestone Dates

Show dates on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.5.3. Critical Path

Clearly show the critical path.

3.5.5.4. Banding

Organize activities as directed to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

3.5.5.5. S-Curves

Earnings curves showing projected early and late earnings and earnings to date.

3.6. PERIODIC SCHEDULE UPDATE MEETINGS

Conduct periodic schedule update meetings for the purposes of reviewing the Contractor’s proposed out of sequence corrections, determining causes for delay, correcting logic, maintaining schedule accuracy and determining earned value. Meetings shall occur at least monthly within five days of the proposed schedule data date and after the Contractor has updated the schedule with Government concurrence respecting actual start dates, actual finish dates, remaining durations and percent complete for each activity it intend to status. Match the acutal start and finish dates with the dates exported, as described in paragraph 3.3.5. Provide a computer with the scheduling software loaded and a projector during the meeting which allows all meeting participants to view the proposed schedule update during the meeting.

The meeting and resultant approvable schedule update shall be a condition precedent to a formal submission of the update as described in SUBMISSION REQUIREMENTS and to the submission of an invoice for payment. The meeting will be a working interactive exchange which will allow the Government and the Contractor the opportunity review the updated schedule on a real time and interactive basis. The Contractor's authorized scheduling representative will organize, sort, filter and schedule the update as requested by the Government. The meeting will last no longer than 8 hours. A rough draft of the proposed activity logic corrections and narrative report shall be provided to the Government 48 hours in advance of the meeting. The Contractor's Project Manager and Authorized Scheduler shall attend the meeting with the Authorized Representative of the Contracting Officer.

3.6.1. Update Submission Following Progress Meeting

Submit a complete update of the project schedule containing all approved progress, revisions, and adjustments, pursuant to paragraph SUBMISSION REQUIREMENTS not later than 4 working days after the periodic schedule update meeting, reflecting only those changes made during the previous update meeting.

3.6.2. Status of Activities

Update statusing information, including Actual Start Dates (AS), Actual Finish Dates (AF), Remaining Durations (RD) and Percent Complete shall be subject to the approval of the Government prior to the meeting. As a minimum, address the following items on an activity by activity basis during each progress meeting:

3.6.2.1. Actual Start and Finish Dates

Accurately status the AS and/or AF dates for each activity currently in-progress or completed since the last update The Government may allow an AF date to be assigned with the percent complete less than 100% to account for the value of work remaining but not restraining successor activities. Only assign AS dates when actual progress occurs on an activity.

3.6.2.2. Remaining Duration

Update the estimated RD for all incomplete activities independent of Percent Complete. Remaining durations may exceed the activity OD or may exceed the activity's prior update RD if the Government considers the current OD or RD to be understated based on current progress, insufficient work crews actually manning the job, unrealistic OD or deficiencies that must be corrected that restrain successor activities.

3.6.2.3. Percent Complete

Update the percent complete for each activity started based on the realistic assessment of earned value. Activities which are complete but for remaining minor punch list work and which do not restrain the initiation of successor activities may be statused 100 percent complete. To allow for proper schedule management, cost load the correction of punch list from Government pre-final inspection activity(ies) not less than 1% of the total contract value, which activity(ies) may be declared 100 percent complete upon completion and correction of all punch list work identified during Government pre-final inspection(s).

3.6.2.4. Logic Changes

Specifically identify and discuss all logic changes pertaining to NTP on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, and other changes that have been made pursuant to contract provisions. The Government will only approve logic revisions for the purpose of keeping the

schedule valid in terms of its usefulness in calculating a realistic completion date, correcting erroneous logic ties, and accurately sequencing the work.

3.6.2.5. Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary. 3) Changes required to correct a schedule that does not represent the actual or planned prosecution and progress of the work.

3.7. REQUESTS FOR TIME EXTENSIONS

In the event the Contractor believes it is entitled to an extension of the contract performance period, completion date, or any interim milestone date, furnish the following for a determination by the Contracting Officer: justification, project schedule data, and supporting evidence as the Contracting Officer may deem necessary. Submission of proof of excusable delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is a condition precedent to any approvals by the Government. In response to each Request For Proposal issued by the Government, the Contractor shall submit a schedule impact analysis demonstrating whether or not the change contemplated by the Government impacts the critical path.

3.7.1. Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with its request. The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information.

Actual delays that are found to be caused by the Contractor's own actions, which result in a calculated schedule delay, will not be a cause for an extension to the performance period, completion date, or any interim milestone date.

3.7.2. Submission Requirements

Submit a justification for each request for a change in the contract completion date of less than 2 weeks based upon the most recent schedule update at the time of the NTP or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

3.7.2.1. A list of affected activities, with their associated project schedule activity number.

3.7.2.2. A brief explanation of the causes of the change

3.7.2.3. An analysis of the overall impact of the changes proposed.

3.7.2.4. A sub-network of the affected area

Identify activities impacted in each justification for change by a unique activity code contained in the required data file.

3.7.3. Additional Submission Requirements

The Contracting Officer may request an interim update with revised activities for any requested time extension of over 2 weeks. Provide this disk within 4 days of the Contracting Officer's request.

3.7.4. If Progress Falls Behind the Approved Project Schedule

3.7.4.1. Should progress fall behind the approved schedule (more than 20 work days of negative float) due to Contractor generated problems, promptly provide a supplemental recovery or completion schedule that illustrates its efforts to regain time to assure a completion by the required contract completion date.

3.7.4.2. The supplemental recovery or completion schedule will not replace the original, approved schedule as the official contract schedule. Continue to update the original, approved schedule on at least a monthly basis. In addition, the Contractor and the Contracting Officer will monitor the supplemental recovery or completion schedule on at least a bi-weekly basis to determine its effect on regaining the rate of progress to assure project completion by the contractually required completion date.

3.7.4.3. Do not artificially improve progress by simply revising the schedule logic, modifying or adding constraints, or shortening future work activity durations. Resource and manpower load the supplemental recovery schedule or completion schedule with crew size and productivity for each remaining activity, indicating overtime, weekend work, and/or double shifts needed to regain the schedule, in accordance with FAR 52.236.15, without additional cost to the Government. Indicate assumptions made and the basis for any logic, constraint, or duration changes used in the creation of the supplemental recovery or completion schedule in a narrative submitted for the Contracting Officer’s approval. Any additional resources or manpower must be evident at the work site. Do not modify the official contract schedule to include these assumptions.

3.7.4.4. Failure to perform work and maintain progress in accordance with the supplemental recovery or completion schedule may result in an interim and final unsatisfactory performance rating and/or may result in corrective action by the Contracting Officer in accordance with FAR 52.236-15.

3.8. DIRECTED CHANGES

If the NTP is issued for changes prior to settlement of price and/or time, submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The Contracting Officer will approve proposed revisions to the schedule prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor with suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor shall continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.9. WEEKLY PROGRESS MEETINGS

3.9.1. The Government and the Contractor shall meet weekly (or as otherwise mutually agreed to) between the meetings described in paragraph PERIODIC SCHEDULE UPDATE MEETINGS for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress and to review planned activities for the upcoming two weeks. The then current and approved schedule update shall be used for the purposes of this meeting and for the production and review of reports. The Contractor’s Project Manager and the Authorized Representative of the Contracting Officer shall attend. The weekly progress meeting will address the status of RFI’s, RFP’s and Submittals.

3.9.2. Provide a bar chart produced by the scheduling software, organized by Total Float and Sorted by Early Start Date, and a two week “look-ahead” schedule by filtering all schedule activities to show only

current ongoing activities and activities schedule to start during the upcoming two weeks, organized by Work Area Code (AREA) and sorted by Early Start Date.

3.9.3. The Government and the Contractor shall jointly review the reports. If it appears that activities on the longest path(s) which are currently driving the calculated completion date (driving activities), are not progressing satisfactorily and therefore could jeopardize timely project completion, corrective action must be taken immediately. Corrective action includes but is not limited to: increasing the number of work crews; increasing the number of work shifts; increasing the number of hours worked per shift; and determining if Government responsibility coded activities require Government corrective action.

3.10. OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

3.11. TRANSFER OF SCHEDULE DATA INTO RMS/QCS

Download and upload the schedule data into the Resident Management System (RMS) prior to RMS databases being transferred to the Government and is considered to be additional supporting data in a form and detail required by the Contracting Officer pursuant to FAR 52.232-5 - Payments under Fixed-Price Construction Contracts. The receipt of a proper payment request pursuant to FAR 52.232-27 - Prompt Payment for Construction Contracts is contingent upon the Government receiving both acceptable and approvable hard copies and electronic export from QCS of the application for progress payment.

End of Section 01 32 01.00 10

SECTION 01 33 00
SUBMITTAL PROCEDURES

1.0 GENERAL

1.1. DEFINITIONS

1.2. NOT USED

1.3. SUBMITTAL CLASSIFICATION

1.4. APPROVED OR CONCURRED WITH SUBMITTALS

1.5. DISAPPROVED SUBMITTALS

1.6. WITHHOLDING OF PAYMENT

1.7. GENERAL

1.8. SUBMITTAL REGISTER

1.9. SCHEDULING

1.10. TRANSMITTAL FORM (ENG FORM 4025)

1.11. SUBMITTAL PROCEDURES

1.12. CONTROL OF SUBMITTALS

1.13. GOVERNMENT APPROVED SUBMITTALS

1.14. INFORMATION ONLY SUBMITTALS

1.15. STAMPS

1.0 GENERAL

1.1. DEFINITIONS

1.1.1. Submittal

Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

1.1.2. Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by SD numbers and titles as follows.

SD-01 Preconstruction Submittals

- Certificates of insurance.
- Surety bonds.
- List of proposed subcontractors.
- List of proposed products.
- Construction Progress Schedule.
- Submittal register.
- Schedule of prices.
- Accident Prevention Plan.
- Work plan.
- Quality control plan.
- Environmental protection plan.

SD-02 Shop Drawings

- Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.
- Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.
- Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

- Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.
- Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

- Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.
- Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.
- Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies that are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

- Calculations, mix designs, analyses or other data pertaining to a part of work.
- Design submittals, design substantiation submittals and extensions of design submittals.

SD-06 Test Reports

- Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)
- Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.
- Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.
- Investigation reports.
- Daily checklists.
- Final acceptance test and operational test procedure.

SD-07 Certificates

- Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.
- Document required of Contractor, or of a supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.
- Confined space entry permits.
- Text of posted operating instructions.

SD-08 Manufacturer's Instructions

- Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

- Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- Factory test reports.

SD-10 Operation and Maintenance Data

- Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

SD-11 Closeout Submittals

- Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

1.1.3. Approving Authority

Office authorized to approve submittal.

1.1.4. Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.2. NOT USED

1.3. SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.3.1. Designer of Record Approved (DA)

1.3.1.1. Designer of Record (DOR) approval is required for all extensions of design, critical materials, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". Provide the Government the number of copies designated hereinafter of all DOR approved submittals, after the DOR has taken appropriate action. The DOR shall ensure that submittals conform to the Solicitation, the Accepted Proposal and the completed design, however see below for those submittals proposing a deviation to the contract or a substitution of a material, system, or piece of equipment that was identified by manufacturer, brand name or model description in the accepted contract proposal.

1.3.1.2. The DOR shall ensure that the submittals comply with all applicable Buy American Act and Trade Agreement Act clauses in the contract. The DOR may confer with the Contracting Officer's Representative for advice and interpretation of those clauses, as necessary.

1.3.1.3. The Government may, but is not required to, review any or all DOR approved submittals for conformance to the solicitation, accepted proposal and the completed design. Except for submittals designated as deviating from the Solicitation, the Accepted Proposal or completed design, the Contractor may proceed with acquisition and installation upon DOR approval. Government Approved (GA)

1.3.2. Government Approved (GA)

Government approval is required for any item specifically designated as requiring Government approval in the Solicitation, for internal and external color finish selections and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.3.3. Government Conformance Review of Design (CR)

The Government will review all intermediate and final design submittals for conformance with the technical requirements of the solicitation. Section 01 33 16 **DESIGN AFTER AWARD** covers the design submittal and review process in detail. Review will be only for conformance with the applicable codes, standards and contract requirements. Design data includes the design documents described in Section 01 33 16 **DESIGN AFTER AWARD**. Generally, design submittals should be identified as SD-05 Design Data submittals.

1.3.4. Designer of Record Approved/Government Conformance Review (DA/CR)

1.3.4.1. Deviations to the Accepted Design. Designer of Record approval and the Government’s concurrence are required for any proposed deviation from the accepted design which still complies with the contract (the Solicitation and Accepted Proposal) before the Contractor is authorized to proceed with material acquisition or installation. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings.” If necessary to facilitate the project schedule, the Contractor and the DOR may discuss a submittal proposing a deviation with the Contracting Officer's Representative prior to officially submitting it to the Government. However, the Government reserves the right to review the submittal before providing an opinion, if it deems it necessary. In any case, the Government will not formally agree to or provide a preliminary opinion on any deviation without the DOR's approval or recommended approval. The Government reserves the right to non-concur with any deviation from the design, which may impact furniture, furnishings, equipment selections or operations decisions that were made, based on the reviewed and concurred design.

1.3.4.2. Substitutions. Unless prohibited or provided for otherwise elsewhere in the Contract, where the accepted contract proposal named products, systems, materials or equipment by manufacturer, brand name and/or by model number or other specific identification, and the Contractor desires to substitute manufacturer or model after award, submit a requested substitution for Government concurrence. Include substantiation, identifying information and the DOR's approval, as meeting the contract requirements and that it is equal in function, performance, quality and salient features to that in the accepted contract proposal.

1.3.5. Designer of Record Approved/Government Approved (DA/GA)

Any proposed deviation to the solicitation and/or the accepted proposal constitutes a change to the contract. In addition to the above stated requirements for proposed deviations to the accepted design, both Designer of Record and Government Approval and, where applicable, a contract modification are required before the Contractor is authorized to proceed with material acquisition or installation for any proposed deviation to the contract. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". The Government reserves the right to accept or reject any such proposed deviation at its discretion.

1.3.6. Information Only

All submittals not requiring Designer of Record or Government approval will be for information only. Provide the Government "For Information Only" copies of all submittals not requiring Government approval or concurrence, after the Designer of Record has taken the appropriate action.

1.4. APPROVED OR CONCURRED WITH SUBMITTALS

Do not construe the Contracting Officer's approval of or concurrence with submittals as a complete check, but only that design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal. Approval or concurrence will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for design, dimensions, all design extensions, such as the design of adequate connections and details, etc., and the satisfactory construction of all work. The Government won't consider re-submittals for the purpose of substituting previously approved materials or equipment unless accompanied by an explanation of why a substitution is necessary.

1.5. DISAPPROVED SUBMITTALS

Make all corrections required by the Contracting Officer, obtain the Designer of Record's approval when applicable, and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. Resubmit any "information only" submittal found to contain errors or unapproved deviations from the Solicitation or Accepted Proposal as one requiring "approval" action, requiring both Designer of Record and Government approval. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, provide prompt notice in accordance with the Contract Clause "Changes" to the Contracting Officer.

1.6. WITHHOLDING OF PAYMENT

No payment for materials incorporated in the work will be made if all required Designer of Record or required Government approvals have not been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

1.7. GENERAL

Make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, the Contractor's Quality Control (CQC) System Manager and the Designer of Record, if applicable, shall check, approve, sign, and stamp all items, indicating action taken. Clearly idenify proposed deviations from the contract requirements. Include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Schedule and make submittals requiring Government approval prior to the acquisition of the material or equipment covered thereby. Pick up and dispose of samples remaining upon completion of the work in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

1.8. SUBMITTAL REGISTER (GA)

Develop a complete list of submittals, including each separate design package submittal. Submit the initial submittal register within 15 days after Notice to Proceed, including, as a minimum, the design packages and other initial submittals required elsewhere in the contract. The Designer of Record shall identify required submittals in the specifications, and use the list to prepare the Submittal Register, utilizing the government-provided software, QCS (see Section 01 45 01.10), to create the ENG Form 4288. Appendix R is a preliminary submittal register input form for use with the Quality Management System and the Resident Office Management System (QCS and RMS). The Government will provide the Contractor the actual Excel Spreadsheet version of this sample input form after award to modify and to use for input into QCS. The Excel Spreadsheet is not totally inputable into QCS, so additional keystroke input will be necessary. The sample input form is not all-inclusive. In addition, additional submittals may be required by other parts of the contract. After award, the parties will meet to discuss contract specific (or task order specific for a task order contract) distribution for the submittals all-inclusive and additional submittals may be required by other parts of the contract. Develop and complete the submittal register as the design is completed. Submit it to the Contracting Officer with the un-reviewed final design package submission or as soon as the design specifications are completed, if before the final design submission. When applicable, if the Contractor elects to fast track design and construction, using multiple design package submissions, update the submittal register to reflect the submittals associated with each design submission, clearly denoting all revisions to the previous submission. The submittal register serves as a scheduling document for submittals and for control of submittal actions throughout the contract period. Coordinate the submit dates and need dates used in the submittal register with dates in the Contractor prepared progress schedule. Submit monthly updates to the submittal register showing the Contractor action codes and actual dates with Government action codes and actual dates or until all submittals have been satisfactorily completed. Revise and submit the submittal register when revising the progress schedule.

1.9. SCHEDULING

Schedule submittals covering component items forming a system or items that are interrelated to be coordinated and submitted concurrently. Schedule certifications to be submitted with the pertinent drawings. Allow adequate time (a minimum of 15 calendar days exclusive of mailing time) and show on the register for those items requiring Government approval or concurrence. No delay damages or time extensions will be allowed for time lost in late submittals by the Contractor.

1.10. TRANSMITTAL FORM (ENG FORM 4025)

Use the transmittal form (ENG Form 4025) for submitting submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor or are included in the QCS software if the Contractor is required to use QCS for this contract. Use a separate transmittal form for each specification section Complete this form by filling out all the heading blank spaces and identify

each item submitted. Exercise special care to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

1.11. SUBMITTAL PROCEDURES

Make submittals as follows:

1.11.1. Procedures

The Government will further discuss detailed submittal procedures with the Contractor at the Post-Award Conference.

1.11.2. Deviations

For submittals which include proposed deviations requested by the Contractor, check the column "variation" of ENG Form 4025. Set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

1.12. CONTROL OF SUBMITTALS

Carefully control his procurement operations to ensure that each individual submittal is made on or before the scheduled submittal date shown on the approved "Submittal Register."

1.13. GOVERNMENT APPROVED OR CONCURRED WITH SUBMITTALS

Upon completion of review of submittals requiring Government approval or concurrence, the Government will stamp and date the submittals as approved or concurred.. The Government will retain two (2) copies of the submittal and return four (4) copy(ies) of the submittal.

1.14. INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe. The Government will retain four (4) copies of information only submittals.

1.15. STAMPS

Use stamps similar to the following on the submittal data to certify that the submittal meets contract requirements:

CONTRACTOR

(FIRM NAME)

Approved

_____

_____

Approved with corrections as noted on submittal data and/or attached sheet(s)

_____

Signature: _____

Title: _____

Date: _____

For design-build construction, both the Contractor Quality Control System Manager and the Designer of Record shall stamp and sign to certify that the submittal meets contract requirements.

SECTION 01 33 16
DESIGN AFTER AWARD

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ATTACHMENT E LEED SUBMITTALS

ATTACHMENT F BUILDING INFORMATION MODELING REQUIREMENTS

ATTACHMENT G DESIGN SUBMITTAL DIRECTORY AND SUBDIRECTORY FILE ARRANGEMENT

1.0 GENERAL INFORMATION

1.1. INTRODUCTION

1.1.1. The information contained in this section applies to the design required after award. After award, the Contractor will develop the accepted proposal into the completed design, as described herein.

1.1.2. The Contractor may elect to fast track the design and construction that is, proceed with construction of parts of the sitework and facilities prior to completion of the overall design. To facilitate fast tracking, the Contractor may elect to divide the design into no more than six (6) design packages per major facility type and no more than three (3) design packages for site and associated work. Designate how it will package the design, consistent with its overall plan for permitting (where applicable) and construction of the project. See Sections 01 33 00 SUBMITTAL PROCEDURES and 01 32 01.00 10 PROJECT SCHEDULE for requirements for identifying and scheduling the design packaging plan in the submittal register and project schedule. See also Sections 01 10 00 STATEMENT OF WORK and 01 57 20.00 10 ENVIRONMENTAL PROTECTION for any specified permit requirements. If early procurement of long-lead item construction materials or installed equipment, prior to completion of the associated design package, is necessary to facilitate the project schedule, also identify those long-lead items and how it will assure design integrity of the associated design package to meet the contract requirements (The Contract consists of the Solicitation requirements and the accepted proposal). Once the Government is satisfied that the long-lead items meet the contract requirements, the Contracting Officer will allow the Contractor to procure the items at its own risk.

1.1.3. The Contractor may proceed with the construction work included in a separate design package after the Government has reviewed the final (100%) design submission for that package, review comments have been addressed and resolved to the Government's satisfaction and the Contracting Officer (or the Administrative Contracting Officer) has agreed that the design package may be released for construction.

1.1.4. INTEGRATED DESIGN. To the maximum extent permitted for this project, use a collaborative, integrated design process for all stages of project delivery with comprehensive performance goals for siting, energy, water, materials and indoor environmental quality and ensures incorporation of these goals. Consider all stages of the building lifecycle, including deconstruction.

1.2. DESIGNER OF RECORD

Identify, for approval, the Designer of Record (“DOR”) that will be responsible for each area of design. One DOR may be responsible for more than one area. Listed, Professional Registered, DOR(s) shall account for all areas of design disciplines. The DOR’s shall stamp, sign, and date each design drawing and other design deliverables under their responsible discipline at each design submittal stage (see contract clause Registration of Designers). If the deliverables are not ready for release for construction, identify them as "preliminary" or "not for release for construction" or by using some other appropriate designation. The DOR(s) shall also be responsible for maintaining the integrity of the design and for compliance with the contract requirements through construction and documentation of the as-built condition by coordination, review and approval of extensions of design, material, equipment and other construction submittals, review and approval or disapproval of requested deviations to the accepted design or to the contract, coordination with the Government of the above activities, and by performing other typical professional designer responsibilities.

2.0 PRODUCTS (Not Applicable)

3.0 EXECUTION

3.1. PRE-WORK ACTIVITIES & CONFERENCES

3.1.1. Design Quality Control Plan

Submit for Government acceptance, a Design Quality Control Plan in accordance with Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL before design may proceed.

3.1.2. Post Award Conference

3.1.2.1. The government will conduct a post award contract administration conference at the project site, as soon as possible after contract award. This will be coordinated with issuance of the contract notice to proceed (NTP). The Contractor and major sub-contractor representatives shall participate. All designers need not attend this first meeting. Government representatives will include COE project delivery team members, facility users, facility command representatives, and installation representatives. The Government will provide an agenda, meeting goals, meeting place, and meeting time to participants prior to the meeting.

3.1.2.2. The post award conference shall include determination and introduction of contact persons, their authorities, contract administration requirements, discussion of expected project progress processes, and coordination of subsequent meetings for quality control (see Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL), Partnering (see below and SCR: Partnering), and the initial design conference (see below).

3.1.2.3. The government will introduce COE project delivery team members, facility users, facility command representatives, and installation representatives. The DB Contractor shall introduce major subcontractors, and other needed staff. Expectations and duties of each person shall be defined for all participants. A meeting roster shall be developed and distributed by the government with complete contact information including name, office, project role, phone, mailing and physical address, and email address.

3.1.3. Partnering & Project Progress Processes

3.1.3.1. The initial Partnering conference may be scheduled and conducted at any time with or following the post award conference. The Government proposes to form a partnership with the DB Contractor to develop a cohesive building team. This partnership will involve the COE project delivery team members, facility users, facility command representatives, installation representatives, Designers of Record, major subcontractors, contractor quality control staff, and contractor construction management staff. This partnership will strive to develop a cooperative management team drawing on the strengths of each team member in an effort to achieve a quality project within budget and on schedule. This partnership will be bilateral in membership and participation will be totally voluntary. All costs, excluding labor and travel expenses, shall be shared equally between the Government and the Contractor. The Contractor and Government shall be responsible for their own labor and travel costs. Normally, partnering meetings will be held at or in the vicinity of the project installation.

3.1.3.2. As part of the partnering process, the Government and Contractor shall develop, establish, and agree to comprehensive design development processes including conduct of conferences, expectations of design development at conferences, fast-tracking, design acceptance, Structural Interior Design (SID)/ Furniture, Fixtures & Equipment (FF&E) design approval, project closeout, etc. The government will explain contract requirements and the DB Contractor shall review their proposed project schedule and suggest ways to streamline processes.

3.1.4. Initial Design Conference

The initial design conference may be scheduled and conducted at the project installation any time after the post award conference, although it is recommended that the partnering process be initiated with or before the initial design conference. Any design work conducted after award and prior to this conference should be limited to site and is discouraged for other items. All Designers of Record shall participate in

the conference. The purpose of the meeting is to introduce everyone and to make sure any needs the contractor has are assigned and due dates established as well as who will get the information. See also Attachment F, BUILDING INFORMATION MODELING REQUIREMENTS for discussion concerning the BIM Implementation Plan demonstration at this meeting. The DB Contractor shall conduct the initial design conference.

3.1.5. Pre-Construction Conference

Before starting construction activities, the Contractor and Government will jointly conduct a pre-construction administrative conference to discuss any outstanding requirements and to review local installation requirements for start of construction. It is possible there will be multiple Pre-Construction Conferences based on the content of the design packages selected by the Contractor. The Government will provide minutes of this meeting to all participants.

3.2. STAGES OF DESIGN SUBMITTALS AND OVER THE SHOULDER PROGRESS REVIEWS

The stages of design submittals described below define Government expectations with respect to process and content. The Contractor shall determine how to best plan and execute the design and review process for this project, within the parameters listed below. As a minimum, the Government expects to see at least one interim design submittal, at least one final design submittal before construction of a design package may proceed and at least one Design Complete submittal that documents the accepted design. The Contractor may sub-divide the design into separate packages for each stage of design and may proceed with construction of a package after the Government accepts the final design for that package. See discussion on waivers to submission of one or more intermediate design packages where the parties partner during the design process. See also Attachment F, BUILDING INFORMATION MODELING REQUIREMENTS for discussion concerning BIM and the various stages of design submittals and over-the-shoulder progress reviews**.**

3.2.1. Site/Utilities

To facilitate fast-track design-construction activities the contractor may submit a final (100%) site and utility design as the first design submittal or it may elect to submit interim and final site and utility design submittals as explained below. Following review, resolution, and incorporation of all Government comments, and submittal of a satisfactory set of site/utility design documents, after completing all other pre-construction requirements in this contract and after the pre-construction meeting, the Government will allow the Contractor to proceed with site development activities, including demolition where applicable, within the parameters set forth in the accepted design submittal. For the first site and utility design submission, whether an interim or final, the submittal review, comment, and resolution times from this specification apply, except that the Contractor shall allow the Government a 14 calendar day review period, exclusive of mailing time. No on-site construction activities shall begin prior to written Government clearance to proceed.

3.2.2. Interim Design Submittals

The Contractor may submit either a single interim design for review, representing a complete package with all design disciplines, or split the interim design into smaller, individual design packages as it deems necessary for fast-track construction purposes. As required in Section 01 32 01.00 10 PROJECT SCHEDULE, the Contractor shall schedule its design and construction packaging plan to meet the contract completion period. This submission is the Government's primary opportunity to review the design for conformance to the solicitation and to the accepted contract proposal and to the Building Codes at a point where required revisions may be still made, while minimizing lost design effort to keep the design on track with the contract requirements. The requirements for the interim design review submittals and review conferences are described hereinafter. This is not necessarily a hold point for the design process; the Contractor may designate the interim design submittal(s) as a snapshot and proceed with design development at its own risk. See below for a waiver, where the parties establish an effective

over-the-shoulder progress review procedure through the partnering process that would eliminate the need for or expedite a formal intermediate design review on one or more individual design packages.

3.2.3. Over-the-Shoulder Progress Reviews

To facilitate a streamlined design-build process, the Government and the Contractor may agree to one-on-one reviewer or small group reviews, electronically, on-line (if available within the Contractor's standard design practices) or at the Contractor's design offices or other agreed location, when practicable to the parties. The Government and Contractor will coordinate such reviews to minimize or eliminate disruptions to the design process. Any data required for these reviews shall normally be provided in electronic format, rather than in hard copy. If the Government and Contractor establish and implement an effective, mutually agreeable partnering procedure for regular (e.g., weekly) over-the shoulder review procedures that allow the Government reviewers the opportunity to keep fully informed of the progress, contents, design intent, design documentation, etc. of the design package, the Government will agree to waive or to expedite the formal intermediate design review period for that package. The Contractor shall still be required to submit the required intermediate design documentation, however the parties may agree to how that material will be provided, in lieu of a formal consolidated submission of the package. It should be noted that Government funding is extremely limited for non-local travel by design reviewers, so the maximum use of virtual teaming methods must be used. Some possible examples include electronic file sharing, interactive software with on-line or telephonic conferencing, televideo conferencing, etc. The Government must still perform its Code and Contract conformance reviews, so the Contractor is encouraged to partner with the reviewers to find ways to facilitate this process and to facilitate meeting or bettering the design-build schedule. The Contractor shall maintain a fully functional configuration management system as described herein to track design revisions, regardless of whether or not there is a need for a formal intermediate design review. The formal intermediate review procedures shall form the contractual basis for the official schedule, in the event that the partnering process determines that the formal intermediate review process to be best suited for efficient project execution. However, the Government pledges to support and promote the partnering process to work with the Contractor to find ways to better the design schedule.

3.2.4. Final Design Submissions

This submittal is required for each design package prior to Government acceptance of that design package for construction. The requirements for the final design submittal review conferences and the Government's acceptance for start of construction are described herein after.

3.2.5. Design Complete Submittals

After the final design submission and review conference for a design package, revise the design package to incorporate the comments generated and resolved in the final review conferences, perform and document a back-check review and submit the final, design complete documents, which shall represent released for construction documents. The requirements for the design complete submittals are described hereinafter.

3.2.6. Holiday Periods for Government Review or Actions

Do not schedule meetings, Government reviews or responses during the last two weeks of December or other designated Government Holidays (including Friday after Thanksgiving). Exclude such dates and periods from any durations specified herein for Government actions.

3.2.7. Late Submittals and Reviews

If the Contractor cannot meet its scheduled submittal date for a design package, it must revise the proposed submittal date and notify the government in writing, at least one (1) week prior to the submittal, in order to accommodate the Government reviewers’ other scheduled activities. If a design submittal is

over one (1) day late in accordance with the latest revised design schedule, or if notification of a proposed design schedule change is less than seven (7) days from the anticipated design submission receipt date, the Government review period may be extended up to seven (7) days due to reviewers' schedule conflicts. If the Government is late in meeting its review commitment and the delay increases the Contractor's cost or delays completion of the project, the Suspension of Work and Defaults clauses provide the respective remedy or relief for the delay.

3.3. DESIGN CONFIGURATION MANAGEMENT

3.3.1. Procedures

Develop and maintain effective, acceptable design configuration management (DCM) procedures to control and track all revisions to the design documents after the Interim Design Submission through submission of the As-Built documents. During the design process, this will facilitate and help streamline the design and review schedule. After the final design is accepted, this process provides control of and documents revisions to the accepted design (See Special Contract Requirement: Deviating From the Accepted Design). The system shall include appropriate authorities and concurrences to authorize revisions, including documentation as to why the revision must be made. Include the DCM procedures in the Design Quality Control Plan. The DCM data shall be available to the Government reviewers at all times. The Contractor may use its own internal system with interactive Government concurrences, where necessary or may use the Government's "DrChecks Design Review and Checking System" (see below and Attachment C).

3.3.2. Tracking Design Review Comments

Although the Contractor may use its own internal system for overall design configuration management, the Government and the Contractor shall use the DrChecks Design Review and Checking System to initiate, respond to, resolve and track Government design compliance review comments. This system may be useful for other data which needs to be interactive or otherwise available for shared use and retrieval. See Attachment C for details on how to establish an account and set-up the DrChecks system for use on the project.

3.3.3. Design and Code Checklists

Develop and complete various discipline-specific checklists to be used during the design and quality control of each submittal. Submit these completed checklists with each design submittal, as applicable, as part of the project documentation. See Section 01 45 04.00 10 Contractor Quality Control, Attachment D for a Sample Fire Protection and Life Safety Code review checklist and Attachment E for LEED SUBMITTALS.

3.4. INTERIM DESIGN REVIEWS AND CONFERENCES

3.4.1. General

At least one interim design submittal, review and review conference is required for each design package (except that, per paragraph 3.2.1, the Contractor may skip the interim design submission and proceed directly to final design on the sitework and utilities package). The DB Contractor may include additional interim design conferences or over-the-shoulder reviews, as needed, to assure continued government concurrence with the design work. Include the interim submittal review periods and conferences in the project schedule and indicate what part of the design work is at what percentage of completion. The required interim design conferences shall be held when interim design requirements are reached as described below. See also Paragraph: **Over-the-Shoulder Progress Reviews** for a waiver to the formal interim design review.

3.4.2. Procedures

After receipt of an Interim Design submission, allow the Government fourteen (14) calendar days after receipt of the submission to review and comment on the interim design submittal. For smaller design packages, especially those that involve only one or a few separate design disciplines, the parties may agree on a shorter review period or alternative review methods (e.g., over-the–shoulder or electronic file sharing), through the partnering process. For each interim design review submittal, the COR will furnish, to the Contractor, a single consolidated, validated listing of all comments from the various design sections and from other concerned agencies involved in the review process using the DrChecks Design Review and Checking System. The review will be for conformance with the technical requirements of the solicitation and the Contractor's RFP proposal. If the Contractor disagrees technically with any comment or comments and does not intend to comply with the comment, he/she must clearly outline, with ample justification, the reasons for noncompliance within five (5) days after receipt of these comments in order that the comment can be resolved. Furnish disposition of all comments, in writing, through DrChecks. The Contractor is cautioned that if it believes the action required by any comment exceeds the requirements of this contract, that it should take no action and notify the COR in writing immediately. The Interim Review conference will be held for each design submittal at the installation. Bring the personnel that developed the design submittal to the review conference. The conference will take place the week after the receipt of the comments by the Contractor. For smaller fast-track packages that involve only a few reviewers, the parties may agree to alternative conferencing methods, such as teleconferencing, or televideo, where available, as determined through Partnering.

3.4.3. Conference Documentation

3.4.3.1. In order to facilitate and accelerate the Government code and contract conformance reviews, identify, track resolution of and maintain all comments and action items generated during the design process and make this available to the designers and reviewers prior to the Interim and subsequent design reviews.

3.4.3.2. The DB Contractor shall prepare meeting minutes and enter final resolution of all comments into DrChecks. Copies of comments, annotated with comment action agreed on, will be made available to all parties before the conference adjourns. Unresolved problems will be resolved by immediate follow-on action at the end of conferences. Incorporate valid comments. The Government reserves the right to reject design document submittals if comments are significant. Participants shall determine if any comments are critical enough to require further design development prior to government concurrence. Participants shall also determine how to proceed in order to obtain government concurrence with the design work presented.

3.5. INTERIM DESIGN REQUIREMENTS

Interim design deliverables shall include drawings, specifications, and design analysis for the part of design that the Contractor considers ready for review.

3.5.1. Drawings

Include comments from any previous design conferences incorporated into the documents to provide an interim design for the “part” submitted.

3.5.2. Design Analyses

3.5.2.1. The designers of record shall prepare and present design analyses with calculations necessary to substantiate and support all design documents submitted. Address design substantiation required by the applicable codes and references and pay particular attention to the following listed items:

3.5.2.2. For parts including sitework, include site specific civil calculations.

3.5.2.3. For parts including structural work, include structural calculations.

(a) Identify all loads to be used for design.

(b) Describe the method of providing lateral stability for the structural system to meet seismic and wind load requirements. Include sufficient calculations to verify the adequacy of the method.

(c) Provide calculations for all principal roof, floor, and foundation members and bracing and secondary members.

(d) Provide complete seismic analyses for all building structural, mechanical, electrical, architectural, and building features as dictated by the seismic zone for which the facility is being constructed.

(e) Computer generated calculations must identify the program name, source, and version. Provide input data, including loads, loading diagrams, node diagrams, and adequate documentation to illustrate the design. The schematic models used for input must show, as a minimum, nodes/joints, element/members, materials/properties, and all loadings, induced settlements/deflections, etc., and a list of load combinations. Include an output listing for maximum/minimum stresses/forces and deflections for each element and the reactions for each loading case and combination.

(f) See also the Security (Anti-Terrorism) requirements below for members subject to Anti-Terrorist Force Protection (ATFP) and Progressive Collapse requirements.

(g) Fully coordinate and integrate the overall structural design between two different or interfacing construction types, such as modular and stick-built or multistory, stacked modular construction. Provide substantiation of structural, consolidation/settlement analysis, etc., as applicable, through the interfaces.

3.5.2.4. For Security (Anti-Terrorism): Provide a design narrative and calculations where applicable, demonstrating compliance with each of the 22 standards in UFC 4-010-01, which includes Design of Buildings to Resist Progressive Collapse (use the most recent version of UFC 4-023-03, regardless of references to any specific version in UFC 4-010-01). Where sufficient standoff distance is not being provided, show calculations for blast resistance of the structural system and building envelope. Show complete calculations for members subjected to ATFP loads, e.g., support members of glazed items (jambs, headers, sills) connections of windows to support members and connections of support members to the rest of the structure. For 3 story and higher buildings, provide calculations to demonstrate compliance with progressive collapse requirements.

3.5.2.5. For parts including architectural work, include building floor area analysis.

3.5.2.6. For parts including mechanical work, include HVAC analysis and calculations. Include complete design calculations for mechanical systems. Include computations for sizing equipment, compressed air systems, air duct design, and U-factors for ceilings, roofs and exterior walls and floors. Contractor shall employ commercially available energy analysis techniques to determine the energy performance of all passive systems and features. Use of hourly energy load computer simulation is required (see paragraph 3.5.5.2 for list of acceptable software). Based on the results of calculations, provide a complete list of the materials and equipment proposed with the manufacturer's published cataloged product installation specifications and roughing-in data.

3.5.2.7. For parts including life safety, include building code analysis and sprinkler and other suppression systems. Notwithstanding the requirements of the Codes, address the following:

(a) A registered fire protection engineer (FPE) must perform all fire protection analyses. Provide the fire protection engineer’s qualifications. See Section 01 10 00, paragraph 5 for qualifications.

(b) Provide all references used in the design including Government design documents and industry standards used to generate the fire protection analysis.

(c) Provide classification of each building in accordance with fire zone, building floor areas and height and number of stories.

(d) Provide discussion and description of required fire protection requirements including extinguishing equipment, detection equipment, alarm equipment and water supply. Alarm and detection equipment shall interface to requirements of Electronic Systems.

(e) Provide hydraulic calculations based on water flow test for each sprinkler system to insure that flow and pressure requirements can be met with current water supply. Include copies of Contractor's water flow testing done to certify the available water source.

3.5.2.8. For parts including plumbing systems:

(a) List all references used in the design.

(b) Provide justification and brief description of the types of plumbing fixtures, piping materials and equipment proposed for use.

(c) Detail calculations for systems such as sizing of domestic hot water heater and piping; natural gas piping; LP gas piping and tanks, fuel oil piping and tanks, etc., as applicable.

(d) When the geotechnical report indicates expansive soils are present, indicate in the first piping design submittal how piping systems will be protected against damage or backfall/backflow due to soil heave (from penetration of slab to the 5 foot building line).

3.5.2.9. For elevator systems:

(a) List all criteria codes, documents and design conditions used.

(b) List any required permits and registrations for construction of items of special mechanical systems and equipment.

3.5.2.10. For parts including electrical work, include lighting calculations to determine maintained foot-candle levels, electrical load analysis and calculations, electrical short circuit and protective device coordination analysis and calculations and arc fault calculations.

3.5.2.11. For parts including telecommunications voice/data (including SIPRNET, where applicable), include analysis for determining the number and placement of outlets

3.5.2.12. For Cathodic Protection Systems, provide the following stamped report by the licensed corrosion engineer or NACE specialist with the first design submission. The designer must be qualified to engage in the practice of corrosion control of buried or submerged metallic surfaces. He/she must be accredited or certified by the National Association of Corrosion Engineers (NACE) as a NACE Accredited Corrosion Specialist or a NACE certified Cathodic Protection Specialist, or must be a registered professional engineer with a minimum of five years experience in corrosion control and cathodic protection, Clearly describe structures, systems or components in soil or water to be protected. Describe methods proposed for protection of each.

3.5.2.13. Air Barrier System: Provide a narrative of the design and installation requirements for the Air Barrier system. As part of the design quality control process an air barrier consultant shall review drawing details to assure that details of critical Air Barrier components are properly detailed and incorporated during the design drawings and process (i.e. window flashing details, penetration in air barrier details, door flashing details, roofing/ceiling barrier interface details and etc.). Furnish the Government written review details and results.

3.5.3. Geotechnical Investigations and Reports:

3.5.3.1. The contractor’s licensed geotechnical engineer shall prepare a final geotechnical evaluation report, to be submitted along with the first foundation design submittal. Make this information available as early as possible during the over-the-shoulder progress review process. Summarize the subsurface conditions and provide recommendations for the design of appropriate utilities, foundations, floor slabs, retaining walls, embankments, and pavements. Include compaction requirements for fill and backfill under

buildings, sidewalks, other structures and open areas. Recommend foundation systems to be used, allowable bearing pressures for footings, lateral load resistance capacities for foundation systems, elevations for footings, grade beams, slabs, etc. Provide an assessment of post-construction settlement potential including total and differential. Provide recommendations regarding lateral earth pressures (active, at-rest, passive) to be used in the design of retaining walls. Include the recommended spectral accelerations and Site Class for seismic design along with an evaluation of any seismic hazards and recommendations for mitigation, if required. Include calculations to support the recommendations for bearing capacity, settlement, and pavement sections. Include supporting documentation for all recommended design parameters such as Site Class, shear strength, earth pressure coefficients, friction factors, subgrade modulus, California Bearing Ratio (CBR), etc. Provide earthwork recommendations, expected frost penetration, expected groundwater levels, recommendations for dewatering and groundwater control and the possible presence of any surface or subsurface features that may affect the construction of the project such as sinkholes, boulders, shallow rock, old fill, old structures, soft areas, or unusual soil conditions. Include pH tests, salinity tests, resistivity measurements, etc., required to design corrosion control and grounding systems. Include the raw field data. Arrange a meeting with the Government subsequent to completion and evaluation of the site specific geotechnical exploration to outline any differences encountered that are inconsistent with the Government provided preliminary soils information. Clearly outline differences which require changes in the foundation type, or pavement and earthwork requirements from that possible and contemplated using the Government furnished preliminary soils investigation, which result in a change to the design or construction. Any equitable adjustment is subject to the provisions of the contract's Differing Site Conditions Clause.

3.5.3.2. Vehicle Pavements: The Contractor's geotechnical report shall contain flexible and rigid pavement designs, as applicable for the project, including design CBR and modulus of subgrade reaction and the required compaction effort for subgrades and pavement layers. Provide Information on the types of base course materials available in the area and design strengths.

3.5.3.3. The Contractor and the professional geotechnical engineer consultant shall certify in writing that the design of the project has been developed consistent with the Contractor's final geotechnical report. The certification shall be stamped by the consulting professional geotechnical engineer and shall be submitted with the first design submission. If revisions are made to the initial design submission, a new certification shall be provided with the final design submission.

3.5.4. LEED Documentation:

Assign a LEED Accredited Professional, responsible to track LEED planning, performance and documentation for each LEED credit through construction closeout. Incorporate LEED credits in the plans, specifications and design analyses. Develop LEED supporting documentation as a separable portion of the Design Analysis and provide with each required design submittal. Include the LEED Project checklist for each non-exempt facility (one checklist may be provided for multiple facilities in accordance with the LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects and the LEED SUBMITTALS (Attachment E, herein) with each submittal. Final design submittal for each portion of the work must include all required design documentation relating to that portion of work (example - all site credit design documents with final site design). Submittal requirements are as indicated in Attachment E, LEED SUBMITTALS. Submit all documentation indicated on Attachment E as due at final design at final design submittal (for fast-track projects with multiple final design submittals, this shall be at the last scheduled final design submittal). All project documentation related to LEED shall conform to USGBC requirements for both content and format, including audit requirements and be separate from other design analyses. Maintain and update the LEED documentation throughout project progress to construction closeout and shall compile product data, receipts, calculations and other data necessary to substantiate and support all credits claimed. The Government may audit any or all individual credits. Audit documentation is not required to be submitted unless requested. These requirements apply to all projects. If the project requires the Contractor to obtain USGBC certification, the Contractor shall also be responsible for obtaining USGBC certification and shall provide written evidence of certification with the construction closeout LEED documentation submittal. Install the USGBC building plaque at the location

indicated by the Government upon receipt. If Contractor obtains USGBC interim design review, submit the USGBC review to the Government within 30 days of receipt for information only.

3.5.4.1. LEED Documentation for Technology Solution Set. If the Solicitation provides a Prescriptive Technology Solution Set, use of the Technology Solution set has no effect on LEED documentation requirements. Provide all required LEED documentation, including energy analysis, in accordance with LEED requirements when using the Technology Solution Set.

3.5.5. Energy Conservation:

3.5.5.1. Refer to Section 01 10 00, Paragraph 5. Interim and Final Design submittals shall demonstrate that each building including the building envelope, HVAC systems, service water heating, power, and lighting systems meet the Mandatory Provisions and the Prescriptive Path requirements of ASHRAE 90.1. Use Compliance Documentation forms available from ASHRAE and included in the ASHRAE 90.1 User's Manual for this purpose. The Architectural Section of the Design Analysis shall include completed forms titled "Building Envelope Compliance Documentation Parts I and II". The Heating Ventilating and Air Conditioning (HVAC) Section of the Design Analysis shall include a completed form titled "HVAC Simplified Approach Option - Part I" if this approach is allowed by the Standard. Otherwise, the HVAC Section of the Design Analysis shall include completed forms titled "HVAC Mandatory Provisions - Part II" and "HVAC Prescriptive Requirements - Part III". The Plumbing Section of the Design Analysis shall include a completed form titled "Service Water Heating Compliance Documentation". The Electrical Section of the Design Analysis shall include an explanatory statement on how the requirements of ASHRAE 90.1 Chapter 8 Power were met. The Electrical Section of the Design Analysis shall also include a completed form titled "Lighting Compliance Documentation".

3.5.5.2. Interim and Final Design submittals which address energy consuming systems, (heating, cooling, service hot water, lighting, power, etc.) must also include calculations in a separate Energy Conservation Section of the Design Analysis which demonstrate and document (a) the baseline energy consumption for the facility or facilities under contract, that would meet the requirements of ANSI/ASHRAE/IESNA Standard 90.1 and (b) the energy consumption of the facility or facilities under contract utilizing the materials and methods required by this construction contract. Use the USGBC Energy and Atmosphere (EA) Credit 1 compliance template / form or an equivalently detailed form for documenting compliance with the energy reduction requirements. This template / form is titled PERFORMANCE RATING METHOD and is available when the project is registered for LEED. The calculation methodology used for this documentation and analysis shall follow the guidelines set forth in Appendix G of ASHRAE 90.1, with two exceptions: a) receptacle and process loads may be omitted from the calculation; and b) the definition of the terms in the formula for Percentage Improvement found in paragraph G1.2 are modified as follows: Baseline Building Performance shall mean the annual energy consumption calculated for a building design intended for use as a baseline for rating above standard design meeting the minimum requirements of the energy standard, and Proposed Building Performance shall mean annual energy consumption calculated for the proposed building design intended for construction. This calculation shall address all energy consuming systems in a single integrated methodology. Include laboratory fume hoods and kitchen ventilation loads in the energy calculation. They are not considered process loads. Individual calculations for heating, cooling, power, lighting, power, etc. systems will not be acceptable. The following building simulation software is acceptable for use in calculating building energy consumption: Hourly Analysis Program (HAP) by Carrier Corp., TRACE 700 by Trane Corp., DOE-2 by US Department of Energy, EnergyPlus by DOD/DOE.

3.5.6. Specifications

Specifications may be any one of the major, well known master guide specification sources. Uuse only one source. Examples include specifications from MASTERSPEC from the American Institute of Architects, SPECTEXT from Construction Specification Institute or Unified Facility Guide Specifications (UFGS using MASTERFORMAT 2004 numbering system), etc. The UFGS are available through the "Whole Building Design Guide" website, using a websearch engine. Manufacturers' product specifications, utilizing CSI's Manu-Spec, three part format may be used in conjunction with the selected

specifications. The designers of record shall edit and expand the appropriate Specifications to insure that all project design requirements, current code requirements, and regulatory requirements are met. Specifications shall clearly identify, where appropriate, specific products chosen to meet the contract requirements (i.e., manufacturers' brand names and model numbers or similar product information). Note that the UFGS are NOT written for Design-Build and must be edited appropriately. For instance, they assume that the Government will approve most submittals, whereas in Design-Build, the Designer of Record has that action, unless this Solicitation requires Government approval for specific submittals. The Designer of Record should also note that some UFGS sections might either prescribe requirements exceeding the Government's own design standards in applicable references or contain requirements that should be selected where appropriately required by the applicable references. At any rate, where the UFGS are consistent with other major, well known master commercial guide specifications, then generally retain such requirements, as good practices.

3.5.7. Building Rendering

Present and provide a draft color computer, artist, or hand drawn rendering with the conceptual design submittal of the building exterior. Perspective renderings shall include a slightly overhead view of the entire building to encompass elevations and the roof configuration of the building. After Government review and acceptance, provide a final rendering, including the following:

Three (3) 18" x 24" color prints, framed and matted behind glass with project title underneath the print.

One (1) Image file (high resolution) in JPG format on CD for those in the submittal distribution list.

3.5.8. Interim Building Design Contents

The following list represents what the Government considers should be included in the overall completed design for a facility or project. It is not intended to limit the contractor from providing different or additional information as needed to support the design presented, including the require design analyses discussed above. As the Contractor develops individual design packages and submits them for Interim review, include as much of the applicable information for an individual design package as is developed at the Interim design level for review purposes. These pieces shall be developed as the design progresses toward the design complete stage.

3.5.8.1. Lawn and Landscaping Irrigation System

3.5.8.2. Landscape, Planting and Turfing

3.5.8.3. Architectural

(a) Design Narrative

(b) Architectural Floor Plans, Typical Wall and Roof Sections, Elevations

(c) Finish schedule

(d) All required equipment

(e) Special graphics requirements

(f) Door and Window Schedules

(g) Hardware sets using BHMA designations

(h) Composite floor plan showing all pre-wired workstations

(i) Structural Interior Design (SID) package: See ATTACHMENT A for specific requirements

(j) Furniture, Fixtures & Equipment (FF&E) design package: See ATTACHMENT B for specific requirements

(k) Air Barrier Design: Details of all Air Barrier components, (i.e. window flashing details, penetrations in air barrier details, door flashing details, roofing/ceiling barrier interface details and etc.)

3.5.8.4. Structural Systems. Include:

(a) Drawings showing principal members for roof and floor framing plans as applicable

(b) Foundation plan showing main foundation elements where applicable

(c) Typical sections for roof, floor, and foundation conditions

3.5.8.5. Plumbing Systems

(a) Show locations and general arrangement of plumbing fixtures and major equipment

(b) Plan and isometric riser diagrams of all areas including hot water, cold water, waste and vent piping. Include natural gas (and meter as required), (natural gas and meter as required), (LP gas), (fuel oil) and other specialty systems as applicable.

(c) Include equipment and fixture connection schedules with descriptions, capacities, locations, connection sizes and other information as required

3.5.8.6. HVAC Systems

(a) Mechanical Floor Plans: The floor plans shall show all principle architectural features of the building which will affect the mechanical design. The floor plans shall also show the following:

(1) Room designations.

(2) Mechanical legend and applicable notes.

(3) Location and size of all ductwork and piping.

(4) Location and capacity of all terminal units (i.e., registers, diffusers, grilles, hydronic baseboards).

(5) Pre-Fabricated Paint Spray Booth (where applicable to project scope)

(6) Paint Preparation Area (where applicable to project scope)

(7) Exhaust fans and specialized exhaust systems.

(8) Thermostat location.

(9) Location of heating/cooling plant (i.e., boiler, chiller, cooling tower, etc).

(10) Location of all air handling equipment.

(11) Air balancing information.

(12) Flue size and location.

(13) Piping diagram for forced hot water system (if used).

(b) Equipment Schedule: Provide complete equipment schedules. Include:

(1) Capacity

(2) Electrical characteristics

(3) Efficiency (if applicable)

(4) Manufacturer's name

(5) Optional features to be provided

(6) Physical size

(7) Minimum maintenance clearances

(a) Details: Provide construction details, sections, elevations, etc., only where required for clarification of methods and materials of design.

(b) HVAC Controls: Submit complete HVAC controls equipment schedules, sequences of operation, wiring and logic diagrams, Input/Output Tables, equipment schedules, and all associated information. See the Statement of Work for additional specific requirements.

3.5.8.7. Fire Protection and Life Safety.

(a) Provide plan for each floor of each building that presents a compendium of the total fire protection features being incorporated into the design. Include the following types of information:

(1) The location and rating of any fire-resistive construction such as occupancy separations, area separations, exterior walls, shaft enclosures, corridors, stair enclosures, exit passageways, etc.

(2) The location and coverage of any fire detection systems

(3) The location and coverage of any fire suppression systems (sprinkler risers, standpipes, etc.)

(4) The location of any other major fire protection equipment

(5) Indicate any hazardous areas and their classification

(6) Schedule describing the internal systems with the following information: fire hazard and occupancy classifications, building construction type, GPM/square foot sprinkler density, area of operation and other as required

(b) Working plans and all other materials submitted shall meet NFPA 13 requirements, with respect to required minimum level of detail.

3.5.8.8. Elevators. Provide:

(a) Description of the proposed control system

(b) Description, approximate capacity and location of any special mechanical equipment for elevators.

3.5.8.9. Electrical Systems.

(a) Electrical Floor Plan(s): Show all principle architectural features of the building which will affect the electrical design. Show the following:

(1) Room designations.

(2) Electrical legend and applicable notes.

(3) Lighting fixtures, properly identified.

(4) Switches for control of lighting.

(5) Receptacles.

(6) Location and designation of panelboards. Clearly indicate type of mounting required (flush or surface) and reflect accordingly in specifications.

(7) Service entrance (conduit and main disconnect).

(8) Location, designation and rating of motors and/or equipment which requires electrical service. Show method of termination and/or connection to motors and/or equipment. Show necessary junction boxes, disconnects, controllers (approximate only), conduit stubs, and receptacles required to serve the motor and/or equipment.

(b) Building Riser Diagram(s) (from pad-mounted transformer to unit load center panelboard): Indicate the types and sizes of electrical equipment and wiring. Include grounding and metering requirements.

(c) Load Center Panelboard Schedule(s): Indicate the following information:

(1) Panelboard Characteristics (Panel Designation, Voltage, Phase, Wires, Main Breaker Rating and Mounting.

(2) Branch Circuit Designations.

(3) Load Designations.

(4) Circuit Breaker Characteristics. (Number of Poles, Trip Rating, AIC Rating)

(5) Branch Circuit Connected Loads (AMPS).

(6) Special Features

(d) Lighting Fixture Schedule(s): Indicate the following information:

(1) Fixture Designation.

(2) General Fixture Description.

(3) Number and Type of Lamp(s).

(4) Type of Mounting.

(5) Special Features.

(e) Details: Provide construction details, sections, elevations, etc. only where required for clarification of methods and materials of design.

3.5.8.10. Electronic Systems including the following responsibilities:

(a) Fire Detection and Alarm System. Design shall include layout drawings for all devices and a riser diagram showing the control panel, annunciator panel, all zones, radio transmitter and interfaces to other systems (HVAC, sprinkler, etc.)

(b) Fire Suppression System Control. Specify all components of the Fire Suppression (FS) System in the FS section of the specifications. Clearly describe how the system will operate and interact with other systems such as the fire alarm system. Include a riser diagram on the drawings showing principal components and interconnections with other systems. Include FS system components on drawing legend. Designate all components shown on floor plans “FS system components” (as opposed to “Fire Alarm components”). Show location of FS control panels, HVAC control devices, sensors, and 120V power panel connections on floor plans. Indicate zoning of areas by numbers (1, 2, 3) and detectors sub-zoned for cross zoning by letter designations (A and B). Differentiate between ceiling mounted and under floor detectors with distinct symbols and indicate sub-zone of each.

(c) Public Address System

(d) Special Grounding Systems. Completely reflect all design requirements in the specifications and drawings. Specifications shall require field tests (in the construction phase), witnessed by the Government, to determine the effectiveness of the grounding system. Include drawings showing existing construction, if any.

(e) Cathodic Protection.

(f) Intrusion Detection, Card Access System

(g) Central Control and Monitoring System

(h) Mass Notification System

(i) Electrical Power Distribution Systems

3.5.8.11. Separate detailed Telecommunications drawings for Information Systems including the following responsibilities:

(a) Telecommunications Cabling

(b) Supporting Infrastructure

(c) Outside Plant (OSP) Cabling - Campus or Site Plans - Exterior Pathways and Inter-Building Backbones

(d) Include a layout of the voice/data outlets (including voice only wall & pay phones) on telecommunication floor plan drawing, location of SIPRNET data outlets (where applicable), and a legend and symbol definition to indicate height above finished floor. Show size of conduit and cable type and size on Riser Diagram. Do not show conduit runs between backboard and outlets on the floor plans. Show underground distribution conduit and cable with sizing from point of presence to entrance facility of building.

(e) Layout of complete building per floor - Serving Zone Boundaries, Backbone Systems, and Horizontal Pathways including Serving Zones Drawings - Drop Locations and Cable ID's

(f) Communication Equipment Rooms - Plan Views - Tech and AMEP/Elevations - Racks and Walls. Elevations with a detailed look at all telecomm rooms. Indicate technology layout (racks, ladder-racks, etc.), mechanical/electrical layout, rack elevation and backboard elevation. They may also be an enlargement of a congested area of T1 or T2 series drawing.

3.6. FINAL DESIGN REVIEWS AND CONFERENCES

A final design review and review conference will be held upon completion of final design at the project installation, or – where equipment is available - by video teleconference or a combination thereof, for any design package to receive Government acceptance to allow release of the design package for construction. For smaller separate design packages, the parties may agree on alternative reviews and conferences (e.g., conference calls and electronic file sharing, etc.) through the Partnering process. Include the final design conference in the project schedule and shall indicate what part of the design work is at 100% completion. The final design conference will be held after the Government has had seven (7) calendar days after receipt of the submission to review the final design package and supporting data. For smaller packages, especially those involving only one or a few design disciplines the parties may agree on a shorter period.

3.7. FINAL DESIGN REQUIREMENTS

Final design deliverables for a design package shall consist of 100% complete drawings, specifications, submittal register and design analyses for Government review and acceptance. The 100% design submission shall consist of drawings, specifications, updated design analyses and any permits required by the contract for each package submitted. In order to expedite the final design review, prior to the conference, ensure that the design configuration management data and all review comment resolutions are up-to-date. Include the 100% SID and 100% FF&E binders for government approval. The Contractor shall have performed independent technical reviews (ITR's) and back-checks of previous comment resolutions, as required by Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL, including providing documentation thereof. Use DrChecks or other acceptable comment tracking system during the ITR and submit the results with each final design package

3.7.1. Drawings

3.7.1.1. Submit drawings complete with all contract requirements incorporated into the documents to provide a 100% design for each package submitted.

3.7.1.2. Prepare all drawings with the Computer-Aided Design and Drafting (CADD)/Computer-Aided Design (CAD) system, organized and easily referenced electronically, presenting complete construction information.

3.7.1.3. Drawings shall be complete. The Contractor is encouraged to utilize graphics, views, notes, and details which make the drawings easier to review or to construct but is also encouraged to keep such materials to those that are necessary.

3.7.1.4. Provide detail drawings that illustrate conformance with the contract. Include room finish schedules, corresponding color/finish/special items schedules, and exterior finish schedules that agree with the submitted SID binders.

3.7.1.5. The design documents shall be in compliance with the latest version of the A/E/C CAD Standard, available at https://cadbim.usace.army.mil/CAD. Use the approved vertical Corps of Engineers title blocks and borders on all drawings with the appropriate firm name included within the title block area.

3.7.1.6. CAD System and Building Information Modeling (BIM) (NOTE: If this is a Single Award or Multiple Award, Indefinite Delivery/Indefinite Quantity Contract, this information will be provided for each task order.)

All CAD files shall be fully compatible with MicroStation V8 or higher. Save all design CAD files as MicroStation V8 or higher files. All submitted BIM Models and associated Facility Data shall be fully compatible with Bentley BIM file format and the USACE Bentley BIM v8 Workspace.

(a) CAD Data Final File Format: During the design development capture geo-referenced coordinates of all changes made to the existing site (facility footprint, utility line installations and alterations, roads, parking areas, etc) as a result of this contract. There is no mandatory methodology for how the geo-referenced coordinates will be captured, however, Engineering and Construction Bulletin No. 2006-15, Subject: Standardizing Computer Aided Design (CAD) and Geographic Information Systems (GIS) Deliverables for all Military Design and Construction Projects identifies the format for final as-built drawings and data sets to be delivered to the government. Close-out requirements at the as-built stage; require final geo-referenced GIS Database of the new facility along with all exterior modifications. The Government will incorporate this data set into the Installation's GIS Masterplan or Enterprise GIS System. See also, Section 01 78 02.00 10 Closeout Submittals.

(b) Electronic Drawing Files: In addition to the native CAD design files, provide separate electronic drawing files (in editable CAD format and Adobe Acrobat PDF version 7.0 or higher) for each project drawing.

(c) Each file (both CAD and PDF) shall represent one complete drawing from the drawing set, including the date, submittal phase, and border. Each drawing file shall be completely independent of any data in any other file, including fonts and shapes not included with the basic CAD software program utilized. Fonts that are not included as part of the default CAD software package installation or recognized as an allowable font by the A/E/C CAD Standard are not acceptable in delivered CAD files. All displayed graphic elements on all levels of the drawing files shall be part of the project drawing image. The drawing files shall not contain any graphic element that is not part of the drawing image.

(d) Deliver BIM Model and associated Facility Data files in their native format. At a minimum, BIM files shall address major architecture design elements, major structural components, mechanical systems and electrical/communication distribution and elements as defined in Attachment F. See Attachment F for additional BIM requirements.

(e) Drawing Index: Provide an index of drawings sheet in CAD as part of the drawing set, and an electronic list in Microsoft Excel of all drawings on the CD. Include the electronic file name, the sheet reference number, the sheet number, and the sheet title, containing the data for each drawing.

(f) Hard Copies: Plot submitted hard copy drawings directly from the "electronic drawing files" and copy for quantities and sizes indicated in the distribution list at the end of this specification section. The Designers of Record shall stamp, sign and date original hard copy sheets as Released For Construction, and provide copies for distribution from this set.

3.7.2. Design Analyses

3.7.2.1. The designers of record shall update, finalize and present design analyses with calculations necessary to substantiate and support all design documents submitted.

3.7.2.2. The responsible DOR shall stamp, sign and date the design analysis. Identify the software used where, applicable (name, version, vendor). Generally, provide design analyses, individually, in an original (file copy) and one copy for the assigned government reviewer.

3.7.2.3. All disciplines review the LEED design analysis in conjunction with their discipline-specific design analysis; include a copy of the separable LEED design analysis in all design analysis submittals.

3.7.2.4. Do not combine multi-disciplined volumes of design-analysis, unless multiple copies are provided to facilitate multiple reviewers (one copy per each separate design analysis included in a volume).

3.7.3. Specifications

Specifications shall be 100% complete and in final form.

3.7.4. Submittal Register

Prepare and update the Submittal Register and submit it with the 100% design specifications (see Specification Section 01 33 00, SUBMITTAL PROCEDURES) with each design package. Include the required submittals for each specification section in a design package in the submittal register.

3.7.5. Preparation of DD Form 1354 (Transfer of Real Property)

This form itemizes the types, quantities and costs of various equipment and systems that comprise the project, for the purpose of transferring the new construction project from the Corps Construction Division to the Installation's inventory of real property. The Government will furnish the DB Contractor's design manager a DD Form 1354 checklist to use to produce a draft Form 1354. Submit the completed checklist and prepared draft Form DD 1354 with the 100% design in the Design Analysis. The Corps will use these documents to complete the final DD 1354 upon completion of construction.

3.7.6. Acceptance and Release for Construction

3.7.6.1. At the conclusion of the Final Design Review (after resolutions to the comments have been agreed upon between DOR and Government reviewers), the Contracting Officer or the ACO will accept the Final Design Submission for the design package in writing and allow construction to start for that design package. The Government may withhold acceptance until all major corrections have been made or if the final design submission requires so many corrections, even though minor, that it isn't considered acceptably complete.

3.7.6.2. Government review and acceptance of design submittals is for contract conformance only and shall not relieve the Contractor from responsibility to fully adhere to the requirements of the contract, including the Contractor’s accepted contract proposal, or limit the Contractor’s responsibility of design as prescribed under Special Contract Requirement: “Responsibility of the Contractor for Design” or limit the Government’s rights under the terms of the contract. The Government reserves the right to rescind inadvertent acceptance of design submittals containing contract deviations not separately and expressly identified in the submittal for Government consideration and approval.

3.8. DESIGN COMPLETE CONSTRUCTION DOCUMENT REQUIREMENTS

After the Final Design Submission and Review Conference and after Government acceptance of the Final Design submission, revise the design documents for the design package to incorporate the comments generated and resolved in the final review conference, perform and document a back-check review and submit the final, design complete documents. Label the final design complete documents “FOR

CONSTRUCTION" or use similar language. In addition to the final drawings and specifications, the following deliverables are required for distribution and field use. The deliverable includes all documentation and supporting design analysis in final form, as well as the final review comments, disposition and the back-check. As part of the quality assurance process, the Government may perform a back-check of the released for construction documentation. Promptly correct any errors or omissions found during the Government back-check. The Government may withhold retainage from progress payments for work or materials associated with a final design package until this submittal has been received and the Government determines that it is complete.

3.9. SUBMITTAL DISTRIBUTION, MEDIA AND QUANTITIES

3.9.1. Submittal Distribution and Quantities

General: The documents which the Contractor shall submit to the Government for each submittal are listed and generally described in preceding paragraphs in this Section. Provide copies of each design submittal and design substantiation as follows (NOTE: If this is a Single Award or Multiple Award, Indefinite Delivery/Indefinite Quantity Contract, this information will be provided for each task order):

Activity and Address	Drawing Size (Full Size) **ANSI D** Full Sets/ *Partial Sets	Design Analyses & Specs Full Sets/ *Partial Sets	Drawing Size (Half Size) **ANSI B** Full Sets/ *Partial Sets	Non-BIM Data CD-ROM or DVD as Necessary (PDF& **.dgn**)	Furniture Submittal (Per Attachment B)	Structural Interior Design Submittal	BIM Data DVD (Per Attach F)
Commander, U.S.Army Engineer District **Kansas City District, ATTN: William Rector**	1/0	5/0	4/0	4	1	2	4
Commander, U.S.Army Engineer District, Center of Standardization **Fort Worth District**	2/0	4/0	4/0	2	N/A	2	2
Installation	1/0	10/0	10/0	5	2	3	2
U.S.Army Corps of Engineers Construction Area Office	1/0	6/0	6/0	3	1	3	1
Information Systems Engineering Command (ISEC)	0/0	0/1	0/0	1	*Partial Set (Work Station/System Furniture- IT Details)	N/A	1

Activity and Address	Drawing Size (Full Size) **ANSI D** Full Sets/ *Partial Sets	Design Analyses & Specs Full Sets/ *Partial Sets	Drawing Size (Half Size) **ANSI B** Full Sets/ *Partial Sets	Non-BIM Data CD-ROM or DVD as Necessary (PDF& **.dgn**)	Furniture Submittal (Per Attachment B)	Structural Interior Design Submittal	BIM Data DVD (Per Attach F)
Huntsville Engineer & Support Center, Central Furnishings Program	N/A	N/A	N/A	N/A	1 Interim/Refer to attachment B for the final submission Qty	N/A	N/A
Other Offices	0/0	2/0	2/0	2	N/A	0	0

***NOTE: For partial sets of drawings, specifications and design analyses, see paragraph 3.9.3.3, below.**

****NOTE: When specified below in 3.9.2, furnish Installation copies of Drawings as paper copies, in lieu of the option to provide secure web-based submittals.**

3.9.2. Web based Design Submittals

Except for full or half-sized drawings for Installation personnel, as designated in the Table above, Web based design submittals will be acceptable as an alternative to the paper copies listed in the Table above, provided a single hard-copy PDF based record set is provided to the Contracting Officer for record purposes. Where the contract requires the Contractor to submit documents to permitting authorities, still provide those authorities paper copies (or in an alternate format where required by the authority). Web based design submittal information shall be provided with adequate security and availability to allow unlimited access those specifically authorized to Government reviewers while preventing unauthorized access or modification. File sizes must be of manageable size for reviewers to quickly download or open on their computers. As a minimum, drawings shall be full scale on American National Standards Institute (ANSI) D sheets (34" x 22"). In addition to the optional website, provide the BIM data submission on DVD to each activity and address noted above in paragraph 3.9.1 for each BIM submission required in Attachment F.

3.9.3. Mailing of Design Submittals

3.9.3.1. Mail all design submittals to the Government during design and construction, using an overnight mailing service. The Government will furnish the Contractor addresses where each copy shall be mailed to after award of the contract (or individual task order if this is an indefinite delivery/indefinite quantity, task order contract). Mail the submittals to five (5) different addresses. Assemble drawing sheets, specs, design analyses, etc. into individual sets; do not combine duplicate pages from individual sets so that the government has to assemble a set.

3.9.3.2. Each design submittal shall have a transmittal letter accompanying it indicating the date, design percentage, type of submittal, list of items submitted, transmittal number and point of contact with telephone number.

3.9.3.3. Provide partial sets of drawings, specifications, design analyses, etc., as designated in the Table in paragraph 3.9.1, to those reviewers who only need to review their applicable portions of the design,

such as the various utilities. The details of which office receives what portion of the design documentation will be worked out after award.

3.10. AS-BUILT DOCUMENTS

Provide as-built drawings and specifications in accordance with Section 01 78 02.00 10, CLOSEOUT SUBMITTALS. Update LEED design phase documentation during construction as needed to reflect construction changes and advancing project completion status (example - Commissioning Plan updates during construction phase) and include updated LEED documentation in construction closeout submittal.

ATTACHMENT A
STRUCTURAL INTERIOR DESIGN (SID) REQUIREMENTS

1.0 GENERAL INFORMATION

Structural Interior Design includes all building related elements and components generally part of the building itself, such as wall finishes, ceilings finishes, floor coverings, marker/bulletin boards, blinds, signage and built in casework. Develop the SID in conjunction with the furniture footprint.

2.0 STRUCURAL INTERIOR DESIGN (SID) REQUIREMENTS FOR THE INTERIM AND FINAL DESIGN SUBMITTALS

2.1. FORMAT AND SCHEDULE

Prepare and submit for approval an interior and exterior building finishes scheme for an interim design submittal. The DOR shall meet with and discuss the finish schemes with the appropriate Government officials prior to preparation of the schemes to be presented. Present original sets of the schemes to reviewers at an interim design conference.

At the conclusion of the interim phase, after resolutions to the comments have been agreed upon between DOR and Government reviewers, the Contractor may proceed to final design with the interior finishes scheme presented.

The SID information and samples are to be submitted in 8 ½" x 11" format using three ring binders with pockets on the inside of the cover. When there are numerous pages with thick samples, use more than one binder. Large D-ring binders are preferred to O-ring binders. Use page protectors that are strong enough to keep pages from tearing out. Anchor large or heavy samples with mechanical fasteners, Velcro, or double-faced foam tape rather than rubber cement or glue. Fold out items must have a maximum spread of 25 ½". Provide cover and spine inserts sheets identifying the document as "Structural Interior Design" package. Include the project title and location, project number, Contractor/A/E name and phone number(s), submittal stage and date.

Design submittal requirements include, but are not limited to:

2.1.1. Narrative of the Structural Interior Design Objectives

The SID shall include a narrative that discusses the building related finishes. Include topics that relate to base standards, life safety, sustainable design issues, aesthetics, durability and maintainability, discuss the development and features as they relate to the occupants requirements and the building design.

2.1.2. Interior Color Boards

Identify and key each item item on the color boards to the contract documents to provide a clear indication of how and where each item will be used. Arrange finish samples to the maximum extent possible by room type in order to illustrate room color coordination. Label all samples on the color boards with the manufacturer's name, patterns and colors name and number. Key or code samples to match key code system used on contract drawings.

Material and finish samples shall indicate true pattern, color and texture. Provide photographs or colored photocopies of materials or fabrics to show large overall patterns in conjunction with actual samples to show the actual colors. Finish samples must be large enough to show a complete pattern or design where practical.

Color boards shall include but not be limited to original color samples of the following:

All walls finishes and ceiling finishes, including corner guards, acrylic wainscoting and wall guards/chair rail finishes

All tile information, including tile grout color and tile patterns.

- All flooring finishes, including patterns.
- All door, door frame finishes and door hardware finishes
- All signage, wall base, toilet partitions, locker finishes and operable/folding partitions and trim
- All millwork materials and finishes (cabinets, counter tops, etc.)
- All window frame finishes and window treatments (sills, blinds, etc.)

Color board samples shall reflect all actual finish textures, patterns and colors required as specified. Patterned samples shall be of sufficient size to adequately show pattern and its repeat if a repeat occurs.

2.1.3. Exterior Color Boards

Prepare exterior finishes color boards in similar format as the interior finishes color boards, for presentation to the reviewers during an interim design conference. Provide original color samples of all exterior finishes including but not limited to the following:

- All Roof Finishes
- All Brick and Cast Stone Samples
- All Exterior Insulation and Finish Samples
- All Glass Color Samples
- All Exterior Metals Finishes
- All Window & Door Frame Finishes
- All Specialty Item Finishes, including trim

Identify each item on the exterior finishes color boards and key to the building elevations to provide a clear indication of how and where each item will be used.

2.2. STRUCTURAL INTERIOR DESIGN DOCUMENTS

2.2.1. General

Structural interior design related drawings must indicate the placement of extents of SID material, finishes and colors and must be sufficiently detailed to define all interior work. The following is a list of minimum requirements:

2.2.2. Finish Color Schedule

Provide finish color schedule(s) in the contract documents. Provide a finish code, material type, manufacturer, series, and color designations. Key the finish code to the color board samples and drawings.

2.2.3. Interior Finish Plans

Indicate wall and floor patterns and color placement, material transitions and extents of interior finishes.

2.2.4. Furniture Footprint Plans

Provide furniture footprint plans showing the outline of all freestanding and systems furniture for coordination of all other disciplines.

2.2.5. Interior Signage

Include interior signage plans or schedules showing location and quantities of all interior signage. Key each interior sign to a quantitative list indicating size, quantity of each type and signage text.

2.2.6. Interior Elevations, Sections and Details

Indicate material, color and finish placement.

ATTACHMENT B
FURNITURE, FIXTURES & EQUIPMENT (FF&E) REQUIREMENTS

1.0 FF&E REQUIREMENTS FOR THE INTERIM AND FINAL DESIGN SUBMITTALS

1.1. NOT USED

1.2. NOT USED

1.3. FURNITURE SELECTION

1.3.1. Select furniture from the GSA Schedules. Specify furniture available open market when an item is not available on the GSA Schedules. Provide justification fort items not available on the GSA Schedules.

1.3.2. To the greatest extent possible when specifying furniture work within a manufacturer's family of furniture for selections, example: Steelcase, Turnstone, Brayton International, Metro, and Vecta are all Steelcase companies. Each alternate should also be specified from a manufacturer's family of furniture, example: first set of alternates would be specified from Knoll's family of furniture and the second from Herman Miller family of furniture. It may be necessary to make some selections from other than a manufacturer's family of furniture if costs are not reasonable for particular items, some items are not available or appropriate for the facility or the items are not on GSA Schedule. If this occurs, consider specifying product from an open line that is accessible by numerous dealerships. Select office furniture including case goods, tables, storage, seating, etc. that is compatible in style, finish and color. Select furniture that complies with ANSI/BIFMA and from manufacturer's standard product line as shown in the most recent published price list and/or amendment and not custom product.

1.4. CONSTRUCTION

1.4.1. Provide knee space at workstations and tables that is not obstructed by panels/legs that interfere with knee space of seated person and specificy modesty panels at walls to be of a height or be hinged to allow access to building wall electrical outlets and communication jacks. Provide desks, storage and tables with leveling devices to compensate for uneven floors.

1.4.2. Unless otherwise noted, specify workstations and storage of steel construction. Provide high pressure laminate worksurface tops constructed to prevent warpage (thermallyfused worksurfaces are not acceptable). Provide user friendly features such as radius edges. Do not use sharp edges and exposed connections and ensure the underside of desks, tables and worksurfaces are completely and smoothly finished. Provide abutting worksurfaces that mate closely and are of equal heights when used in side-by-side configurations in order to provide a continuous and level worksurface.

1.4.3. Drawers shall stay securely closed when in the closed position and protect wires from damage during drawer operation. Include a safety catch to prevent accidental removal when fully open

1.4.4. Unless otherwise noted, provide lockable desks and workstations, filing cabinets and storage. Key all locks within a one person office the same; key all one person offices within a building differently. If an office or open office area has more than one workstation, key all the workstations differently, but key all locks within an individual workstation the same. Use tempered glass glazing when glazing is required. Use light-emitting diode (LED)/solid state lighting where task lighting is required in furniture.

1.5. FINISHES AND UPHOLSTERY

1.5.1. Specify neutral colors for casegoods, furniture systems, storage and tables. Specify desk worksurfaces and table tops that are not too light or too dark in color and have a pattern to help hide soiling. Accent colors are allowed in break and lounge areas. Keep placement of furniture systems panel

fabric accent colors to a minimum. All finishes shall be cleanable with ordinary household cleaning solutions.

1.5.2. Use manufacturer's standard fabrics; including textile manufacturers fabrics that have been graded into the furniture manufactures fabric grades and are available through their GSA Schedule. Customers Own Material (COM) can be used in headquarter buildings in command suites with executive furniture. Coordinate specific locations with Corps of Engineers Interior Designer.

1.5.3. Specify seating upholstery that meets Wyzenbeek Abrasion Test, 55,000 minimum rubs. Specify a soil retardant finish for woven fabrics if Crypton or vinyl upholstery is not provided for seating in dining areas. Use manufacturer's standard fabrics. This includes textile manufacturers fabrics that have been graded into the furniture manufactures fabric grades and are available through their GSA Schedule. Specify upholstery and finish colors and patterns that help hide soiling. Specify finishes that can be cleaned with ordinary household cleaning solutions.

1.6. ACCESSORIES

1.6.1. Specify all accessories required for completely finished furniture installation. Provide filing cabinets and storage for office supplies. Provide tack surfaces at workstations with overhead storage. Provide tackable surfaces at workstations with overhead storage.

1.6.2. Not Used.

1.6.3. Workstations are to be equipped with stable keyboard trays that have height adjustability, tilting capability, including negative tilt, have a mouse pad at same height as the keyboard tray that can accommodate both left and right handed users, and retractable under worksurface.

1.7. MISSION UNIQUE EQUIPMENT

Funding for FF&E furniture items and mission unique equipment (MUE) items are from two different sources. Separate the designs and procurement documentation for FFE items and MUE. MUE includes, but is not limited to, items such as commerical appliances, fitness equipment, IT equipment and supporting carts. The User will purchase and install mission unique equipment items, unless otherwise noted. Identify locations of known MUE items such as commercial appliances, etc. for space planning purposes.

1.8. SUSTAINABILITY

1.8.1. For all designs provided regardless of facility type, make every effort to implement all aspects of sustainability to the greatest extent possible for all the selections made in the FF&E package. This includes but is not limited to the selection of products that consider: **Material Chemistry and Safety of Inputs** (What chemicals are used in the construction of the selections?); **Recyclability** (Do the selections contain recycled content?); **Disassembly** (Can the selections be disassembled at the end of their useful life to recycle their materials?).

1.8.2. Make selections to the greatest extent possible of products that possess current McDonough Braungart Design Chemistry (MBDC) certification or other "third-party" certified Cradle to Cradle program, Forest Stewardship Council (FSC) certification, GREENGAURD certification or similar "third-party" certified products consisting of low-emitting materials.

1.9. FURNITURE SYSTEMS

1.9.1. General.

Where appropriate, design furniture systems in open office areas. Coordinate style and color of furniture systems with other storage, seating, etc. in open office areas. Minimize the number of workstation typicals and the parts and pieces required for the design to assist in future reconfiguration and inventorying.

1.9.2. Connector Systems.

Specify a connector system that allows removal of a single panel or spine wall within a typical workstation configuration without requiring disassembly of the workstation or removal of adjacent panels. Specify connector system with tight connections and continuous visual seals. When Acoustical panels are used, provide connector system with continuous acoustical seals. Specify concealed clips, screws, and other construction elements, where possible.

1.9.3. Panels and Spine Walls

Specify panels and spine walls with hinged or removable covers that permit easy access to the raceway when required but are securely mounted and cannot be accidentally dislodged under normal conditions. Panels shall be capable of structurally supporting more than 1 fully loaded component per panel per side. Raceways are to be an integral part of the panel and must be able to support lay-in cabling and have a large capacity for electrical and IT. Do not thread cables through the frame.

1.9.4. Electrical And Information/Technology (IT)

Design furniture with electrical systems that meets requirements of UL 1286 when powered panels are required and UL approved task lights that meet requirements of NFPA 70. Dependent on user requirements and Section 01 10 00, paragraph 3 requirements, it is recommended that workstation electrical and IT wiring entry come from the building walls to eliminate the use of power poles and access at the floor. Design electrical and IT systems that are easily accessed in the spine wall and panels without having to move return panels and components. Electrical and IT management will be easily accessible by removable wall covers which can be removed while workstation components are still attached. Specify connector system that has continuation of electrical and IT wiring within workstations and workstation to workstation.

1.9.5. Pedestals

Specify pedestals that are interchangeable from left to right, and right to left, and retain pedestal locking system capability.

1.10. EXECUTIVE FURNITURE

1.10.1. Design for executive furniture in command areas, coordinate specific locations with Corps of Engineers Interior Designer. Use upgraded furniture, upholsteries and finishes in command suites. This includes but is not limited to wood casegoods, seating and tables. Select executive furniture casegoods from a single manufacturer and style line, to include workstations, credenzas, filing, and storage, etc.

1.10.2. Specify furniture with wood veneer finish with mitered solid wood edge of same wood type. Other executive office furniture such as seating, tables, executive conference room furniture, etc. shall be compatible in style, finish and color with executive furniture casegoods.

1.11. SEATING

1.11.1. General

Specify appropriate chair casters and glides for the floor finish where the seating is located. All task seating shall support up to a minimum of 250 lbs.

1.11.2. Desk and Guest Seating

Select ergonomic desk chairs with casters, waterfall front, swivel, tilt, variable back lock, adjustable back height or adjustable lumbar support, pneumatic seat height adjustment, and padded, contoured upholstered seat and back. Desk and guest chair backs may be other than upholstered such as mesh fabric if it is ergonomically designed, forms to back and is comfortable. Depending on scale of desk chair provide seat pan forward and back adjustment to increase or decrease depth of seat pan. All desk chairs shall have an adjustable seat height range of 4 1/2", range to include 16 1/2-20". Select guest chairs that are compatible in style, finish and color with the desk chairs.

1.11.3. Conference Room Seating

At tables, select ergonomic conference seating with casters, non-upholstered arms, waterfall front, swivel, tilt, pneumatic seat height adjustment, and padded, contoured seat and back, unless otherwise noted. Select arm height and/or design that allows seating to be moved up closely to the table top. Conference chair backs may be other than upholstered such as mesh fabric if it is ergonomically designed, forms to back and is comfortable. Perimeter conference chairs shall be compatible in style, finish and color with conference seating at the tables.

1.11.4. Lounge, Waiting and Reception Area Seating

Select seating with arms and cushioned, upholstered seat and back. In heavy use areas, arms shall be easily cleaned such as non-upholstered arms or upholstered arms with wood arm caps unless otherwise noted.

1.11.5. Break Room Seating

Select stackable seating that is easily cleaned. Seating shall be appropriate for table and counter heights as applicable with non-upholstered arms if arms are required. Chairs shall have metal legs and composite materials for seats.

1.12. FILING AND STORAGE.

Select storage and shelving units that meet customer’s functional load requirements for stored items. Specify counterweights for filing cabinets when required by the manufacturer for stability. File drawers shall allow only one drawer to be opened at a time. Provide heavy duty storage and shelving if information is not available.

1.13. TRAINING TABLES.

raining tables shall be reconfigurable, moveable and storable; lighter weight folding with dollies or castered as necessary. Plastic laminate self edges are unacceptable. Specify power and data requirements and dollies as required.

1.14. FURNITURE WARRANTIES.

Specify manufacturer's performance guarantees or warranties that include parts, labor and transportation as follows:

Furniture System, unless otherwise noted – 10 year minimum
Furniture System Task Lights – 2 year minimum, excluding bulbs
Furniture System Fabric – 3 year minimum
Wood Desks - 10 year minimum

Metal Desks – 12 year minimum
Seating, unless otherwise noted - 10 year minimum
Seating Mechanisms and Pneumatic Cylinders - 10 years
Seating Fabric - 3 years minimum
Wood Filing and Storage - 10 year minimum

Tables, unless otherwise noted - 10 year minimum
Table Mechanisms – 5 year minimum
Table Ganging Device - 1 year minimum
Items not listed above - 1 year minimum

ATTACHMENT C
TRACKING COMMENTS IN DRCHECKS

1.0 General

The Government and DB Contractor shall set up the project in Dr Checks. Throughout the design process, the parties shall enter, track, and back-check comments using the DrChecks system. Government and Contractor reviewers enter design review comments into DrChecks. Designers of Record shall annotate comments timely and specifically to indicate for the review conference exactly what action will be taken or why the action is not required. After the design review conference and prior to the next design submittal for the package, the DOR's will annotate those comments that require DOR action, design revision, etc. to show how and where it has been addressed in the design documents, This shall be part of the required design configuration management plan. Comments considered critical by the conference participants shall be flagged as such.

2.0 DrChecks Review Comments

The Contractor and the Government shall monitor DrChecks to assure all comments are annotated and resolved prior to the next submittal. Print and include the DrChecks comments and responses and included in the design analysis for record in the next design submittal for that package.

2.1. Upon review of comments prior to the design review conference, the DOR(s) shall identify whether they concur, non-concur, mark it "for information only" or mark it "check and resolve". Indicate exactly what action will be taken or why the action is not required.

2.2. Conference participants (reviewers) will expect coordination between Design Analysis calculations and the submitted design. Reviewers will also focus on the design submittal's satisfaction of the contract requirements.

2.3. After the conference, the DOR(s) shall formally respond to each applicable comment in DrChecks a second time prior to the next submittal, clearly indicating what action was taken and what drawing/spec/design analysis changed. Designers of Record are encouraged to directly contact reviewers to discuss and agree to the formal comment responses rather than relying only on DrChecks and review meetings to discuss comments. With the next submittal, reviewers will back-check answers to the comments against the new submittal, in addition to reviewing additional design work.

2.4. Clearly annotate in DrChecks those comments that, in the DB Contractor's opinion, require effort outside the scope of the contract. Do not proceed with work outside the contract until a modification to the contract is properly executed, if one is necessary.

3.0 DrChecks Initial Account Set-Up

To initialize an office's use of DrChecks, choose a contact person within the office to call the DrChecks Help Desk at 800-428-HELP, M-F, 8AM-5PM, Central time. This POC will be given an office password to distribute to others in the office. Individuals can then go to the hyperlink at http://www.projnet.org and register as a first time user. Upon registration, each user will be given a personal password to the DrChecks system.

3.1. Once the office and individuals are registered, the COE's project manager or lead reviewer will assign the individuals and/or offices to the specific project for review. At this point, persons assigned can make comments, annotate comments, and close comments, depending on their particular assignment.

4.0 DrChecks Reviewer Role

The Contractor is the technical reviewer and the Government is the compliance reviewer of the DB's design documents. Each reviewer enters their own comments into the Dr Checks system. To enter comments:

4.1. Log into DrChecks.

4.2. Click on the appropriate project.

4.3. Click on the appropriate review conference. An Add comment screen will appear.

4.4. Select or fill out the appropriate sections (particularly comment discipline and type of document for sorting) of the comment form and enter the comment in the space provided.

4.5. Click the Add Comment button. The comment will be added to the database and a fresh screen will appear for the next comment you have.

4.6. Once comments are all entered, exit DrChecks by choosing "My Account" and then Logout.

5.0 DrChecks Comment Evaluation (Step 1 of 2)

The role of the DOR(s) is to evaluate and respond to the comments entered by the Government's and DB Contractor's reviewers. To respond to comments:

5.1. Log into DrChecks.

5.2. Click on the appropriate project.

5.3. Under "Evaluate" click on the number under "Pending".

5.4. Locate the comments that require your evaluation. (Note: If you know the comment number you can use the Quick Pick window on your home page in DrChecks; enter the number and click on go.)

5.5. Select the appropriate evaluation radio button (concur, non-concur, for information only, or check and resolve) and respond with a brief explanation in the Discussion field. An explanation other than to say "concur" is not necessary for "Concur", but may be useful for the Design Configuration Management purposes.

5.6. Click on the Add button. The evaluation will be added to the database and a fresh screen will appear with the next comment.

5.7. Once evaluations are all entered, exit DrChecks by choosing "My Account" and then Logout.

6.0 DrChecks Comment Evaluation (Step 2 of 2)

This is where the DOR(s) respond to each applicable comment in DrChecks after the design review conference, prior to the next submittal, clearly indicating what action was taken and what drawing/spec/design analysis changed. Respond to the previous comments, following the same steps as above, adding the narrative in the discussion field.

7.0 DrChecks Back-Check

At the following design conference, (where applicable) or at some other agreed time, Government and Contractor reviewers will back-check comment annotations against newly presented documents to verify that the designers' responses are acceptable and that all revisions have been completed. Reviewers

shall either enter additional back-check comments, if necessary, or close those where actions are complete.

7.1. Log into DrChecks.

7.2. Click on the appropriate project.

7.3. Under “My Backcheck” click on the number under “Pending”.

7.4. If you agree with the designer’s response select “Close Comment” and add a closing response if desired.

7.5. If you do not agree with the designer’s response or the submittal does not reflect the response given, select “Issue Open”, enter additional information.

7.6. Click on the Add button. The back-check will be added to the database and a fresh screen will appear with the next comment.

7.7. Once back-checks are all entered, exit DrChecks by choosing “My Account” and then Logout. The design is completed and final when there are no pending comments to be evaluated and there are no pending or open comments under back-check.

ATTACHMENT D
SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW

Instructions: Use the information outlined in this document to provide the minimum requirement for development of Fire Protection and Life Safety Code submittals for all building projects. Additional and supplemental information may be used to further develop the code review. Insert N/A after criteria, which may be “not applicable”.

1.0 SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW

1.1. Project Name (insert name and location)

1.2. Applicable Codes and Standards

1.2.1. Unified Facilities Criteria (UFC): 3-600-01, Design: Fire Protection Engineering For Facilities

1.2.2. International Building Code (IBC) for fire resistance requirements, allowable floor area, building height limitations and building separation distance requirements, except as modified by UFC 3-600-01.

1.2.3. National Fire Protection Association (NFPA) 101 Life Safety Code (latest edition), for building egress and life safety and applicable criteria in UFC 3-600-01.

1.2.4. ADA and ABA Accessibllity Guidelines. For Buildings and Facilities See Section 01 10 00, Paragraph 3 for facility specific criteria.

1.3. Occupancy Classification
IBC chapters 3 and 4

1.4. Construction Type
IBC chapter 6

1.5. Area Limitations
IBC chapter 5, table 503

1.6. Allowable Floor Areas
IBC section 503, 505

1.7. Allowable area increases
IBC section 506, 507

1.8. Maximum Height of Buildings
IBC section 504

1.9. Fire-resistive substitution

1.10. Occupancy Separations
IBC table 302.3.2

1.11. Fire Resistive Requirements

1.11.1. Exterior Walls - [_____] hour rating, IBC table 601, 602

1.11.2. Interior Bearing walls - [_____] hour rating

1.11.3. Structural frame - [_____] hour rating

1.11.4. Permanent partitions - [_____] hour rating

1.11.5. Shaft enclosures - [_____] hour rating

1.11.6. Floors & Floor-Ceilings - [_____] hour rating

1.11.7. Roofs and Roof Ceilings - [_____] hour rating

1.12. Automatic Sprinklers and others used to determine the need for automatic Extinguishing Equipment, Extinguishing Systems, Foam Systems, Standpipe

1.12.1. UFC 3-600-01, chapters 4 and 6 systems, wet chemical systems, etc. State which systems are required and to what criteria they will be designed.

1.12.2. UFC 3-600-01, Appendix B Occupancy Classification. Note the classification for each room. This may be accomplished by classifying the entire building and noting exceptions for rooms that differ (E.g. The entire building is Light Hazard except boiler room and storage rooms which are [_____], etc.)

1.12.3. UFC 3-600-01, Chapter 3 Sprinkler Design Density, Sprinkler Design Area, Water Demand for Hose Streams (supply pressure and source requirements).

1.12.4. UFC 3-600-01, Chapter 4 Coverage per sprinkler head. Extended coverage sprinkler heads are not permitted.

1.12.5. Available Water Supply. Provide the results of the water flow tests showing the available water supply static pressure and residual pressure at flow. Based on this data and the estimated flow and pressure required for the sprinkler system, determine the need for a fire pump.

1.12.6. NFPA 13, Para. 8.16.4.6.1. Provide backflow preventer valves as required by the local municipality, authority, or water purveyor. Provide a test valve located downstream of the backflow preventer for flow testing the backflow preventer at full system demand flow. Route the discharge to an appropriate location outside the building.

1.13. Kitchen Cooking Exhaust Equipment

Describe when kitchen cooking exhaust equipment is provided for the project. Type of extinguishing systems for the equipment should be provided. per NFPA 96. Show all interlocks with manual release switches, fuel shutoff valves, electrical shunt trips, exhaust fans, and building alarms.

1.14. Portable Fire Extinguishers, fire classification and travel distance. per NFPA 10

1.15. Enclosure Protection and Penetration Requirements. - Opening Protectives and Through Penetrations

1.15.1. IBC Section712, 715 and Table 715.3. Mechanical rooms, exit stairways, storage rooms, janitor [_____] hour rating. IBC Table 302.1.1

1.15.2. Fire Blocks, Draft Stops, Through Penetrations and Opening Protectives

1.16. Fire Dampers. Describe where fire dampers and smoke dampers are to be used (IBC Section 716 and NFPA 90A}. State whether isolation smoke dampers are required at the air handler.

1.17. Detection Alarm and Communication. UFC 3-600-01, (Chapter 5); NFPA 101 para. 3.4 (chapters 12-42); NFPA 72

1.18. Mass Notification. Describe building/facility mass notification system (UFC 4-021-01) type and type of base-wide mass notification/communication system. State whether the visible notification appliances will be combined with the fire alarm system or kept separate. (Note: Navy has taken position to combine visible notification appliances with fire alarm).

1.19. Interior Finishes (classification). NFPA 101.10.2.3 and NFPA 101.7.1.4

1.20. Means of Egress

1.20.1. Separation of Means of Egress, NFPA 101 chapters 7 and 12-42; NFPA101.7.1.3

1.20.2. Occupant Load, NFPA101.7.3.1 and chapters 12-42.

1.20.3. Egress Capacity (stairs, corridors, ramps and doors) NFPA101.7.3.3

1.20.4. Number of Means of Egress, NFPA101.7.4 and chapters 12-42.

1.20.5. Dead end limits and Common Path of Travel, NFPA 101.7.5.1.6 and chapters 12-42.

1.20.6. Accessible Means of Egress (for accessible buildings), NFPA101.7.5.4

1.20.7. Measurement of Travel Distance to Exits, NFPA101.7.6 and chapters 12-42.

1.20.8. Discharge from Exits, NFPA101.7.7.2

1.20.9. Illumination of Means of Egress, NFPA101.7.8

1.20.10. Emergency Lighting, NFPA101.7.9

1.20.11. Marking of Means of Egress, NFPA101.7.10

1.21. Elevators, UFC 3-600-01, Chapter 6; IBC and ASME A17.1 - 2000,(Safety Code for Elevators and Escalators)

1.22. Accessibility Requirements, ADA and ABA Accessibility Guidelines for Buildings and Facilities

1.23. Certification of Fire Protection and Life Safety Code Requirements. (Note: Edit the Fire team membership if necessary). Preparers of this document certify the accuracy and completeness of the Fire Protection and Life Safety features for this project in accordance with the attached completed form(s).

1.24. Designer of Record. Certification of Fire protection and Life Safety Code Requirements. (Note: Edit the Fire team members if necessary). Preparers of this document certify the accuracy and completeness of the Fire Protection and Life Safety features of this project.

Fire Protection Engineer of Record:

_____

Signature and Stamp

Date

OR

Architect of Record:

_____

Signature and Stamp

Date

Mechanical Engineer of Record:

_____

Signature and Stamp

Date

Electrical Engineer of Record:

_____

Signature/Date

ATTACHMENT E
LEED SUBMITTALS

LEED Credit Paragraph	Contractor Check Here if Credit is Claimed	**LEED-NC v3 Submittals (OCT09)**		Provide for Credit Audit Only		Date Submitted (to be filled in by Contractor)	Government Reviewer's Use
PAR		**FEATURE**	**DUE AT**		**REQUIRED DOCUMENTATION**	**DATE**	**REV**
GENERAL							
	GENERAL - All calculations shall be in accordance with LEED 2009 Reference Guide.						
	GENERAL: Obtain excel version of this spreadsheet at http://en.sas.usace.army.mil/enWeb, "Engineering Criteria".						
	GENERAL - For all credits, narrative/comments may be added to describe special circumstances or considerations regarding the project's credit approach.						
	GENERAL - Include all required LEED drawings indicated below in contract drawings with applicable discipline drawings, labeled For Reference Only.						
	NOTE: Each submittal indicated with "**" differs from LEED certified project submittals by either having a different due date or being an added submittal not required by GBCI.						
	NOTE: Projects seeking LEED certification need only submit to GBCI whatever documentation is acceptable to GBCI (for example, licensed professional certifications). This checklist identifies what must be submitted to the Government for internal review purposes. Government review of LEED documentation in no way supercedes or modifies the requirements and rulings of of GBCI for purposes of compliance with project requirement to obtain LEED certifiaction.						
	GENERAL - Audit documentation may include but is not limited to what is indicated in this table.						
			Closeout		List of all Final Design submittals revised after final design to reflect actual closeout conditions. Revised Final Design submittals. - OR - Statement confirming that no changes have been made since final design that effect final design submittal documents.		Proj Engr (PE)
CATEGORY 1 - SUSTAINABLE SITES							
SSPR1		Construction Activity Pollution Prevention (PREREQUISITE)	**Final Design		List of drawings and specifications that address the erosion control, particulate/dust control and sedimentation control measures to be implemented.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			**Final Design		Narrative that indicates which compliance path was used (NPDES or Local standards) and describes the measures to be implemented on the project. If a local standard was followed, provide specific information to demonstrate that the local standard is equal to or more stringent than the NPDES program.		CIV
SS1		Site Selection	Final Design		Statement confirming that project does not meet any of the prohibited criteria.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design	X	LEED Site plan drawing that shows all proposed development, line depicting boundary of all bodies of water and/or wetlands within 100 feet of project boundary and a line depicting 5' elevation above 100 year flood line that falls within project boundary. Not required if neither condition applies.		CIV
SS2		Development Density & Community Connectivity	Final Design		Option 1: LEED Site vicinity plan showing project site and surrounding development. Show density boundary or note drawing scale.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design		Option 1: Table indicating, for project site and all surrounding sites within density radius (keyed to site vicinity plan), site area and building area. Project development density calculation. Density radius calculation. Development density calculation within density radius.		CIV
			Final Design		Option 2: LEED Site vicinity plan showing project site, the 1/2 mile community radius, pedestrian walkways and the locations of the residential development(s) and Basic Services surrounding the project site.		CIV
			Final Design		Option 2: List (including business name and type) of all Basic Services facilities within the 1/2 mile radius, keyed to site vicinity plan.		CIV
SS3		Brownfield Redevelopment	Final Design		Narrative describing contamination and the remediation activities included in project. Include statement indicating how site was determined to be a brownfield.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
SS4.1		Alternative Transportation: Public Transportation Access	Final Design		Statement indicating which option for compliance applies. State whether public transportation is existing or proposed and, if proposed, cite source of this information.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design		Option 1: LEED Site vicinity plan showing project site, mass transit stops and pedestrian path to them with path distance noted.		CIV
			Final Design		Option 2: LEED Site vicinity plan showing project site, bus stops and pedestrian path to them with path distance noted.		CIV
SS4.2		Alternative Transportation: Bicycle Storage & Changing Rooms	Final Design		FTE calculation. Bicycle storage spaces calculation. Shower/changing facilities calculation.		CIV
			Final Design		List of drawings that show the location(s) of bicycle storage areas. Statement indicating distance from building entrance.		CIV
			Final Design		List of drawings that show the location(s) of shower/changing facilities and, if located outside the buiding, statement indicating distance from building entrance.		ARC

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SS4.3		Alternative Transportation: Low Emitting & Fuel Efficient Vehicles	Final Design		Statement indicating which option for compliance applies. FTE calculation. Statement indicating total parking capacity of site.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design		Option 1: Low-emission & fuel-efficient vehicle calculation.		CIV
			Final Design		Option 1: List of drawings and specification references that show location and number of preferred parking spaces for low-emission & fuel-efficient vehicles and signage.		CIV
			Final Design		Option 1: Statement indicating quantity, make, model and manufacturer of low-emission & fuel-efficient vehicles to be provided. Statement confirming vehicles are zero-emission or indicating ACEEE vehicle scores.		CIV
			Final Design		Option 2: Low-emission & fuel-efficient vehicle parking calculation.		CIV
			Final Design		Option 2: List of drawings and specification references that show location and number of preferred parking spaces and signage.		CIV
			Final Design		Option 3: Low-emission & fuel-efficient vehicle refueling station calculation.		CIV
			Final Design		Option 3: List of drawings and specifications indicating location and number of refueling stations, fuel type and fueling capacity for each station for an 8-hour period.		CIV
			Closeout	X	Option 3: Construction product submittals indicating what was provided and confirming compliance with respect to fuel type and fueling capacity for each station for an 8-hour period.		CIV
SS4.4		Alternative Transportation: Parking Capacity	Final Design		Statement indicating which option for compliance applies.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design		Option 1: Preferred parking calculation including number of spaces required, total provided, preferred spaces provided and percentage.		CIV
			Final Design		Option 2: FTE calculation. Preferred parking calculation including number of spaces provided, preferred spaces provided and percentage.		CIV
			Final Design		Options 1 and 2: List of drawings and specification references that show location and number of preferred parking spaces and signage.		CIV
			Final Design		Option 3: Narrative indicating number of spaces required and provided and describing infrastructure and support programs with description of project features to support them.		CIV
SS5.1		Site Development: Protect or Restore Habitat	**Final Design		Option 1: List of drawing and specification references that convey site disturbance limits.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			**Final Design		Option 2: LEED site plan drawing that delineates boundaries of each preserved and restored habitat area with area (sf) noted for each.		CIV
			**Final Design		Option 2: Percentage calculation of restored/preserved habitat to total site area. List of drawings and specification references that convey restoration planting requirements.		CIV
SS5.2		Site Development: Maximize Open Space	Final Design		Option 2: LEED site plan drawing delineating boundary of vegetated open space adjacent to building with areas of building footprint and designated open space noted.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
SS6.1		Stormwater Design: Quantity Control	Final Design		Statement indicating which option for compliance applies.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design		Option 1: Indicate pre-development and post-development runoff rate(cfs) and runoff quantity (cf) -OR - Narrative describing site conditions, measures and controls to be implemented to prevent excessive stream velocities and erosion.		CIV
			Final Design		Option 2: Indicate pre-development and post-development runoff rate(cfs) and runoff quantity (cf). Indicate percent reduction in each.		CIV
SS6.2		Stormwater Design: Quality Control	Final Design		For non-structural controls, list all BMPs used and, for each, describe the function of the BMP and indicate the percent annual rainfall treated. List all structural controls and, for each, describe the pollutant removal and indicate the percent annual rainfall treated.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
SS7.1		Heat Island Effect: Non-Roof	**Final Design		LEED site plan drawing indicating locations and quantities of each paving type, including areas of shaded pavement. Percentage calculation indicating percentage of reflective/shaded/open grid area.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV

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SS7.2		Heat Island Effect: Roof	Final Design		Option 1: Percentage calculation indicating percentage of SRI compliant roof area. List of drawings and specification references that convey SRI requirements and roof slopes.		ARC
			Final Design		Option 1: List of specified roof materials indicating, for each, type, manufacturer, product name and identification if known, SRI value and roof slope.		ARC
			**Closeout		Option 1: List of installed roof materials indicating, for each, manufacturer, product name and identification, SRI value and roof slope.		PE
			Closeout	X	Option 1: Manufacturer published product data or certification confirming SRI		PE
			Final Design		Option 2: Percentage calculation indicating percentage of vegetated roof area.		ARC
			Final Design		Option 3: Combined reflective and green roof calculation.		ARC
			Final Design		Option 3: List of specified roof materials indicating, for each, type, manufacturer, product name and identification if known, SRI value and roof slope.		ARC
			**Closeout		Option 3: List of installed roof materials indicating, for each, manufacturer, product name and identification, SRI value and roof slope.		PE
			Closeout	X	Option 3: Manufacturer published product data or certification confirming SRI		PE
SS8		Light Pollution Reduction	Final Design		Interior Lighting: List of drawings and specification references that convey interior lighting requirements (location and type of all installed interior lighting, location of non-opaque exterior envelope surfaces, allowing confirmation that maximum candela value from interiorfixtures does not intersect non-opaque building envelope surfaces). - OR - List of drawings and specification references that show automatic lighting controls compliance with credit requirement.		ELEC
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		ELEC
			Final Design		Exterior Lighting: List of drawings and specification references that convey exterior lighting requirements (location and type of all site lighting and building façade/landscape lighting).		ELEC
			Final Design		Exterior Site Lighting Power Density (LPD): Tabulation for exterior site lighting indicating, for each location identification or description, units of measure, area or distance of the location, actual LPD using units consistent with ASHRAE 90.1, and the ASHRAE allowable LPD for that type of location. Percentage calculation of actual versus allowable LPD for all site lighting.		ELEC
			Final Design		Exterior Building Facade/Landscape Lighting Power Density (LPD): Tabulation for exterior building facade/landscape lighting indicating, for each location identification or description, units of measure, area or distance of the location, actual LPD using units consistent with ASHRAE 90.1, and the ASHRAE allowable LPD for that type of location. Percentage calculation of actual versus allowable LPD for all building facade/landscape lighting.		ELEC
			Final Design		Exterior Lighting IESNA Zone: Indicate which IESNA zone is applicable to the project.		ELEC
			Final Design		Exterior Lighting Site Lumen table indicating, for each fixture type, quantity installed, initial lamp lumens per luminaire, initial lamp lumens above 90 degrees from Nadir, total lamp lumens and total lamp lumens above 90 degrees. Percentage of site lamp lumens above 90 degrees from nadir to total lamp lumens.		ELEC
			Final Design		Exterior Lighting Narrative describing analysis used for addressing requirements for light trespass at site boundary and beyond.		ELEC
CATEGORY 2 – WATER EFFICIENCY							
WEPR1		Water Use Reduction: 20% Reduction	Final Design		Statement confirming which occupancy breakdown applies (default or special). For special occupancy breakdown, indicate source and explanation for ratio.		MEC
			Final Design		Occupancy calculation including male/female numbers for FTEs, visitors, students, customers, residential and other type occupants/users		MEC
			Final Design		Statement indicating percent of male restrooms with urinals. Statement indicating annual days of operation.		MEC

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			Final Design		Baseline flush fixture calculation spreadsheet indicating, for each fixture type, gender, flush rate, daily uses per person for each occupant type identified in occupancy calculation and annual baseline flush fixture water usage.		MEC
			Final Design		Design case flush fixture calculation spreadsheet indicating, for each fixture type, gender, fixture manufacturer, fixture model number, flush rate, percent of occupants using this fixture type, daily uses per person for each occupant type identified in occupancy calculation and annual design case flush fixture water usage.		MEC
			Closeout	X	Manufacturer published product data or certification confirming fixture water usage.		PE
WE1.1		Water Efficient Landscaping: Reduce by 50%	Final Design		Statement indicating which option for compliance applies.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design		Calculation indicating, for baseline and design case, total water applied, total potable water applied, total non-potable water applied. Design case percent potable water reduction. If nonpotable water is used, indicate source of nonpotable water.		CIV
			Final Design		List of landscape plan drawings.		CIV
			Final Design		Narrative describing landscaping and irrigation design strategies, including water use calculation methodology used to determine savings and, if non-potable water is used, specific information about source and available quantity.		CIV
WE1.2		Water Efficient Landscaping: No Potable Water Use or No Irrigation	Same as WE1.1		Same as WE1.1		CIV
WE2		Innovative Wastewater Technologies	Final Design		Statement confirming which option for compliance applies.		MEC
			Final Design		Statement confirming which occupancy breakdown applies (default or special). For special occupancy breakdown, indicate source and explanation for ratio.		MEC
			Final Design		Occupancy calculation including male/female numbers for FTEs, visitors, students, customers, residential and other type occupants/users		MEC
			Final Design		Statement indicating percent of male restrooms with urinals. Statement indicating annual days of operation.		MEC
			Final Design		Baseline flush fixture calculation spreadsheet indicating, for each fixture type, gender, flush rate, daily uses per person for each occupant type identified in occupancy calculation and annual baseline flush fixture water usage.		MEC
			Final Design		Design case flush fixture calculation spreadsheet indicating, for each fixture type, gender, fixture manufacturer, fixture model number, flush rate, percent of occupants using this fixture type, daily uses per person for each occupant type identified in occupancy calculation and annual design case flush fixture water usage.		MEC
			Final Design		Option 1: If onsite non-potable water is used, identify source(s), indicate annual quantity from each source and indicate total annual quantity from all onsite non-potable water sources.		MEC
			Final Design		Option 1: Summary calculation indicating baseline annual water consumption, design case annual water consumption, non-potable annual water consumption and total percentage annual water savings.		MEC
			Final Design		Option 2: Statement confirming on-site treatment of all generated wastewater to tertiary standards and all treated wastewater is either infiltrated or used on-site.		MEC
			Final Design		Option 2: List of drawing and specification references that convey design of on-site wastewater treatment features.		CIV
			Final Design		Option 2: On-site water treatment quantity calculation indicating all on-site wastewater source(s), annual quantity treated, annual quantity infiltrated and annual quantity re-used on site from each source and totals for annual quantity treated, annual quantity infiltrated and annual quantity re-used on site from all sources.		CIV
			Final Design		Option 2: Wastewater summary calculation indicating design case annual flush fixture water usage, annual on-site water treatment and percentage sewage convyance reduction.		MEC
			Final Design		Narrative describing project strategy for reduction of potable water use for sewage conveyance, including specific information on reclaimed water usage and treated wastewater usage.		MEC
WE3		Water Use Reduction: 30% - 40% Reduction	Same as WEPR1		Same as WEPR1		MEC
CATEGORY 3 – ENERGY AND ATMOSPHERE							

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EAPR1		Fundamental Commissioning of the Building Energy Systems (PREREQUISITE)	**Final Design		**Owner's Project Requirements document		ALL
			**Final Design		**Basis of Design document for commissioned systems		MEC, ELEC
			**Final Design		**Commissioning Plan		MEC, ELEC
			Closeout		Statement confirming all commissioning requirements have been incorporated into construction documents.		PE
			Closeout		Commissioning Report		PE
EAPR2		Minimum Energy Performance (PREREQUISITE)	Final Design		Statement listing the mandatory provisions of ASHRAE 90.1 that project meets relative to compliance with this prerequisite and indicating which compliance path was used.		MEC ELEC ARC
			Final Design		Statement indicating which compliance path option applies.		MEC
			Final Design		Option 1: Statement confirming simulation software capabilities and confirming assumptions and methodology.		MEC
			Final Design		Option 1: General information including simulation program, principal heating source, percent new construction and renovation, weather file, climate zone and Energy Star Target Finder score.		MEC
			Final Design		Option 1: Space summary listing, for each building use, the conditioned area, unconditioned area and total area and include total area for each category		MEC
			Final Design		Option 1: List of all simulation output advisory message data and show difference between baseline and proposed design		MEC
			Final Design		Option 1: Comparison summary for energy model inputs including description of baseline and design case energy model inputs, showing both by element type		MEC
			Final Design		Option 1: Energy type summary lising, for each energy type, utility rate description, units of energy and units of demand		MEC
			Final Design		Option 1: Statement indicating whether project uses on-site renewable energy. If yes, list all sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost		MEC
			Final Design		Option 1: If analysis includes exceptional calculation methods, statement describing how exceptional calculation measure cost savings is determined		MEC
			Final Design		Option 1: If analysis includes exceptional calculation methods, for each exceptional calculation method indicate energy types and, for each energy type, annual energy savings, annual cost savings, and brief descriptive narrative		MEC
			Final Design		Option 1: Baseline performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand for all four orientations. For each orientation indicate total annual energy use for each orientation and total annual process energy use.		MEC
			Final Design		Option 1: Baseline energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC
			Final Design		Option 1: Proposed Design performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand, baseline annual and peak energy demand and percent savings. Indicate total annual energy use and total annual process energy use for both proposed design and baseline and percent savings.		MEC
			Final Design		Option 1: Proposed Design energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC
			Final Design		Option 1: Energy cost and consumption by energy type report indicating, for each energy type, proposed design and baseline annual use and annual cost, percent savings annual use and annual cost. Indicate for renewable energy annual energy generated and annual cost. Indicate exceptional calculations annual energy savings and annual cost savings. Indicate building total annual energy use, annual energy cost for proposed design and baseline and indicate percent savings annual energy use and annual energy cost.		MEC

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			Final Design		Option 1: Compliance summaries from energy simulation software. If software does not produce compliance summaries provide output summaries and example input summaries for baseline and proposed design supporting data in the tables. Output summaries must include simulated energy consumption by end use and total energy use and cost by energy type. Example input summaries should represent most common systems and must include occupancy, use pattern, assumed envelope component sizes and descriptive features and assumed mechanical equipment types and descriptive features		MEC
			Final Design		Option 1: Energy rate tariff from project energy providers (only if not using LEED Reference Guide default rates)		MEC
EAPR3		Fundamental Refrigerant Management (PREREQUISITE)	Final Design		Statement indicating which option for compliance applies.		MEC
			Final Design		Option 2: Narrative describing phase out plan, including specific information on phase out dates and refrigerant quantities.		MEC
EA1		Optimize Energy Performance	Final Design		Statement indicating which compliance path option applies.		MEC
			Final Design		Option 1: Statement confirming simulation software capabilities and confirming assumptions and methodology.		MEC
			Final Design		Option 1: General information including simulation program, principal heating source, percent new construction and renovation, weather file, climate zone and Energy Star Target Finder score.		MEC
			Final Design		Option 1: Space summary listing, for each building use, the conditioned area, unconditioned area and total area and include total area for each category		MEC
			Final Design		Option 1: List of all simulation output advisory message data and show difference between baseline and proposed design		MEC
			Final Design		Option 1: Comparison summary for energy model inputs including description of baseline and design case energy model inputs, showing both by element type		MEC
			Final Design		Option 1: Energy type summary lising, for each energy type, utility rate description, units of energy and units of demand		MEC
			Final Design		Option 1: Statement indicating whether project uses on-site renewable energy. If yes, list all sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost		MEC
			Final Design		Option 1: If analysis includes exceptional calculation methods, statement describing how exceptional calculation measure cost savings is determined		MEC
			Final Design		Option 1: If analysis includes exceptional calculation methods, for each exceptional calculation method indicate energy types and, for each energy type, annual energy savings, annual cost savings, and brief descriptive narrative		MEC
			Final Design		Option 1: Baseline performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand for all four orientations. For each orientation indicate total annual energy use for each orientation and total annual process energy use.		MEC
			Final Design		Option 1: Baseline energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC
			Final Design		Option 1: Proposed Design performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand, baseline annual and peak energy demand and percent savings. Indicate total annual energy use and total annual process energy use for both proposed design and baseline and percent savings.		MEC
			Final Design		Option 1: Proposed Design energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC
			Final Design		Option 1: Energy cost and consumption by energy type report indicating, for each energy type, proposed design and baseline annual use and annual cost, percent savings annual use and annual cost. Indicate for renewable energy annual energy generated and annual cost. Indicate exceptional calculations annual energy savings and annual cost savings. Indicate building total annual energy use, annual energy cost for proposed design and baseline and indicate percent savings annual energy use and annual energy cost.		MEC

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			Final Design		Option 1: Compliance summaries from energy simulation software. If software does not produce compliance summaries provide output summaries and example input summaries for baseline and proposed design supporting data in the tables. Output summaries must include simulated energy consumption by end use and total energy use and cost by energy type. Example input summaries should represent most common systems and must include occupancy, use pattern, assumed envelope component sizes and descriptive features and assumed mechanical equipment types and descriptive features		MEC
			Final Design		Option 1: Energy rate tariff from project energy providers (only if not using LEED Reference Guide default rates)		MEC
EA2.1		On-Site Renewable Energy	Final Design		Statement indicating which compliance path option applies.		ELEC
			Final Design		List all on-site renewable energy sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost. Indicate total annual energy use (all sources), total annual energy cost (all sources) and percent renewable energy cost.		ELEC MEC
			Final Design		Option 1: Indicate, for renewable energy,proposed design total annual energy generated and annual cost.		ELEC MEC
			Final Design		Option 2: Indicate CBECS building type and building gross area. Provide the following CBECS data: median annual electrical intensity, median annual non-electrical fuel intensity, average electric energy cost, average non-electric fuel cost, annual electric energy use and cost, annual non-electric fuel use and cost.		ELEC MEC
			Final Design		Option 2: Narrative describing renewable systems and explaining calculation method used to estimate annual energy generated, including factors influencing performance.		ELEC MEC
EA2.2		On-Site Renewable Energy	Same as EA2.1		Same as EA2.1		ELEC MEC
EA2.3		On-Site Renewable Energy	Same as EA2.1		Same as EA2.1		ELEC MEC
EA3		Enhanced Commissioning	**Final Design		**Owner's Project Requirements document (OPR)		ALL
			**Final Design		**Basis of Design document for commissioned systems (BOD)		ELEC MEC
			**Final Design		**Commissioning Plan		ELEC MEC
			Closeout		Statement confirming all commissioning requirements have been incorporated into construction documents.		PE
			Closeout		**Commissioning Report		PE
			**Final Design		Statement by CxA confirming Commissioning Design Review		
			Closeout		Statement by CxA confirming review of Contractor submittals for compliance with OPR and BOD		PE
			Closeout		**Systems Manual		PE
			Closeout		Statement by CxA confirming completion of O&M staff and occupant training		PE
			Closeout		**Scope of work for post-occupancy review of building operation, including plan for resolution of outstanding issues		PE
			**Predesign		Statement confirming CxA qualifications and contractual relationships relative to work on this project, demonstrating that CxA is an independent third party.		MEC
EA4		Enhanced Refrigerant Management	Final Design		Refrigerant impact calculation table with all building data and calculation values as shown in LEED 2009 Reference Guide Example Calculations		MEC
			Final Design		Narrative describing any special circumstances or explanatory remarks		
			Closeout	X	Cut sheets highlighting refrigerant data for all HVAC components.		PE
EA5		Measurement & Verification	Closeout		Statement indicating which compliance path option applies.		PE
			Closeout		Measurement and Verification Plan including Corrective Action Plan		PE
			Closeout		**Scope of work for post-occupancy implementation of M&V plan including corrective action plan.		PE
EA6		Green Power	Closeout		Statement indicating which compliance path option applies.		PE
			Closeout		Option 1: Indicate proposed design total annual electric energy usage		PE
			Closeout		Option 2: Indicate actual total annual electric energy usage		PE
			Closeout		Option 3: Calculation indicating building type, total gross area, median electrical intensity and annual electric energy use		PE

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PAR		**FEATURE**	**DUE AT**		**REQUIRED DOCUMENTATION**	**DATE**	**REV**
			Closeout		Green power provider summary table indicating, for each purchase type, provider name, annual quantity green power purchased and contract term. Indicate total annual green power use and indicate percent green power		PE
			Closeout		Narrative describing how Green Power or Green Tags are purchased		PE
CATEGORY 4 – MATERIALS AND RESOURCES							
MRPR1		Storage & Collection of Recyclables (PREREQUISITE)	Final Design		Statement confirming that recycling area will accommodate recycling of plastic, metal, paper, cardboard and glass. Narrative indicating any other materials addressed and coordination with pickup.		ARC
MR1.1		Building Reuse: Maintain 55% of Existing Walls, Floors & Roof	**Final Design		If project includes a building addition, confirm that area of building addition does not exceed 2x the area of the existing building.		ARC
			**Final Design		Spreadsheet listing, for each building structural/envelope element, the existing area and reused area. Total percent reused.		ARC
MR1.2		Building Reuse: Maintain 75% of Existing Walls, Floors & Roof	Same as MR1.1		Same as MR1.1		ARC
MR1.3		Building Reuse: Maintain 95% of Existing Walls, Floors & Roof	Same as MR1.1		Same as MR1.1		ARC
MR1.4		Building Reuse: Maintain 50% of Interior Non-Structural Elements	**Final Design		If project includes a building addition, confirm that area of building addition does not exceed 2x the area of the existing building.		ARC
			**Final Design		Spreadsheet listing, for each building interior non-structural element, the existing area and reused area. Total percent reused.		ARC
MR2.1		Construction Waste Management: Divert 50% From Disposal	**Preconstruction		Waste Management Plan		PE
			**Construction Quarterly and Closeout		Spreadsheet calculations indicating material description, disposal/diversion location (or recycling hauler), weight, total waste generated, total waste diverted, diversion percentage		PE
			**Construction Quarterly and Closeout		Receipts/tickets for all items on spreadsheet		PE
MR2.2		Construction Waste Management: Divert 75% From Disposal	Same as MR2.1		Same as MR2.1		PE
MR3.1		Materials Reuse: 5%	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Closeout		Spreadsheet calculations indicating, for each reused/salvaged material, material description, source or vendor, cost. Total reused/salvaged materials percentage.		PE
MR3.2		Materials Reuse: 10%	Same as MR3.1		Same as MR3.1		PE
MR4.1		Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Closeout		Spreadsheet calculations indicating, for each recycled content material, material name/description, manufacturer, cost, post-consumer recycled content percent, pre-consumer recycled content percent, source of recycled content data. Total post-consumer content materials cost, total pre-consumer content materials cost, total combined recycled content materials cost, recycled content materials percentage.		PE
			Final Design or NLT Preconstruction		**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.		PE
			Closeout	X	Manufacturer published product data or certification, confirming recycled content percentages in spreadsheet		PE
MR4.2		Recycled Content: 20% (post-consumer + 1/2 pre-consumer)	Same as MR4.1		Same as MR4.1		PE
MR5.1		Regional Materials:10% Extracted, Processed & Manufactured Regionally	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Closeout		Spreadsheet calculations indicating, for each regional material, material name/description, manufacturer, cost, percent compliant, harvest distance, manufacture distance, source of manufacture and harvest location data. Total regional materials cost, regional materials percentage.		PE
			Preconstruction		**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.		PE
			Closeout	X	Manufacturer published product data or certification confirming regional material percentages in spreadsheet		PE

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MR5.2		Regional Materials:20% Extracted, Processed & Manufactured Regionally	Same as MR5.1		Same as MR5.1		PE
MR6		Rapidly Renewable Materials	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Closeout		Spreadsheet calculations indicating, for each rapidly renewable material, material name/description, manufacturer, cost, rapidly renewable content percent, rapidly renewable product value. Total rapidly renewable product value, rapidly renewable materials percentage.		PE
			Final Design		**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.		ARC
			Closeout	X	Manufacturer published product data or certification confirming rapidly renewable material percentages in spreadsheet		PE
MR7		Certified Wood	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Closeout		Spreadsheet calculations indicating, for each certified wood material, material name/description, vendor, cost, wood component percent, certified wood percent of wood component, FSC chain of custody certificate number. Total certified wood product value, certified wood materials percentage.		PE
			Final Design or NLT Preconstruction		**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.		PE
			Closeout	X	Vendor invoices, FSC chain of custody certificates and anufacturer published product data or certification confirming all certified wood materials percentages in spreadsheet.		PE
INDOOR ENVIRONMENTAL QUALITY							
EQPR1		Minimum IAQ Performance (PREREQUISITE)	Final Design		Statement indicating which option for compliance applies, stating applicable criteria/requirement, and confirming that project has been designed to meet the applicable requirements.		MEC
			Final Design		Narrative describing the project's ventilation design, including specifics about fresh air intake volumes and special considerations.		MEC
EQPR2		Environmental Tobacco Smoke (ETS) Control (PREREQUISITE)	Final Design		Statement indicating which option for compliance applies, stating applicable criteria/requirement, and confirming that project has been designed to meet the applicable requirements.		ARC
			Final Design		List of drawing and specification references that convey conformance to applicable requirements (signage, exhaust system, room separation details, etc).		ARC
EQ1		Outdoor Air Delivery Monitoring	Final Design		Statement indicating which option for compliance applies and confirming that project has been designed to meet the applicable requirements.		MEC
			Final Design		List of drawing and specification references that convey conformance to applicable requirements.		MEC
			Final Design		Narrative describing the project's ventilation design and CO2 monitoring system, including specifics about monitors, operational parameters and setpoints.		MEC
			Closeout	X	Cut sheets for CO2 monitoring system.		PE
EQ2		Increased Ventilation	Final Design		Statement indicating which option for compliance applies and confirming that project has been designed to meet the applicable requirements.		MEC
			Final Design		Narrative describing the project's ventilation design, including specifics about zone fresh air intake volumes and demonstrating compliance.		MEC
			Final Design		Option 2: Narrative describing design method used for determining natural ventilation design, including calculation methodology/model results and demonstrating compliance.		MEC
			Final Design		List of drawing and specification references that convey conformance to applicable requirements.		MEC
EQ3.1		Construction IAQ Management Plan: During Construction	**Preconstruction		Construction IAQ Management Plan		PE
			Closeout		Statement confirming whether air handling units were operated during construction		PE
			Closeout		Dated jobsite photos showing examples of IAQ management plan practices being implemented. Label photos to indicate which practice they demonstrate. Minimum one photo of each practice at each building.		PE

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PAR		**FEATURE**	**DUE AT**		**REQUIRED DOCUMENTATION**	**DATE**	**REV**
			Closeout		Spreadsheet indicating, for each filter installed during construction, the manufacturer, model number, MERV rating, location installed, and if it was replaced immediately prior to occupancy.		PE
EQ3.2		Construction IAQ Management Plan: Before Occupancy	**Preconstruction		Construction IAQ Management Plan		PE
			Closeout		Statement indicating which option for compliance applies and confirming that required activities have occurred that meet the applicable requirements.		PE
			Closeout		Option 1a: Narrative describing the project's flushout process, including specifics about temperature, airflow and duration, special considerations (if any) and demonstrating compliance.		PE
			Closeout		Option 1b: Narrative describing the project's pre-occupancy and post-occupancy flushout processes, including specifics about temperature, airflow and duration, special considerations (if any) and demonstrating compliance.		PE
			Closeout		Option 2: Narrative describing the project's IAQ testing process, including specifics about contaminants tested for, locations, remaining work at time of test, retest parameters and special considerations (if any).		PE
			Closeout		Option 2: IAQ testing report demonstrating compliance.		PE
EQ4.1		Low Emitting Materials: Adhesives & Sealants	Closeout		Spreadsheet indicating, for each applicable indoor adhesive, sealant and sealant primer used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data.		PE
			Closeout		Spreadsheet indicating, for each applicable indoor aerosol adhesive, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data - OR - Statement confirming no indoor aerosol adhesives were used for the project.		PE
			Closeout	X	Manufacturer published product data or certification confirming material VOCs in spreadsheet		PE
EQ4.2		Low Emitting Materials: Paints & Coatings	Closeout		Spreadsheet indicating, for each applicable indoor paint and coating used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data.		PE
			Closeout		Spreadsheet indicating, for each applicable indoor anti-corrosive/anti-rust paint and coating used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data - OR - Statement confirming no indoor anti-corrosive/anti-rust paints were used for the project .		PE
			Closeout	X	Manufacturer published product data or certification confirming material VOCs in spreadsheet		PE
EQ4.3		Low Emitting Materials: Flooring Systems	Closeout		Spreadsheet indicating, for each indoor flooring system used, the manufacturer, product name/model number, if it meets LEED requirement (yes/no) and source of LEED compliance data.		PE
			Closeout		Spreadsheet indicating, for each indoor carpet cushion used, the manufacturer, product name/model number, if it meets LEED requirement (yes/no) and source of LEED compliance data - OR - Statement confirming no indoor carpet cushion was used for the project.		PE
			Closeout	X	Manufacturer published product data or certification confirming material compliance label in spreadsheet		PE
EQ4.4		Low Emitting Materials: Composite Wood & Agrifiber Products	Closeout		Spreadsheet indicating, for each indoor composite wood and agrifiber product used, the manufacturer, product name/model number, if it contains added urea formaldehyde (yes/no) and source of LEED compliance data.		PE
			Closeout	X	Manufacturer published product data or certification confirming material urea formaldehyde in spreadsheet		PE
EQ5		Indoor Chemical & Pollutant Source Control	Closeout		Spreadsheet indicating, for each permanent entryway system used, the manufacturer, product name/model number and description of system.		PE
			Final Design		List of drawing and specification references that convey locations and installation methods for entryway systems.		ARC
			Final Design		Spreadsheet indicating, for each chemical use area, the room number, room name, description of room separation features (walls, floor/ceilings, openings) and pressure differential from surrounding spaces with doors closed - OR - Statement confirming that project includes no chemical use areas and that no hazardous cleaning materials are needed for building maintenance.		ARC MEC
			Final Design		If project includes chemical use areas: List of drawing and specification references that convey locations of chemical use areas, room separation features and exhaust system.		ARC MEC

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PAR		**FEATURE**	**DUE AT**		**REQUIRED DOCUMENTATION**	**DATE**	**REV**
			Final Design		If project includes places where water and chemical concentrate mixing occurs: List of drawing and specification references that convey provisions for containment of hazardous liquid wastes OR - Statement confirming that project includes no places where water and chemical concentrate mixing occurs.		ARC MEC
			Closeout		If project includes chemical use areas: Spreadsheet indicating, for AHUs/mechanical ventilation equipment serving occupied areas, the manufacturer, model number, MERV rating, location installed, and if it was replaced immediately prior to occupancy (yes/no) - OR - Statement confirming that project does not use mechanical equipment for ventilation of occupied areas.		PE
EQ6.1		Controllability of Systems: Lighting	Final Design		Calculation indicating total number of individual workstations, number of workstations with individual lighting controls and the percentage of workstations with individual lighting controls.		ELEC
			Final Design		For each shared multi-occupant space, provide a brief description of lighting controls.		ELEC
			Final Design		Narrative describing lighting control strategy, including type and location of individual controls and type and location of controls in shared multi-occupant spaces.		ELEC
EQ6.2		Controllability of Systems: Thermal Comfort	Final Design		Calculation indicating total number of individual workstations, number of workstations with individual thermal comfort controls and the percentage of workstations with individual thermal comfort controls.		MEC
			Final Design		For each shared multi-occupant space, provide a brief description of thermal comfort controls.		MEC
			Final Design		Narrative describing thermal comfort control strategy, including type and location of individual and shared multi-occupant controls.		MEC
EQ7.1		Thermal Comfort: Design	Final Design		Design criteria spreadsheet indicating, for spring, summer, fall and winter, maximum indoor space design temperature, minimum indoor space design temperature and maximum indoor space design humidity.		MEC
			Final Design		Narrative describing method used to establish thermal comfort control conditions and how systems design addresses the design criteria, including compliance with the referenced standard.		MEC
EQ7.2		Thermal Comfort: Verification	Final Design		Narrative describing the scope of work for the thermal comfort survey, including corrective action plan development		MEC
			Final Design		List of drawing and specification references that convey permanent monitoring system.		MEC
EQ8.1		Daylight & Views: Daylight 75% of Spaces	Final Design		Option 2: Table indicating all regularly occupied spaces with space area and space area with compliant daylight zone. Sum of regularly occupied areas and regularly occupied areas withcompliant daylight zone. Percentage calculation of areas withcompliant daylight zone to total regularly occupied areas.		ARC
			Final Design		Option 1: Simulation model method, software and output data		ELEC
			Final Design		Option 1: Table indicating all regularly occupied spaces with space area, space area with minimum 25 footcandles daylighting illumination, and method of providing glare control. Sum of regularly occupied areas and regularly occupied areas with 25 fc daylighting. Percentage calculation of areas with 25 fc daylighting to total regularly occupied areas.		ELEC
			Final Design		For all occupied spaces excluded from the calculation, provide narrative indicating reasons for excluding the space.		ARC
			Final Design		List of drawing and specification references that convey exterior glazed opening head and sill heights, glazing performance properties and glare control/sunlight redirection devices.		ARC
			Closeout	X	Manufacturer published product data or certification confirming glazing Tvis in spreadsheet		PE
EQ8.2		Daylight & Views: Views for 90% of Spaces	Final Design		Table indicating all regularly occupied spaces with space area and space area with access to views. Sum of regularly occupied areas and regularly occupied areas with access to views. Percentage calculation of areas with views to total regularly occupied areas.		ARC
			Final Design		For all occupied spaces excluded from the calculation, provide narrative indicating reasons for excluding the space.		ARC
			Final Design		LEED Floor plan drawings showing line of sight diagramming of views areas in each regularly occupied space. List of drawing/specification references that convey exterior glazed opening head and sill heights.		ARC
INNOVATION & DESIGN PROCESS							

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PAR		**FEATURE**	**DUE AT**		**REQUIRED DOCUMENTATION**	**DATE**	**REV**
IDc1.1		Innovation in Design	Final Design		Narrative decribing intent, requirement for credit, project approach to the credit. List of drawings and specification references that convey implementation of credit. All other documentation that validates claimed credit.		
IDc1.2		Innovation in Design	Final Design				
IDc1.3		Innovation in Design	Final Design				
IDc1.4		Innovation in Design	Final Design				
IDc2		LEED Accredited Professional	Final Design		Narrative indicating name of LEED AP, company name of LEED AP, description of LEED AP's role and responsiblilities in the project.		ARC

ATTACHMENT F
Version 05-31-2011

BUILDING INFORMATION MODELING REQUIREMENTS

1.0 Section 1 - General

1.1. Definitions. See Section 7 for definitions of terms used in this document.

1.2. Submittal Format

1.2.1. The Model shall be developed using Building Information Modeling ("BIM") supplemented with Computer Aided Design ("CAD") content as necessary to produce a complete set of Construction Documents. Printed design submittal drawings shall be ANSI D size, suitable for half-size scaled reproduction.

1.2.2. BIM submittals shall conform to the requirements of Sections 3 and 4 below.

1.2.3. For each Center of Standardization (CoS) facility type included in this Project, all Models and associated Facility Data shall be submitted in . The submittals shall be fully operable, compatible, and editable within the native BIM tools.

2.0 Section 2 – Design Requirements

2.1. Use of BIM for Design. Contractor shall use BIM application(s) and software(s) to develop Project designs consistent with the following requirements.

2.1.1. Baseline Model. The Contractor will not be provided a baseline multi-discipline BIM Project Model.

2.1.2. USACE BIM Workspace.

2.1.3. Reference. Refer to ERDC TR-06-10, "U.S. Army Corps of Engineers Building Information Modeling Road Map" from the CAD/BIM Technology Center website for more information on the USACE BIM implementation goals.

2.1.4. Industry Foundation Class (IFC) Support. The Contractor's selected BIM application(s) and software(s) must be consistent with the current IFC property sets. Any deviations from or additions to the IFC property sets for any new spaces, systems, and equipment must be submitted for Government acceptance.

2.1.5. BIM Project Execution Plan.

2.1.5.1. Develop a BIM Project Execution Plan ("Plan" or "PxP") documenting the BIM uses, analysis technologies and workflows.

2.1.5.2. Contractors shall utilize the link for the USACE BIM PROJECT EXECUTION PLAN (USACE PxP) Template located in Attachment H to develop an acceptable Plan.

2.2. BIM Requirements.

2.2.1. Facility Data. Develop the Facility Data to include material definitions and attributes that are necessary for the Project facility design and construction as described in Section 4.0. Additional data in support of Section 6.0 Contractor Electives is encouraged to be added to the Model.

2.2.2. Model Content. The Model and Facility Data shall include, at a minimum, the requirements of Section 4 below.

2.2.3. Model Granularity. Individual elements may vary in level of detail within the Model, but at a minimum must include all features that would be included on a quarter inch (1/4" = 1'0") scaled drawing (e.g., at least 1/16th, 1/8th and 1/4th), or on appropriately scaled civil drawings.

2.3. Output. Submitted Drawings (e.g., plans, elevations, sections, schedules, details, etc.) shall be derived (commonly known as extractions, views or sheets) from the Model and Facility Data. Drawings derived from the Model shall remain connected to the Model for the life of the Project and documented in the PxP. Drawings not derived from the Model shall also be documented in the PxP.

2.3.1. Drawings derived from the Model shall be compliant with the A/E/C CAD Standard. Deliver electronic CAD files used for the creation of the Construction Documents per requirements in Section 01 33 16, the criteria of the USACE Kansas City District, ATTN: William Rector District, and as noted herein.

2.3.2. The CAD file format specified for drawings shall not dictate which application(s) are used for development and execution of the Model and Facility Data. Application(s) used shall be documented in the PxP.

2.4. Quality Control Parameters. Implement quality control ("QC") parameters for the Model, including:

2.4.1. Model Standards Checks. QC validation ensures that the Project Facility Data set has no undefined, incorrectly defined or duplicated elements. Identify and report non-compliant elements and submit a corrective action plan. Provide the Government with detailed justification and request Government acceptance for any non-compliant element that the Contractor proposes to be allowed to remain in the Model.

2.4.2. CAD Standards Checks. QC checking ensures that the fonts, dimensions, line styles, levels and other construction document formatting issues are followed per requirements in Section 01 33 16. Identify and report non-compliant content and submit a corrective action plan.

2.4.3. Other Parameters. Develop such other QC parameters as Contractor deems appropriate for the Project and provide to the Government for acceptance.

2.5. Design and Construction Reviews. Perform design and construction reviews at each submittal stage under Section 3 to test the Model, including:

2.5.1. Visual Checks. Checking to ensure the design intent has been followed and that there are no unintended elements in the Model.

2.5.2. Interference Management Checks. Locate conflicting spatial data in the Model where two elements are occupying the same space. Log hard interferences (e.g., mechanical vs. structural, or mechanical vs. mechanical, overlaps in the same location) and soft interferences, (e.g., conflicts regarding equipment clearance, service access, fireproofing, insulation, code space requirements) in a written report and resolve.

2.5.3. IFC Coordination View. Provide an IFC Coordination View in IFC Express format for all deliverables. Provide exported property set data for all IFC supported named building elements.

2.5.4. Other Parameters. Develop other design and construction review parameters as the Contractor deems appropriate for the Project and provide to the Government for acceptance.

3.0 Section 3 – Submittal Requirements

3.1. General Submittal Requirements.

3.1.1. Provide submittals in compliance with the PxP deliverables at stages as described below.

3.1.2. For each Interim Design Submittal as set forth in Paragraphs 3.3 through 3.6, provide a Contractor-certified written report confirming that consistency checks as identified in Paragraphs 2.4 and 2.5 above have been completed. This report shall be discussed as part of the review process and shall address cross-discipline interferences, if any.

3.1.3. At each Interim Design Submittal as set forth in Paragraphs 3.3 through 3.6, provide the Government with:

3.1.3.1. The Model, Facility Data, Workspace and CAD Data files in the native BIM/CAD format.

3.1.3.2. A copy of the Model in an interactive review format such as Bentley Navigator, Autodesk Navisworks, Adobe 3D PDF 7.0 (or later), Google Earth KMZ or other format per PxP requirements. The format for reviews can change between submittals.

3.1.3.3. A list of all submitted electronic files including a description, directory, and file name for each file submitted. For all CAD printed sheets, include a list of the sheet titles and sheet numbers. Identify which files have been produced from the Model and Facility Data.

3.1.4. The Government shall confirm acceptability of all submittals identified in Section 3 in coordination with the USACE Geographic District BIM Manager.

3.2. Initial Design Conference Submittal.

3.2.1. Submit a digital copy of the PxP where, in addition to Paragraph 3.1.4, the USACE Geographic District BIM Manager will coordinate with the USACE CoS BIM Manager to confirm acceptability of the Plan or advise as to additional processes or activities necessary to be incorporated into the PxP.

3.2.2. Within thirty (30) days after the acceptance of the PxP, conduct a demonstration to review the Plan for clarification, and to verify the functionality of planned Model technology workflow and processes. If modifications are required, the Contractor shall complete the modifications and resubmit the PxP performing a subsequent demonstration for Government acceptance. There will be no payment for design or construction until the PxP is completed and accepted by the Government. The Government may also withhold payment if there is design and construction for unacceptable performance in executing the accepted PxP.

3.3. Interim Design Submittals.

3.3.1. BIM and CAD Data. Submit the Model with Facility Data per the requirements identified in Paragraphs 2.2 and 2.3 as applicable to the Interim Design package(s).

3.4. Final Design Submissions and Design Complete Submittals.

3.4.1. BIM and CAD Data. Submit the Model with Facility Date per the requirements identified in Paragraphs 2.2 and 2.3. Acceptance according to Paragraph 3.1.4 is required before commencement of construction, as described in Paragraph 3.7.6 of Section 01 33 16.

3.5. Construction Submittals – Over-The-Shoulder Progress Reviews. Periodic quality control meetings or construction progress review meetings shall include quality control reviews on the implementation and use of the Model, including interference management and design change tracking information.

3.6. Final As-Built BIM and CAD Data Submittal. Submit the final Model, Facility Data, and CAD files reflecting as-built construction conditions for Government acceptance, as specified in Section 01 78 02.00 10, PROJECT CLOSEOUT.

4.0 Section 4 – BIM Model Minimum Requirements and Output

4.1. General Provisions. The Model shall be developed to include the systems described below as they would be built, the processes of installing them, and to reflect final as-built construction conditions. The deliverable Model at the Interim Design Stage and at the Final Design Stage ("released for construction") shall be developed to include as many of the systems described below as are necessary and appropriate at that design stage.

4.2. Architectural/Interior Design. The Architectural systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Model requirements include:

4.2.1. Spaces. The Model shall include spaces defining actual net square footage and net volume, and holding data to develop the room finish schedule including room names and numbers. Include program information to verify design space against programmed space, using this information to validate area quantities.

4.2.2. Walls and Curtain Walls. Each wall shall be depicted to the exact height, length, width and ratings (thermal, acoustic, fire) to properly reflect wall types. The Model shall include all walls, both interior and exterior, and the necessary intelligence to produce accurate plans, sections and elevations depicting these design elements.

4.2.3. Doors, Windows and Louvers. Doors, windows and louvers shall be depicted to represent their actual size, type and location. Doors and windows shall be modeled with the necessary intelligence to produce accurate window and door schedules.

4.2.4. Roof. The Model shall include the roof configuration, drainage system, penetrations, specialties, and the necessary intelligence to produce accurate plans, building sections and generic wall sections where roof design elements are depicted.

4.2.5. Floors. The floor slab(s) shall be developed in the Structural Model and then referenced by the Architectural Model.

4.2.6. Ceilings. All heights and other dimensions of ceilings, including soffits, ceiling materials, or other special conditions shall be depicted in the Model with the necessary intelligence to produce accurate plans, building sections and wall sections where ceiling design elements are depicted.

4.2.7. Vertical Circulation. All continuous vertical components (i.e., non-structural shafts, architectural stairs, handrails and guardrails) shall be accurately depicted and shall include the necessary intelligence to produce accurate plans, elevations and sections in which such design elements are referenced.

4.2.8. Architectural Specialties. All architectural specialties (i.e., toilet room accessories, toilet partitions, grab bars, lockers, and display cases) and millwork (i.e., cabinetry and counters) shall be accurately depicted with the necessary intelligence to produce accurate plans, elevations, sections and schedules in which such design elements are referenced.

4.2.9. Signage. The Model shall include all signage and the necessary intelligence to produce accurate plans and schedules.

4.2.10. Schedules. Provide door, window, hardware sets using BHMA designations, flooring, wall finish, and signage schedules from the Model, indicating the type, materials and finishes used in the design.

4.3. Furniture. The furniture Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing, and have necessary intelligence to produce accurate plans. Representation of furniture elements is to be 2D. Contractor may provide a minimal number of 3D representations as examples. Examples of furniture include, but are not limited to, desks, furniture systems, seating, tables, and office storage.

4.3.1. Furniture Coordination. Furniture that makes use of electrical, data or other features shall include the necessary intelligence to produce coordinated documents and data.

4.4. Equipment. The Model may vary in level of detail for individual elements. Equipment shall be depicted to meet layout requirements with the necessary intelligence to produce accurate plans and schedules, indicating the configuration, materials, finishes, mechanical, and electrical requirements.. Examples of equipment include but are not limited to copiers, printers, refrigerators, ice machines and microwaves.

4.4.1. Schedules. Provide furniture and equipment schedules from the model indicating the materials, finishes, mechanical, and electrical requirements.

4.5. Structural. The Structural systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Model requirements include:

4.5.1. Foundations. All necessary foundation and/or footing elements, with necessary intelligence to produce accurate plans and elevations.

4.5.2. Floor Slabs. Structural floor slabs shall be depicted with all necessary recesses, curbs, pads, closure pours, and major penetrations accurately depicted.

4.5.3. Structural Steel. All steel columns, primary and secondary framing members, and steel bracing for the roof and floor systems (including decks), including all necessary intelligence to produce accurate structural steel framing plans, related building/wall sections, and schedules.

4.5.4. Cast-in-Place Concrete. All walls, columns, beams, including necessary intelligence to produce accurate plans and building/wall sections, depicting cast-in-place concrete elements.

4.5.5. Expansion/Contraction Joints. Joints shall be accurately depicted.

4.5.6. Stairs. All framing members for stair systems, including necessary intelligence to produce accurate plans and building/wall sections depicting stair design elements.

4.5.7. Shafts and Pits. All shafts and pits, including necessary intelligence to produce accurate plans and building/wall sections depicting these design elements.

4.5.8. Openings and Penetrations. All major openings and penetrations that would be included on a quarter inch (1/4"=1'0") scaled drawing.

4.6. Mechanical. The Mechanical systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Small diameter (less than 1-1/2" NPS) field-routed piping is not required to be depicted in the Model. Additional minimum Model requirements include:

4.6.1. HVAC. All necessary heating, ventilating, air-conditioning and specialty equipment, including air distribution for supply, return, ventilation and exhaust ducts, control systems, registers, diffusers, grills, and hydronic baseboards with necessary intelligence to produce accurate plans, elevations, building/wall sections and schedules.

4.6.1.1. Mechanical Piping. All necessary piping and fixture layouts, and related equipment, including necessary intelligence to produce accurate plans, elevations, building/wall sections, and schedules.

4.6.2. Plumbing. All necessary plumbing piping and fixture layouts, floor and area drains, and related equipment, including necessary intelligence to produce accurate plans, elevations, building/wall sections, riser diagrams, and schedules.

4.6.3. Equipment Clearances. All Mechanical equipment clearances shall be modeled for use in interference management and maintenance access requirements.

4.6.4. Elevator Equipment. All necessary equipment and control systems, including necessary intelligence to produce accurate plans, sections and elevations depicting these design elements.

4.7. Electrical/Telecommunications. The Electrical and Telecommunications systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4”=1’0”) scaled drawing. Small diameter (less than 1-1/2”Ø) field-routed conduit is not required to be depicted in the Model. Additional minimum Model requirements include:

4.7.1. Interior Electrical Power and Lighting. All necessary interior electrical components (i.e., lighting, receptacles, special and general purpose power receptacles, lighting fixtures, panelboards, cable trays and control systems), including necessary intelligence to produce accurate plans, details and schedules. Lighting and power built into furniture/equipment shall be modeled.

4.7.2. Special Electrical. All necessary special electrical components (i.e., security, mass notification, public address, nurse call and other special electrical occupancy sensors, and control systems), including necessary intelligence to produce accurate plans, details and schedules.

4.7.3. Grounding. All necessary grounding components (i.e., lightning protection systems, static grounding systems, communications grounding systems, and bonding), including necessary intelligence to produce accurate plans, details and schedules.

4.7.4. Telecommunications. All existing and new telecommunications service controls and connections, both above ground and underground, with necessary intelligence to produce accurate plans, details and schedules. Cable tray routing shall be modeled without detail of cable contents.

4.7.5. Exterior Building Lighting. All necessary exterior lighting including all lighting fixtures, relevant existing and proposed support utility lines and equipment with necessary intelligence to produce accurate plans, details and schedules.

4.7.6. Equipment Clearances. All Electrical equipment clearances shall be modeled for use in interference management and maintenance access requirements.

4.8. Fire Protection. The fire protection system Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4”=1’0”) scaled drawing. Additional minimum Model requirements include:

4.8.1. Fire Protection System. All relevant fire protection components (i.e., branch piping, sprinkler heads, fittings, drains, pumps, tanks, sensors, control panels) with necessary intelligence to produce accurate plans, elevations, building/wall sections, riser diagrams, and schedules. All fire protection piping shall be modeled.

4.8.2. Fire Alarms. Fire alarm/mass notification devices and detection system shall be indicated with necessary intelligence to produce accurate plans depicting them.

4.9. Civil. The Civil Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a one inch (1"=100') scaled drawing. Additional minimum Model requirements include:

4.9.1. Terrain (DTM). All relevant site conditions and proposed grading, including necessary intelligence to produce accurate Project site topographical plans and cross sections.

4.9.2. Drainage. All existing and new drainage piping, including upgrades thereto, including necessary intelligence to produce accurate plans and profiles for the Project site.

4.9.3. Storm Water and Sanitary Sewers. All existing and new sewer structures and piping, including upgrades thereto, with necessary connections to mains or other distribution points as appropriate, including necessary intelligence to produce accurate plans and profiles .

4.9.4. Utilities. All necessary new utilities connections from the Project building(s) to the existing or newly-created utilities, and all existing above ground and underground utility conduits, including necessary intelligence to produce accurate plans and site-sections.

4.9.5. Roads and Parking. All necessary roadways, parking lots, and parking structures, including necessary intelligence to produce accurate plans, profiles and cross-sections.

5.0 Section 5 - Ownership and Rights in Data

5.1. Ownership. The Government has ownership of and rights at the date of Closeout Submittal to all CAD files, BIM Model, and Facility Data developed for the Project in accordance with FAR Part 27, clauses incorporated in Section 00 72 00, Contract Clauses and Special Contract Requirement 1.14 GOVERNMENT RE-USE OF DESIGN (Section 00 73 00). The Government may make use of this data following any deliverable.

6.0 Section 6 – Contractor Electives

6.1. Applicable Criteria. If the Contractor elected to include one or more of the following features as an elective in its accepted contract proposal for additional credit, as described in the proposal submission requirements and evaluation criteria, the requirements of paragraphs 6.2 through 6.5 are as applicable for those elective feature(s) that will be included in the project.

6.2. COBIE Compliance. The Model and Facility Data for the Project shall fulfill Construction Operations Building Information Exchange (COBIE) requirements on the Whole Building Design Guide website (www.wbdg.org) , including all requirements for the indexing and submission of Portable Document Format (PDF) and other appropriate records that would otherwise be printed and submitted in compliance with Project operations and maintenance handover requirements.

6.3. Project Scheduling using the Model. In the PxP and during the Initial Design Conference Submittal Demonstration, provide an overview of the use of BIM in the development and support of the Project construction schedule.

6.3.1. Submittal Requirements. During the Stages identified in Paragraphs 3.3 through 3.6, the Contractor shall deliver the construction schedule derived from the Model.

6.3.1.1. Construction Submittals – Over-The-Shoulder Progress Reviews. Periodic quality control meetings or construction progress review meetings shall include quality control reviews on the implementation and use of the Model for Project scheduling.

6.4. Cost Estimating. In the PxP and during the Initial Design Conference Submittal Demonstration, provide an overview of the use of BIM in the development and support of cost estimating, or other costing applications such as comparative cost analysis for proposed changes and estimate validation.

6.4.1. Submittal Requirements. During the Stages identified in Paragraphs 3.3 through 3.6, the Contractor shall deliver cost estimating information derived from the Model.

6.4.2. Project Completion. At Project completion, the Contractor shall provide an Micro Computer Aided Cost Estimating System Generation II (“MII”) Cost Estimate that follows the USACE Cost Engineering Military Work Breakdown System (“WBS”), a modified Uniformat, to at least the sub-systems level and uses quantity information supplied directly from Model output to the maximum extent possible, though other "gap" quantity information will be included by the contractor as necessary for a complete and accurate Cost Estimate. (See Paragraph 6.4.2.2).

6.4.2.1. Sub system level extracted quantities from the Model for use within the Estimate shall be provided according to how detailed line items or tasks should be installed/built so that accurate costs can be developed and/or reflected. When developing a Model, the contractor shall be cognizant of construction sequencing at the beginning stages of Model development, such as recognizing tasks performed on the first floor versus the same task on higher floors that will be more labor intensive and, therefore, need to have a separate quantity and be priced differently. Tasks and their extracted quantities from the Model shall be broken down by their location (proximity in the structure) as well as the complexity of installation.

6.4.2.2. At all design Stages it shall be acknowledged that BIM output will not generate all quantities that are necessary in order to develop a complete and accurate cost estimate of the Project based on the design alone. (An example of this would be plumbing that is less than 1.5" diameter and, therefore, not expected to be modeled due to permitted level of design granularity; this information is commonly referred to as “The Gap”. Quantities addressing “The Gap” and their associated costs shall be included in the final Project actual Cost Estimates as well even though not derived directly from the Model data).

6.5. Other Analyses and Reports. Structural, energy and efficiency, EPACT 2005 & EISA 2007, lighting design, daylighting, electrical power, psychrometric processing, shading, programming, LEED, fire protection, code compliance, Life Cycle Cost, acoustic, plumbing and other analyses that may be generated from the Model or reports summarizing the data compiled from these analyses shall be submitted in the form established by contractor in its accepted PxP.

7.0 Definitions

7.1. The following definitions apply specifically in the context of this attachment only.

7.2. “Model”: An electronic, three-dimensional representation of facility elements with associated intelligent attribute data (“Facility Data”).

7.3. “Facility Data”: The non-graphical information attached to objects in the Model that defines various characteristics of the object. Facility Data can include properties such as parametric values that drive physical sizes, material definitions and characteristics (e.g. wood, metal), manufacturer data, industry standards (e.g. AISC steel properties), and project identification numbers. Facility Data can also define supplementary physical entities that are not shown graphically in the Model, such as insulation around a duct, or hardware on a door.

7.4. “Workspace”: A collection of content libraries and supporting files that define and embody a BIM standard. A workspace includes BIM libraries such as wall types, standard steel shapes, furniture, HVAC fittings, and sprinkler heads. It also contains sheet libraries such as print/plot configurations, font and text style libraries, and sheet borders and title blocks. The USACE has developed Workspaces

specific to USACE BIM standards; these workspaces are dependent on specific versions of the BIM applications they serve. All USACE BIM Workspaces can be downloaded from the CAD/BIM Technology Center (https://cadbim.usace.army.mil). In some cases, there is a specific Workspace for a given CoS Facility Standard Design.

7.5. "IFC": Industry Foundation Class, a standard and file format used for the exchange of BIM data; see www.iai-tech.org. Note: In the context of this attachment, IFC does not mean "Issued For Construction."

ATTACHMENT G
DESIGN SUBMITTAL DIRECTORY AND SUBDIRECTORY FILE ARRANGEMENT

Organize electronic design submittal files in a subdirectory/file structure in accordance with the following table.
The Contractor may suggest a slightly different structure, subject to the discretion of the government.

Design Submittal Directory and Subdirectory File Arrangement.

Directory	Sub-Directory	Sub-Directory or Files	Files
Submittal/Package Name	Narratives	PDF file or files with updated design narrative for each applicable design discipline	
	Drawings	PDF (subdirectory)	Single PDF file with all applicable drawing sheets - bookmarked by sheet number and name
		BIM (subdirectory) See Attachment F.	BIM project folder (with files) per the USACE Workspace. Include an Excel drawing index file with each drawing sheet listed by sheet #, name and corresponding dgn file name (Final Design & Design Complete only)
	Design Analysis & Calculations	Individual PDF files containing design analysis and calculations for each discipline applicable to the submittal	
		PDF file with Fire Protection and Life Safety Code Review checklist	
	LEED	PDF file with updated Leed Check List	
		PDF file or files with LEED Templates for each point with applicable documentation included in each file.	
		LEED SUBMITTALS	
	Energy Analysis	PDF with baseline energy consumption analysis	
		PDF with actual building energy consumption analysis	
	Specifications	Single PDF file with table of contents and all applicable specifications sections.	
		Submittal Register (Final Design & Design Complete submittal only)	
	Design Quality Control	PDF file or files with DQC checklist(s) and/or statements	
	Building Rendering(s)	PDF file of rendering for each building type included in contract (Final Design & Design Complete).	

ATTACHMENT H
USACE BIM Project Execution Plan (PxP) Template Version 1.0

This template is a tool that is provided to assist in the development of a USACE BIM Project Execution Plan as required per contract. The template provides a standard format for organizations to establish their general means and methods for meeting the scope and deliverable requirements in Attachment F. It was adapted from the buildingSMART alliance™ (bSa) Project "BIM Project Execution Planning" as developed by The Computer Integrated Construction (CIC) Research Group of The Pennsylvania State University. The bSa project is sponsored by The Charles Pankow Foundation, Construction Industry Institute (CII), Penn State Office of Physical Plant (OPP), and The Partnership for Achieving Construction Excellence (PACE). The template can be found at the following link:

https://mrsi.usace.army.mil/rfp/Shared%20Documents/USACE_BIM_PXP_TEMPLATE_V1.0.pdf

Please note: Instructions and examples to assist with the completion of this template are currently in grey. The text can and should be modified to suit the needs of the organization filling out the template. If modified, the format of the text should be changed to match the rest of the document. This can be completed, in most cases, by selecting the normal style in the template styles.

SECTION 01 45 01.10
QUALITY CONTROL SYSTEM (QCS)

1.0 GENERAL

1.1. CORRESPONDENCE AND ELECTRONIC COMMUNICATIONS

1.2. QCS SOFTWARE

1.3. SYSTEM REQUIREMENTS

1.4. RELATED INFORMATION

1.5. CONTRACT DATABASE

1.6. DATABASE MAINTENANCE

1.7. IMPLEMENTATION

1.8. DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

1.9. MONTHLY COORDINATION MEETING

1.10. NOTIFICATION OF NONCOMPLIANCE

1.0 GENERAL

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. The Contractor module, user manuals, updates, and training information can be downloaded from the RMS web site. This joint Government-Contractor use of RMS and QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data
- Request for Information
- Accident Reporting
- Safety Exposure Manhours

1.1. CORRESPONDENCE AND ELECTRONIC COMMUNICATIONS

For ease and speed of communications, both Government and Contractor will exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

1.2. OTHER FACTORS

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01 32 01.00 10, PROJECT SCHEDULE, Section 01 33 00, SUBMITTAL PROCEDURES, and Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through QCS. Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith shall be included in the contract pricing for the work.

1.3. QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the QCS software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide QCS on CD-ROM. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

1.4. SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run QCS:

(a) Hardware

- IBM-compatible PC with 1000 MHz Pentium or higher processor
- 256 MB RAM for workstation / 512+ MB RAM for server

- 1 GB hard drive disk space for sole use by the QCS system
- Compact disk (CD) Reader, 8x speed or higher
- SVGA or higher resolution monitor (1024 x 768, 256 colors)
- Mouse or other pointing devise
- Windows compatible printer (Laser printer must have 4+ MB of RAM)
- Connection to the Internet, minimum 56K BPS

(b) Software

- MS Windows 2000 or higher
- MS Word 2000 or newer
- Latest version of : Netscape Navigator, Microsoft Internet Explorer, or other browser that supports HTML 4.0 or higher
- Electronic mail (E-mail), MAPI compatible
- Virus protection software that is regularly upgraded with all issued manufacturer's updates

1.5. RELATED INFORMATION

1.5.1. QCS USER GUIDE

After contract award, the Contractor shall download instructions for the installation and use of QCS from the Government RMS Internet Website. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

1.5.2. CONTRACTOR QUALITY CONTROL (CQC) TRAINING

The use of QCS will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

1.6. CONTRACT DATABASE

Prior to the pre-construction conference, the Government will provide the Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by using the government's SFTP repository built into QCS import/export function. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.7. DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the QCS database throughout the duration of the contract. The Contractor shall establish and maintain the QCS database at the Contractor's site office. Data updates to the Government, e.g., daily reports, submittals, RFI’s, schedule updates, payment requests, etc. shall be submitted using the government's SFTP repository built into QCS export function. If permitted by the Contracting Officer, email or CD-ROM may be used instead (see Paragraph DATA SUBMISSION VIA CD-ROM). The QCS database typically shall include current data on the following items:

1.7.1. ADMINISTRATION

1.7.1.1. Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver Contractor administrative data in electronic format.

1.7.1.2. Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in QCS. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format.

1.7.1.3. Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

All Requests For Information (RFI) shall be exchanged using the Built-in RFI generator and tracker in QCS.

1.7.1.4. Equipment

The Contractor's QCS database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.7.1.5. Management Reporting

QCS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of QCS. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

1.7.2. FINANCES

1.7.2.1. Pay Activity Data

The QCS database shall include a list of pay activities that the Contractor shall develop in conjunction with the design and construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

1.7.2.2. Payment Requests

All progress payment requests shall be prepared using QCS. The Contractor shall complete the payment request worksheet prompt payment certification, and payment invoice in QCS. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using QCS. The Contractor shall submit the payment request, prompt payment certification, and payment invoice with supporting data by using the government's SFTP repository built into QCS export function. If permitted by the Contracting Officer, E-mail or a CD-ROM may be used. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

1.7.3. Quality Control (QC)

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. The Contractor shall provide the Government a Contractor

Quality Control (CQC) Plan within the time required in Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a QCS update reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.7.3.1. Daily Contractor Quality Control (CQC) Reports

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the QCS-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government within 24 hours after the date covered by the report. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

1.7.3.2. Deficiency Tracking

The Contractor shall use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. The Contractor shall maintain a current log of its QC punch list items in the QCS database. The Government will log the deficiencies it has identified using its QA punch list items. The Government's QA punch list items will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA punch list items.

1.7.3.3. QC Requirements

The Contractor shall develop and maintain a complete list of QC testing and required structural and life safety special inspections required by the International Code Council (ICC), transferred and installed property, and user training requirements in QCS. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via QCS.

1.7.3.4. Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

1.7.3.5. Labor and Equipment Hours

The Contractor shall log labor and equipment exposure hours on a daily basis. This data will be rolled up into a monthly exposure report.

1.7.3.6. Accident/Safety Tracking Reporting

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize QCS to advise the Government of any accidents occurring on the jobsite. This supplemental entry is not to be considered as a substitute for completion of mandatory notification and reports, e.g., ENG Form 3394 and OSHA Form 300.

1.7.3.7. Features of Work

The Contractor shall include a complete list of the features of work in the QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.7.3.8. Hazard Analysis

The Contractor shall use QCS to develop a hazard analysis for each feature of work included in its CQC Plan. The hazard analysis shall address any hazards, or potential hazards, that may be associated with the work

1.7.4. Submittal Management

The Government will provide the submittal register form, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. The Contractor and Designer of Record (DOR) shall develop and maintain a complete list of all submittals, including completion of all data columns and shall manage all submittals. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use QCS to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using QCS. QCS and RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

1.7.5. Schedule

The Contractor shall develop a design and construction schedule consisting of pay activities, in accordance with Section 01 32 01.00 10, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the QCS database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01 32 01.00 10 PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

1.7.5.1. Import/Export of Data

QCS includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data from RMS, and schedule data using SDEF.

1.8. IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its QCS database, and to provide the Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

1.9. DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of QCS data is by using the government's SFTP repository built into QCS export function.. Other data should be submitted using E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of CD-ROM for data transfer. Data on CDs shall be exported using the QCS built-in export function. If used, CD-ROMs will be submitted in accordance with the following:

1.9.1. File Medium

The Contractor shall submit required data on CD-ROMs. They shall conform to industry standards used in the United States. All data shall be provided in English.

1.9.2. Disk Or Cd-Rom Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the QCS file name, full contract number, contract name, project location, data date, name and telephone number of person responsible for the data.

1.9.3. File Names

The files will be automatically named by the QCS software. The naming convention established by the QCS software shall not be altered in any way by the Contractor.

1.10. MONTHLY COORDINATION MEETING

The Contractor shall update the QCS database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the Contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions.

The Contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable QCS export file is received.

1.11. NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

End of Section 01 45 01.10

SECTION 01 45 04.00 10
CONTRACTOR QUALITY CONTROL

1.0 GENERAL

1.1. REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Refer to the latest edition, as of the date of the contract solicitation.

- ASTM INTERNATIONAL (ASTM)
- ASTM D 3740 Minimum Requirements for Agencies

  Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- ASTM E 329 Agencies Engaged in the Testing

  and/or Inspection of Materials Used in Construction
- U.S. ARMY CORPS OF ENGINEERS (USACE)

  ER 1110-1-12 Quality Management

1.2. PAYMENT

There will be no separate payment for providing and maintaining an effective Quality Control program. Include all costs associated therewith in the applicable unit prices or lump-sum prices contained in the Contract Line Item Schedule.

2.0 PRODUCTS (Not Applicable)

3.0 EXECUTION

3.1. GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product, which complies with the contract requirements. The system shall cover all design and construction operations, both onsite and offsite, and shall be keyed to the proposed design and construction sequence. The site project superintendent is responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager at the site, responsible for the overall site activities, including but not limited to quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site. Different contractors have different names for the on-site overall project supervisor. For clarification, the term “site project superintendent” refers to the Contractor’s senior site representative or “on-site manager”, or other similar title, as those terms are used in contract Clause 52.236-7, “Superintendence by the Contractor” and in the Division 00 Section(s) of the solicitation for this contract or task order,.or elsewhere in the contract. It does not refer to a construction superintendent, unless that person is also the Contractor’s permanently assigned senior site representative in charge of all on-site activities.

3.2. QUALITY CONTROL PLAN

Furnish for Government review, not later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 30 days of operation. Design and construction may begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. The Government will not permit work outside of the features of work included in an accepted interim plan to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started. Where the applicable Code issued by the International Code Council calls for an inspection by the Building Official, the Contractor shall include the inspections in the Quality Control Plan and shall perform the inspections. The Designer of Record shall develop a program for any special inspections required by the applicable International Codes and the Contractor shall perform these inspections, using qualified inspectors. Include the special inspection plan in the QC Plan.

3.2.1. Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents subcontractors, designers of record, consultants, architect/engineers (AE), fabricators, suppliers, and purchasing agents:

3.2.1.1. A description of the quality control organization. Include a chart showing lines of authority and an acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. A CQC System Manager shall report to the project superintendent or someone higher in the contractor's organization.

3.2.1.2. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function. Also include those responsible for performing and documenting the inspections required by the International Codes and the special inspection program developed by the designer of record.

3.2.1.3. A copy of the letter to the CQC System Manager, signed by an authorized official of the firm, which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Furnish copies of these letters.

3.2.1.4. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents subcontractors, designers of record, consultants, architect engineers (AE), offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

3.2.1.5. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. Use only Government approved Laboratory facilities.

3.2.1.6. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

3.2.1.7. Procedures for tracking design and construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

3.2.1.8. Reporting procedures, including proposed reporting formats.

3.2.1.9. A list of the definable features of work. A definable feature of work is a task, which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

3.2.1.10. A list of all inspections required by the International Codes and the special inspection program required by the code and this contract.

3.2.2. Additional Requirements for Design Quality Control (DQC) Plan

The following additional requirements apply to the Design Quality Control (DQC) plan:

3.2.2.1. The Contractor's QCP Plan shall provide and maintain a Design Quality Control (DQC) Plan as an effective quality control program which will assure that all services required by this design-build contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, competent, independent reviewers identified in the DQC Plan shall review all documents. Use personnel who were not involved in the design effort to produce the design to perform the independent technical review (ITR). The ITR is intended as a quality control check of the design. Include, at least, but not necessarily limited to, a review of the contract requirements (the accepted contract or task order proposal and amended RFP), the basis of design, design calculations, the design configuration management documentation and check the design documents for errors, omissions, and for coordination and design integration. The ITR team is not required to examine, compare or comment concerning alternate design solutions but should concentrate on ensuring that the design meets the contract requirements. Correct errors and deficiencies in the design documents prior to submitting them to the Government.

3.2.2.2. Include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. Submit these completed checklists at each design phase as part of the project documentation.

3.2.2.3. A Design Quality Control Manager, who has the responsibility of being cognizant of and assuring that all documents on the project have been coordinated, shall implement the DQC Plan This individual shall be a person who has verifiable engineering or architectural design experience and is a registered professional engineer or architect. Notify the Government, in writing, of the name of the individual, and the name of an alternate person assigned to the position.

3.2.2.4. Develop and maintain effective, acceptable design configuration management (DCM) procedures to control and track all revisions to the design documents after the Interim Design Submission through submission of the As-Built documents. Include the DCM plan as a subset of the DQC Plan. See Section ‘Design After Award’.

3.2.3. Acceptance of Plan

Government acceptance of the Contractor's plan is required prior to the start of design and construction. Acceptance is conditional and will be predicated on satisfactory performance during the design and construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4. Notification of Changes

After acceptance of the CQC Plan, notify the Government in writing of any proposed change. Proposed changes are subject to Government acceptance.

3.3. COORDINATION MEETING

After the Postaward Conference, before start of design or construction, and prior to acceptance by the Government of the CQC Plan, the Contractor and the Government shall meet and discuss the Contractor's quality control system. Submit the CQC Plan for review a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, design activities, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. The Government will prepare minutes of the meeting for signature by both parties. . The minutes shall become a part of the contract file. There may be occasions when either party will call for subsequent conferences to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4. QUALITY CONTROL ORGANIZATION

3.4.1. Personnel Requirements

The requirements for the CQC organization are a CQC System Manager, a Design Quality Manager, and sufficient number of additional qualified personnel to ensure contract compliance. The CQC organization shall also include personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. Provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly furnish complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation to the CQC organization. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2. CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a BA/BS graduate of an ACCE accredited construction management college program. The CQC system Manager may alternately be an engineering technician with at least 2 years of college and an ICC certification as a Commercial Building Inspector (Residential Building Inspector certification will be required for Military Family Housing projects). In addition, the CQC system manager shall have a minimum of 5 years construction experience on construction similar to this contract. The CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. Assign the CQC System Manager no other duties (except may also serve as Safety and Health Officer, if qualified and if allowed by Section 00 73 00). Identify an alternate for the CQC System Manager in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager but the alternate may have other duties in addition to serving in a temporary capacity as the acting QC manager.

3.4.3. CQC Personnel

3.4.3.1. In addition to CQC personnel specified elsewhere in the contract provide specialized CQC personnel to assist the CQC System Manager in accordance with paragraph titled Area Qualifications.

3.4.3.2. These individuals may be employees of the prime or subcontractor; be responsible to the CQC System Manager; **are not intended to be full time, but must be physically present at the construction site during work on their areas of responsibility**; have the necessary education and/or

experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan. **One person may cover more than one area, provided that they are qualified to perform QC activities for the designated areas below and provided that they have adequate time to perform their duties:**

3.4.4. Experience Matrix

3.4.4.1. Area Qualifications

3.4.4.1.1. Civil - Graduate Civil Engineer or (BA/BS) graduate in construction management with 4 years experience in the type of work being performed on this project or engineering technician with 5 yrs related experience.

3.4.4.1.2. Mechanical - Graduate Mechanical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or engineering technician with an ICC certification as a Commercial Mechanical Inspector with 5 yrs related experience.

3.4.4.1.3. Electrical - Graduate Electrical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or engineering technician with an ICC certification as a Commercial Electrical Inspector with 5 yrs related experience.

3.4.4.1.4. Structural - Graduate Structural Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or person with an ICC certification as a Reinforced Concrete Special Inspector and Structural Steel and Bolting Special Inspector (as applicable to the type of construction involved) with 5 yrs related experience.

3.4.4.1.5. Plumbing - Graduate Mechanical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience, or person with an ICC certification as a Commercial Plumbing Inspector with 5 yrs related experience.

3.4.4.1.6. Concrete, Pavements and Soils Materials Technician (present while performing tests) with 2 yrs experience for the appropriate area

3.4.4.1.7. Testing, Adjusting and Balancing Specialist must be a member (TAB) Personnel of AABC or an experienced technician of the firm certified by the NEBB (present while testing, adjusting, balancing).

3.4.4.1.8. Design Quality Control Manager Registered Architect or Professional Engineer (not required on the construction site)

3.4.4.1.9. Registered Fire Protection Engineer with 4 years related experience or engineering technician with 5 yrs related experience (but see requirements for Fire Protection Engineer of Record to witness final testing in Section 01 10 00, paragraph 5.10, Fire Protection).

3.4.4.1.10. QC personnel assigned to the installation of the telecommunication system or any of its components shall be Building Industry Consulting Services International (BICSI) Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification. In lieu of BICSI certification, QC personnel shall have a minimum of 5 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products. QC personnel shall witness and certify the testing of telecommunications cabling and equipment.

3.4.5. Additional Requirement

In addition to the above experience and/or education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management for Contractors". This course is periodically offered at TBD. Inquire of the District or Division sponsoring the course for fees and other expenses involved, if any, for attendance at this course.

3.4.6. Organizational Changes

When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5. SUBMITTALS AND DELIVERABLES

Make submittals as specified in Section 01 33 00 ***SUBMITTAL PROCEDURES***. The CQC organization shall certify that all submittals and deliverables are in compliance with the contract requirements.

3.6. CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. The CQC organization shall conduct at least three phases of control for each definable feature of the construction work as follows:

3.6.1. Preparatory Phase

Perform this phase prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

3.6.1.1. A review of each paragraph of applicable specifications, reference codes, and standards. Make a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field at the preparatory inspection. Maintain these copies in the field, available for use by Government personnel until final acceptance of the work.

3.6.1.2. A review of the contract drawings.

3.6.1.3. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

3.6.1.4. Review of provisions that have been made to provide required control inspection and testing.

3.6.1.5. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

3.6.1.6. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

3.6.1.7. A review of the appropriate activity hazard analysis to assure safety requirements are met.

3.6.1.8. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

3.6.1.9. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

3.6.1.10. Discussion of the initial control phase.

3.6.1.11. Notify the Government at least 24 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the preparatory phase actions by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2. Initial Phase

Accomplish this phase at the beginning of a definable feature of work. Include the following actions:

3.6.2.1. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

3.6.2.2. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

3.6.2.3. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

3.6.2.4. Resolve all differences.

3.6.2.5. Check safety to include compliance with and upgrading of the Accident Prevention plan and activity hazard analysis. Review the activity analysis with each worker.

3.6.2.6. Notify the Government at least 24 hours in advance of beginning the initial phase. The CQC System Manager shall prepare and attach to the daily CQC report separate minutes of this phase. Indicate exact location of initial phase for future reference and comparison with follow-up phases.

3.6.2.7. Repeat the initial phase any time acceptable specified quality standards are not being met.

3.6.3. Follow-up Phase

Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Conduct final follow-up checks and correct deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work.

3.6.4. Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.7. TESTS

3.7.1. Testing Procedure

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements and project design documents. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory, or establish an approved testing laboratory at the project

site. The Contractor may elect to use a laboratory certified and accredited by the Concrete and cement Reference Laboratory (CCRL) or by AASHTO Materials Reference Laboratory (AMRL) for testing procedures that those organizations certify. The Contractor shall perform the following activities and record and provide the following data:

3.7.1.1. Verify that testing procedures comply with contract requirements and project design documents.

3.7.1.2. Verify that facilities and testing equipment are available and comply with testing standards.

3.7.1.3. Check test instrument calibration data against certified standards.

3.7.1.4. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

3.7.1.5. Include results of all tests taken, both passing and failing tests, recorded on the CQC report for the date taken. Include specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2. Testing Laboratories

3.7.2.1. Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.2.2. Capability Recheck

If the selected laboratory fails the capability check, the Government will assess the Contractor a charge of $1,375 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.3. Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4. Furnishing or Transportation of Samples for Government Quality Assurance Testing

The Contractor is responsible for costs incidental to the transportation of samples or materials. Deliver samples of materials for test verification and acceptance testing by the Government to the Corps of Engineers Laboratory, f.o.b., at the following address:

- For delivery by mail:

  US Army Corps of Engineers

  Travis Lynch

  1334 1st Street, Building 2204

Ft Leonard Wood, MO 65473

- For other deliveries:

  US Army Corps of Engineers

  Travis Lynch

  1334 1st Street, Building 2204

  Ft Leonard Wood, MO 65473

The area or resident office will coordinate, exact delivery location, and dates for each specific test.

3.8. COMPLETION INSPECTION

3.8.1. Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the SPECIAL CONTRACT REQUIREMENTS Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications, the CQC Manager shall conduct an inspection of the work. Prepare a punch list of items which do not conform to the approved drawings and specifications and include in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2. Pre-Final Inspection

As soon as practicable after the notification above, the Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Correct any items noted on the Pre-Final inspection in a timely manner. Accomplish these inspections and any deficiency corrections required by this paragraph within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.8.3. Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall attend the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups and major commands may also attend. The Government will formally schedule the final acceptance inspection based upon results of the Pre-Final inspection. Provide notice to the Government at least 14 days prior to the final acceptance inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9. DOCUMENTATION

3.9.1. Maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers using

government-provided software, QCS (see Section 01 45 01.10). The report includes, as a minimum, the following information:

3.9.1.1. Contractor/subcontractor and their area of responsibility.

3.9.1.2. Operating plant/equipment with hours worked, idle, or down for repair.

3.9.1.3. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

3.9.1.4. Test and/or control activities performed with results and references to specifications/drawings requirements. Identify the applicable control phase (Preparatory, Initial, Follow-up). List deficiencies noted, along with corrective action.

3.9.1.5. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

3.9.1.6. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.

3.9.1.7. Offsite surveillance activities, including actions taken.

3.9.1.8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

3.9.1.9. Instructions given/received and conflicts in plans and/or specifications.

3.9.1.10. Provide documentation of design quality control activities. For independent design reviews, provide, as a minimum, identity of the ITR team, the ITR review comments, responses and the record of resolution of the comments.

3.9.2. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. Furnish the original and one copy of these records in report form to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, submit one report for every 7 days of no work and on the last day of a no work period. Account for all calendar days throughout the life of the contract. The first report following a day of no work shall be for that day only. The CQC System Manager shall sign and date reports. The report shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel. The Contractor may submit these forms electronically, in lieu of hard copy.

3.10. NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

End of Section 01 45 04.00 10

SECTION 01 50 02
TEMPORARY CONSTRUCTION FACILITIES

1.0 OVERVIEW

1.1. GENERAL REQUIREMENTS

1.2. AVAILABILITY AND USE OF UTILITY SERVICES

1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.4. PROTECTION AND MAINTENANCE OF TRAFFIC

1.5. MAINTENANCE OF CONSTRUCTION SITE

1.6. GOVERNMENT FIELD OFFICE

1.0 OVERVIEW

1.1. GENERAL REQUIREMENTS

1.1.1. Site Plan

Prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Also indicate if the use of a supplemental or other staging area is desired.

1.2. AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1. See Section 00 72 00, Contract Clauses and Section 00 73 00, Special Contract Requirements, for Utility Availability requirements.

1.2.2. Sanitation

Provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

1.2.3. Telephone

Make arrangements and pay all costs for desired telephone facilities.

1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.3.1. Bulletin Board

Immediately upon beginning of onsite work, provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Display legible copies of the aforementioned data until work is completed. Remove the bulletin board from the site upon completion of the project.

1.3.2. Project and Safety Signs

Erect a project sign and a site safety sign with informational details as provided by the Government at the Post award conference, within 15 days prior to any work activity on project site. Update the safety sign data daily, with light colored metallic or non-metallic numerals. Remove the signs from the site upon completion of the project. Engineer Pamphlet EP 310-1-6a contains the standardized layout and construction details for the signs. It can be found through a GOOGLE Search or try the US Army Corps of Engineers Techinfo Website at http://www.hnd.usace.army.mil/techinfo/. Click on Publications then go to Engineer Pamphlets and select EP 310-1-6a.

1.4. PROTECTION AND MAINTENANCE OF TRAFFIC

Provide access and temporary relocated roads as necessary to maintain traffic. Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Take measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property.

The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. Investigate the adequacy of existing roads and the allowable load limit on these roads. Repair any damage to roads caused by construction operations.

1.4.1. Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Construct haul roads with suitable grades and widths. Avoid sharp curves, blind corners, and dangerous cross traffic. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Provide adequate lighting to assure full and clear visibility for full width of haul road and work areas during any night work operations. Remove haul roads designated by the Contracting Officer upon completion of the work and restore those areas.

1.4.2. Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.5. MAINTENANCE OF CONSTRUCTION SITE

Mow grass and vegetation located within the boundaries of the construction site for the duration of the project, from NTP to contract completion. Edge or neatly trim grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers from NTP to contract completion.

1.6. GOVERNMENT FIELD OFFICE

1.6.1. Resident Engineer's Office

Provide the Government Resident Engineer with an office, approximately 900 square feet in floor area, co-located on the project site with the Contractor’s office and providing space heat, air conditioning, electric light and power, power and communications outlets and toilet facilities consisting of at least one lavatory and at least one water closet complete with connections to water and sewer mains. Provide a mail slot in the door or a lockable mail box mounted on the surface of the door. Provide outlets for 4 government phones and same number of LAN connections for Government computers. Coordinate with the Resident Engineer for locations. Provide a conference room with space large enough for 8 personnel to hold meetings. Provide a minimum of two outlets per government work station and at least one outlet per 10 feet of wall space for other government equipment. Provide at least twice weekly janitorial service. Remove the office facilities upon completion of the work and restore those areas. Connect and disconnect utilities in accordance with local codes and to the satisfaction of the Contracting Officer.

1.6.2. Trailer-Type Mobile Office

The Contractor may, at its option, furnish and maintain a trailer-type mobile office acceptable to the Contracting Officer and providing as a minimum the facilities specified above Securely anchor the trailer to the ground at all four corners to guard against movement during high winds, per EM 385-1-1.

End of Section 01 50 02

SECTION 01 57 20.00 10
ENVIRONMENTAL PROTECTION

1.0 GENERAL REQUIREMENTS

Minimize environmental pollution and damage that may occur as the result of construction operations. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this contract. Comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations

1.1. SUBCONTRACTORS

Ensure compliance with this section by subcontractors.

1.2. ENVIRONMENTAL PROTECTION PLAN

1.2.1. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Define issues of concern within the Environmental Protection Plan as outlined in this section. Address each topic in the plan at a level of detail commensurate with the environmental issue and required construction task(s). Identify and discuss topics or issues which are not identified in this section, but which the Contractor considers necessary, after those items formally identified in this section. Prior to commencing construction activities or delivery of materials to the site, submit the Plan for review and Government approval. The Contractor shall meet with the Government prior to implementation of the Environmental Protection Plan, for the purpose of discussing the implementation of the initial plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. Maintain and keep the Environmental Protection Plan current onsite.

1.2.2. Compliance

No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

1.2.3. Contents

The plan shall include, but shall not be limited to, the following:

1.2.3.1. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.

1.2.3.2. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable

1.2.3.3. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel

1.2.3.4. Description of the Contractor's environmental protection personnel training program

1.2.3.5. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. Include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.

1.2.3.6. Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site

1.2.3.7. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Include measures to minimize the amount of mud transported onto paved public roads by vehicles or runoff.

1.2.3.8. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.

1.2.3.9. Drawing showing the location of on-installation borrow areas.

1.2.3.10. A spill control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The spill control plan supplements the requirements of EM 385-1-1. This plan shall include as a minimum:

(a) The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Government and the local Fire Department in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.

(b) The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup

(c) Training requirements for Contractor's personnel and methods of accomplishing the training

(d) A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.

(e) The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency

(f) The methods and procedures to be used for expeditious contaminant cleanup

1.2.3.11. A solid waste management plan identifying waste minimization, collection, and disposals methods, waste streams (type and quantity), and locations for solid waste diversion/disposal including clearing debris and C&D waste that is diverted (salvaged, reused, or recycled). Detail the contractor's actions to comply with, and to participate in, Federal, state, regional, local government, and installation sponsored recycling programs to reduce the volume of solid waste at the source. Identify any subcontractors responsible for the transportation, salvage and disposal of solid waste. Submit licenses or permits for solid waste disposal sites that are not a commercial operating facility. Attach evidence of the facility's ability to accept the solid waste to this plan. A construction and demolition waste management plan, similar to the plan specified in the UFGS 01 74 19 (formerly 01572) may be used as the non-hazardous solid waste management plan. Provide a Non-Hazardous Solid Waste Diversion Report. Submit the report on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and each quarter thereafter (e.g. the first working day of January, April, July, and October) until the end of the project. Additionally, a summary report, with all data fields, is required at the end of the project. The report shall indicate the total type and amount of waste generated, total type and amount of waste diverted, type and amount of waste sent to waste-to-energy facility and alternative daily cover, in tons along with the percent that was diverted. Maintain, track and report construction and demolition waste data in a manner such that the installation can enter the data into the Army SWAR database, which separates data by type of material. A cumulative report in LEED Letter Template format may be used but must be modified to include the date disposed of/diverted and include

the above stated diversion data. NOTE: The Solid Waste Diversion Reports are separate documentation than the LEED documentation.

1.2.3.12. DELETED.

1.2.3.13. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.

1.2.3.14. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, include a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time in the contaminant prevention plan. Update the plan as new hazardous materials are brought on site or removed from the site. Reference this plan in the storm water pollution prevention plan, as applicable.

1.2.3.15. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the waste water, include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented and any required permits. If surface discharge will be the method of disposal, include a copy of the permit and associated documents as an attachment prior to discharging the waste water. If disposal is to a sanitary sewer, include documentation that the waste water treatment plant Operator has approved the flow rate, volume, and type of discharge.

1.2.3.16. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during construction. Include methods to assure the protection of known or discovered resources and shall identify lines of communication between Contractor personnel and the Government.

1.2.3.17. A pesticide treatment plan, updated, as information becomes available. Include: sequence of treatment, dates, times, locations, pesticide trade name, EPA registration numbers, authorized uses, chemical composition, formulation, original and applied concentration, application rates of active ingredient (i.e. pounds of active ingredient applied), equipment used for application and calibration of equipment. The Contractor is responsible for Federal, State, Regional and Local pest management record keeping and reporting requirements as well as any additional Installation specific requirements. Follow AR 200-1, Chapter 5, Pest Management, Section 5-4, “Program Requirements” for data required to be reported to the Installation.

1.3. PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Government shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. Both the Contractor and the Government will

sign this survey, upon mutual agreement as to its accuracy and completeness. The Contractor develop a plan that depicts how it will protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their preservation may cause to the Contractor's work under the contract.

1.4. ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations, requested by the Contractor, from the drawings, plans and specifications which may have an environmental impact will be subject to approval by the Government and may require an extended review, processing, and approval time. The Government reserves the right to disapprove alternate methods, even if they are more cost effective, if the Government determines that the proposed alternate method will have an adverse environmental impact.

1.5. NOTIFICATION

The Government will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. The Contractor shall, after receipt of such notice, inform the Government of the proposed corrective action and take such action when approved by the Government. The Government may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Government may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

2.0 PRODUCTS (NOT USED)

3.0 EXECUTION

3.1. LAND RESOURCES

Confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. Do not attach or fasten any ropes, cables, or guys to any trees for anchorage unless specifically authorized. Provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Remove all stone, soil, or other materials displaced into uncleared areas..

3.1.1. Work Area Limits

Prior to commencing construction activities, mark the areas that need not be disturbed under this contract. Mark or fence isolated areas within the general work area which are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. Personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

3.1.2. Landscape

Clearly identify trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved by marking, fencing, or wrapping with boards, or any other approved techniques. Restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

3.1.3. Erosion and Sediment Controls

Provide erosion and sediment control measures in accordance with Federal, State, and local laws and regulations. Coordinate with approving authorities (federal, state, etc.) for specific requirements to be included in the plan. The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's construction activities. Keep the area of bare soil exposed at any one time by construction operations to a minimum necessary. Construct or install temporary and permanent erosion and sediment control best management practices (BMPs). BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. Remove any temporary measures after the area has been stabilized.

3.1.4. Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Government. Make only approved temporary movement or relocation of Contractor facilities. Provide erosion and sediment controls for on-site borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant and/or work areas to protect adjacent areas.

3.2. WATER RESOURCES

Monitor construction activities to prevent pollution of surface and ground waters. Do not apply toxic or hazardous chemicals to soil or vegetation unless otherwise indicated. Monitor all water areas affected by construction activities. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by state or federally issued Clean Water Act permits.

3.2.1. Stream Crossings

Stream crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, State, and local governments or impede state-designated flows.

3.2.2. Wetlands

Do not enter, disturb, destroy, or allow discharge of contaminants into any wetlands.

3.3. AIR RESOURCES

Comply with all Federal and State air emission and performance laws and standards for equipment operation, activities, or processes.

3.3.1. Particulates

Control dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants, including weekends, holidays and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators or other methods are permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with all State and local visibility regulations.

3.3.2. Odors

Control odors from construction activities at all times. Odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances.

3.3.3. Sound Intrusions

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the state and Installation rules.

3.3.4. Burning

Burning is not allowed on the project site unless specified in other sections of the specifications or by written authorization. Specific times, locations, and manners of burning shall be subject to approval.

3.4. CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

3.4.1. Solid Wastes

Place solid wastes (excluding clearing debris) in containers which are emptied on a regular schedule. Conduct handling, storage, and disposal to prevent contamination. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with solid waste. Transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. The minimum acceptable off-site solid waste disposal option is a Subtitle D RCRA permitted landfill. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Comply with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

3.4.2. Chemicals and Chemical Wastes

Dispense chemicals, ensuring no spillage to the ground or water. Perform and document periodic inspections of dispensing areas to identify leakage and initiate corrective action. The Government may periodically review this documentation. Collect chemical waste in corrosion resistant, compatible containers. Monitor and remove collection drums to a staging or storage area when contents are within 6 inches of the top. Classify, manage, store, and dispose of wastes in accordance with Federal, State, and local laws and regulations.

3.4.3. Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable state and local regulations. Hazardous materials are defined in 49 CFR 171 - 178. At a minimum, manage and store hazardous waste in compliance with 40 CFR 262. Take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. Segregate hazardous waste from other materials and wastes; protect it from the weather by placing it in a safe covered location and take precautionary measures, such as berming or other appropriate measures, against accidental spillage. Store, describe, package, label, mark, and placard hazardous waste and hazardous material in accordance with 49 CFR 171 - 178, state, and local laws and regulations. Transport Contractor generated hazardous waste off Government property in accordance with the Environmental Protection Agency and the Department of Transportation laws and regulations. Dispose of hazardous waste in compliance with Federal, State and local laws and regulations. Immediately report spills of hazardous or toxic materials to the Government and the Facility Environmental Office. Contractor will be responsible for cleanup and cleanup costs due to spills.

Contractor is responsible for the disposition of Contractor generated hazardous waste and excess hazardous materials.

3.4.4. Fuel and Lubricants

Conduct storage, fueling and lubrication of equipment and motor vehicles in a manner that affords the maximum protection against spill and evaporation. Manage and store fuel, lubricants and oil in accordance with all Federal, State, Regional, and local laws and regulations.

3.5. RECYCLING AND WASTE MINIMIZATION

Participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project. Line and berm fueling areas and establish storm water control structures at discharge points for site run-off. Keep a liquid containment clean-up kit available at the fueling area.

3.6. HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Existing historical, archaeological, and cultural resources within the Contractor's work area are shown on the drawings. Protect and preserve these resources during the life of the Contract. Temporarily suspend all activities that may damage or alter such resources, if any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found during excavation or other construction activities. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, notify the Government so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. Cease all activities that may result in impact to or the destruction of these resources. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

3.7. BIOLOGICAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitat. Protect threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.

3.8. INTEGRATED PEST MANAGEMENT

Coordinate, through the Government, with the Installation Pest Management Coordinator (IPMC) at the earliest possible time prior to pesticide application, in order to minimize impacts to existing fauna and flora. Discuss integrated pest management strategies with the IPMC and receive concurrence from the IPMC, through the COR, prior to the application of any pesticide associated with these specifications. Give IMPC personnel the opportunity to be present at all meetings concerning treatment measures for pest or disease control and during application of the pesticide. The use and management of pesticides are regulated under 40 CFR 152 - 186.

3.8.1. Pesticide Delivery and Storage

Deliver pesticides, approved for use on the Installation, to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

3.8.2. Qualifications

Use the services of a subcontractor for pesticide application whose principal business is pest control. The subcontractor shall be licensed and certified in the state where the work is to be performed.

3.8.3. Pesticide Handling Requirements

Formulate, treat with, and dispose of pesticides and associated containers in accordance with label directions.

3.8.4. Application

A state certified pesticide applicator shall apply pesticides in accordance with EPA label restrictions and recommendations.

3.9. PREVIOUSLY USED EQUIPMENT

Clean all previously used construction equipment prior to bringing it onto the project site. Ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the USDA jurisdictional office for additional cleaning requirements.

3.10. MILITARY MUNITIONS

Immediately stop work in that area and immediately inform the Government, in the event military munitions, as defined in 40 CFR 260, are discovered or uncovered.

3.11. TRAINING OF CONTRACTOR PERSONNEL

Train personnel in all phases of environmental protection and pollution control. Conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. Conduct additional meetings for new personnel and when site conditions change. The training and meeting agenda shall include methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

3.12. POST CONSTRUCTION CLEANUP

Clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing , obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade, fill and seed the entire disturbed area, unless otherwise indicated.

SECTION 01 62 35
RECYCLED/RECOVERED MATERIAL

1.0 GENERAL

1.1. REFERENCES

1.2. OBJECTIVES

1.3. EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

1.4. EPA PROPOSED ITEMS INCORPORATED IN THE WORK

1.5. EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

1.0 GENERAL

1.1. REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

- U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
- 40 CFR 247 Comprehensive Procurement Guideline for Products Containing Recovered Materials

1.2. OBJECTIVES

Government procurement policy is to acquire, in a cost effective manner, items containing the highest percentage of recycled and recovered materials practicable consistent with maintaining a satisfactory level of competition without adversely affecting performance requirements or exposing suppliers' employees to undue hazards from the recovered materials. The Environmental Protection Agency (EPA) has designated certain items which must contain a specified percent range of recovered or recycled materials. The Contractor shall make all reasonable efforts to use recycled and recovered materials in providing the EPA designated products and in otherwise utilizing recycled and recovered materials in the execution of the work.

1.3. EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

Materials that have been designated by EPA as being products which are or can be made with recovered or recycled materials, when incorporated into the work under this contract, shall contain at least the minimum percentage of recycled or recovered materials indicated by EPA unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

1.4. EPA PROPOSED ITEMS INCORPORATED IN THE WORK

Products other than those designated by EPA are still being researched and are being considered for future Comprehensive Procurement Guideline (CPG) designation. It is recommended that these items, when incorporated in the work under this contract, contain the highest practicable percentage of recycled or recovered materials, provided specified requirements are also met.

1.5. EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

There are many products listed in 40 CFR 247 which have been designated or proposed by EPA to include recycled or recovered materials that may be use by the Contractor in performing the work but will not be incorporated into the work. These products include office products, temporary traffic control products, and pallets. It is recommended that these non-construction products, when used in the conduct of the work, contain the highest practicable percentage of recycled or recovered materials and that these products be recycled when no longer needed.

End of Section 01 62 35

SECTION 01 78 02.00 10
CLOSEOUT SUBMITTALS

1.0 OVERVIEW

1.1. SUBMITTALS

1.2. PROJECT RECORD DOCUMENTS

1.3. EQUIPMENT DATA

1.4. CONSTRUCTION WARRANTY MANAGEMENT

1.5. MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

1.6. OPERATION AND MAINTENANCE MANUALS

1.7. FIELD TRAINING

1.8. PRICING OF CONTRACTOR-FURNISHED AND INSTALLED PROPERTY AND GOVERNMENT-FURNISHED CONTRACTOR-INSTALLED PROPERTY

1.9. LEED REVIEW MEETINGS

1.10. RED ZONE MEETING

1.11. FINAL CLEANING

1.12. INTERIM FORM DD1354 "TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

EXHIBIT 1 SAMPLE RED ZONE MEETING CHECKLIST

1.0 OVERVIEW

1.1. SUBMITTALS

Government approval is required for any submittals with a "G" designation; submittals not having a "G" designation are for Designer of Record approval or for information only. Submit the following in accordance with Section 01 33 00 submittals*:*

SD-02 Shop Drawings

– As-Built Drawings - G

▪ Drawings showing final as-built conditions of the project. Provide electronic drawing files as specified in Section 01 33 16, 3 sets of blue-line prints , one set of reproducible mylar drawings and one set of the approved working as-built drawings.

SD-03 Product Data

– As-Built Record of Equipment and Materials

▪ Two copies of the record listing the as-built materials and equipment incorporated into the construction of the project.

– Construction Warranty Management Plan

▪ Three sets of the construction warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. Furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

– Warranty Tags

▪ Two record copies of the warranty tags showing the layout and design.

– Final Cleaning

▪ Two copies of the listing of completed final clean-up items.

1.2. PROJECT RECORD DOCUMENTS

1.2.1. As-Built Drawings – G

An as-built drawing is a construction drawing revised to reflect the final as-built conditions of the project as a result of modifications and corrections to the project design required during construction. The final as-built drawings shall not have the appearance of marked up drawings, but that of professionally prepared drawings as if they were the "as designed" drawings.

1.2.2. Maintenance of As-Built Drawings

1.2.2.1. The Configuration Management Plan shall describe how the Contractor will maintain up-to-date drawings, how it will control and designate revisions to the drawings and specifications (In accordance with Special Contract Requirement: ***Deviating from the Accepted Design*** and Section 01 33 16: ***Design after Award***, the Designer of Record's approval is necessary for any revisions to the accepted design).

1.2.2.2. Make timely updates, carefully maintaining a record set of working as-built drawings at the job site, marked in red, of all changes and corrections from the construction drawings. Enter changes and corrections on drawings promptly to reflect "Current Construction". Perform this update no less frequently

than weekly for the blue line drawings and update no less frequently than quarterly for the CADD/CAD and BIM files, which were prepared previously in accordance with Section 01 33 16. Include a confirmation that the as-builts are up to date with the submission of the monthly project schedule.

1.2.2.3. If the DB Contractor fails to maintain the as-built drawings as required herein, the Government will retain from the monthly progress payment, an amount representing the estimated monthly cost of maintaining the as-built drawings. Final payment with respect to separately priced facilities or the contract as a whole will be withheld until the Contractor submits acceptable as-built drawings and the Government approves them.

1.2.2.4. The marked-up set of drawings shall reflect any changes, alterations, adjustments or modifications. Changes must be reflected on all sheets affected by the change. Changes shall include marking the drawings to reflect structural details, foundation layouts, equipment sizes, and other extensions of design.

1.2.2.5. Typically, room numbers shown on the drawings are selected for design convenience and do not represent the actual numbers intended for use by the end user. Final as-built drawings shall reflect actual room numbers adopted by the end user.

1.2.2.6. If there is no separate contract line item (CLIN) for as-built drawings, the Government will withhold the amount of $35,000, or 1% of the present construction value, whichever is the greater, until the final as-built drawing submittal has been approved by the Government.

1.2.3. Underground Utilities

The drawings shall indicate, in addition to all changes and corrections, the actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Locate Valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Record average elevation of the top of each run or underground structure..

1.2.4. Partial Occupancy

For projects where portions of construction are to be occupied or activated before overall project completion, including portions of utility systems, supply as-built drawings for those portions of the facility being occupied or activated at the time the facility is occupied or activated. Show this same as-built information previously furnished on the final set of as-built drawings.

1.2.5. As-Built Conditions That are Different From the construction Drawings

Accurately reflect all as-built conditions that are different, such as dimensions, road alignments and grades, and drainage and elevations, from the construction drawings on each drawing. If the as-built condition is accurately reflected on a shop drawing, then furnish that shop drawing in CADD format. Reference the final as-built construction drawing the shop drawing file that includes the as-built information. In turn, the shop drawing shall reference the applicable construction as-built drawing. Delete any options shown on drawings and not selected clearly reflect options selected on final as-built drawings.

1.2.6. Additional As-Built Information that Exceeds the Detail Shown on the construction Drawings:

These as-built conditions include those that reflect structural details, foundation layouts, equipment, sizes, mechanical and electrical room layouts and other extensions of design, that were not shown in the project design documents because the exact details were not known until after the time of approved shop

drawings. It is recognized that these shop drawing submittals (revised showing as-built conditions) will serve as the as-built record without actual incorporation into the construction drawings, piping, and equipment drawings. Include locations of all explorations, logs of all explorations, and results of all laboratory testing, including those provided by the Government. Furnish all such shop drawings in CADD /CADformat. Include fire protection details, such as wiring, performed for the design of the project.

1.2.7. Final As-Built Drawings

Submit final as-built CADD/CAD and BIM Model(s) and Facility Data files at the time of Beneficial Occupancy of the project or at a designated phase of the project. In the event the Contractor accomplishes additional work after this submittal, which changes the as-built conditions, submit a new DVD with all drawing sheets , one copy of affected Mylars and three blue-line copies of affected sheets which depict additional changes.

1.2.8. Title Blocks

In accordance with the configuration management plan, clearly mark title blocks to indicate final as-built drawings.

1.2.9. Other As-Built Documents

Provide scans of all other documents such as design analysis, catalog cuts, certification documents that are not available in native electronic format in an organized manner in Adobe.pdf format.

1.2.9.1. LEED Documentation

Update LEED documentation on at least a monthly basis and have it available for review by the Government on the jobsite at all times during construction. Submit the final LEED Project Checklist(s), final LEED submittals checklist and complete project documentation, verifying the final LEED score and establishing the final rating. Provide full support to the validation review process, including credit audits. See also the LEED documentation requirements in Section 01 33 16, DESIGN AFTER AWARD.

1.2.9.2. GIS Documentation

Provide final geo-referenced GIS database of the new building footprint along with any changes made to exterior of the building. The intent of capturing the final building footprint and exterior modifications in a GIS database is to provide the installation with a data set of the comprehensive changes made to the landscape as a result of the construction project. The Government will incorporate this data set into the installations existing GIS MasterPlan or Enterprise GIS system. The GIS database deliverable shall follow a standard template provided to the Contractor by the Government, adhere to detailed specifications outlined in ECB No 2006-15, and be documented using the Federal Geographic Data Committee (FGDC) metadata standard.

1.3. EQUIPMENT DATA

1.3.1. Real Property Equipment

Provide an Equipment-in-Place list of all installed equipment furnished under this contract. Include all information usually listed on manufacturer's name plate. Include the cost of each piece of installed property F.O.B. construction site. For each of the items which is specified herein to be guaranteed for a specified period from the date of acceptance thereof, provide the following information: The name, serial and model number address of equipment supplier, or manufacturer originating the guaranteed item. The Contractor's guarantee to the Government of these items will not be limited by the terms of any manufacturer's guarantee to the Contractor. Furnish the list as one (1) reproducible and three (3) copies

thirty (30) calendar days before completion of any segment of the contract work which has an incremental completion date.

1.3.2. Maintenance and Parts Data

Furnish a brochure, catalog cut, parts list, manufacturer's data sheet or other publication showing detailed parts data on all other equipment subject to repair and maintenance procedures not otherwise required in Operations and Maintenance Manuals specified elsewhere in this contract. Distribution of directives shall follow the same requirements as listed in paragraph above.

1.3.3. Construction Specifications

Furnish permanent electronic files of final as-built construction specifications, including modifications thereto, with the as-built drawings.

1.4. CONSTRUCTION WARRANTY MANAGEMENT

1.4.1. Prior to the end of the one year warranty, the Government may conduct an infrared roof survey on any project involving a membrane roofing system. This survey will be conducted in accordance with ASTM C1153-90, "Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging". The Contractor shall replace all damaged materials and locate and repair sources of moisture penetration.

1.4.2. Management

1.4.2.1. Warranty Management Plan

Develop a warranty management plan containing information relevant to the clause ***Warranty of Construction*** in FAR 52.246-21. Submit the warranty management plan for Government approval at least 30 days before the planned pre-warranty conference. In the event of phased turn-over of the contract, update the Warranty Management Plan as necessary to include latest information required. Include all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. Submit warranty information made available during the construction phase prior to each monthly pay estimate. Assemble information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period shall begin on the date of project acceptance and shall continue for the full product warranty period. The Contractor, Government, including the Customer Representative shall jointly conduct warranty inspections, 4 months and 9 months, after acceptance. The warranty management plan shall include, but shall not be limited to, the following information:

(1) Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the contractors, subcontractors, manufacturers or suppliers involved.

(2) Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.

(3) A list for each warranted equipment, item, feature of construction or system indicating:

(i) Name of item.

(ii) Model and serial numbers.

(iii) Location where installed.

(iv) Name and phone numbers of manufacturers or suppliers.

(v) Names, addresses and telephone numbers of sources of spare parts.

(vi) Warranties and terms of warranty. Include one-year overall warranty of construction. Indicate those items, which have extended warranties with separate warranty expiration dates.

(vii) Cross-reference to warranty certificates as applicable.

(viii) Starting point and duration of warranty period.

(ix) Summary of maintenance procedures required to continue the warranty in force.

(x) Cross-reference to specific pertinent Operation and Maintenance manuals.

(xi) Organization, names and phone numbers of persons to call for warranty service.

(xii) Typical response time and repair time expected for various warranted equipment.

(4) The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

(5) Procedure and status of tagging of all equipment covered by extended warranties.

(6) Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.4.3. Performance Bond

1.4.3.1. The Contractor's Performance Bond will remain effective throughout the construction warranty period.

1.4.3.2. In the event the Contractor or his designated representative(s) fails to commence and diligently pursue any work required under this clause, and in a manner pursuant to the requirements thereof, the Government shall have a right to demand that said work be performed under the Performance Bond by making written notice on the surety. If the surety fails or refuses to perform the obligation it assumed under the Performance Bond, the Government shall have the work performed by others, and after completion of the work, may make demand for reimbursement of any or all expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

1.4.3.3. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Government will have the right to recoup expenses from the bonding company.

1.4.3.4. Following oral or written notification of required warranty repair work, the Contractor will respond as dictated by para. 1.4.5. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Government to proceed against the Contractor as outlined in the paragraph 1.4.5.5 and/or above.

1.4.4. Pre-Warranty Conference

Prior to contract completion, or completion of any phase or portion of contract to be turned over, and at a time designated by the Contracting Officer, the Contractor shall meet with the Government to develop a mutual understanding with respect to the requirements of this clause. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Government for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor will furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warrantied construction, will be continuously

available, and will be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of his responsibilities in connection with other portions of this provision.

1.4.5. Contractor's Response to Warranty Service Requirements.

Following Government oral or written notification, which may include authorized installation maintenance personnel, the Contractor shall respond to warranty service requirements in accordance with the "Warranty Service Priority List" and the three categories of priorities listed below. Submit a report on any warranty item that has been repaired during the warranty period. The report shall include the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframe specified, the Government will perform the work and backcharge the construction warranty payment item established.

1.4.5.1. First Priority Code 1 Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

1.4.5.2. Second Priority Code 2 Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

1.4.5.3. Third Priority Code 3 All other work to be initiated within 3 work days and work continuously to completion or relief.

1.4.5.4. The "Warranty Service Priority List" is as follows:

- Code 1 - Air Conditioning System

(a) Buildings with computer equipment.

(b) Barracks, mess halls (entire building down).

- Code 2 - Air Conditioning Systems

(a) Recreational support.

(b) Air conditioning leak in part of building, if causing damage.

(c) Air conditioning system not cooling properly

(d) Admin buildings with Automated Data Processing (ADP) equipment not on priority list.

- Code 1 - Doors

(a) Overhead doors not operational.

- Code 1 - Electrical

(a) Power failure (entire area or any building operational after 1600 hours).

(b) Traffic control devices.

(c) Security lights.

(d) Smoke detectors and fire alarm systems

(e) Power or lighting failure to an area, facility, portion of a facility, which may adversely impact health, safety, security, or the installation's mission requirement, or which may result in damage to property.

- Code 2 - Electrical

(a) Power failure (no power) for unoccupied buildings or portions thereof or branch circuits within occupied buildings, not listed as Code 1.

(a) Receptacle and lights, not listed as code 1.

- Code 3 - Electrical

(a) Street, parking area lights

- Code 1 - Gas

(a) Leaks and breaks.

(b) No gas to cantonment area.

- Code 1 - Heat

(a) Area power failure affecting heat.

(b) Heater in unit not working.

- Code 2 Heat

(a) All heating system failures not listed as Code 1.

- Code 3 - Interior

(a) Floor damage

(b) Paint chipping or peeling

- Code 1 - Intrusion Detection Systems - N/A.
- Code 2 - Intrusion Detection Systems other than those listed under Code 1
- Code 1 - Kitchen Equipment

(a) Dishwasher.

(b) All other equipment hampering preparation of a meal.

- Code 2 - Kitchen Equipment

(a) All other equipment not listed under Code 1.

- Code 2 - Plumbing

(a) Flush valves not operating properly

(b) Fixture drain, supply line commode, or water pipe leaking.

(c) Commode leaking at base.

- Code 3 - Plumbing

(a) Leaking faucets

- Code 1 - Refrigeration

(a) Mess Hall.

(b) Medical storage.

- Code 2 - Refrigeration

(a) Mess hall - other than walk-in refrigerators and freezers.

- Code 1 - Roof Leaks

(a) Temporary repairs will be made where major damage to property is occurring.

- Code 2 - Roof Leaks

(a) Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.

- Code 1 - Sprinkler System

(a) All sprinkler systems, valves, manholes, deluge systems, and air systems to sprinklers.

- Code 1 - Tank Wash Racks (Bird Baths)

(a) All systems which prevent tank wash.

- Code 1 - Water (Exterior)

(a) Normal operation of water pump station.

- Code 2 - Water (Exterior)

(a) No water to facility.

- Code 1 - Water, Hot (and Steam)

(a) Barracks (entire building).

- Code 2 - Water, Hot

(a) No hot water in portion of building listed under Code 1

1.4.5.5. Should parts be required to complete the work and the parts are not immediately available, the Contractor shall have a maximum of 12 hours after arrival at the job site to provide the Government, with firm written proposals for emergency alternatives and temporary repairs for Government participation with the Contractor to provide emergency relief until the required parts are available on site for the Contractor to perform permanent warranty repair. The Contractors proposals shall include a firm date and time that the required parts shall be available on site to complete the permanent warranty repair. The Government will evaluate the proposed alternatives and negotiate the alternative considered to be in the best interest of the Government to reduce the impact of the emergency condition. Alternatives considered by the Government will include the alternative for the Contractor to "Do Nothing" while waiting until the required parts are available to perform permanent warranty repair. Negotiating a proposal which will require Government participation and the expenditure of Government funds shall constitute a separate procurement action by the using service.

1.4.6. Equipment Warranty Identification Tags

1.4.6.1. Provide warranty identification tags at the time of installation and prior to substantial completion shall provide warranty identification tags on all Contractor and Government furnished equipment which the Contractor has installed.

(a) The tags shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent pressure-sensitive adhesive back, and they shall be installed in a position that is easily (or most easily) noticeable. Tag each component of contractor furnished equipment that has differing warranties on its components.

(b) Submit sample tags, representing how the other tags will look, for Government review and approval.

(c) Tags for Warrantied Equipment: The tag for this equipment shall be similar to the following: Exact format and size will be as approved.

EQUIPMENT WARRANTY - CONTRACTOR FURNISHED EQUIPMENT

MFG NAME MODEL NO.

SERIAL NO.

CONTRACT NO.

CONTRACTOR NAME

CONTRACTOR WARRANTY EXPIRES

MFG WARRANTY(IES) EXPIRE

EQUIPMENT WARRANTY - GOVERNMENT FURNISHED EQUIPMENT

MFG NAME MODEL NO.

SERIAL NO.

CONTRACT NO.

DATE EQUIP PLACED IN SERVICE

MFG WARRANTY(IES) EXPIRE

(d) If the manufacturer's name (MFG), model number and serial number are on the manufacturer's equipment data plate and this data plate is easily found and fully legible, this information need not be duplicated on the equipment warranty tag

1.4.6.2. Execution: Complete the required information on each tag and install these tags on the equipment by the time of and as a condition of final acceptance of the equipment.

1.5. MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

Submit; all reports, statements, certificates, and completed checklists for testing, adjusting, balancing, and commissioning of mechanical systems prior to final inspection and transfer of the completed facility for approval, as specified in applicable technical specification sections.

1.6. OPERATION AND MAINTENANCE MANUALS

1.6.1. General Requirements

1.6.1.1. Inasmuch as the operations and maintenance manuals are required to operate and maintain the facility, the operations and maintenance (O&M) manuals will be considered a requirement prior to substantial completion of any facility to be turned over to the Government. Beneficial occupancy of all or portions of a facility prior to substantial completion will not relieve the Contractor of liquidated damages, if substantial completion exceeds the required completion date.

1.6.1.2. Provide one permanent electronic copy on CD-ROM and 2 hard copies of the Equipment Operating, Maintenance, and Repair Manuals. Provide separate manuals for each utility system as defined hereinafter. Submit Operations and Maintenance manuals for approval before field training or 90 days before substantial completion (whichever occurs earlier). If there is no separate CLIN for O&M Manuals, the Government will withhold an amount representing $20,000, as non-progressed work, until submittal and approval of all O&M manuals are complete.

1.6.2. Definitions

1.6.2.1. Equipment

A single piece of equipment operating alone or in conjunction with other equipment to accomplish a system function.

1.6.2.2. System

A combination of one or more pieces of equipment which function together to accomplish an intended purpose (i.e. HVAC system is composed of many individual pieces of equipment such as fans, motors, compressors, valves, sensors, relays, etc.)

1.6.3. Hard Cover Binders

The manuals shall be hard cover with posts, or 3-ring binders, so sheets may be easily substituted. Print the following identification on the cover: the words "EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUALS," the project name, building number, and an indication of utility or systems covered, the name of the Contractor, and the Contract number. Manuals shall be approximately 8-1/2 by 11-inches with large sheets folded in and capable of being easily pulled out for reference. All manuals for the project must be similar in appearance, and be of professional quality.

1.6.4. Warning Page

Provide a warning page to warn of potential dangers (if they exist, such as high voltage, toxic chemicals, flammable liquids, explosive materials, carcinogens, high pressures, etc.). Place the warning page inside the front cover and in front of the title page. Include any necessary Material Safety Data Sheets (MDSD) here.

1.6.5. Title Page

The title page shall include the same information shown on the cover and show the name of the preparing firm and the date of publication.

1.6.6. Table of Contents

Each volume of the set of manuals for this project shall include a table of contents, for the entire set, broken down by volume.

1.6.7. GENERAL

Organize manuals according to the following format, and include information for each item of equipment Submit a draft outline and table of contents for approval at 50% contract completion.

TABLE OF CONTENTS

PART I: Introduction

- Equipment Description
- Functional Description
- Installation Description

PART II: Operating Principles

PART III: Safety

PART IV: Preventive Maintenance

- Preventive Maintenance Checklist, Lubrication
- Charts and Diagrams

PART V: Spare Parts Lists

- Troubleshooting Guide
- Adjustments
- Common Repairs and Parts Replacement

PART VI: Illustrations

1.6.7.1. Part I-Introduction

Part I shall provide an introduction, equipment or system description, functional description and theory of operation, and installation instructions for each piece of equipment. Include complete instructions for uncrating, assembly, connection to the power source and pre-operating lubrication in the installation instructions as applicable. Illustrations, including wiring and cabling diagrams, are required as appropriate in this section. Include halftone pictures of the equipment in the introduction and equipment description, as well as system layout drawings with each item of equipment located and marked. Do not use copies of previously submitted shop drawings in these manuals.

1.6.7.2. Part II-Operating Principles

Part II shall provide complete instructions for operating the system, and each piece of equipment. Illustrations, halftone pictures, tables, charts, procedures, and diagrams are required when applicable. This will include step-by-step procedures for start-up and shutdown of both the system and each component piece of equipments, as well as adjustments required to obtain optimum equipment performance, and corrective actions for malfunctions. Show performance sheets and graphs showing capacity data, efficiencies, electrical characteristics, pressure drops, and flow rates here, also. Marked-up catalogs or catalog pages do not satisfy this requirement. Present performance information as concisely as possible with only data pertaining to equipment actually installed. Include actual test data collected for Contractor performance here.

1.6.7.3. Part III-Safety

Part III shall contain the general and specific safety requirements peculiar to each item of equipment. Repeat safety information as notes cautions and warnings in other sections where appropriate to operations described.

1.6.7.4. Part IV-Preventive Maintenance

Part IV shall contain a troubleshooting guide, including detailed instructions for all common adjustments and alignment procedures, including a detailed maintenance schedule. Also include a diagnostic chart showing symptoms and solutions to problems. Include test hookups to determine the cause, special tools and test equipment, and methods for returning the equipment to operating conditions. Information may be in chart form or in tabular format with appropriate headings. Include instructions for the removal, disassembly, repair, reassembly, and replacement of parts and assemblies where applicable and the task is not obvious.

1.6.7.5. Part V-Spare Parts List

Part V shall contain a tabulation of description data and parts location illustrations for all mechanical and electrical parts. The heading of the parts list shall clearly identify the supplier, purchase order number, and equipment. Include the unit price for each part. List parts by major assemblies, and arrange the listing in columnar form. Include names and addresses of the nearest manufacturer's representatives, as well as any special warranty information. Provide a list of spare parts that are recommended to be kept in stock by the Government installation.

1.6.7.6. Part VI-Illustrations

Part VI shall contain assembly drawings for the complete equipment or system and for all major components. Include complete wiring diagrams and schematics. Other illustrations, such as exploded views, block diagrams, and cutaway drawings, are required as appropriate.

1.6.8. Framed Instructions

Post framed instructions are required for substantial completion. Post framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, including equipment, ductwork, piping valves, dampers, and control sequence at a location near the equipment described. Prepare condensed operating instructions explaining preventive maintenance procedures methods of checking the system for normal safe operation, valve schedule and procedures for safely starting and stopping the system in type form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. Submit proposed diagrams, instructions, and other sheets prior to posting. Post the framed instructions before field training.

1.6.9. (Reserved. See 1.7 for Field Training)

1.6.10. System/Equipment Requirements

1.6.10.1. Facility Heating System

Provide information on the following equipment: boilers, water treatment, chemical feed pumps and tanks, converters, heat exchangers, pumps, unit heaters, fin-tube radiation, air handling units (both heating only and heating and cooling), and valves (associated with heating systems).

1.6.10.2. Air-Conditioning Systems

Provide information in chillers, packaged air-conditioning equipment, towers, water treatment, chemical feed pumps and tanks, air-cooled condensers, pumps, compressors, air handling units, and valves (associated with air-conditioning systems).

1.6.10.3. Temperature Control and HVAC Distribution Systems

Provide all information described for the following equipment: valves, fans, air handling units, pumps, boilers, converters and heat exchangers, chillers, water cooled condensers, cooling towers, and fin-tube radiation, control air compressors, control components (sensors, controllers, adapters and actuators), and flow measuring equipment.

1.6.10.4. Central Heating Plants

Provide the information described for the following equipment: boilers, converters, heat exchangers, pumps, fans, steam traps, pollution control equipment, chemical feed equipment, control systems, fuel handling equipment, de-aerators, tanks (flash, expansion, return waters, etc.), water softeners, and valves.

1.6.10.5. Heating Distribution Systems

Provide the information described for the following equipment: valves, fans, pumps, converters and heat exchangers, steam traps, tanks (expansion, flash, etc.), and piping systems.

1.6.10.6. Exterior Electrical Systems

Provide information on the following equipment: power transformers, relays, reclosers, breakers, and capacitor bank controls.

1.6.10.7. Interior Electrical Systems

Provide information on the following equipment: relays, motor control centers, switchgear, solid state circuit breakers, motor controller, EPS lighting systems, wiring diagrams and troubleshooting flow chart on control systems, and special grounding systems.

1.6.10.8. Energy Monitoring and Control Systems

The maintenance manual shall include descriptions of maintenance for all equipment, including inspection, periodic preventative maintenance, fault diagnosis, and repair or replacement of defective components.

1.6.10.9. Domestic Water Systems

Provide the identified information on the following equipment: tanks, unit process equipment, pumps, motors, control and monitoring instrumentation, laboratory test equipment, chemical feeders, valves, switching gear, and automatic controls.

1.6.10.10. Wastewater Treatment Systems

Provide the identified information on the following equipment: tanks, unit process equipment, pumps, motors, control and monitoring instrumentations, laboratory test equipment chemical feeders, valves, scrapers, skimmers, comminutors, blowers, switching gear, and automatic controls.

1.6.10.11. Fire Protection Systems

Provide information on the following equipment: alarm valves, manual valves, regulators, foam and gas storage tanks, piping materials, sprinkler heads, nozzles, pumps, and pump drivers.

1.6.10.12. Fire Alarm and Detection Systems

(1) The maintenance manual shall include description of maintenance for all equipment, including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

(2) Provide all software; database with complete identification of programmable portions of system equipment and devices, and all other system programming data on all modes of the system; connecting cables; and proprietary equipment necessary for the operation, maintenance, testing, repair and programming, etc. of the system and that may be required for implementation of future changes to the fire system (additional and/or relocated initiating devices, notification devices, etc.

(3) Provide all system and equipment technical data and computer software with the requisite rights to Government use, in accordance with the applicable contract clauses.

(4) Training shall include software and programming required for the effective operation, maintenance, testing, diagnostics and expansion of the system.

1.6.10.13. Plumbing Systems

Provide information on the following equipment: water heaters, valves, pressure regulators backflow preventors, piping materials, and plumbing fixtures.

1.6.10.14. Liquid Fuels Systems

Provide information on the following equipment: tanks, automatic valves manual valves, filter separators, pumps, mechanical loading arms, nozzles, meters, electronic controls, electrical switch gear, and fluidic controls.

1.6.10.15. Cathodic Protection Systems

Provide information on the following material and equipment: rectifiers, meters, anodes, anode backfill, anode lead wire, insulation material and wire size, automatic controls (if any), rheostats, switches, fuses and circuit breakers, type and size of rectifying elements, type of oil in oil-immersed rectifiers, and rating of shunts.

1.6.10.16. Generator Installations

Provide information on the following equipment: generator sets, automatic transfer panels, governors, exciters, regulators starting systems, switchgear, and protective devices.

1.6.10.17. Miscellaneous Systems

Provide information on the following: communication and ADP systems, security and intrusion alarm, elevators, material handling, active solar, photovoltaic, nurse call, paging, intercom, closed circuit TV, irrigation, sound and material delivery systems, kitchen, refrigeration, disposal, ice making equipment, and other similar type special systems not otherwise specified.

1.6.10.18. Laboratory, Environmental and Pollution Control Systems

Provide information on the following equipment: wet scrubbers, quench chambers, scrub tanks, liquid oil separators, and fume hoods.

1.7. FIELD TRAINING

Field Training is a requirement for substantial completion. Conduct a training course for the operating staff for each particular system. Conduct the training is to be conducted during hours of normal working time after the system is functionally complete. The field instructions shall cover all of the items contained in the Equipment Operating, Maintenance and Repair Manuals. The training will include both classroom and "hands-on" training. Submit a lesson plan outlining the information to be discussed during training periods. Submit this lesson plan for approval 90 days before contract completion before the field training occurs. Record training on DVD and furnish to the Government within ten (10) days following training. Document all training and furnish a list of all attendees.

1.8. PRICING OF CONTRACTOR-FURNISHED AND INSTALLED PROPERTY AND GOVERNMENT-FURNISHED CONTRACTOR-INSTALLED PROPERTY

Promptly furnish and require any sub-contractor or supplier to furnish, in like manner, unit prices and descriptive data required by the Government for Property Record purposes of fixtures and equipment furnished and/or installed by the Contractor or sub-contractor, except prices do not need to be provided for Government-Furnished Property.

1.9. LEED REVIEW MEETINGS

1.9.1. Pre-Closeout Meeting. Approximately 30 days before submittal of LEED closeout documentation, the Contractor and the Government's project delivery team (including Installation representative) will meet to review the documentation, determine which, if any, credits will be audited and identify any corrections/missing items prior to the closeout LEED documentation submittal.

1.9.2. Approximately 14 days after submittal of LEED closeout documentation, the Contractor and the Government's project delivery team (including Installation representative) will meet to review the LEED closeout documentation. The review conference will include discussion of and resolution of all review comments to ensure consensus on achievement of credits and satisfactory documentation. At the review conference a final score will be determined and endorsed in writing by all parties.

1.10. RED ZONE MEETING

At approximately 80% of contract completion or 60 days before the anticipated Beneficial Occupancy Date (BOD), whichever occurs first, the Contractor and the Government's project delivery team will conduct what is known as the Red Zone Meeting to discuss the close-out process, to schedule the events and review responsibilities for actions necessary to produce a timely physical, as well as fiscal, project close-out. The Red Zone meeting derives its name from the football term used to describe the team effort to move the ball the last 20 yards into the end zone. The close-out of a construction project sometimes can be equally as hard and most definitely requires the whole team’s efforts. The ACO will chair the meeting. If not already provided, shortly before the meeting, the Contractor shall provide an electronic copy or access to the CADD as-built drawings, completed commensurate with the amount of work completed at the time of the Red Zone Meeting, as an indicator of the Contractors’ understanding of and ability to meet the USACE CADD Standards and to ensure that the Contractor is making progress with CADD As-Built requirements. EXHIBIT 1 is a generic meeting checklist.

1.11. FINAL CLEANING

Clean the premises in accordance with FAR clause 52.236-12 and additional requirements stated here. Remove stains, foreign substances, and temporary labels from surfaces. Vacuum carpet and soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean or replace filters of operating equipment if cleaning isn't possible or practicable. Remove debris from roofs, drainage systems, gutters, and downspouts. Sweep paved areas and rake clean landscaped areas. Remove waste, surplus materials, and rubbish from the site. Remove all temporary structures, barricades, project signs, fences and construction facilities. Submit a list of completed clean-up items on the day of final inspection.

1.12. INTERIM FORM DD1354 "TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

Near the completion of Project, but a minimum of 60 days prior to final acceptance of the work, complete, update draft provided with the final design package(s) (see Section 01 33 16, paragraph 3.7.5) and submit an accounting of all installed property on Interim Form DD1354 "Transfer and Acceptance of Military Real Property." Include any additional assets/improvements/alterations and cost updates from the Draft DD Form 1354. Contact the COR for any project specific information necessary to complete the DD Form 1354. This form will be a topic for the Red Zone Meeting discussed above. For information purposes, a blank DD Form 1354 (fill-able) in ADOBE (PDF) may be obtained at the following web site: http://www.dtic.mil/whs/directives/infomgt/forms/eforms/dd1354.pdf Submit the completed Checklist for Form DD1354 of Government-Furnished and Contractor-Furnished/Contractor Installed items. Attach this list to the updated DD Form 1354. Instructions for completing the form may be obtained through the US Army Corps of Engineers TECHINFO Website at http://www.hnd.usace.army.mil/techinfo/ under publications, in Unified Facilities Criteria UFC 1-300-08.

EXHIBIT 1

SAMPLE

Red Zone Meeting Checklist

Date:_____

Contract No.	
Description / Location	
Contractor	
Contracting Officer	

Action	**Completion Milestone**	√
Inspections		
Fire		
Safety		
Pre-final		
Mechanical Test & Balance		
Commissioning		
Landscaping Complete		
Erosion Control		
Beneficial Occupancy Date (BOD)		
Furniture Installation		
Comm Installation		
As-Built Drawings		
Provide all O&M manuals, tools, shop drawings, spare parts, etc. to customer		
Training of O&M Personnel		
Provide Warranty documents to Customer		
Contract completion		
Final Inspection		

User move-in		
DD Form 1354, Transfer of Real Property completed & signed		
Ribbon cutting		
Payroll Clearances		
DD Form 2626 - Construction Contractor Performance Evaluation		
DD Form 2631 – A-E Performance Rated after Construction		
Status of Pending Mods and REA's/Claims		
Final Payment Completed		
Release of Claims		
Return of Unobligated Funds		
Move Project from CIP to General Ledger		
Financial completion		

End of Section 01 78 02.00 10

Appendix A

Geotechnical Information

"For Information Only"

Provisions of Section 01 33 16 Paragraph 3.5.3.1 Apply

This documents contains appendices
A: 2004 Preliminary Site Investigation
B: Phase 1 Geotechnical Report
C: Phase 2 Geotechnical Report

This Document is Available via the US Army Corps of Engineers ftp Site at:

ftp://ftp.usace.army.mil/pub/nwk/PN%2057194%20PPB%20V%20Geotechnical%20Reports/

Appendix B

List of Drawings

PDF Drawings are provided.

Civil

Permanent Party Barracks	Title Page
Vicinity Location and Site Maps	GI002
Project Location Map	

Architectural

Typical 1st Floor Plan	DI-1
Typical 2nd Floor Plan	DI-2
Typical Furniture Plan	DI-3

As-Built Data – Previous Phase

Overall Grading Plan	C-300
Beneficial Fill Grading Plan	C303

Topographic Plans

Site Survey	001
Site Survey	002
Site Survey	003
Site Survey	004
Site Survey	005
Site Survey	006
Site Survey	007
Site Survey	008
Site Survey	009

Appendix C

Utility Connections

Reference: Appendix J Drawings.
Sheet 2 of 2 labeled “Sample layout” identify utility connection points.

Appendix D

Results of Fire Flow Tests

For information Only

Conducted by FES D Location OKLAHOMA & MINNESOTA Date 11-11-07

Hydrant coefficient .88 Elevation 1092 Static 70 Residual 54 @ Flow 3700 GPM (BLUE)

	ELEVATION	RESIDUAL	P, TOT	GPM
F-1	1096	62	44	1110
F-2	1114	54	32	950
				2060

FIRE HOUSE CALC: 3730 GPM @ 20 PSI

STATIC
0 GPM @ 70 PSI

RESIDUAL
2060 GPM @ 54 PSI

FLOW
3700 GPM @ 20 PSI

Scale Used A

PRESSURE
(Bars = kPa ÷ 100)

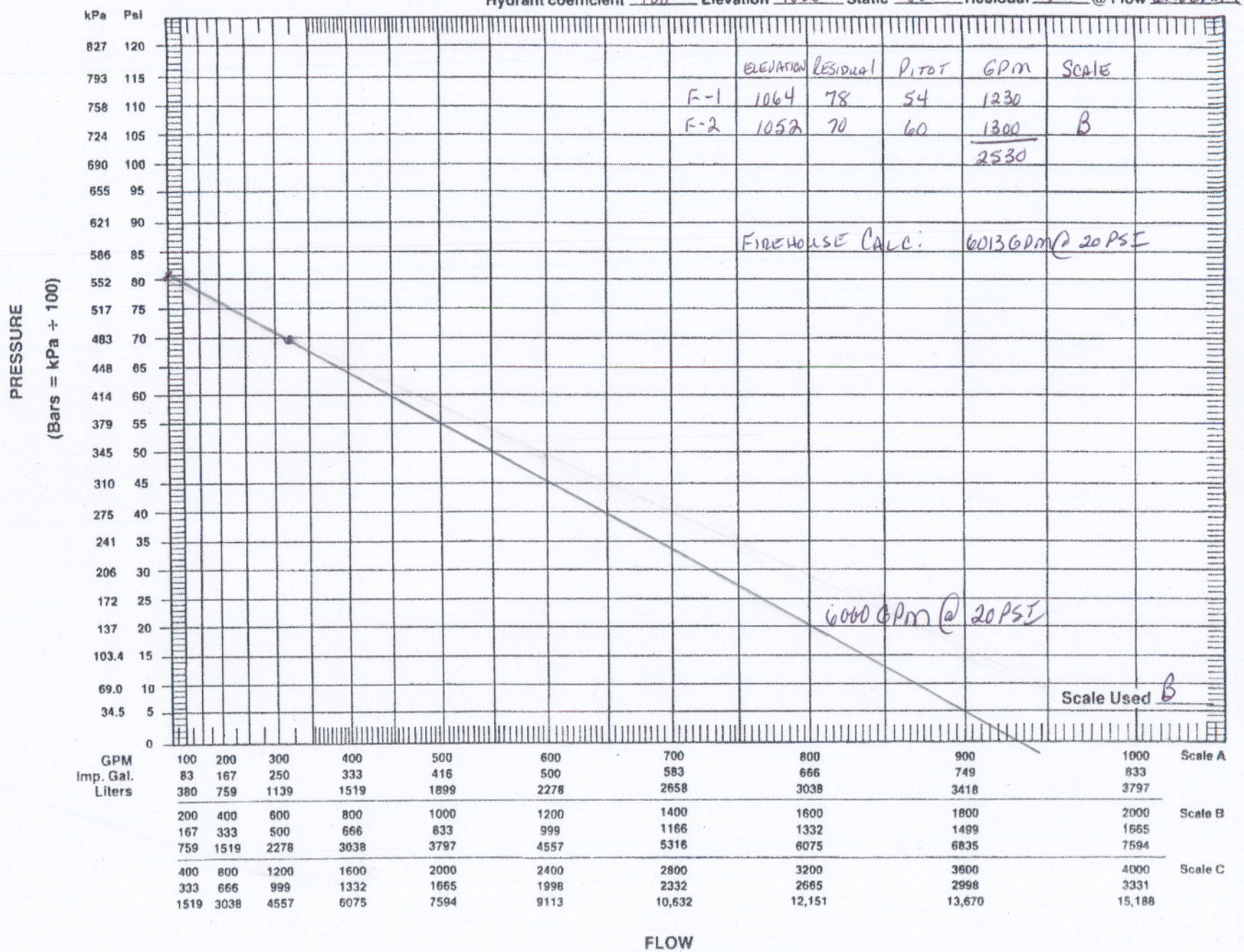
kPa	Psi
827	120
793	115
758	110
724	105
690	100
655	95
621	90
586	85
552	80
517	75
483	70
448	65
414	60
379	55
345	50
310	45
275	40
241	35
206	30
172	25
137	20
103.4	15
69.0	10
34.5	5
0	

GPM	100	200	300	400	500	600	700	800	900	1000	Scale A
Imp. Gal.	83	167	250	333	416	500	583	666	749	833	
Liters	380	759	1139	1519	1899	2278	2658	3038	3418	3797	
	200	400	600	800	1000	1200	1400	1600	1800	2000	Scale B
	167	333	500	666	833	999	1166	1332	1499	1665	
	759	1519	2278	3038	3797	4557	5316	6075	6835	7594	
	400	800	1200	1600	2000	2400	2800	3200	3600	4000	Scale C
	333	666	999	1332	1665	1998	2332	2665	2998	3331	
	1519	3038	4557	6075	7594	9113	10,632	12,151	13,670	15,188	

FLOW

Conducted by FESD Location MICHIGAN & 1900 area Date 11-11-07

Hydrant coefficient .188 Elevation 1068 Static 82 Residual 70 @ Flow 6000 GPM (BLUE)



MP DRIVE
REPLACEMENT A
LOUISIA
EAST 4TH STREET
EAST 5TH STREET
MICHIGAN AVENUE
MINNESOTA AVENUE
EAST 8TH STREET
JADWIN DRIVE
PICK PLAC
2041
2042
2043
2051
2073
2080
2081
2113A
2385
2341
2340
2373
2370
2369
4801
1706
1705
1701
1700
1704
1703
1707
TA-120
1052
F2
1064
F1
10" INCH
TEST
1046
F2
1114
10 INCH
F1
1096
1092
TEST

ENVIRONMENTAL REQUIREMENTS

ENVIRONMENTAL DIVISION

STANDARD CONTRACT LANGUAGE (revision of 21 December 2009)

1. **NATIONAL ENVIRONMENTAL POLICY ACT (NEPA):** NEPA requires that all Army facilities complete an environmental impact analysis according to 32 Code of Federal Regulations Part 651 and Army Regulation 200-2, for proposed actions. This analysis considers the anticipated direct, indirect, and cumulative impacts of the specific proposed action on the natural, human, and socioeconomic environment. This project was reviewed by the DPW Environmental Division and a NEPA document prepared which contains a site analysis and site specific requirements. This is a legally binding document and the requirements contained in it must be adhered to in addition to the Standard Environmental Contract Language. The contractor shall reference the NEPA review documents and shall contact the Environmental Division (596-0882) for clarification of any requirement: The documentation will be at the Environmental Division if none is available in the contract, and the contractor shall seek out that information if it has not otherwise been provided prior to the beginning of any contracted activities.

2. **NATURAL RESOURCES:**

2.1. **Forest Products** – If the work area contains trees that must be removed, the area must be surveyed for salvageable forest products, which must be disposed of in accordance with AR 405-90, Disposal of Real Estate, and AR 200-1, Environmental Protection and Enhancement. At such time as the project limits are established, the DPW Natural Resource Branch (NRB) must conduct a survey and provide a map and fair market value of the timber.

2.2. **Threatened & Endangered Species** – If the area contains potential roost trees (dead or dying trees with sloughing bark) for the Indiana bat, a federally endangered species, these trees may only be removed during the period of 01 November through 31 March of the following year.

2.3. **Cultural Resources** – The Contractor shall protect existing historical, archaeological, and cultural resources within the work area and shall be responsible for their preservation during the life of the Contract. Work affecting these resources is not allowed unless prior approval is received by the Fort Leonard Wood DPW Natural Resources Branch. If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered of found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this include but are not limited to any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other unexpected constructed feature; and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made.

3. **WATER QUALITY:**

3.1. **Spill Prevention and Response Plan** – A Spill Prevention and Response Plan is required and shall include the procedures, instructions, and reports to be used in the event of a spill of a substance regulated by 40 CFR 112, 40 CFR 265, and/or regulated under State or Local laws and regulations. This plan shall include the name of the individual who will report any spills or hazardous substance releases, and the individual who will follow up with complete documentation.

3.2. **Spill Response** – Spills of hazardous materials/wastes, and spills of petroleum/oil/lubricants, shall be immediately reported and cleaned up to the satisfaction of the Fort Leonard Wood Environmental Branch at the Contractor's expense. Spills must be reported immediately to the local Fire Department (911), the Fort Leonard Wood Environmental Branch (573/596-0882), and the Contracting Officer (CO/COR). The Contractor shall cease all activity in the area of the spill or in the area of discovered contamination and shall not commence work in that area until so directed by the CO/COR. Contractor shall provide verification, as required, that Contractor employees are properly trained in spill response and cleanup in accordance with all Federal, State, Local, and Fort Leonard Wood laws and regulations and guidance. The

Contractor shall prepare the “Fort Leonard Wood Spill Report” form, Attachment 1. The completed form shall be submitted to the Environmental Branch via the CO/COR.

3.3. **Secondary Containment** – All petroleum, oil, lubricants, hazardous materials, and hazardous wastes in 55-gallon containers or larger must have secondary containment capable of holding at least 110% of the capacity of the single largest container. This also applies to animal-based and vegetable-based grease commonly associated with dining facilities.

3.4. **Rinsate –** Rinsate from cement trucks must be contained on site and not allowed to discharge from the site.

3.5. **Backflow Preventers** – All facilities must have backflow preventers on service lines plus potential cross contamination sources.

3.6. Stormwater Runoff and On-site Erosion and Sediment Control – All sites with land disturbing activities, regardless of size, must install erosion and sediment control measures to prevent erosion and sediment from leaving the land disturbance site. Land disturbing activities 1-acre or greater require a Permit from the Missouri Department of Natural Resources. All sites must be final stabilized through re-vegetation or medium such as gravel or rock.

3.6.1. **Stormwater Runoff** – Section 438 of the Energy Independence and Security Act of 2007 requires "The sponsor of any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 square feet shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow.”

3.6.2. **On-site Erosion and Sediment Control** – All sites with land disturbing activities less than 1-acre must install erosion and sediment control measures to prevent erosion and sediment from leaving the land disturbance site and be restored per the approved FLW Excavation Permit, (“Dig Permit”) FLW Form 364. Land disturbing activities 1-acre or greater require a Land Disturbance Permit from the Missouri Department of Natural Resources. Refer to Section 6.6 for the Land Disturbance Permit requirements.

4. TOXIC SUBSTANCES:

4.1. **Lead-Based Paint** – No lead-based paint (LBP) or materials containing LBP may be used at Fort Leonard Wood. With a demolition or renovation, if the presence of lead-based paint (LBP) is unknown, it should be assumed to be present, especially in structures built prior to 1980. Demolition of structures containing LBP must be done using precautions to prevent the release of the hazardous substance, such as whole component removal. If whole components containing LBP are removed or if a building is demolished, Missouri Department of Natural Resources (MDNR) Solid Waste Regulations require disposal in a State-permitted demolition or sanitary landfill. Or, a structure may be remediated by removing the lead-based paint using lead-safe work practices; however, any lead-based paint removed or recovered from the site must be handled as Hazardous Waste IAW Federal, State, Local, and FLW Regulations. For additional information, contact the DPW Environmental Branch (573/596-0882).

4.1.1. For any lead-based paint remediation performed by a Contractor other than the Base Maintenance Contractor, all lead-based paint and/or other hazardous wastes must be packaged, labeled, marked, and disposed of by the Contractor performing the work according to Federal, State, Local, and FLW Regulations. All hazardous waste manifests must be signed by the FLW Hazardous Waste Program Manager. Manifests shall be provided at least 48 hours prior to the expected shipment date. Under no circumstances will hazardous waste be handled or removed from the site without first consulting with the FLW Hazardous Waste Program Manager. The appropriate test method to make a non-hazardous determination, should the Contractor elect to have the waste tested, is the Toxicity Characteristic Leaching Procedure (TCLP), EPA Method 1311, which is described in Appendix 11, 40 CFR Part 261. All test results shall be provided to the FLW Hazardous Waste Program Manager for review. This includes TCLP testing and any other analytical testing performed that impacts the determination of wastes from this site.

4.2. **Non-Liquid Polychlorinated Biphenyls** – PCBs may be present in the caulk used in windows, door frames, masonry columns and other masonry building materials in many buildings, including schools, built

or renovated between 1950 and 1978. The contractor shall coordinate all potential NLPCB related work (i.e., work on such facilities and structures as described above) with the FLW environmental office, who must approve all sampling and work. No PCBs may be used at Fort Leonard Wood. If building materials containing PCBs are to be removed, a PCB Removal Plan shall be submitted to the Fort Leonard Wood Environmental Branch for approval prior to commencement. Contact the Fort Leonard Wood Environmental Branch at 573/596-0882 for further clarification.

4.3. **Asbestos Containing Materials –** No Asbestos Containing Materials (ACMs) may be used at Fort Leonard Wood. All 9-square-inch floor tile is assumed to contain asbestos and some 12-square-inch tile contains asbestos, therefore, floor tile that is broken, in poor condition, or is to be disturbed needs to be tested for asbestos content prior to beginning work. Furthermore, if any suspect ACMs are discovered, the project must stop, and the suspect material must be tested for asbestos content. If applicable, the Contractor is responsible for testing and must coordinate the testing with the Fort Leonard Wood DPW Environmental Branch. The testing may be done only by certified individuals. If testing confirms that asbestos is present, then the ACMs may be removed only by individuals certified to remove ACMs, and the ACMs must be disposed of in accordance with all applicable Federal, State, and Local regulations, including Fort Leonard Wood policies. Upon conclusion of the Asbestos removal, the Contractor is required to complete the "Fort Leonard Wood Asbestos Project Compliance and Completion" form, Attachment 2, and submit the completed form to the Environmental Branch via the CO/COR. Contact the Fort Leonard Wood DPW Environmental Branch at 573/596-0882 for more information.

5. WASTE MANAGEMENT:

5.1. **Debris Burning** – Fort Leonard Wood restrictions do not allow construction materials, demolition materials, or any debris to be burned.

5.2. **Solid Wastes –** Solid wastes (excluding land clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill shall be the minimum acceptable off-site solid waste disposal. The Contractor shall verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. The Contractor shall comply with Federal, State, local laws and regulations and Fort Leonard Wood guidance pertaining to the use of landfill areas.

5.3. **Contractor Generated Hazardous Wastes/Excess Hazardous Materials** – Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable State and local regulations. Hazardous materials are defined in 49 CFR 171 – 178. The Contractor shall, at a minimum, manage and store hazardous waste in compliance with 40 CFR 262. The Contractor shall take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. The Contractor shall segregate hazardous waste from other materials and wastes, shall protect it from the weather by placing it in a safe covered location, and shall take precautionary measures such as berming or other appropriate measures against accidental spillage. The Contractor shall be responsible for storage, describing, packaging, labeling, marking, and placarding of hazardous waste and hazardous material in accordance with 49 CFR 171 – 178, State, and local laws and regulations. The Contractor shall transport Contractor generated hazardous waste off Government property in accordance with the Environmental Protection Agency and the Department of Transportation laws and regulations. The Contractor shall dispose of hazardous waste in compliance with Federal, State, and local laws and regulations. Spills of hazardous or toxic materials shall be immediately reported to the local Fire Department (911), the Fort Leonard Wood Environmental Branch (573-596-0882), and the Contracting Officer Representative. Cleanup and cleanup costs due to spills shall be the Contractor's responsibility. The disposition of Contractor generated hazardous waste and excess hazardous materials are the Contractor's responsibility.

5.4. **Disposition of Materials –** All materials removed and not reused or designated as salvage material in this project shall become the property of the Contractor. The Contractor shall dispose of such materials at a State and Resource Conservation and Recovery Act approved Treatment, Storage, and Disposal Facility or permitted off-post landfill licensed by the state of Missouri. The Contractor shall lawfully dispose of such materials at the Contractor's sole expense in accordance with the following rules. On a case by case basis, and only with written permission from DPW Environmental Branch and also direction from the

Contracting Officer (CO) or Contracting Officer's Representative (COR), natural land clearing wastes and or clean fill may be allowed to remain on Fort Leonard Wood (FLW) property. Any costs contained in the contract for off site (FLW) disposal shall be reimbursed to the government when disposition of natural land clearing waste and or clean fill is authorized for use on FLW property.

5.5. Recyclable Materials – The Contractor shall recycle products whenever possible and to the fullest extent practicable. Recycling shall be in accordance with all Federal, State, Local, and Fort Leonard Wood laws and regulations and guidance. The Contractor shall deliver all uncontaminated recyclable materials to the Fort Leonard Wood Recycling Center, Building 2549 during normal business hours M-F 0800-1630. Current recyclable materials include clean corrugated and non-corrugated cardboard, plastic and aluminum. Wood pallets in good condition shall be recycled during normal business hours M-F 0800-1630 (see Recycle Center attendant before unloading pallets). Unusable pallets shall be broken up and placed in dumpsters. Materials not currently recyclable by the Fort Leonard Wood Recycling Center shall be disposed of as provided below.

5.6. Disposal of Waste, Natural Materials.

5.6.1. Burning of Woody Natural Materials. Burning of woody natural materials, logs, stumps, limbs etc is allowed only with an Air Curtain Destructor or equivalent high efficiency equipment and only with written approval by the DPW Environmental Branch. The DPW Environmental Branch will review the proposal to determine the potential impact to the Installation's Air Quality Permit and Air Monitors. If authorization is granted, the Contractor will still be subject to shut-down if deemed necessary by the DPW Environmental Branch in order to prevent impacts to training and operations and/or avoid Air Quality Permit compliance impacts. Tonnage of woody natural materials burned will be recorded on the FLW Construction and Demolition waste management report, Attachment #3. All ash generated will be disposed of in accordance with all federal, state, local and FLW guidance and regulations at the contractors expense.

5.6.2. Cantonment – The Contractor shall dispose of leaves and grass clippings (removed from bags) generated by this project at the Fort Leonard Wood Compost Area or off of FLW property and in accordance with all federal, state, local laws and FLW regulations and guidance. The Contractor shall dispose of logs greater than 6 inches in diameter either by disposal at a Fort Leonard Wood Fire Wood Cutting Site (or other designated location on Fort Leonard Wood after written approval is provided by the DPW Environmental Branch and direction is provided by the CO or COR), or by sale or retention for sale, or off of FLW property in accordance with all federal, state, local laws and FLW regulations and guidance. The Contractor shall dispose of wood chips, tree stumps and logs, limbs and brush less than 6 inches in diameter and all other natural waste material off of FLW property, in accordance with all federal state local laws and Fort Leonard Wood regulations and guidance. Or on a case by case basis a site on FLW property may be provided for disposition. Written permission from DPW Environmental must be obtained prior to disposition which will only be done at the direction of the CO or COR. Natural chipped materials may also be beneficially reused on the project site to include permanent on-site erosion control berms only per the NPDES permit not to exceed three (3) feet high by six (6) feet wide, or for disposition or sale as mulch.

5.6.3. **Range and Training Areas, potentially containing metal residue from munitions firing** - As determined by DPW Environmental Branch and DPTM, all waste natural materials potentially containing metal residue from munitions firing shall remain on site and shall not be mulched, chipped or placed in drainage ways. Any other disposition of materials from these areas shall be in accordance with all federal, state, local laws and FLW regulations and guidance.

5.6.4. **Range and Training Areas, without metal residue from munitions firing** - Logs greater than 6 inches in diameter *may b*e sold or placed at a designated location on Fort Leonard Wood after written approval is provided by the DPW Environmental Branch and direction is provided by the CO or COR). Stumps and Brush less than 6 inches in diameter shall be disposed off of FLW property and in accordance with all federal, state, local laws and FLW regulations and guidance. Wood chips may be used for onsite erosion control berms not to exceed (3) feet high by (6) feet wide, used as mulch or sold. Whole Stumps may be used on site for erosion control in drainage areas or as project design features such as lane markers. No natural Materials listed in 5.6.3 may be brought on to the Training Areas (TAs) or Ranges from other sites for disposition unless they are to be used on site for erosion control or project design features. The Contractor shall remove and dispose of all unused natural waste material from FLW property in accordance with all federal, state, local laws and FLW regulations and guidance before the contract is completed.

5.7. **Disposal of Waste, Fill Materials –** The Contractor shall dispose of clean waste fill materials (unpainted cinder block, brick and concrete with no exposed steel, rock, asphalt, and clean soil with no organic material) at a landfill off-Post licensed by the State of Missouri to accept such waste, or on a case by case basis and only with written approval by DPW Environmental Branch and also with direction from the CO or COR may use the Fort Leonard Wood Clean Fill site or other sites on FLW approved for use by the DPW and DPW Environmental Branch. Concrete shall have no exposed or protruding steel. The Contractor shall dispose of contaminated waste fill materials at al landfill off-post licensed by the State of Missouri to accept such waste. The Contractor shall provide all necessary information for disposal to the landfill operator, including any required testing of materials and completion of forms required by the Missouri Department of Natural Resources (MDNR).

5.8. **Disposal of Demolition Waste –** The Contractor shall recycle all construction and demolition waste to the fullest extent possible. The Contractor shall complete the "Fort Leonard Wood Construction and Demolition Waste Management Report", Attachment 3, as specified in the document and comply with all guidance contained in the document. The completed form shall be submitted to the Environmental Branch via the CO/COR. In accordance with Executive Order 13423 "Strengthening Federal Environmental, Energy and Transportation Management" January 24, 2007 a minimum of 50% by weight of the total project solid waste shall be diverted from the landfill. The Contractor shall dispose of demolition waste at a landfill off-post licensed by the State of Missouri to accept such waste. Disposal of demolition waste shall be in accordance with 10 CSR Chapter 80-4. The Contractor shall provide all necessary forms and information for the disposal to the landfill operator and MDNR.

5.9. **Disposal of Hazardous Waste** – The contractor shall be responsible for the costs of testing and disposal of hazardous waste; all hazardous wastes must be packaged, labeled, marked and disposed of by the contractor performing the work IAW Federal, State, Local, and FLW Regulations. All hazardous waste manifests must be signed by the FLW Hazardous Waste Program Manager. Manifests shall be provided at least 48 hours prior to the expected shipment date. Under no circumstances will hazardous waste be handled or removed from the site without first consulting with the FLW Hazardous Waste Program Manager. The appropriate test method to make a non-hazardous determination, should the contractor elect to have the waste tested, is the Toxicity Characteristic Leaching Procedure (TCLP), EPA Method 1311, which is described in Appendix 11, 40 CFR Part 261. All test results shall be made available to the FLW Hazardous Waste Program Manager for review. This includes TCLP testing and any other analytical testing performed which impacts the determination of wastes from this site. The Contractor shall dispose of any wastes classified as hazardous wastes under the Resource Recovery and Conservation Act (RCRA) in accordance with all Federal, State, local, and Fort Leonard Wood laws and regulations and guidance regarding storage, manifesting, shipment, treatment and disposal of such materials. The storage, containerization, characterization, labeling, placarding, documentation, transportation and final disposition of all hazardous waste will be accomplished in accordance with all Federal, State, local, and Fort Leonard Wood laws and regulations and guidance. The Contractor will procure all necessary licenses, permits and authorizations. All mercury containing thermostats and switches, PCB ballasts and fluorescent lighting will be disposed of through the Fort Leonard Wood base maintenance Contractor according to the Fort Leonard Wood SOP "Lighting and Thermostat Recycle/Disposal Guidance." The Contractor shall lawfully dispose of materials at the Contractor's sole expense. Notification and approval by the Contracting Officer and the Fort Leonard Wood Environmental Coordinator is required 10 business days prior to any action related to the disposal of hazardous waste. The Government will have and exercise full and complete control over determining suitability of the Treatment, Storage, and Disposal Facility (TSDF).

5.10. **Disposal of Other Waste** – The Contractor shall dispose of any wastes not specifically covered here at a landfill off-post licensed by the State of Missouri to accept such waste.

5.11. **Waste Management Documentation** – The Contractor shall document all wastes disposed of outside of Fort Leonard Wood by delivering to the CO/COR a landfill disposal form signed and dated by the landfill operator which shows the nature, amount and location of materials delivered to the landfill. In case of sale of logs or retention for sale of logs, the Contractor shall provide a signed statement indicating the disposition of the logs. Construction and Demolition debris will be documented on the Fort Leonard Wood Construction and Demolition Waste Management Report form, attached.

5.11.1. When applicable, the Contractor shall provide the generator, at each site, a properly prepared, typed and error-free, hazardous/special waste manifest and the Toxic Characteristic Leaching Procedure (TCLP) EPA method 1311 analysis appropriate to the waste and current waste profile from

the TSDF each time waste is offered for transportation off site. A written Land Disposal Restriction Notice shall accompany each hazardous/special waste manifest, as required. The Contractor shall ensure the completed manifest is returned to the generator within 35 days from the initial transporter's date of signature. The Contractor shall provide the generator at each site a certification of disposal statement for each hazardous/special waste manifest initiated. The Contractor shall also document all waste disposals by delivering to the CO/COR copies of the landfill disposal form signed and dated by the landfill operator which shows the nature, amount, and location of materials delivered to the landfill. In case of sale of logs or retention for sale of logs, the Contractor shall provide a signed statement indicating the disposition of the logs. Copies of this documentation shall be provided to the Contracting Officer prior to requesting final payment on the affected order(s). The work outlined above is a subsidiary portion of the contract work, and is assigned a value of 5% of the value of each affected project. The Contractor shall assign a value of that amount in the breakdown for progress payments. If the Contractor fails to maintain and provide environmental documentation as required herein, the Government will consider that satisfactory progress has not been achieved, thereby requiring the retention of 5% from any request for progress payment, on top of any other retainage applied for cause.

6. **PERMITS:** It shall be the responsibility of the Contractor to obtain *all* permits/licenses required for performance of the contract. The Contractor shall be responsible for determining the fee basis and paying all filing fees and taxes. Payment of fines, penalties, and associated fees for noncompliance or improper performance of applicable work shall be the responsibility of the Contractor. The Contractor shall perform all work in compliance with the Permit. The Contractor shall allow entry to State and Federal regulatory agency inspectors. The Contractor shall be responsible for any fines and penalties associated with non-compliance. The Contractor Copies of the permit applications and associated documentation shall be routed through the Contracting Officer/Contracting Officer Representative to the appropriate DPW Divisions for review and approval prior to submittal. A transmittal letter signed by the current DPW Director will be provided as the Missouri Department of Natural Resources (MDNR) will not accept or process the application for the associated permit without the signed transmittal letter. This is a time consuming effort and the Contractor should begin the permit process well in advance of the Notice to Proceed in order to avoid delaying the start of the project. A copy of all approved permits shall be submitted to the Contracting Officer/Contracting Officer Representative and the Environmental Branch (573/596-0882).

6.1. **Drinking Water Permits** – Should a water main extension or a fire hydrant be installed required as part of this contract, or any modification to the water system that would require a permit as outlined in 10 CSR 60-3, the Contractor is responsible for obtaining that permit from MDNR. Water permits are issued from the Jefferson City Office. In addition to the permit application, eight sets of DRAFT professional engineer stamped plans and specifications must be submitted for the DPW to review prior to final approval from the Director. Government comments must be resolved prior to preparation of final documents. Once approved, two sets of Final Missouri Professional Engineer stamped plans and specifications, along with the completed permit application forms, are submitted to the DPW Operations Division. Once the cover letter has been signed by the DPW Director, the Contractor will then forward plans/specs/permit application/fees to MDNR. Should MDNR require additional information, the same procedures will be followed prior to forwarding to the State. A copy of the permit must be provided to the DPW Environmental Branch for official records within five (5) business days of receipt. Any permit application fees are to be paid by the Contractor. The Contractor is responsible for full compliance with all terms and conditions of the permit. This work may not proceed until the State issued permit is provided and posted at the job site as required by the permit. Once the project is complete, the Contractor's Professional Engineer will complete the "Statement of Work Completed" form, furnished with the permit and provide the signed form to the DPW Environmental Branch for forwarding to MDNR.

6.2. **Waste Water Permits** – Should a waste water main extension or a Lift Station be installed as part of this contract, or any modification to the wastewater system that would require a permit as outlined in 10 CSR 20-6.010, the Contractor is responsible for obtaining that permit from MDNR. Waste water permits are issued from the Rolla Satellite Office. In addition to the permit application, eight sets of DRAFT professional engineer stamped plans and specifications must be submitted for the DPW to review prior to final approval from the Director. Government comments must be resolved prior to preparation of final documents. Once approved, two sets of Final Missouri Professional Engineer stamped plans and specifications, along with the completed permit application forms, are submitted to the DPW Operations

Division. Once the cover letter has been signed by the DPW Director, the Contractor will then forward plans/specs/permit application/fees to MDNR. Should MDNR require additional information, the same procedures will be followed prior to forwarding to the State. A copy of the permit must be provided to the DPW Environmental Branch for official records within five (5) business days of receipt. Any permit application fees are to be paid by the Contractor. The Contractor is responsible for full compliance with all terms and conditions of the permit. This work may not proceed until the State issued permit is provided and posted at the job site as required by the permit. Once the project is complete, the Contractor's Professional Engineer will complete the "Application for Letter of Authorization" form, furnished with the permit, and provide the form to the DPW Environmental Branch to be submitted to MDNR. If a waste water Lift Station is required as part of this contract, a backup generator is required for support in the event electrical power becomes unavailable.

6.3. **Air Permits** – Air emissions sources require construction permits in Missouri. Air permits are issued for the specific design and equipment (stacks, vents, exhaust systems, open vats, storage tanks (sources of evaporation), incinerators, boilers, generators (i.e., any combustion equipment), etc.). It is the Contractor's responsibility to obtain permits before construction starts and ensure compliance with the permit. Route all air permit requests through the CO/COR.

6.4. **Land Disturbance Permits (National Pollutant Discharge Elimination System Permits)** – Land disturbance is defined as any activity that disturbs the root zone of vegetation or disturbs compacted soil to an erodible state such as clearing, grubbing and grading. Should the project entail land disturbance of 1-acre or greater, but less than 5-acres, State Form O must be completed (in accordance with 10 CSR 20-6.200) and provided to the Contracting Officer/Contracting Officer Representative. For projects that cause land disturbance of 5 acres or more, State Forms E and G must be completed (in accordance with 10 CSR 20-6.200) and provided to the Contracting Officer/Contracting Officer Representative (CO/COR). In addition, a Storm Water Pollution Prevention Plan (SWPPP) must be provided (in accordance with 10 CSR 20-6.200) that includes a site specific sketch/drawing showing all planned erosion control devices. In addition to the appropriate State forms, a USGS 1" = 2,000' scale map showing the exact location of the project is required. Once approved, a signed cover letter from the Director of Public Works will be provided to the Contractor to include with the application. The Contractor will forward the permit application/drawings/fees to the MDNR. Any permit application fees are to be paid by the Contractor.

6.4.1. The Contractor is responsible for compliance with all terms and conditions contained in the permit until the Permit is formally terminated by the Missouri Department of Natural Resources. Earth disturbing activities may not proceed until the State issued permit is obtained and posted at the job site as required by the permit. Attachment 4 provides a sample copy of a Permit.

6.4.2. Each site with a Land Disturbance Permit must provide copies of the completed weekly inspection reports and completed inspection reports no more than 48-hours after a rain event. The Contractor must also complete and submit monthly the "Fort Leonard Wood Land Disturbance Permit Compliance Self Certification" form, Attachment 5. All inspection reports and monthly Compliance Certification submittals are required until the Permit is terminated by the Missouri Department of Natural Resources. All submittals are to be provided within 5-days of completion to the DPW Environmental Branch via the CO/COR.

6.4.3. Interim soil stabilization is required until final stabilization is met. All sites must be final stabilized as per the Missouri Permit: "The project is considered to be stabilized when perennial vegetation, pavement, buildings, or structures using permanent materials cover all areas that have been disturbed. With respect to areas that have been vegetated, vegetative cover shall be at least 70% of fully established plant density over 100% of the disturbed site." Use of Missouri native perennial vegetation is highly encouraged.

6.5. Missouri Separate Storm Sewer (MS4) Permit – Construction activities occurring on Department of Army Fort Leonard Wood property are regulated by a Municipal Separate Storm Sewer System (MS4) Permit. This is a permit, regulated by the Environmental Protection Agency under the Clean Water Act and administered by the Missouri Department of Natural Resources, legally mandates that Fort Leonard Wood decrease the quantity and increase the quality of stormwater runoff through improved site design, and

selection and maintenance of Best Management Practices that minimize point and non-point pollution sources. This permit requires that Fort Leonard Wood maintain a rigorous land disturbance oversight program that proactively enforces adherence to land disturbance permit requirements regulating pre- and post-construction runoff from permitted activity, and report the status of compliance annually.

7. **ENERGY AND SUSTAINABILITY:** The Federal government is committed to designing, locating and constructing, maintaining, and operating its facilities in an energy efficient and sustainable manner. It shall be the responsibility of the Contractor to comply with all of the following federal energy and sustainability executive orders and policies. The Contractor shall be responsible for determining the applicability of each of these for their project. Copies of each of these requirements can be obtained from the Contracting Officer/Contracting Officer Representative or the Environmental Branch (573/596-0882).

7.1. **Heating, Ventilation, Air Conditioning (HVAC)** – The Army standard is that no Class I or Class II ozone-depleting substances (ODSs) may be used and that any alternative refrigerants must have a Toxicity Clearance through the Center for Health Promotion and Preventive Medicine (CHPPM). Contractors may access the list of CHPPM Toxicity Clearances at the following website: http://chppm-www.apgea.army.mil/tox/product.aspx

7.2. **DoD Green Procurement Program (GPP) –** The DoD GPP requires green products and services to be purchased to the maximum extent practicable. The Contractor shall comply with applicable Federal Acquisition Regulations (FARs). The Contractor shall consult with the contracting official to determine the applicability of the GPP to their project.

7.3. **Executive Order 13423 – Strengthening Federal Environmental, Energy, and Transportation Management, 26 Jan 07 –** The Federal Government is required to adhere to the environmental, energy and transportation requirements outlined in the state executive order. Therefore, Contractors must be able to work with the federal government to comply with these requirements. Examples of required goals include improved energy efficiency and reduced green house gas emissions, reduced water consumption, green procurement, and high performance building requirements.

7.4. **Energy Policy Act of 2005** – The Contractor shall support the Federal Energy Reduction Goals as required by the Energy Policy Act of 2005. Contractor must adhere to the regulations and specifications contained within this Act. Contractor must consider the cost of required energy reductions when preparing Request for Proposal.

7.5. **Energy Independence and Security Act of 2007** – The Contractor shall support the Federal requirement that all lighting in Federal Buildings use Energy Star products. The Contractor shall ensure compliance with Subtitle C – High-Performance Federal Buildings. This requirement has applications to building energy use and HVAC systems as well as the following stormwater requirements. Refer to Section 3.6.1 for the stormwater requirements.

7.6. **Army's Sustainable Design and Development (SDD) Policy**

7.6.1. Military Construction Program – All vertical construction projects with climate-controlled facilities (mechanically heated or cooled for human comfort) must achieve the SILVER level of Leadership in Energy and Environmental Design – New Construction (LEED-NC). This requirement applies to all construction on Ft. Leonard Wood, including Army Reserve, Army Readiness Centers and Armed Forces Reserve Centers, regardless of funding source and including BRAC. All LEED projects must be registered with the US Green Building Council and must be certifiable by the USGBC. Five percent of Army building projects are chosen for validation, in which case, certification is required. Associated costs shall be captured in the DD Form 1391.

7.6.2. Garrison-level Approved Projects – Projects authorized to be approved by the Garrison Commander - shall incorporate SDD features to the maximum extent possible but are exempt from meeting the minimum score requirement for the SILVER level of LEED. Incorporating SDD can increase energy efficiency and reduce energy costs, increase the tonnage recycled minimize pollution

7.6.3. Exemptions

7.6.3.1. Horizontal construction projects (ranges, roads, airfields, etc.) shall incorporate SDD features to the maximum extent possible, but are exempt from meeting the minimum score requirement for the SILVER level of LEED.

7.6.3.2. The requirement to achieve the SILVER level of LEED applies to permanent facility construction only; required interim facilities are exempt. An interim facility requirement is a short-term urgent requirement for facilities lasting three years or less, normally.

7.6.3.3. Renovation and Repair projects are required to incorporate SDD features and be scored using LEED-NC, but are exempt when they do not exceed the garrison commander authority or they have a repair to replacement ratio less than or equal to 25%.

7.7. **Conformance with the Fort Leonard Wood ISO 14001 Environmental Management System** - The Contractor shall perform work under this contract consistent with the policy and objectives identified in the Fort Leonard Wood ISO 14001 Environmental Management System (EMS). The Contractor shall perform work in a manner that conforms to all appropriate Environmental Management Programs and Operational Controls identified by the Fort Leonard Wood EMS. In the event of an environmental nonconformance or noncompliance associated with the contracted services, the Contractor shall take corrective and/or preventative actions. In the case of a noncompliance, the Contractor shall respond and take corrective action immediately. In the case of a nonconformance, the Contractor shall respond and take corrective action based on the time schedule established by the EMS Coordinator. In addition, the Contractor shall ensure that their employees are aware of the roles and responsibilities identified by the SMS and how these requirements affect their work performed under this contract. Information can be found in the Contractor Section of the DPW Environmental Division Website.

7.7.1. All on-site Contractor personnel shall complete FLW EMS awareness training, and as is identified in the Training Requirements of the Contractor Section of the DPW Environmental Division Website (www.wood.army.mil/dpwenv).

Fort Leonard Wood
Directorate of Public Works
Environmental Division

Spill Report

Any spill or release of POLs, hazardous waste, or hazardous material into the environment must be reported immediately by calling 911. Within 3 days of the incident, complete and submit this Spill Report Form to the DPW Environmental Branch in Building 2101, which is located at the intersection of 2nd Street and Replacement Avenue. The form may also be submitted via fax (573-596-0869) or email (angela.rinck@us.army.mil). For more information, call 573-596-0882 during duty hours.

Report to DPW made by:

Name: _____ Signature: _____

Title: _____ Location: _____

Date: _____ Time: _____

Material spilled: _____

Volume spilled: _____

Location of spill: _____

Date, time, and duration of spill: _____

Cause of spill (Attach additional pages if necessary):

Corrective action taken to control and/or mitigate the effects of the spill (Attach additional pages if necessary):

Plan for preventing recurrence (Attach additional pages if necessary):

Other contacted, i.e. Fire Department:

Name: _____ Date/Time: _____

Name: _____ Date/Time: _____

Name: _____ Date/Time: _____

Fort Leonard Wood
Directorate of Public Works
Environmental Division

Construction and Demolition (C&D) Waste Management Report

The contractor shall make all reasonable efforts to recycle and recover C&D waste from this project. A minimum of 50%, by weight, of total project solid waste shall be diverted from the landfill in accordance with Executive Order 13423 "Strengthening Federal Environmental, Energy, and Transportation Management", 24 January, 2007. Waste management consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project mandates. Companies and facilities used for recycling, reuse, and disposal shall be appropriately permitted for the intended use to the extent required by federal, state, and local regulations. The contractor shall provide on-site instructions for separating, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project. Records shall be maintained to document the quantity of waste generated, the quantity of waste diverted through sale, reuse, or recycling, and the quantity of waste disposed of by landfill or incineration. This form shall be used to record the information. The contractor shall submit this report of all non-hazardous C&D waste generation no later than 10 days after each fiscal quarter ends, starting the first quarter that C&D waste is generated. This report shall be submitted through the contracting officer or representative to the Directorate of Public Works Solid Waste Program Manager 573-596-0882, Building 2101. Contractor shall provide an electronic or paper copy.

Project name: _____ Location: _____

Contract number: _____ Report period covered: _____ to _____

Contractor: _____ Prepared by: _____

Gov't contract inspector: _____ Date: _____

Email: _____ Phone: _____

Waste Type	Total Generated (by weight in tons)	Management Method (by weight in tons)	
		Recycled or Salvaged	Disposed
Examples: Concrete	505,000	500,000 crushed for reuse at _____	5,000 to landfill
Mixed debris	1,000	0	1,000 to landfill
Scrap metal	10	10 recycled to A1 metals	0
Wall board/Sheet Rock			
Stumps, Brush, Wood Chips (beneficially reused on site)			
Stumps, Brush, Wood Chips (off FLW)			
Scrap Metal			

Waste Type	**Total Generated** (by weight in tons)	**Management Method** (by weight in tons)	
		Recycled or Salvaged	**Disposed**
Concrete			
Clean fill (FLW clean fill)			
Clean fill (off FLW)			
Compost (FLW compost)			
Compost (off FLW)			
Other			
TOTAL			

Landfill name:

Comments:

Example Waste Types:

Wallboard	Recycled to manufacturer.
Stumps & Brush	Logs less than 6 inches in diameter, all limbs, twigs, stumps and other brush.
Concrete	Contaminated concrete will be disposed of at an off-post authorized landfill.
Clean fill	Uncontaminated soil, rock, sand, gravel, concrete unpainted and with no exposed steel, unpainted brick, unpainted cinderblock, asphalt, and NO organic material.
Compost	Leaves, grass, and straw removed from trash bags (absolutely no trash or trash bags).
Scrap metal	Turned in as recyclable material.
Wood chips	

Specific guidance for disposition of C&D and Land Clearing materials is contained in the Environmental Requirements section of each project contract.

Fort Leonard Wood
Directorate of Public Works
Environmental Division

Land Disturbance Permit Compliance Self Certification

The permit below is in compliance with all stipulations of the State of Missouri Land Disturbance Permit:

Permit number: _____

Project name or description: _____

Project building number or location: _____

Contract number (if applicable): _____

I certify that all of the Best Management Practices, including performing Weekly Site Inspections, under this State of Missouri Land Disturbance Permit are currently maintained in compliance with applicable federal law (40 CFR Section 319 of the Federal Clean Water Act) and the site specific Storm Water Pollution Prevention Plan.

Check only one:

☐ There is **no** outstanding compliance issues remaining on this site.

☐ There are compliance issues which will be corrected within seven days per the Permit.

_____ _____

Print and Sign
Land Disturbance Permit
Continuing Authority

Compliance Self Certification Date

_____ _____

Print and Sign
Land Disturbance Site Manager
(if applicable)

Compliance Self Certification Date

This certification must be submitted to the following address within 15 days from the end of each month until the permit is terminated by the Missouri Department of Natural Resources.

Fort Leonard Wood Directorate of Public Works
Environmental Compliance Branch (LMNE-LNW-PWEE)
Storm Water Program Manager
1334 First Street
Fort Leonard Wood, MO 65473

Fort Leonard Wood
Directorate of Public Works
Environmental Division

Construction Permit Application Review Process

The following is Directorate of Public Works review process for all permit applications. This process must be followed to ensure timely review of permit applications.

1. Contractor shall provide the completed application and supporting documentation (including the Professional Engineer stamped drawings for water and waste water main extensions) to the Contracting Officer Representative (COR). Note this is a time consuming effort and the contractor should begin the permit process well in advance of the NTP in order to avoid delaying the start of the project.

2. The COR will submit the above to the Fort Leonard Wood Directorate of Public Works (DPW).

3. Appropriate staff of Fort Leonard Wood DPW (Planning Division, Operations Division, Engineering Division, and Environmental Division) will review.

4. DPW staff comments and/or approves.

5. DPW returns plans/specifications to COR/Contractor with the application transmittal letter signed by the Director of Public Works. This letter serves as the official Permit request. The Missouri Department of Natural Resources (MDNR) *will not* process any permit application for projects located on Fort Leonard Wood without this DPW transmittal letter.

6. Contractor submits documents, application, and Permit fee to the MDNR.

7. MDNR reviews/comments/issues Permit. Note: MDNR will not issue a Permit until their comments, if any, are adequately addressed.

8. Contractor provides copy of correspondence and Permit to the Fort Leonard Wood DPW Environmental Branch to maintain in the compliance file.

9. Construction may begin.

10. All permitted activities will be inspected for compliance by staff from Fort Leonard Wood, the Missouri Department of Natural Resources, and/or the Environmental Protection Agency, Region VII.

11. As the Permit holder, the Contractor is responsible for full compliance, and all fines, penalties, or other stipulations.

Fort Leonard Wood
Directorate of Public Works
Environmental Division

State Permit – Review Processing

The following table provides a short list of contracted actions that generally require an additional environmental compliance review or require a permit or other document. This is not an all-inclusive list. If in doubt, please contact the Environmental Division for assistance at 573-596-0882 or visit the Environmental Division Web page at www.us.army.mil/dpwenv

REGULATORY AREA	DOCUMENT, PERMIT or NOTIFICATION	COST (estimated)	STATE PROCESSING TIME (estimated)	FLW CONTACT
Asbestos Work: Required for all Friable Asbestos projects	Notification 10-days prior to work start	$0	none	Keith Duncan
Land Disturbance- Erosion Control: Any earth disturbance 1-acre or greater	Erosion Control Permit	$300	Up to 6-months from date State receives application and fee payment	Shannon Kelly
Drinking Water: New/changes to the systems to include distribution system	Water Permit to "Construct"	$50-$3K	Up to 6 months from date State receives application, with plans/specs, and fee payment. PE stamp required	Carl Stenger
Waste Water: New/changes to: systems to include collection system	Water Permit to "Construct"	$50-$3K	Up to 6 months from date State receives application, with plans/specs, and fee payment. PE stamp required	Carl Stenger
Tanks- Underground: New/changes to: Underground Storage Tanks	Notification required	$100	Minimum 30-days upon receipt of notice and fee payment, prior to work start	Carl Stenger
Tanks-Aboveground: New/changes to Aboveground Storage Tanks	Permit to "Construct"	$150	Approx 60-days from date State receives request for permit determination and receives fee payment	Carl Stenger
Tanks: Install new fuel storage tanks	Permit to "Construct"	$150-$10K	Up to 9-months from date State receives application with plans/specs and fee payment	Carl Stenger
Utilities: Install new/replace emergency generators	Air Permit to "Construct"	$150-$10K	Up to 9-months from date State receives application with plans/specs and fee payment	Steve Flier
Utilities: New/changes to: large facility HVAC systems	Air Permit to "Construct"	$150-$10K	Up to 9-months from date State receives application with plans/specs	Steve Flier
Utilities: Replace Boiler or install new boiler(s)	Air Permit to "Construct"	$150-$10K	Up to 9-months from date State receives application with plans/specs	Steve Flier

APPENDIX

PROCEDURE FOR COORDINATION OF TREE REMOVAL

FORT LEONARD WOOD, MISSOURI

The following is a process for the coordination of tree removal on all Fort Leonard Wood projects.

- During the charette an initial discussion on the removal of trees shall be conducted. As the site plan is developed during the charette a preliminary determination shall be made on the removal of trees. The civil design engineer is responsible for coordinating this issue with FLW DPW personnel. At a minimum this shall include Dan James (573-596-2814), Brian Nelson (573-596-0901), and Thomas Glueck (573-596-2814) of the FLW DPW staff.

- Early in the design process (10-35%) the civil designer shall conduct a site visit to verify the survey shows all trees and their location.

- Upon completion of the 35% design the civil engineer shall coordinate closely with FLW DPW in regards to the removal of trees. This will require a site visit, which at a minimum will include Dan James, Brian Nelson, and Thomas Glueck of the DPW staff. The civil engineer shall ensure that FLW DPW fully understands the trees to remain and the trees to be removed during construction. Any site plan changes recommended based on the site visit shall be coordinated through the project manager for coordination with all stake holders and PDT members.

- At the 65% design submittal the civil engineer will coordinate any changes from the 35% submittal with the appropriate DPW personnel. This includes adjustments to the site layout, final grading, storm drainage, and utility impacts on the removal of trees. A site visit shall be conducted if deemed necessary.

- At the final design submittal the civil engineer will coordinate any changes from the 65% submittal with the appropriate DPW personnel. This includes adjustments to the site layout, final grading, storm drainage, and utility impacts on the removal of trees. A final plan-in-hand shall be conducted by the civil engineer to ensure that DPW personnel are in agreement on trees to be removed and those to remain. The site visit shall include DPW personnel and a representative from the Corps construction office. This shall be coordinated with Jesse Vance (816-389-3529).

- Prior to the start of construction one final site visit shall be held by the Corps construction office (Jesse Vance) to mark trees for removal. This shall include all necessary DPW staff to include at a minimum Dan James and Thomas Glueck.

Missouri Department of Natural Resources

Managing Construction and Demolition Waste

Solid Waste Management Program fact sheet 7/2006

This guidance is provided primarily for construction and demolition contractors, construction and demolition waste haulers, roofing contractors, remodeling businesses, homebuilders and homeowners. Cities and counties that issue building permits may also find the information helpful. The guidance covers only those residuals commonly produced during building construction and demolition. You may obtain information about managing other wastes by contacting the sources listed on the last page of this fact sheet.

This fact sheet is not intended for guidance on the management of surface coatings removed from bridges, water towers or other similar outdoor structures.

Waste types

During building construction and demolition, you may produce one or more of the following types of residuals:

1. Clean fill
2. Recovered materials
3. Regulated construction and demolition waste
4. Hazardous materials and hazardous wastes, or
5. Asbestos-containing materials.

Management requirements differ for each of these.

1. Clean fill is “uncontaminated soil, rock, sand, gravel, concrete, asphaltic concrete, cinder blocks, brick, minimal amounts of wood and metal and inert (nonreactive) solids...for fill, reclamation or other beneficial use” [§260.200(4), RSMo].

Minimal means the smallest amount possible. For example, concrete containing wire mesh or rebar may be used as clean fill. However, exposed rebar should be removed before use. Under no circumstances are roofing shingles, sheet rock, wood waste or other construction and demolition wastes defined as clean fill.

Concrete, cinder blocks, bricks or other clean fill materials that are painted with non-heavy metal-based paints are also considered clean fill. Before use as clean fill, it is the generator’s responsibility to determine if the painted materials are hazardous wastes. The most typical contaminants are lead and other heavy metals. This determination can be made by representative sampling or by applying historical knowledge of the materials in question. If asphaltic concrete is to be used as clean fill; it is generally recommended that it not be crushed or ground any smaller than necessary. This will help to minimize the leaching of chemicals found within the asphaltic material. Although not regulated as waste, placement of clean fill materials may be subject to requirements of the department’s Water Protection Program if it is placed in contact with surface or subsurface waters of the state, or would otherwise violate water quality

PUB002045

standards. Contact the department's Water Protection Program at (573) 751-1300 if you have any questions regarding this approval. Local requirements concerning the use of clean fill may apply as well. Contact the Hazardous Waste Program at (573) 751-3176 for questions on determining whether materials intended as clean fill may be hazardous and disposal options.

2. Recovered materials are those removed for reuse (lumber, doors, windows, ceramic tile and glass) and those removed to be recycled into new products.

Potentially recyclable construction and demolition wastes may include scrap metals, asphalt shingles, sheet rock, lumber, glass and electrical wire. However, it is important to remember that recovered waste must be used in some way. Separating out certain wastes to be recycled into new products without having a market for them is expensive and pointless. Storing recovered materials indoors is expensive. Storing them outdoors may lower their value, since most will degrade or deteriorate when exposed to the weather. Depending on how they are stored, they may harbor rodents, provide breeding grounds for insects or be a potential fire hazard. Recyclables may not be collected and dumped on the ground while waiting for markets to develop. Therefore, before you deliver recyclable materials to a processing or recovery facility, be sure the facility is legitimate. The Planning Unit of the department's Solid Waste Management Program (SWMP) has information about many recycling facilities in Missouri. You may contact the Planning Unit at (573) 751-5401.

If you plan to remove reusable or recyclable materials from construction and demolition waste, the sorting must take place at the construction or demolition site.

The wastes cannot be hauled from the site and dumped for later sorting, except at a permitted processing facility or at a facility that has received a permit exemption from SWMP. Although the Missouri Department of Natural Resources strongly encourages the recovery of potential waste materials whenever possible, these activities must be done legally.

3. Regulated construction and demolition wastes are those that are not classified as clean fill and that are not being reused or recycled. Regulated non-hazardous construction and demolition wastes must be disposed of at a permitted landfill or transfer station. They must not be burned to avoid violating air and solid waste laws. They must not be buried (except at a permitted landfill). They must not be hauled to private or public property and dumped or buried, even with the landowner's permission. If that happens, everyone involved, including the contractor(s), subcontractor(s), the hauler(s) and the landowner(s) can and will be held liable for the illegal disposal (§§260.210, 260.211 and/or 260.212, RSMo). If you are a building contractor, you need to know that burying construction waste from a building anywhere on the property is illegal (§260.210.1, RSMo). See page four for a description of penalties for illegal disposal of construction and demolition waste.

4. Hazardous Materials and Hazardous Wastes. Although you may find a variety of hazardous materials in old buildings, lead-based paint and asbestos are the most common ones that demolition contractors need to deal with. Asbestos is discussed in the next section of this document.

Recent studies conducted by the U.S. Agency for Toxic Substances and Disease Registry, and by independent researchers, show that the health effects of lead exposure are greater than previously thought. Children are especially vulnerable to the effects of lead poisoning. Because lead and other toxic heavy metals may be contained in the wastes noted above, they require careful management and disposal.

For many years, lead-based paint was used in residences and businesses for its stable coating properties. Although lead-based paint was virtually banned by the Consumer Product Safety Commission in 1978 for residential application, it is often encountered when buildings are renovated or demolished. Also, lead-based paint is still manufactured and sold for corrosion or rust inhibition on steel structures and for other industrial purposes. In older buildings, lead was also used for roofs, cornices, tank linings, and electrical conduits. In plumbing, soft solder, an alloy of lead and tin, was used for soldering tinplate and copper pipe joints.

Additional guidance for handling demolition waste containing lead-based paint or other heavy metals (such as cadmium or chromium) is available by calling the department's Hazardous Waste Program at (573) 751-3176.

Hazardous waste requirements for demolition wastes - Demolition-related waste categories typically include

- Paint Residue - Paint chips, paint scrapings, and paint-contaminated blast residue from building renovations or demolition projects,
- Demolition Debris - Masonry, metal and boards that have been painted with lead-based (or other heavy metal-based) paint, and
- Scrap Metal - Metal objects that contain lead or other heavy metals.

For households, the following management options apply, whether or not a contractor is doing the work for you.

- Paint Residue - Paint residue may be placed in the household trash. Before disposal, wrap tightly in a plastic bag or other container. It will be picked up by your trash hauler and taken to a sanitary landfill for disposal.
- Demolition Debris - May be placed in your household trash. It may be picked up by your trash hauler and taken to a sanitary or demolition landfill for disposal.
- Scrap Metal - Scrap metal should be taken to a salvage yard operator for recycling. If this is not possible, the metal may be placed in your household trash and picked up by your waste hauler for disposal at a sanitary or demolition landfill.

For generators other than households - This category includes commercial and business enterprises, institutions and industrial buildings, and other structures not specifically identified.

Paint Residue - Paint residue must be laboratory tested before disposal. The appropriate test method is the Toxicity Characteristic Leaching Procedure (TCLP), EPA Method 1311, which is described in Appendix 11 of the Code of Federal Regulations, Title 40, Part 261 (40 CFR Part 261). The test must include the eight metals noted in 40 CFR Part 261.24 (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver).

Environmental laboratories capable of conducting a TCLP may be found in the telephone Directory's *Yellow Pages*. If one or more of analytical limits meets or exceeds the regulatory limit, the waste is hazardous. Hazardous wastes must be managed, transported, and disposed of according to the Missouri Hazardous Waste Management Law and Regulations.

This may require that the generator send paint residue to a permitted hazardous waste disposal facility. In some cases, a lead smelter may accept lead-based paints for use in their lead production processes.

If laboratory analysis shows that the paint residue is non-hazardous, it must be disposed of at a sanitary landfill as "special waste". Paint residue may not be disposed of in a demolition landfill.

Procedures for managing special wastes are included in the guidance, titled *Special Waste* technical bulletin (PUB2050). The landfill may require you to complete a special waste disposal request form, and provide the results of testing on the paint waste to show that it is not hazardous before accepting the waste.

Demolition Debris - Demolition debris painted with heavy metals need not be tested before disposal. Such wastes may be disposed of in either a sanitary or a demolition landfill in Missouri.

Scrap Metal - Scrap metal painted with heavy metals may be sent to a salvage yard for recycling. If this is not possible, the metal may be disposed of at a sanitary or demolition landfill.

5. Asbestos. All public, institutional, or commercial buildings (and in some instances, residential structures) must be inspected for asbestos before renovation or demolition activities begin. Before planning a demolition project, bidding a project, letting a bid or beginning the demolition, it is important to know if the building has any asbestos-containing materials (ACM) and who is responsible for removing them. Buildings may contain asbestos in materials such as ceiling or floor tile, as insulation or soundproofing on ceilings, pipes, ductwork or boilers, or on the outside as transite siding or in shingles. The presence of ACM cannot be confirmed just by looking. A thorough inspection of any regulated building must be conducted by a Missouri certified asbestos inspector to determine the presence and condition of ACM. Depending upon the results of the inspection, a registered asbestos abatement contractor may be required. Contact the department's Air Pollution Control Program's Asbestos Unit at (573) 751-4817 for more specific information about managing ACM. Visit www.dnr.mo.gov/env/apcp/Asbestos.htm for more information about asbestos requirements.
If the ACM is to go to a landfill or transfer station, contact the facility in advance to see if they accept ACM and if they have any special handling or packaging requirements.

Penalties for illegal disposal of construction and demolition wastes The Missouri Solid Waste Management Law provides for civil penalties for persons who dispose of or allow the disposal of regulated construction and demolition wastes in unpermitted areas.

The law also contains criminal provisions for some types of illegal construction and demolition waste disposal. There may be additional penalties for violations of Air and Hazardous Waste Laws depending on the situation and means of disposal. For Solid Waste Management Law violations alone:

1. Civil Penalties: Any person who disposes of construction and demolition waste or allows the disposal of construction and demolition waste in an area not permitted for such disposal may be assessed a civil penalty of up to $1,000 per day per violation (§260.240, RSMo).
2. Criminal Penalties: Any person who purposely or knowingly disposes of or causes the disposal of regulated quantities of construction and demolition waste or other solid waste may be prosecuted for violating the criminal provisions of §§260.211 and 260.212, RSMo. Convictions may include fines of $20,000 or more, community service, and/or clean up of the illegally dumped waste. In some cases, persons convicted of illegal dumping have served time in jail.
3. The Missouri Air Conservation Law and regulations provide for civil penalties of up to $10,000 per day per violation for persons who violate the requirements for handling, packaging, transporting or disposing of ACM. The federal Clean Air Act also contains civil and criminal penalties for violations. The same penalties apply for persons who illegally dispose of construction and demolition waste by burning.

Other requirements

Other legal requirements related to managing construction and demolition wastes include:

1. Anyone engaged in building construction, modification or demolition must maintain a record of all sites used for construction and demolition waste disposal for one year. The records must be made available to department staff upon request (§260.210.7, RSMo).
2. Cities and counties that issue building permits are required to notify each permittee, in writing, of the legal requirements for construction and demolition waste disposal (§260.210.8, RSMo).
3. A person shall be guilty of conspiracy...if he knows or should have known that his agent or employee has violated the civil or criminal provisions of the law related to illegal disposal of construction and demolition waste or other solid waste (§260.212.9, RSMo).
4. Anyone selling, conveying or transferring property that contains construction and demolition waste or other solid waste (whether buried or not), must disclose the existence and location of the waste disposal site to a potential buyer early in the negotiation process (§260.213, RSMo).
5. Anyone hauling materials that could fall or blow off a vehicle, including construction and demolition waste, must cover the load or secure it so that none of it can become dislodged and fall from the vehicle (§307.010, RSMo). In addition, many landfills and transfer stations in Missouri require all incoming loads to be covered. Some facilities accept open loads, but may charge you extra for them.
6. A person commits the crime of littering if they throw or place, or cause to be thrown or placed, any garbage, trash, refuse or rubbish of any kind on the right-of-way of any public road or highway, in or on any waters of the state or the stream banks, and on any public or private property (owned by another without their consent) (§577.070, RSMo).

Additional information

You may obtain additional information about properly managing construction and demolition wastes from the sources listed below.

Missouri Department of Natural Resources

Air Pollution Control Program (573) 751-4817
Hazardous Waste Program (573) 751-3176
Solid Waste Management Program (573) 751-5401
Water Protection Program (573) 751-1300

Regional Offices

Kansas City Regional Office (816) 622-7000
Northeast Regional Office (Macon) (660) 385-8000
St. Louis Regional Office (314) 416-2960
Southeast Regional Office (Poplar Bluff) (573) 840-9750
Southwest Regional Office (Springfield) (417) 891-4300
Solid Waste Management Program (573) 751-5401

On the Web

Construction and Demolition information is available from the Solid Waste Management Program at www.dnr.mo.gov/env/swmp/index.html.
Environmental publications are available at www.dnr.mo.gov/pubs/.

Additional considerations and sources

Hazardous waste requirements are found in the Missouri Hazardous Waste Management Laws, Sections 260.345 through 260.575 of the Revised Statutes of Missouri (RSMo).

The Missouri Hazardous Waste Regulations are found in Title 10, Division 25 of the Code of State Regulations (CSR). Most of the federal environmental requirements in Title 40 of the Code of Federal Regulations (CFR) is adopted by reference into the Missouri regulations.

Solid waste requirements are found in the Solid Waste Management Law in Sections 260.200 through 260.345 RSMo, and the regulations in Title 10, Division 80 in the CSR. Copies of the Revised Statutes of Missouri are available through the Reviser of Statutes at (573) 526-1288, or are available online at www.moga.mo.gov.

Copies of the Missouri Code of State Regulations are available through the Missouri Secretary of State at (573) 751-4015, or are available online at www.sos.missouri.gov/adrules/csr/csr.asp.

Federal regulations may be viewed at federal depository libraries or may be purchased from a U.S. Government Bookstore, the U.S. Government Printing Office, or from a commercial information service such as the Bureau of National Affairs. Federal Regulations are also available online at www.gpoaccess.gov/cfr/index.html.

Other Guidance

The Missouri Department of Health and Senior Services - Office of Lead Licensing and Accreditation may be contacted for information regarding training, licensure and work practice standards for lead abatement activities. Disposal is an abatement activity. See Missouri Revised Statutes 701.300 and 701.338.

Please note that many municipalities have their own additional requirements that might be more strict than those discussed above.

For more information, call or write

Missouri Department of Natural Resources
Hazardous Waste Program
P.O. Box 176, Jefferson City, MO 65102-0176
1-800-361-4827 or (573) 751-7560 office
(573) 751-7869 fax
www.dnr.mo.gov/env/hwp/index.html

Missouri Department of Natural Resources
Solid Waste Management Program
P. O. Box 176, Jefferson City, MO 65102-0176
1-800-361-4827 or (573) 751-5401 office
(573) 526-3902 fax
www.dnr.mo.gov/env/swmp/index.html

Missouri Department of Natural Resources
Air Pollution Control Program
P.O. Box 176, Jefferson City, MO 65102-0176
1-800-361-4827 or (573) 751-4817 office
(573) 751-2706 fax
www.dnr.mo.gov/env/apcp/index.html

Missouri Department of Health and Senior Services
Office of Lead Licensing and Accreditation
P.O. Box 570, Jefferson City, MO 65102-0570
1-888-837-0927 or (573) 526-5873
(573) 526-0441 fax
www.dhss.mo.gov/Lead/

Fort Wood Daily Pesticide Report Sheet

Agency/Company:
Applicator:
Building or Area:

Date:
Building or Exterior Control Type:
Building Construction Type:

Page: ____ of ____

Control Area Description	Area Size or Acres	Target Pest	Infestation Level	Control Operation/& Work Origin	Pesticide Used-EPA #	Formul-ation Type & %	Application Rate per Unit Area	Gals. H_2O	Finish Spray Concen-tration %	Amount of Spray Solution	Labor Time	Total of Chemical Concen-trate Used	Product Unit

Measurement Units: a x b = Feet x Feet
AC = Acres MSF = 1000 Square Feet
LF = Linear Feet MCF = 1000 Cubic Feet

Work Origin: SW = Scheduled Work
WR = Work Request TC = Trouble Call
RI = Routine Inspection

Formulation: A = Aerosol B = Bait
D = Dust E = Emulsion F = Fumigant
GL = Gel GR = Granules W = Wetable Pwdr.
L = Liquid S = Solution WG = Wetable Granule

Appendix F

Photographs of surrounding barracks

1. Exterior

2. Exterior

3. Exterior

4. Exterior

5. Landing

6. Kitchen

7. Kitchen

8. Kitchen

9. Kitchen

10. Bedroom

11. Bedroom

12. Bedroom

13. Bedroom

14. Bedroom

15. Bedroom

16. Bathroom, 17 Bathroom

18. Vanity, 19 Vanity

20. Walk-in-Closet, 21 Walk-in-Closet

22. Exterior Light

23. Meter Bank

24. Mechanical room

25. Street

26. From Troop Trail

Appendix G

GIS Guidance

This document is for use after award.

Appendix G
Spatial Data Standard for Facilities, Infrastructure and Environment (SDSFIE) Guide for GIS Deliverables Created as Part of Military Design and Construction Projects

Fort Leonard Wood, Missouri

Introduction

This Appendix provides guidance for implementing Engineering and Construction Bulletin (ECB) No. 2006-15, "Standardizing Computer Aided Design (CAD/CADD) and Geographic Information Systems (GIS) Deliverables for all Military Design and Construction Projects" (http://www.wbdg.org/ccb/ARMYCOE/COEECB/ecb_2006_15.pdf). This guidance establishes the requirements for geospatial data deliverables produced as part of design, design-build, or design-bid-build contracts for Fort Leonard Wood, Missouri. It includes description of the:

- Coordinate System and Datums;
- Data Quality Standard;
- Deliverables;
- SDSFIE-Compliant GIS Deliverable Specification; and
- Metadata.

Coordinate System and Datums

All geospatial deliverables (CADD or GIS format), whether obtained via survey or any other data collection process, shall be measured in meters. The coordinate system for all geospatial data will be UTM Zone 15. The vertical datum, if applicable, will be North American Vertical Datum 1988 (NAVD 88). The horizontal datum will be WGS84.

Precise specifications of the UTM Coordinate System, are as follows:

Grid Coordinate System Name: Universal Transverse Mercator

UTM Zone Number: 15

Transverse Mercator Projection

Scale Factor at Central Meridian: 0.999600

Longitude of Central Meridian: -93.000000

Latitude of Projection Origin: 0.000000

False Easting: 500000.000000

False Northing: 0.000000

Planar Coordinate Information

Planar Distance Units: meters

Coordinate Encoding Method: coordinate pair

Coordinate Representation

Abscissa Resolution: 0.000032

Ordinate Resolution: 0.000032

Geodetic Model

Horizontal Datum Name: D_WGS_1984

Ellipsoid Name: WGS_1984

Semi-major Axis: 6378137.000000

Denominator of Flattening Ratio: 298.257224

Data Quality Standard

As Built Survey

An as-built condition survey should be performed to capture the information listed in this Appendix. All relevant features shall be identified on as-built drawings and shall be GPS or conventional surveyed to the level of accuracy specified below.

Coordinate Accuracy

The Contractor shall use conventional surveying and other methods, such as a total station or GPS for field data collection at an accuracy level in accordance with "Geospatial Positioning Accuracy Standards, Part 4: Architecture, Engineering Construction, and Facilities Management. Published by the FGDC and available at http://www.fgdc.gov/standards/standards_publications/index_html.

Horizontal and vertical accuracy of features, where vertical coordinates are collected, shall be +/- 2cm.

Surveyor Certification Requirement

The surveyor shall verify the survey for accuracy and a statement will be provided to the government stating the level of accuracy for the data being reported (in metric units). In addition to the accuracy statement, the following information should be provided in a survey report:

- Coordinate system & datum used;
- Projection;

- Units of measure (vertical and horizontal);
- Attribute description (GPS data dictionary—features, attributes and attribute values);
- Source - Receiver type, antenna type, receiver settings, number of positions per point feature, correction method and any field other relevant field procedures utilized;
- Survey method;
- Equipment list;
- Calibration documentation;
- Description of control points and control diagrams;
- Field notes; and
- Field-collected data (in addition to the post-processed final data used to prepare the geospatial data deliverable).

Utilities

Underground and aboveground utility lines shall be surveyed at a minimum of two points along every straight run, at every change of direction, at every tie in point, and at any change in line size.

Deliverables

The intent of the deliverable set is to provide the Installation with comprehensive geospatial information about the facility footprint and site features that exist outside the building(s). The electronic deliverables must be in the file format and data standard used by the Installation's Operations and Maintenance System (as noted in "Coordinate System and Datums", above).

The Installation requires deliverables in the following software formats:

- GIS Files
    - ESRI geodatabase file.
    - The coordinate system, projection, datum(s) and units will be defined for the layer and will be documented in the metadata.
    - Where captured, vertical coordinate information will be stored as a feature attribute as meters above mean sea level. Polygon-z, polyline-z, and point-z formatted files are not requested.
- CADD Files
    - MicroStation DGN files in A/E/C CADD format, using the coordinate system, projection, datum, and units specified in the RFP.

100% Design (Design Complete)

Final design deliverables for each design package should consist of (A) the drawings and specifications, and (B) the GIS file(s):

- 100% complete drawings, specifications, calculations/design analysis, and a list of all comments and their resolution for that work package. All final design drawings will be in the A/E/C CADD Standard format, current version as agreed upon by the government and the contractor. The A/E/C CADD Standard is available at https://tsc.wes.army.mil/products/standards/aec/aecstdweb.asp. Metadata shall be delivered with each CADD file, and will meet the standard specified in this Appendix.
- A corresponding SDSFIE-compliant GIS deliverable for the feature layers listed in Table 1 of this Appendix. For each listed layer the contractor should provide either a GIS deliverable or a statement that no features in that layer will be constructed, be modified, or pose a design constraint for the project. The SDSFIE standard is available at http://www.sdsfie.org. Metadata shall be delivered with each GIS data layer and will meet the standard specified in this Appendix.

As-Built (Construction Complete)

Final construction deliverables shall consist of (A) the as built drawings and specifications, and (B) the GIS file(s). The contractor will provide a submittal of the CADD and GIS files that depict the as-built condition of the site. The data layers to be delivered, the coordinate accuracy of the features, the required attribution, and the metadata will meet the standards specified in this Appendix.

For each layer listed in Table 1, the contractor will provide either a GIS deliverable or a statement that no features in that layer were constructed or modified. The tie in to a utility main line is considered a modification of the utility main line, and the portions of main lines that were exposed should therefore be included in the deliverable.

SDSFIE-Compliant Deliverable Specification

Geodatabase Template

Upon request the government will provide the contractor with an SDSFIE-compliant GIS layer template to be used for populating the GIS deliverables required under the contract. The contractor shall populate the layers without modifying the template. The contractor shall ensure that layers to be delivered but not included in the template, should the template not be complete, are fully compliant with the current SDSFIE standard.

There may be circumstances in which SDSFIE compliance cannot be maintained. In such circumstances, proposed deviations with the standard must be communicated by the contractor and reviewed by the government. Approval for the deviation shall be documented.

Data Integrity Check

The contractor shall utilize a topology build and clean routine and assure the following:

- No erroneous overshoots, undershoots, dangles or intersections in the line work;
- Lines should all be continuous, i.e. do not create dashed lines with many small line segments;
- Point features should be digitized as points, not graticules, cells, symbols or icons;
- No sliver polygons;
- All polygons completely close and have a single unique centroid; and
- Digital representation of the common boundaries for all graphic features must be coincident, regardless of feature layer.

Required GIS Data Layers and Required Attributes

Table 1 lists the SDSFIE-compliant GIS data layers that are to be delivered as part of this contract. The list is based on a review of the type(s) of facility(s) being constructed. However, it is possible that some layers in the list will not be used.

Metadata

The contractor shall prepare metadata conforming to the most current version of the Federal Geospatial Data Committee's (FGDC) Content Standard for Digital Geospatial Metadata (CSDGM) at http://www.fgdc.gov/standards/standards_publications. Appendix A of the ECB, http://www.wbdg.org/ccb/ARMYCOE/COEECB/ecb_2006_15.pdf, is the FGDC metadata profile for Army Installations and should be followed as closely as possible. An ESRI Metadata Stylesheet for Army Geospatial Data is posted at https://gis.hqda.pentagon.mil. Metadata content will accompany all electronic geospatial data submissions. This includes both CADD and GIS formats. A metadata file shall accompany, at minimum, each CADD data set and/or each GIS data set. Metadata should be prepared to FGDC standards and delivered in XML format readable by software applications that use the FGDC XML format standard (such as ESRI ArcMap 9.x).

Table 1. SDSFIE Layer Names and Required Attributes.

Note: Required attributes, where specified, are listed following the SDSFIE layer name. Elevation information, reported as meters above mean sea level, is required for layers where "coord_z" is listed as a required attribute.

airfield_light_point
airfield_surface_centerline
airfield_surface_edge_line
airfield_surface_marking_area
airfield_surface_marking_line
airfield_surface_site
area_size (acres); area_u_d (area unit of measure, acres); perim (meters); perim_u_d (perimeter unit of measure, meters); coord_x (centroid, WGS84 UTM); coord_y (centroid, WGS84 UTM); paved_d (paved code, Yes/No); feat_name (airfield name)
athletic_court_area
athletic_field_area
athletic_miscellaneous_area
borrow_area
breakline
building_floor_area
building_room_area
building_space_area
canopy_pavilion_site
communications_amplifier_point
communications_antenna_site
coord_X (WGS84 UTM), coord_y (WGS84 UTM), area_size(acres), area_u_d(area unit of measure), perim(perimeter dimension, meters), perim_u_d(perimeter unit of measure, meters)
communications_coaxial_line
communications_device_point
communications_equip_point
communications_fiberoptic_line
communications_handhole_point
communications_manhole_site
communications_pedestal_site
communications_splitter_point
communications_telephone_point
communications_terminator_point
communications_twisted_pair_line
communications_vault_site

Table 1. Continued

compressed_air_pipe_line
control_point
culvert_centerline
curb_line
digital_elevation_model_point
easement_right_of_way_area
electrical_cable_line
dispostn_d (disposition code, domain); instl_ty_d (installation type code, domain)
electrical_capacitor_point
electrical_ductbank_line
electrical_generator_point
electrical_junction_site
electrical_meter_point
electrical_motor_point
electrical_pedestal_point
electrical_regulator_point
electrical_substation_site
dispostn_d (disposition code, domain); sst_ty_d (type of service label, domain)
electrical_switch_point
electrical_transformer_bank_point
electrical_transformer_vault_point
elevation_contour_line
fence_line
fuel_fitting_point
fuel_flow_direction_arrow
fuel_hydrant_point
fuel_junction_site
fuel_line
fuel_meter_point
fuel_pump_booster_station_point
fuel_source_point
fuel_tank_site
gate_line
gate_point
hazardous_materiels_storage_area
hsb_cat_d (the general nature of hazardous waste, domain); area_size (acres);
area_u_d(area unit of measure, acres); perim (perimeter dimension), perim_u_d (meters);
coord_x (WGS84 UTM); coord_y (WGS84 UTM);

Table 1. Continued

hazardous_materiels_storage_location_site
heat_cool_anchor_point
heat_cool_flow_direction_arrow
heat_cool_junction_site
heat_cool_line
heat_cool_marker_point
heat_cool_meter_point
heat_cool_plant_area
heat_cool_pump_point
heat_cool_rectifier_point
heat_cool_regulator_point
heat_cool_valve_point
hospital_structure_site
industrial_waste_fitting_point
industrial_waste_flow_direction_arrow
industrial_waste_grit_chamber_point
industrial_waste_junction_point
industrial_waste_lagoon_area
industrial_waste_line
industrial_waste_meter_point
industrial_waste_neutralizer_point
industrial_waste_oil_water_separator_site
industrial_waste_tank_point
industrial_waste_treatment_plant_area
industrial_waste_valve_point
natural_gas_fitting_point
natural_gas_flow_direction_arrow
natural_gas_junction_point
natural_gas_light_point
natural_gas_line
natural_gas_marker_point
natural_gas_meter_point
natural_gas_rectifier_point
natural_gas_regulator_reducer_point
natural_gas_valve_point
pedestrian_sidewalk_centerline
pipeline_line
piprod_d (pipeline product code, domain); oper_nm (operator name, mixed case)

Table 1. Continued

radar_site
railroad_bridge_centerline
railroad_centerline
tot_len (total length of track, meters); length_u_d (length unit of measure, meters); feat_name (name of railroad, mixed case); cond_d (condition code, domain); traf_vol_d (traffic volume code, domain)
railroad_feature_point
railroad_station_site
railroad_yard_area
recreation_park_area
recreation_trail_centerline
regulated_aboveground_storage_tank_site
regulated_storage_tank_farm_area
regulated_underground_storage_tank_site
road_bridge_area
road_bridge_centerline
road_centerline
category_d; num_lanes; feat_len; length_u_d; feat_name; road_name; alt_name; rou1_typ_d; rou1_name; rou2_typ_d; rou2_name; rou3_typ_d; rou3_name
road_feature_point
road_guardrail_line
road_site
slab_area
solid_waste_compactor_point
solid_waste_dump_area
solid_waste_incinerator_point
solid_waste_landfill_area
solid_waste_material_recovery_facility_point
solid_waste_stockpile_area
solid_waste_transfer_station_point
spill_containment_feature_area
spill_containment_tank_point
spot_elevation_point
storm_culvert_site
storm_sewer_armor_point
storm_sewer_culvert_line
storm_sewer_downspout_point
storm_sewer_fitting_point

Table 1. Continued

storm_sewer_flood_area
storm_sewer_flow_direction_arrow
storm_sewer_headwall_line
storm_sewer_inlet_point
storm_sewer_junction_point
storm_sewer_line
storm_sewer_oil_water_seperator_site
storm_sewer_open_drainage_area
storm_sewer_open_drainage_line
storm_sewer_pump_point
storm_sewer_reservoir_point
structure_existing_site
structure_future_site
tower_site
tunnel_centerline
utility_electric_utility_site
utility_pole_guy_point
utility_pole_tower_point
utility_pole_tower_site
vehicle_parking_area
wastewater_discharge_point
wastewater_filtration_bed_area
wastewater_fitting_point
wastewater_flow_direction_arrow
wastewater_grease_trap_point
wastewater_grit_chamber_point
wastewater_junction_point
wastewater_lagoon_area
wastewater_line
wastewater_neutralizer_point
wastewater_oil_water_separator_site
wastewater_pump_ejector_station_site
wastewater_pump_point
wastewater_septic_tank_point
wastewater_treatment_plant_site
wastewater_valve_point
water_fire_connection_point
water_fitting_point

Table 1. Continued

water_hydrant_point
water_junction_point
water_line
water_marker_point
water_meter_point
water_pump_point
water_regulator_reducer_point
water_reservoir_area
water_tank_site
water_valve_point
water_vent_point

11.4 EXTERIOR SIGN STANDARD

Signs have a major effect on the appearance of Fort Leonard Wood and the professionalism or its units. The number of signs on the installation shall be held to the absolute minimum required for directions, identification, and customer service. This section establishes standards for standardizing sign material, color, style, types, and placement throughout the installation.

Standardized signage systems facilitate movement, provide a sense of orientation, and reinforce standards of excellence and visually communicate information. Signs are highly visible features that must be attractive and compatible with their surroundings. Careful consideration must be given to what a sign says, how it is said, its visual appearance and organization, its location, structural support system, and relation to other signs within the installation.

Signage creates a unifying element throughout FLW that visually ties the installation visual zones and themes together and builds a reference and continuity that translates into confidence and reassurance when traveling throughout the installation. The standards to apply for signage color, type, and sizing are found in Technical Manual (TM) 5-807-10, *Signage* (See Section 9, paragraph 9.6 Pavement Marking Standards.).

11.4.1 Sign System Characteristics

There are several basic design characteristics that, by serving to convey necessary information clearly and attractively, are an integral part of any successful signage system. These characteristics are:

Simplicity: Provide only needed information, avoid redundancy, and eliminate over-signing with resultant clutter and visual confusion. Sign messages must be clear, simple, and easy for individuals to process quickly.

Continuity: The system will be applied uniformly and consistently throughout the entire installation. The importance of consistent implementation extends from the larger issues of sign type and size down to accurate color continuity and matching typestyles.

Visibility: Signs will be located at significant decision points and oriented to provide clear sight lines for the intended user. Coordinate locations with respect to landscaping, utilities, adjacent

signage, and various other street design elements to ensure long-term maximum visibility.

Legibility: Sign typestyle, line spacing, color, and size all combine to create the crucial design characteristics of legibility. Sign design will take into consideration users such as motorist, pedestrians, or bicyclists and the relative travel speed at which each type of user will be traveling when viewing the signs.

11.4.2 Vocabulary-Communications

A common language has been created for establishing a signing system. The different components that create the sign package have been named and referred to within the total signing system.

The creation of a "signage language" helps generate a unified bond within sign types that make up a signage family. This signage language may be considered in terms of the following:

- Information or Message
- Typography
- Presentation: height, shape, style, color, materials and graphics
- Architectural Influence: 3D qualities of the sign and the method of support such as a masonry base unit
- Graphic Architecture: the placement of the letters and artwork within the sign panel and their relationship to each other.

11.4.3 Types of Exterior Signs

There are six basic categories of exterior signs: Identification, Motivation, Guide, Mandatory/Prohibitory, Information, and Regulatory signs.

11.4.3.1 Identification Signs

There are four basic types of identification signs: Installation, Military Headquarters, Military Facility, and Community Facility Identification signs. These are signs that identify entrances to the installation, areas within the installation, major tenants, buildings, and organizational or functional components. They identify a location, and greet the visitor to that location. They should be compatible in scale and character with the architecture and also blend with the natural surroundings.

Wall mounted identification signs may be used instead of freestanding signs. Wall mounted signs eliminate visual clutter and minimize maintenance.

These signs are designed to include the following:

Typeface: Lettering is self-adhesive backing material.

- Building Title: Helvetica Medium, Upper and lower case
- Building Addresses: Helvetica Medium, Upper and lower case

Color:

- Panel: Dark Brown (Pantone 18-1027 TPX. See Supplemental Page L-4a)
- Lettering: White
- Post: Dark Brown
- Exposed panel backs and edges: Dark Brown
- All paint: Semi gloss

Materials

- Panel: Double-face 1/8" thick aluminum
- Post: Steel Pipe
- Foundation: Concrete pier or direct burial

See Technical Manual (TM) 5-807-10, *Signage*, for further sign specifications and for sign placement guidelines.

11.4.3.1.1 Installation Identification Signs

Installation identification signs name the installation and display the official US Army plaque. The designation "United States Army" must appear at the top of the sign in accordance with AR 420-70, para 2-7h. Every installation entrance shall have an installation identification sign displaying only the US Army plaque, with the words "United States Army, Fort (Name of Fort), and gate name as indicated in Figure 11.22, Installation Entrance Signs. The placement of Senior Mission Commander logo, unit crest, and other installation identification signs, monuments, or displays shall be located inside the installation beyond the cleared area of the Access Control Point (ACP) of entry. When used service-wide, these signs convey a uniform image of strength and

Fig. 11.22 – U.S. Army Standard Installation Entrance Sign

stability to the public. Emblems, branch colors, unit mottos, names, and titles of individuals are not to be displayed.

Installation identification signs consist of three types:

Sign Type A1 - Main Entrance Sign identifies the principal visitor entrance.

Sign Type A2 - Secondary Entrance Sign identifies entry points with relatively high volumes of visitor traffic.

Sign Type A3 - Limited Access Entry Gate Sign identifies entry points with limited public access.

See Technical Manual (TM) 5-807-10, *Signage*, paragraph 3-3, for sign specifications and paragraph 3-11 for sign placement guidelines.

11.4.3.1.2 Military Headquarters Identification Signs

Military head-quarters identification signs identify military activities and facilities and carry unit name information and street addresses
(Fig. 11.23).

Fig. 11.23 – Headquarters Identification Sign

Military headquarters identification signs consist of four types:

Sign Type B1 - Installation Headquarters Sign identifies the central administration of the installation.

Sign Type B2 - Command, Division, and Brigade Headquarters Sign

Sign Type B3 - Battalion Headquarters Sign

Sign Type B4 - Headquarters Building Entrance Sign identifies the building entrance for all levels of authority. In addition, Type B4 is used to identify a unit headquarters that has a special entry point other than the main entrance of a building.

Name plate attachments are prohibited. Insignias, emblems, branch colors, unit mottos, names, or titles of individuals will not be used on these signs.

Identify buildings with either a free-standing or building-mounted sign, but not both. Building mounted signs are preferred. Free-standing building identification signs should be kept to a minimum. A primary objective of the installation orientation system is to reduce the number of signs and to eliminate the visual clutter that results from the over use of signage. Locate signs only where they are needed to provide orientation. As a general rule, provide one sign for each building. An option to the standard building identification sign is the use of facility-mounted, individual letter-type signs affixed to the buildings. The size and location of these signs should be standardized throughout the installation, normally over the building main entrance. See Figure 11.24.

These signs are designed to include the following:

Typeface: The letter shall be mounted to the wall according to the manufacturers' specifications.

- Building Lettering Size: 2mm to 25mm (1/16" to 1") deep, Helvetica medium typeface.
- The depth separates them from the plane of the wall and gives them a crisp appearance, while the Helvetica medium typeface relates to other Army signs.

Color:

- The color or finish of the letters should compliment the predominant color of the building while providing enough contrast with the background for visibility.
- Use a light-color or bright metallic finish for the lettering on dark buildings and a standard brown or dark bronze finish for the lettering on light colored buildings.

Materials:

- Several letter materials are available through sign manufacturers; however, rigid foam with aluminum facing is the preferred letter material.
- Letter material should be selected based on durability, architectural compatibility, and cost effectiveness.

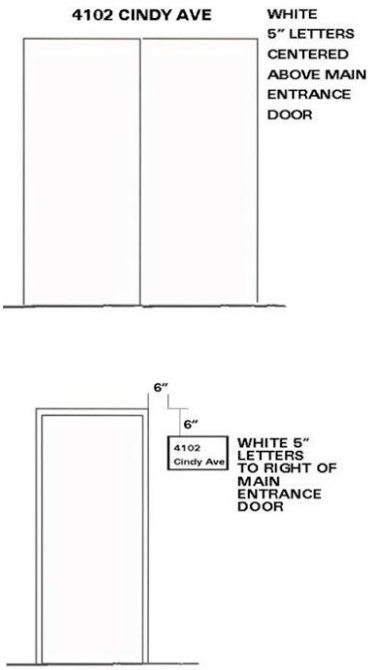


Fig. 11.24 - Street Address Location at Entrance Doors

11.4.3.1.3 Military Facility Identification Signs

Military facility identification signs are used to identify company level organizations and other military facilities not included in the

installation identification or military headquarters sign types. Insignias, emblems, branch colors, unit mottos, names, or titles of individuals will not be used on these signs.

Military facility identification signs consist of seven types:

Sign Type C1 - Centralized Primary Facility Sign, identifies multiple service units in one or a complex of buildings. In addition, one service unit comprised of sub-services which are used by a large volume of military and civilian personnel may be identified by Type C1.

Sign Type C2 - Centralized Secondary Facility Sign, may be used where the volume of civilian traffic does not warrant the use of sign Type C1, such as military unit storage facilities.

Sign Type C3 - Primary Facility Sign, identifies a large scale facility serving a large volume of military and civilian personnel, but does not list individual services units or sub-services.

Sign Type C4 - Secondary facility Sign identifies company level organizations and individual service units.

Sign Type C5 - Primary Entrance Sign identifies the main entry points of a service facility.

Sign Type C6 - Secondary Entrance Sign, identifies the same information as Type C5, but is smaller in size.

Sign Type C7 - Restricted Facility Sign identifies the facility name or area which is restricted.

11.4.3.1.4 Community Facility Identification Signs

These identify activities and facilities used for non-military purposes. The standards for community signs also apply to signs for private firms operating on base. AAFES facilities and nationally recognized food chain franchises operated by AAFES may utilize their individual registered trademark signage in general compliance with these standards. These signs should be kept at a low profile and design and color should match the installation-wide system.

Community identification signs consist of seven types:

Sign Type D1 - Centralized Primary Facility Sign identifies several activities or organizations in one or a complex of buildings.

Sign Type D2 - Primary Facility with Changeable Message Board identifies an individual organization or facility and provides a changeable message board for information on activities.

Sign Type D3 - Primary Facility Sign identifies an organization.

Sign Type D4 - Secondary Facility Sign, identifies the same information as Type D3, but is smaller in size.

Sign Type D5 - Building Entrance Sign identifies the facility entrance and hours of operation.

Sign Type D6 - Recreation Facility Sign identifies an outdoor recreation or park facility and hours of operation.

Sign Type D7 - Bus Stop Sign identifies bus routes, stops, and schedules.

1

1.4.3.2 Motivation Signs

These signs are used to boost morale, improve safety, aid in recruiting, and accomplish other special objectives. Motivation signs are unique in appearance and do not have specified graphic layouts.

Motivation signs include three types:

Sign Type E1 - Installation Motivation Sign identifies the principle commends or divisions stationed at the installation.

Sign Type E2 - Standard Motivation Sign is used to support campaigns and special events.

Sign Type E3 - Unit Motivation Sign is used to express unit pride and display organizational insignias, emblems, and mottos.

11.4.3.3 Guide Signs

These signs are the essential means for locating destinations and routing travel to those destinations within a military installation. This includes site directory map signs at all entrance gates and other key points with the installation, large street name signs at all intersections, and large-lettered destination signs of not more than three lines. These signs provide the most efficient means of guiding traffic to destinations within the installation.

11.4.4.4 Mandatory/Prohibitory Signs

This category of signage is intended to maintain security and safety on the installation perimeter and at other specific secure areas. These signs notify visitors of restrictions, as well as other security procedures. The guidelines for design, fabrication, and placement of warming signs are found in Technical Manual (TM) 5-807-10, *Signage*, paragraph 3-9.

There are several types of installation warning signs as follows:

Sign Type G1 - Warning Sign is intended as a search and authorized personnel warning sign.

Sign Type G2 - Warning Sign is intended as a restricted area warning sign.

Sign Type G3 - Warning Sign, identifies general hazards, regulations and security information as Type G2, but is smaller in size.

Sign Type G4 - Safety Sign identifies specific dangers and warns personnel and visitors of physical hazards and unsafe practices.

Sign Type G5 and G6 - Parking Sign.
Handicapped parking signs should show the international handicapped symbol in white on the required blue background. Strictly limit reserved parking signs to visitors, customers, handicapped, key officials, and incentive award winners (NCO of the Quarter). Use metal signs approximately 4" high and mechanically fastened to the vertical curb face. Design and color should match the installation-wide system.

Sign Type G7 - Special Traffic Conditions Sign, such as tactical equipment limits and trail crossings, follow guidelines established in MTMC Pamphlet 55-14, *Traffic Engineering for Better Signs and Markings* and standards in the *Manual of Uniform Traffic Control Devices (MUTCD)*.

11.4.3.5 Information Signs

These are used to provide educational information and directional guidance for visitors. These signs is used to give priority to the destinations of facilities that are likely to have a great deal of first time traffic include the Commissary, Post Exchange, Clinic, Community Center, clubs, billeting, and major Army activities.

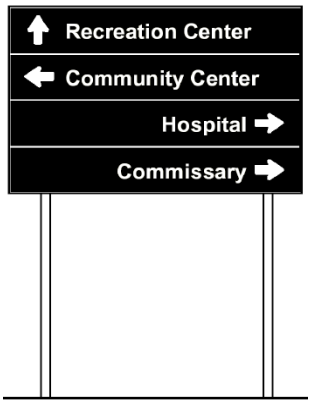


Fig. 11.25 – Guidance Signs Locate at Major Decision Points

These signs are designed to include the following:

Typeface: Lettering is self-adhesive backing material.

- Helvetica Medium, upper and lower case

Arrow:

- Place at the end indicating direction (Fig 11.25)
- Stoke width: Helvetica Medium cap

Color:

- Panel: Dark Brown (Pantone 18-1027 TPX. See Supplemental Page L-4a)
- Lettering: White
- Post: Black
- Exposed panel backs and edges: Dark Brown
- All paint: Semi gloss

Materials:

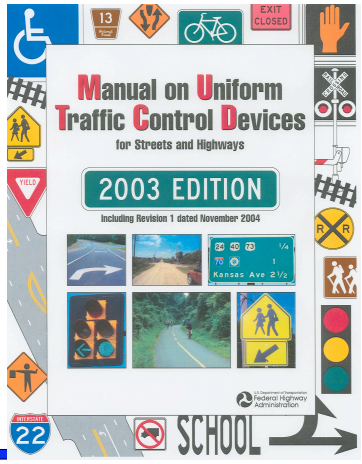
- Panel: Double-face, 1/8" thick aluminum
- Post: Black steel signposts are encouraged. Black vinyl sleeves for signpost and dark brown adhesive vinyl sheeting for the backs of signs provide a low-maintenance option.
- Foundation: Concrete pier or direct burial

There are two types of information signs:

Sign Type H1 - Exhibit Information Sign.

Sign Type H2 - Guidance Sign provides direction guidance motorist or pedestrian in, around, and out of the installation. The legibility and placement of this sign, as well as the order of information, is critical to their effectiveness. These signs should be place in central locations and at major decision points along circulation routes.

Messages will be grouped in the following order according to their arrow direction: forward, left, and right. In addition, placement of the message on the sign panel is determined by the arrow direction. Destinations forward and left are listed first and have flush left messages. Destinations right are listed next and have flush right messages. The arrow is centered in the space between the message and the edge of the sign. Prioritize destinations to be listed by giving the highest priority to the destinations that are most often sought by people new to the garrison or that serve as highly visible landmarks on the garrison. Those who live or work on the garrison or who visit frequently do not need the degree of help required by a first time or infrequent visitor. These signs are designed to include the following:



11.4.3.6 Regulatory Signs

These signs provide the rules for travel and parking on the installation. They include highway signs, warning signs, parking

control signs, etc. Related to these signs are pavement markings and traffic signals. *Manual of Uniform Traffic Control Devices (MUTCD)* (Fig. 11.26) standardizes regulatory devices throughout the country to ensure that they mean the same to, and require the same action by, all motorists (Fig.11.27). Therefore, compliance with the MUTCD will contribute to the safe, orderly, and efficient movement of traffic. Also see MTMC Pamphlet 55-14, *Traffic Engineering for Better Signs and Markings*.

These signs are designed to include the following:

Typeface: Lettering is self-adhesive backing material.

- Helvetica Medium, upper and lower case

Color:

- Panel: Sign color, size and shape prescribed by the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)
- Post: Black
- Exposed panel backs and edges: Dark Brown

Material:

- Panel: Double-face, 1/8" thick aluminum
- Post: Steel breakaway pipe
- Foundation: Concrete pier or direct burial

Fig. 11.27 – MUTCD Regulatory Signs

11.4.4 Street Addresses

The addressing procedures prescribed in Department of Defense Manual (DODM) 4525.8-M, DoD Official Mail Manual are mandatory for use by all DoD components. DoD 4525.8-M, Chapter 3 prescribes the following:
All DoD addresses shall be assigned so they are compatible with the United States Postal Services automated delivery point sequencing (C3.3).

- The DoD installation is responsible for assigning city-style, street address on the installation (C3.3.2.2).
- Street addresses shall be assigned and used even though a DoD activity may deliver the mail to the addressee (C3.3.2.2.1).

- Only geographically locatable civilian-style street address (such as 4102 Cindy Avenue) shall be used (C3.3.2.2.4).
- Installations shall not use one street address for the entire installation and then use secondary unit designators such as "Building 123" to designate the delivery addresses on the installation (C3.3.2.2.5).
- Addresses such as "Building 123 Roberts Street" are not a valid address format and shall not be used (C3.3.2.2.6).

11.4.5 Address Placement Standards

- Place addresses by the front entrance of the building so they can be seen (C3.3.2.3.1).
- Place both the street name and address number on the building if both the building number and street address are visible from the street.
- Building identification signs will use street addresses.
- Buildings without identification signs shall have the address number and street name centered above the main entrance or located to the right side.

11.4.6 Circuit Running Trail Sign Standards

- Sign panel shall be fabricated of 1/8" thick aluminum or approved equal. All exposed surfaces of the sign panel including the reverse side and edges shall have a field or factory applied paint or enamel finish over primer.
- Signs shall be secured to posts with two 0.25 inch carriage bolts cut flush with the nut. Head of bolt shall be painted to match face of sign. Non-compatible metals shall be isolated by coating or gasket material so as to prevent galvanic action.
- Post shall be 3 x 3 wood or 3 inch diameter pipe or 3 inch tube. Post shall be treated to resist structural degeneration or corrosion. Finish on post may be either natural or white paint or factory applied white low sheen enamel.
- Post shall be set so that at least 60 centimeters (24 inches) of length is set firmly in earth. Type font shall be Helvetica Medium, 10 centimeters (4 inches) high, painted in white enamel on a colored panel.
- Unless otherwise directed, sign shall give distance in miles or quarter fractions thereof.

- Sign shall contain two lines of type. The upper line shall read "MILE". The lower line shall consist of a numeral/s indicating unit distance. Center each line on the sign panel.
  Example: MILE MILE
  3/4 3
- See Fig. 11.28 and Paragraph. 9.12.5 Recreational Running Trails for additional guidance.

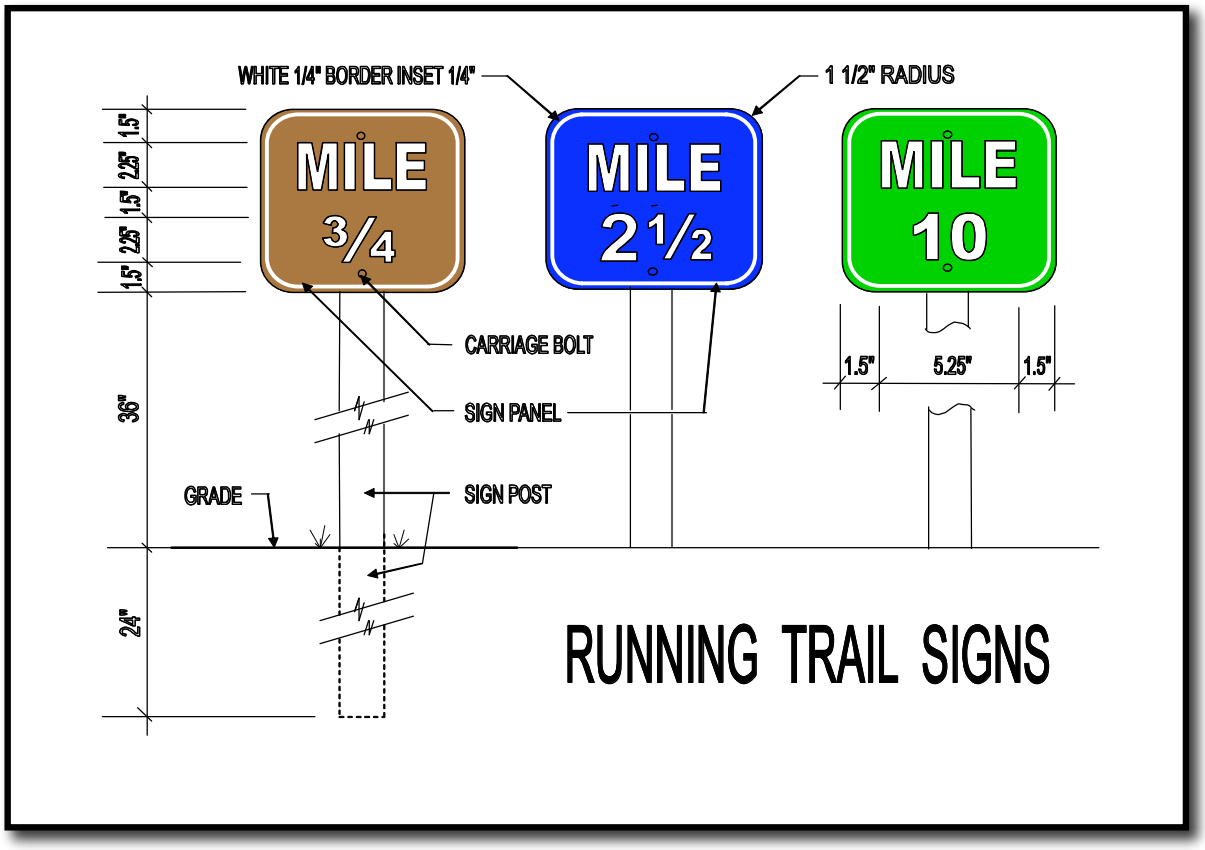


Fig. 11.28 - Signage for Circuit Running Trails Detail

11.4.7 Electronic Exterior Signs

All exterior flashing signs, traveling lights, or signs animated by lights of changing degrees of intensity or color are prohibited.

11.4.8 Housing Area Sign Standards

Street and address identification signs within housing areas should be complimentary to the architectural setting of the housing area and approved by the installation Real Property Planning Board. Housing numbers should be placed on the curb in front of the respective house and on the house where lighting will effectively light the numbering.

11.4.9 Street Sign Standards

Street name identification signs should be designed with the same lettering, color, and materials as other information signs (Fig. 11.29).

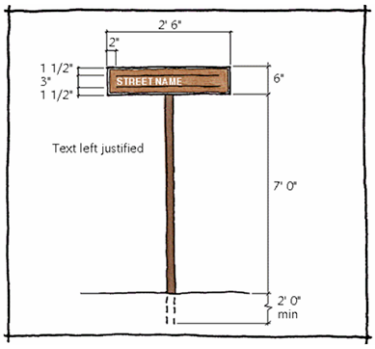


Fig. 11.29 - Typical Street Signs

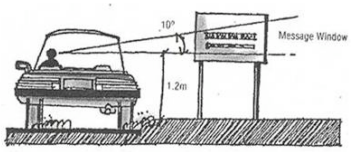
11.4.10 Wheeled Electrical Signs

Wheeled electrical signs will have an attractive presentation. Temporary landscape elements should be used whenever possible. The siting of this type of sign will be approved by the RPPB. No sign of this type will be left in place for longer than six (6) months. After which time, the sign will be removed or turned into a permanent sign.

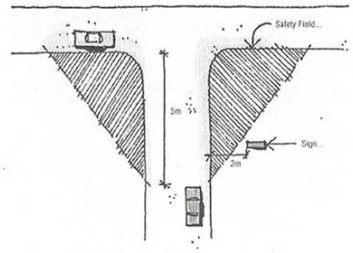
11.4.11 Sign Placement

Placement of signs differs according to the type of sign and the specific site constraints. The following guidelines apply to placement of the majority of signs.

- Do not place more than one sign at any location. Traffic rules are the exception to this rule.
- Place signs in areas free of visual clutter and landscape materials.
- Place signs in locations that allow enough time for the user to read and react to the message.
- Signs should not be placed to block sight lines at intersections.
- Place signs approximately 1.2 meters (4 feet) above ground level to be within 10 degrees the driver's line of vision (Fig 11-30). Provide proper placement to avoid a hazard to children.



Placement with reference to message copy



Placement with reference to signing

Fig. 11.30 - Placement Is Critical To Ensure Easy Readability

11.4.12 Sign System Typography

11.4.12.1 Military Emblems

The Army has a rich tradition of military heraldry. Military emblems are an important part of the soldiers' identity and the emblems have been carefully crafted over the years to express unit pride and unique history and function of the unit. The care and use of organizational emblems in a signage system can add visual interest as well as build pride and a sense of history. However, the overuse of miscellaneous emblems can lead to clutter and a

dilution of their importance. Colors for military emblems must be in accordance with the Institute of Heraldry.

11.4.12.2 Department of the Army Plaque

The plaque should be displayed on installation identification signage to emphasize the heritage and professionalism of the United States Army. The design of the plaque must be in accordance with Army Regulation (AR) 840-1, *Department of the Army Seal, and Department of the Army Emblem and Branch of Service Plaques*, and must be reproduced in full color.

11.4.12.3 Insignias

The use of branch insignia, shoulder sleeve insignia, coat of arms, and/or distinctive insignia on headquarters signs is permitted. All military emblems must appear in full color. Motivational symbols or motifs will not be used.

11.4.13 Reduce Visual Clutter

Over-signing detracts form a uniform sign system and if left uncontrolled will eventually destroy the integrity of the system. (Fig. 11.31)

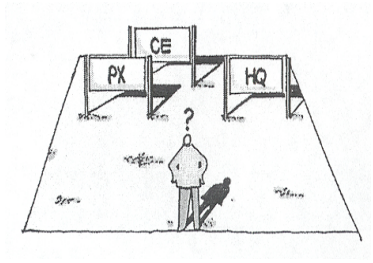


Fig. 11.31 - Visual Clutter Causes Confusion

Clutter creates confusion and ineffectiveness. Often motorist and pedestrians are confused by the bombardment of messages that have no relationship to each other, or the communication is on such a minimal level that the sign serves no purpose.

11.4.14 Location Maps

The location map is an integral element of an installation entrance. The location map display provides information and sense of place to the viewer. The design and construction should be of compatible architectural materials found throughout the installation (Fig. 11.32).

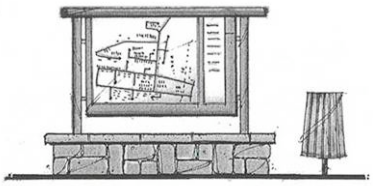


Fig. 11.32 - Location Maps Provide a Sense of Place

The location map will contain the following characteristics within the design.

- Plexiglas secured over map for protection against graffiti and the elements
- Architecturally compatible materials used for the base
- Paved walk-up area
- Litter receptacle

- Provide parking adjacent
- Provide current takeaway maps

9.6 PAVEMENT MARKING STANDARDS

9.6.1 Pavement markings shall be as described in Part 3 of the Manual of Uniform Traffic Control Devices (MUTCD), also see Chapter 6, Site Elements, paragraph 6.4.4.3.4, for traffic related signage.

9.6.2 Concrete curbs and gutters shall not be painted. Markings shall be restricted to the pavement surface and marking paint shall not be applied to concrete curb, gutter, or any portion thereof including curb cuts for vehicle or wheelchair access.

9.6.3 Markings intended to prohibit parking shall be applied to the pavement surface parallel to the curb and gutter in a continuous band for the entirety of the restricted length of pavement.

9.6.4 Where appropriate a boxed area shall be created with diagonal lines to establish a no parking zone in street conditions such as curb side parking, etc.

Appendix I

Acceptable Plants List

The following extract is provided from the
Fort Leonard Wood Installation Design Guide.
It is labeled there as Appendix “O”

APPENDIX O
PLANT PALETTE

O.1 The visual image conveyed by a military installation is created by the architectural character site organization, and the landscape design. Section 10, *Landscape Design Standards* describes the required selection, placement, and maintenance of plant material at Fort Leonard Wood. Planted material includes trees, shrubs, bedding plants and ground covers such as grass for lawns. These plants collectively provide a simple and cost effective enhancement to the general appearance of the installation. Moreover plantings add an element of human scale to open spaces and can be used functionally to screen undesirable views, buffer winds, reinforce the hierarchy of the circulation system, or provide a visual transition between dissimilar land uses and enhance Force Protection measures. (See Fig. O.1 and Fig. O.2)

Fig. O.1 – Landscaping improves the overall visual quality of the installation

O.2 Plant selection and placement must be carefully considered for reasons of sustainabilitiy as discussed in Section 10 *Landscape Design Standards.*

Fig. O.2 – Trees provide shade and visual interest including seasonal color.

O.3 A plant palette has been created to simplify this process of plant selection and placement. The plant slection list, which follow, have been created corresponding to each of the Visual Zones established in Section 5, *Visual Themes and Zones*. The Visual Zone Map and Table are included in this Appendix as Fig. O.3 and Table O-1.

Note: Print single sided only. Pages O-3 through O-93 will automatically print in landscape.

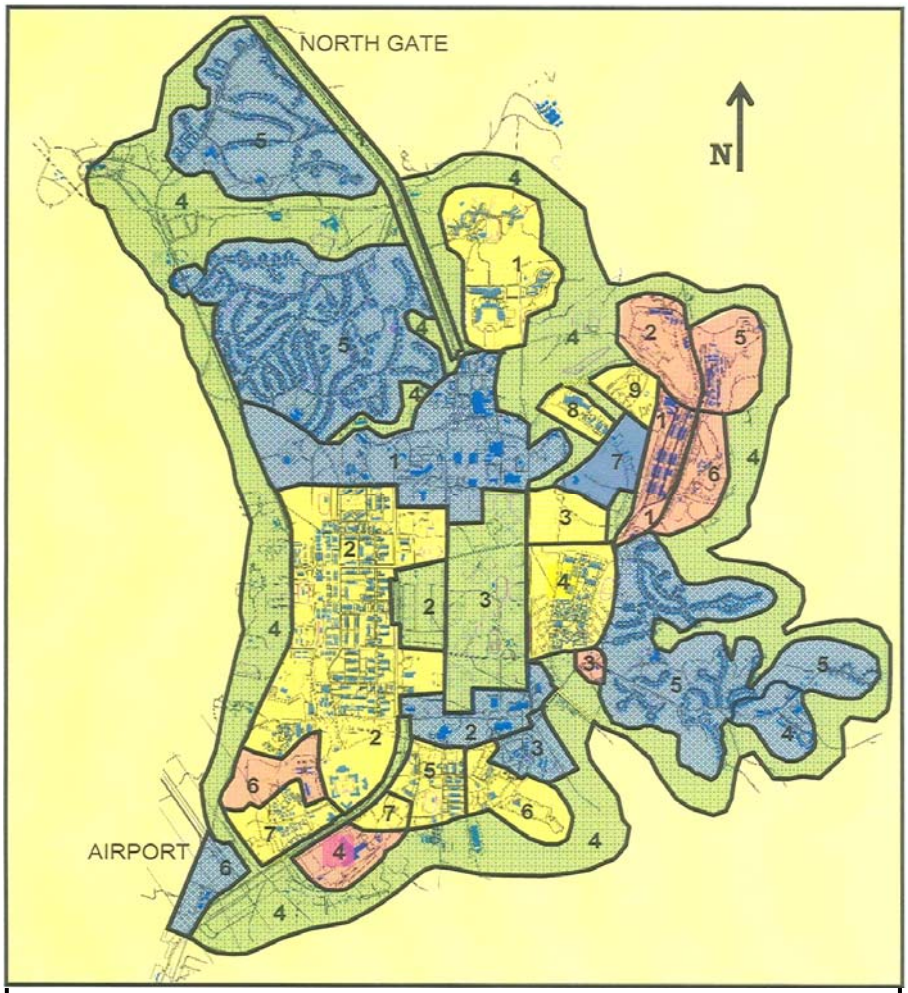


FIG. O-3 FORT LEONARD WOOD VISUAL ZONES MAP

TABLE O-1 VISUAL THEME AND ZONE RELATIONSHIP CHART			
OPEN AREA THEME	**COMMUNITY LIFE THEME**	**MISSION THEME**	**INDUSTRIAL THEME**
Visual Zones	Visual Zones	Visual Zones	Visual Zones
1-Missouri Ave. Entry Corridor 2-Gammon Field 3-Outdoor Recreation 4-Natural Environment	1-Town Center 2-Community Activities Area 3- Preservation Area 4- Sturgis Heights 5-Family Housing 6-Airport Facilities 7-Tech Park	1-Maneuver Center 2-Initial Entry Training 3-Permanent Party Barracks 4-Specker Barracks 5-MP Troop Complex 6-US Army Reserve 7-Army Nat'l Guard 8-Battalion Reception 9- Special Training	1-Supply Facilities 2- Logistics 3-Water Treatment 4-TMP 5-Public Works 6-Vehicle Maintenance

PLANT SELECTION LIST
Plant Material Suitability Matrix

GAMMON FIELD and OUTDOOR RECREATION

* Indicates poisonous **Indicates thorned

Botanical Name	Common Name	Plant Type			Shape							Growth Rate			Flowering			Special Interest			Soil Conditions					Exposure			Tolerance			Functional Uses							Notes
		Deciduous	Evergreen	Native	Conical	Columnar	Round/Oval	Weeping	Upright	Spreading	Irregular	Fast	Moderate	Slow	Spring	Summer	Fall	Foliage	Fruit	Fall Color	Moist	Average	Dry	Acidic	Alkaline	Sun	Part Shade	Full Shade	Pest Resistant	Drought Resistant	Pollution Tolerant	Specimen	Street Tree	Massing	Screen/Windbreak	Parking Lot	Park/Lawn	Barrier	
LARGE TREES																																							
Acer saccharum	Sugar Maple	∇		∇			∇							∇						∇		∇		∇			∇	∇				∇	∇	∇	∇		∇		Specify 'Legacy'
Betula nigra	River Birch	∇		∇			∇						∇							∇	∇	∇		∇		∇	∇					∇			∇		∇		Specify 'Heritage', Soil pH 6.5 or less
Celtis laevigata	Sugar Hackberry	∇		∇			∇						∇							∇	∇			∇	∇	∇			∇	∇	∇		∇	∇	∇	∇	∇		Specify 'All Seasons' or 'Magnifica'
Fraxinus americana	White Ash	∇		∇			∇						∇							∇	∇					∇							∇	∇		∇	∇		Specify 'Autumn Applause' or 'Autumn Purple'
Fraxinus pennsylvanica	Green Ash	∇		∇							∇	∇								∇	∇	∇	∇	∇		∇				∇	∇		∇	∇	∇	∇	∇		Specify 'Summit' or 'Marshall Seedless'
Ginkgo biloba*	Ginkgo (male)	∇									∇			∇				∇		∇	∇	∇		∇	∇	∇			∇	∇	∇	∇		∇	∇		∇		
Liquidambar styraciflua	American Sweetgum	∇		∇			∇					∇								∇	∇			∇		∇						∇		∇	∇		∇		
Liriodendron tulipifera	Tuliptree	∇		∇			∇					∇			∇					∇		∇		∇		∇						∇		∇	∇		∇		
Quercus palustris *	Pin Oak	∇		∇	∇							∇								∇	∇			∇		∇								∇	∇				Develops iron chlorosis in high pH soils
Quercus phellos *	Willow Oak	∇		∇			∇						∇							∇	∇	∇				∇	∇		∇			∇	∇	∇	∇	∇	∇		
Quercus rubra *	Northern Red Oak	∇		∇			∇					∇								∇		∇		∇		∇			∇			∇	∇	∇	∇	∇	∇		Develops iron chlorosis in high pH soils
Pinus ponderosa*	Ponderosa Pine		∇		∇								∇								∇	∇	∇		∇	∇				∇	∇			∇	∇		∇		
Pinus strobus	White Pine		∇	∇	∇							∇									∇	∇		∇		∇	∇							∇	∇		∇		Develops iron chlorosis in high pH soils
Taxodium distichum	Bald Cypress	∇		∇	∇								∇								∇	∇	∇	∇		∇				∇	∇	∇		∇	∇		∇		
MEDIUM TREES																																							

PLANT SELECTION LIST
Plant Material Suitability Matrix

GAMMON FIELD and OUTDOOR RECREATION

* Indicates poisonous **Indicates thorned

Botanical Name	Common Name	Plant Type			Shape							Growth Rate			Flowering			Special Interest			Soil Conditions					Exposure			Tolerance			Functional Uses							Notes
		Deciduous	Evergreen	Native	Conical	Columnar	Round/Oval	Weeping	Upright	Spreading	Irregular	Fast	Moderate	Slow	Spring	Summer	Fall	Foliage	Fruit	Fall Color	Moist	Average	Dry	Acidic	Alkaline	Sun	Part Shade	Full Shade	Pest Resistant	Drought Resistant	Pollution Tolerant	Specimen	Street Tree	Massing	Screen/Windbreak	Parking Lot	Park/Lawn	Barrier	
Acer platanoides	Norway Maple	∇				∇							∇		∇					∇	∇	∇	∇	∇	∇				∇				∇	∇		∇		Specify ‘Columnare' or 'Summershade'
Acer rubrum*	Red Maple	∇		∇			∇						∇		∇					∇	∇	∇		∇			∇				∇		∇	∇		∇		Specify ‘Red Sunset', 'October Glory', or 'Armstrong'
Carpinus caroliniana	American Hornbeam	∇		∇							∇			∇						∇	∇	∇					∇	∇				∇		∇	∇	∇	∇		Smooth “beech-like” bark
Gleditsia triacanthos 'inermis' *	Thornless Honeylocust	∇		∇						∇		∇								∇	∇	∇				∇				∇	∇		∇	∇		∇	∇		Specify ‘Moraine' or 'Shademaster'
Koelreuteria paniculata	Goldenrain Tree	∇					∇						∇			∇			∇	∇		∇	∇		∇	∇			∇	∇	∇	∇	∇	∇	∇	∇	∇		
Nyssa sylvatica	Black Gum (Tupelo)	∇		∇			∇							∇					∇		∇	∇		∇		∇	∇					∇		∇	∇		∇		Not wind tolerant, Needs soil pH 5.5 –6.5
Picea abies	Norway Spruce		∇		∇								∇									∇				∇	∇			∇				∇	∇		∇		
Pinus thunbergii	Japanese Black Pine		∇		∇								∇									∇				∇				∇				∇	∇				Short-lived, Salt tolerant
Quercus acutissima*	Sawtooth Oak	∇		∇			∇						∇		∇					∇		∇				∇	∇		∇					∇	∇		∇		Develops iron chlorosis in high pH soils
SMALL TREES																																								
Acer ginnala	Amur Maple	∇					∇						∇		∇				∇	∇		∇		∇	∇	∇	∇					∇		∇	∇		∇		Specify ‘Flame’ or ‘Red Rhapsody’
Amelanchier laevis	Serviceberry	∇		∇			∇						∇		∇				∇	∇	∇	∇		∇		∇	∇					∇		∇	∇		∇		Also Amelanchier arborea
Cercis canadensis	Redbud	∇		∇						∇			∇		∇					∇		∇		∇	∇	∇	∇					∇		∇	∇		∇		‘Forest Pansy’ purple leaf form
Crataegus crus-galli inermis	Thornless Cockspur Hawthorn	∇		∇			∇							∇	∇				∇	∇		∇	∇	∇	∇	∇					∇	∇		∇	∇			∇	
Crataegus phaenopyrum**	Washington Hawthorn	∇		∇			∇							∇	∇				∇	∇		∇	∇	∇	∇	∇					∇	∇		∇	∇		∇	∇	Red berries, Thorns
Crataegus viridis 'Winter King'**	Winter King Hawthorn	∇		∇			∇							∇	∇				∇	∇		∇	∇	∇	∇	∇					∇	∇		∇	∇		∇	∇	Red berries, Thorns

PLANT SELECTION LIST Plant Material Suitability Matrix		Plant Type			Shape							Growth Rate			Flower-ing			Special Interest			Soil Conditions					Expos-ure			Toler-ance			Functional Uses							
GAMMON FIELD and OUTDOOR RECREATION * Indicates poisonous **Indicates thorned		Deciduous	Evergreen	Native	Conical	Columnar	Round/Oval	Weeping	Upright	Spreading	Irregular	Fast	Moderate	Slow	Spring	Summer	Fall	Foliage	Fruit	Fall Color	Moist	Average	Dry	Acidic	Alkaline	Sun	Part Shade	Full Shade	Pest Resistant	Drought Resistant	Pollution Tolerant	Specimen	Street Tree	Massing	Screen/Windbreak	Parking Lot	Park/Lawn	Barrier	
Botanical Name	**Common Name**	**Plant Characteristics**																			**Plant Culture**											**Landscape Use**							**Notes**
Magnolia x virginiana	Sweet Bay Magnolia		∇	∇						∇			∇		∇			∇			∇	∇		∇		∇	∇	∇				∇							Semi-evergreen, tolerates wet sites
LARGE SHRUBS																																							
Aronia arbutifolia ‘Brilliantisima’	Red Chokeberry	∇		∇					∇					∇	∇				∇	∇	∇	∇	∇	∇			∇	∇						∇				∇		
Aronia melanocarpa	Black Chokeberry	∇		∇					∇					∇	∇				∇		∇	∇	∇			∇	∇						∇	∇			∇		‘Autumn Magic’, Iroquois Beauty’, ‘Viking’
Cornus sericea	Redosier Dogwood	∇		∇						∇		∇			∇				∇	∇	∇	∇				∇	∇	∇					∇	∇					Specify ‘Cardinal’, ‘Baileyi’, ‘Coloradenis’ or ‘Cheyenne’ for reddest bark color
Forsythia intermedia ‘Compact’	Border Forsythia	∇							∇			∇			∇							∇		∇	∇	∇					∇			∇	∇		∇		Specify ‘Karl Sax’ or ‘Spring Glory’
Hydrangea quercifolia*	Oakleaf Hydrangea	∇		∇					∇					∇		∇				∇		∇					∇		∇					∇				∇		Specify ‘Snow Queen’
Ilex deciduas*	Possumhaw	∇		∇							∇		∇						∇			∇				∇	∇	∇					∇	∇					Needs male and female for fruiting effect
Rhus typhina	Staghorn Sumac	∇		∇						∇		∇							∇	∇		∇	∇			∇				∇				∇	∇				Specify ‘Dissecta’ or ‘Laciniata’
Viburnum x burkwoodii	Burkwood Viburnum	∇		∇						∇			∇		∇				∇	∇		∇		∇		∇	∇						∇	∇			∇		
Viburnum x dentatum	Arrowwood Viburnum	∇		∇						∇			∇		∇				∇	∇		∇		∇		∇	∇			∇	∇		∇		∇				
Viburnum opulus	Cranberrybush Viburnum	∇		∇					∇				∇		∇				∇		∇	∇		∇	∇	∇	∇						∇	∇	∇	∇			Specify ‘Compactum’ for smaller shrub
MEDIUM SHRUBS																																							
Berberis thunbergii atropurpurea**	Japanese Red Barberry	∇					∇						∇		∇			∇	∇	∇		∇	∇			∇				∇	∇			∇	∇	∇	∇	∇	Specify ‘Crimson Pygmy’ or ‘Rose Glow’
Rhus aromatica	Fragrant Sumac	∇		∇							∇			∇					∇	∇		∇		∇		∇	∇						∇						Specify ‘Green Globe’

PLANT SELECTION LIST
Plant Material Suitability Matrix

GAMMON FIELD and OUTDOOR RECREATION

* Indicates poisonous **Indicates thorned

Botanical Name	Common Name	Plant Type			Shape							Growth Rate			Flowering			Special Interest			Soil Conditions					Exposure			Tolerance			Functional Uses							Notes
		Deciduous	Evergreen	Native	Conical	Columnar	Round/Oval	Weeping	Upright	Spreading	Irregular	Fast	Moderate	Slow	Spring	Summer	Fall	Foliage	Fruit	Fall Color	Moist	Average	Dry	Acidic	Alkaline	Sun	Part Shade	Full Shade	Pest Resistant	Drought Resistant	Pollution Tolerant	Specimen	Street Tree	Massing	Screen/Windbreak	Parking Lot	Park/Lawn	Barrier	
Ilex glabra 'Compacta'*	Compact Inkberry Holly		∇	∇			∇							∇	∇				∇		∇					∇	∇	∇						∇	∇	∇	∇		Avoid high pH soils
Pinus mugo var. mugo	Mugo Pine		∇							∇				∇								∇			∇	∇	∇						∇	∇		∇		Tolerates calcareous soils
SMALL SHRUBS																																							
Juniperus procumbens	Japgarden Juniper		∇							∇				∇				∇				∇	∇	∇	∇	∇			∇	∇			∇		∇		∇		Specify 'Nana' or 'Greenmound'
Rhus arommatica 'Gro-low'	Gro-low Sumac	∇		∇							∇			∇	∇				∇	∇		∇		∇		∇	∇						∇				∇		
GROUND COVERS																																							
Coronilla varia	Crown Vetch	∇								∇			∇			∇					∇	∇				∇							∇			∇	∇		Low maintenance bank cover
Hemerocallis spp.	Daylilies	∇								∇			∇			∇						∇				∇	∇											
Lonica japonica 'halliana'	Hall's Honeysuckle	∇								∇		∇				∇			∇			∇				∇	∇						∇		∇			
GRASSES																																							
Schizachyrium scoparium	Little Blue Stem	∇		∇					∇				∇		∇		∇		∇		∇					∇							∇				∇		
Festuca elatior 'Jaguar'*	Jaguar Turftype Tall Fesue	∇								∇			∇						∇		∇					∇											∇		
Andropogon gerardii	Big Bluestem	∇		∇					∇				∇		∇		∇		∇		∇					∇				∇			∇				∇		
Sporobolus heterolepis	Prairie Dropseed	∇		∇			∇						∇		∇		∇		∇		∇					∇							∇			∇	∇		
Sorgnastrum nutans 'Sioux Blue'	Sioux Blue Indian Grass	∇		∇					∇				∇		∇		∇		∇		∇					∇				∇		∇	∇				∇		Specify 'Sioux Blue' for blue foliage

PLANT SELECTION LIST Plant Material Suitability Matrix		Plant Type			Shape							Growth Rate			Flower-ing			Special Interest			Soil Conditions					Expos-ure			Toler-ance			Functional Uses							
PRESERVATION AREA * Indicates poisonous **Indicates thorned		Deciduous	Evergreen	Native	Conical	Columnar	Round/Oval	Weeping	Upright	Spreading	Irregular	Fast	Moderate	Slow	Spring	Summer	Fall	Foliage	Fruit	Fall Color	Moist	Average	Dry	Acidic	Alkaline	Sun	Part Shade	Full Shade	Pest Resistant	Drought Resistant	Pollution Tolerant	Specimen	Street Tree	Massing	Screen/Windbreak	Parking Lot	Park/Lawn	Barrier	
Botanical Name	**Common Name**	**Plant Characteristics**																			**Plant Culture**											**Landscape Use**							**Notes**
LARGE TREES																																							
Acer saccharum	Sugar Maple	∇		∇			∇							∇			∇			∇		∇		∇			∇	∇				∇	∇	∇	∇		∇		Specify ‘Legacy’
Celtis laevigata	Sugar Hackberry	∇		∇			∇						∇				∇			∇	∇			∇	∇	∇			∇	∇	∇		∇	∇	∇	∇	∇	∇	Specify ‘All Seasons’ or ‘Magnifica’
Fraxinus pennsylvanica	Green Ash	∇		∇							∇	∇								∇	∇	∇	∇			∇				∇	∇		∇	∇	∇	∇	∇		Specify ‘Summit’ or ‘Marshall Seedless’
Liquidambar s. 'Rotundiloba'	Fruitless Sweetgum	∇		∇			∇					∇								∇	∇			∇		∇						∇		∇	∇		∇		
Quercus palustris *	Pin Oak	∇		∇	∇							∇								∇	∇			∇		∇								∇	∇		∇		Develops iron chlorosis in high pH soils
Quercus phellos *	Willow Oak	∇		∇			∇						∇							∇	∇	∇				∇	∇		∇			∇	∇	∇	∇	∇	∇	
Quercus rubra *	Northern Red Oak	∇		∇			∇					∇								∇		∇		∇		∇			∇			∇	∇	∇	∇	∇	∇		Develops iron chlorosis in high pH soils
Picea glauca	White Spruce		∇		∇								∇					∇			∇	∇				∇	∇			∇	∇	∇		∇	∇		∇		
Pinus ponderosa*	Ponderosa Pine		∇		∇								∇								∇	∇	∇		∇	∇				∇	∇			∇	∇		∇		
Pinus strobus	White Pine		∇	∇	∇							∇									∇	∇		∇		∇	∇							∇	∇		∇		Develops iron chlorosis in high pH soils
Taxodium distichum	Bald Cypress	∇		∇	∇								∇					∇		∇	∇	∇	∇	∇		∇				∇	∇	∇	∇		∇	∇		
MEDIUM TREES																																							
Acer rubrum*	Red Maple	∇		∇			∇						∇		∇					∇	∇	∇		∇			∇					∇		∇	∇		∇		Specify ‘Red Sunset', 'October Glory', or 'Armstrong'
Gleditsia triacanthos 'inermis' *	Thornless Honeylocust	∇		∇						∇		∇								∇	∇	∇				∇				∇	∇		∇	∇		∇		Specify ‘Moraine' or 'Shademaster'

PLANT SELECTION LIST
Plant Material Suitability Matrix

PRESERVATION AREA

* Indicates poisonous **Indicates thorned

Botanical Name	Common Name	Plant Type			Shape							Growth Rate			Flowering			Special Interest			Soil Conditions					Exposure			Tolerance			Functional Uses							Notes
		Deciduous	Evergreen	Native	Conical	Columnar	Round/Oval	Weeping	Upright	Spreading	Irregular	Fast	Moderate	Slow	Spring	Summer	Fall	Foliage	Fruit	Fall Color	Moist	Average	Dry	Acidic	Alkaline	Sun	Part Shade	Full Shade	Pest Resistant	Drought Resistant	Pollution Tolerant	Specimen	Street Tree	Massing	Screen/Windbreak	Parking Lot	Park/Lawn	Barrier	
		Plant Characteristics																			**Plant Culture**										**Landscape Use**							
Koelreuteria paniculata	Goldenrain Tree	∇					∇						∇			∇			∇	∇		∇	∇		∇			∇	∇	∇	∇	∇	∇	∇	∇	∇		
Picea abies	Norway Spruce		∇		∇								∇									∇				∇	∇			∇				∇	∇		∇		
Pyrus calleryana 'Bradford'	Bradford Pear	∇					∇					∇			∇					∇		∇	∇			∇			∇	∇	∇			∇	∇	∇	∇		Also 'Capital', 'Redspire', or 'Artistocrat'; susceptible to wind damage
Quercus acutissima*	Sawtooth Oak	∇		∇			∇						∇		∇					∇		∇		∇		∇	∇		∇					∇	∇		∇		Develops iron chlorosis in high pH soils
Tilia Americana	Basswood	∇		∇			∇						∇			∇						∇				∇	∇							∇	∇		∇		Specify 'Rosehill', 'Douglas' or 'Redmond'
Tilia cordata	Littleleaf Linden	∇					∇						∇		∇					∇		∇				∇					∇		∇	∇	∇	∇	∇		Specify 'June Bride' or 'Greenspire'
SMALL TREES																																							
Cercis Canadensis	Redbud	∇		∇						∇			∇		∇					∇		∇		∇	∇	∇	∇					∇		∇	∇		∇		'Forest Pansy' is a purpleleaf form
Cornus florida	Flowering Dogwood	∇		∇						∇				∇	∇				∇	∇		∇				∇						∇					∇		Specify 'Cherokee Princess' or 'Rubra'
Cornus kousa	Kousa Dogwood	∇					∇							∇	∇				∇	∇		∇		∇		∇	∇		∇	∇		∇		∇			∇		Specify var. chinensis or 'Milky Way'
Crataegus crus-galli inermis	Thornless Cockspur Hawthorn	∇		∇			∇							∇	∇				∇	∇		∇	∇	∇	∇	∇				∇		∇	∇			∇		
Malus x 'Bob White'	Bob White Crabapple	∇					∇						∇		∇				∇			∇		∇		∇							∇	∇		∇		
Malus x 'Mary Potter'	Mary Potter Crabapple	∇								∇			∇		∇				∇			∇		∇		∇			∇				∇	∇		∇		
Malus x 'Prairiefire'	Prairiefire Crabapple	∇									∇		∇		∇				∇			∇		∇		∇			∇				∇	∇		∇		
Malus x 'Red Jewel'	Red Jewel Crabapple	∇				∇							∇		∇				∇			∇		∇		∇							∇	∇		∇		
Malus x 'Donald	Donald Wyman	∇									∇		∇		∇				∇			∇		∇		∇			∇				∇	∇		∇		

PLANT SELECTION LIST
Plant Material Suitability Matrix

PRESERVATION AREA

* Indicates poisonous **Indicates thorned

Botanical Name	Common Name	Plant Type			Shape							Growth Rate			Flowering			Special Interest			Soil Conditions					Exposure			Tolerance			Functional Uses							Notes
		Deciduous	Evergreen	Native	Conical	Columnar	Round/Oval	Weeping	Upright	Spreading	Irregular	Fast	Moderate	Slow	Spring	Summer	Fall	Foliage	Fruit	Fall Color	Moist	Average	Dry	Acidic	Alkaline	Sun	Part Shade	Full Shade	Pest Resistant	Drought Resistant	Pollution Tolerant	Specimen	Street Tree	Massing	Screen/Windbreak	Parking Lot	Park/Lawn	Barrier	
		Plant Characteristics																			**Plant Culture**										**Landscape Use**							
Wyman'	Crabapple																																						
Malus x 'Sugar Tyme'	Sugar Tyme Crabapple	∇				∇							∇		∇				∇			∇		∇			∇			∇				∇	∇		∇		
LARGE SHRUBS																																							
Euonymous alatus 'Compactus'*	Dwarf Burning Bush	∇								∇				∇						∇		∇	∇			∇	∇	∇	∇					∇	∇	∇	∇	∇	Favorite for deer
Taxus x media 'Hicksii'	Hick's Yew		∇			∇								∇								∇		∇		∇	∇	∇						∇		∇	∇		
Viburnum dilatatum	Linden Viburnum	∇							∇					∇	∇				∇	∇	∇	∇		∇			∇		∇			∇		∇	∇		∇		Specify 'Asian Beauty' or 'Eric'
Viburnum plicatum var. toment	Doublefile Viburnum	∇					∇						∇		∇				∇	∇		∇					∇		∇					∇			∇		Specify 'Lanarth', 'Mariesii' or 'Cascade'
Viburnum x rhytid. 'Willowwood'	Willowwood Viburnum	∇								∇			∇		∇		∇		∇			∇				∇	∇		∇					∇	∇		∇		
MEDIUM SHRUBS																																							
Azalea yedoense poukhanense*	Korean Azalea	∇					∇							∇	∇					∇		∇		∇			∇	∇				∇					∇		Needs protected site
Berberis mentorensis	Mentor Barberry	∇					∇					∇			∇					∇		∇	∇			∇	∇		∇					∇	∇	∇	∇	∇	Good hedge plant
Berberis thunbergii atropurpurea**	Japanese Red Barberry	∇					∇						∇					∇	∇	∇		∇	∇			∇				∇	∇			∇	∇	∇	∇	∇	Specify 'Crimson Pygmy' or 'Rose Glow'
Cotoneaster divaricata	Spreading Cotoneaster	∇								∇			∇		∇				∇	∇		∇	∇	∇	∇	∇	∇		∇	∇				∇	∇	∇	∇		
Ilex glabra 'Compacta'*	Compact Inkberry Holly		∇	∇			∇							∇	∇				∇		∇					∇	∇	∇						∇	∇	∇	∇		Avoid high pH soils
Pinus mugo var. mugo	Mugo Pine		∇							∇				∇								∇			∇	∇	∇							∇	∇		∇		Tolerates calcareous soils
Taxus x media 'Densiformis'*	Densiformis Yew		∇							∇				∇								∇				∇	∇	∇						∇		∇	∇		Avoid heavy clay soils and wet sites

PLANT SELECTION LIST
Plant Material Suitability Matrix

PRESERVATION AREA

* Indicates poisonous **Indicates thorned

Botanical Name	Common Name	Plant Type			Shape							Growth Rate			Flowering			Special Interest			Soil Conditions					Exposure			Tolerance			Functional Uses							Notes
		Deciduous	Evergreen	Native	Conical	Columnar	Round/Oval	Weeping	Upright	Spreading	Irregular	Fast	Moderate	Slow	Spring	Summer	Fall	Foliage	Fruit	Fall Color	Moist	Average	Dry	Acidic	Alkaline	Sun	Part Shade	Full Shade	Pest Resistant	Drought Resistant	Pollution Tolerant	Specimen	Street Tree	Massing	Screen/Windbreak	Parking Lot	Park/Lawn	Barrier	
		Plant Characteristics																			**Plant Culture**																	
SMALL SHRUBS																																						
Cotoneaster apiculata	Cranberry Cotoneaster	∇								∇				∇	∇				∇	∇		∇	∇	∇	∇	∇				∇	∇			∇					
Juniperus horizontalis spp.	Horizontal Juniper		∇							∇				∇				∇				∇	∇		∇	∇				∇	∇			∇		∇	∇		
Juniperus chinensis procumbens	Procumbens Juniper		∇							∇				∇				∇				∇	∇	∇	∇	∇				∇	∇			∇		∇	∇		Specify ‘Nana’ or ‘Greenmound’
Spirea x bumalda	Anthony Waterer Spirea	∇				∇						∇				∇				∇		∇	∇			∇								∇		∇	∇		Also ‘Goldflame’
Spirea japonica	Japanese Spirea	∇				∇						∇				∇				∇		∇	∇			∇								∇		∇	∇		Specify ‘Little Princess’ or ‘Goldmound’
GROUND COVERS																																						
Euonymus fortunei ‘Coloratus’*	Purpleleaf Wintercreeper		∇							∇		∇						∇		∇		∇	∇	∇	∇	∇	∇	∇						∇		∇	∇		
Hedera helix x ‘Baltic’*	Baltic Ivy		∇							∇		∇									∇	∇		∇	∇	∇	∇	∇						∇		∇	∇		Also ‘Bulgaria’
Liriope muscari	Big Blue Liriope		∇							∇			∇				∇					∇	∇	∇		∇	∇							∇		∇	∇		
Vinca minor	Vinca minor		∇							∇			∇		∇						∇	∇					∇	∇						∇			∇		
GRASSES																																						
Festuca elatior ‘Jaguar’*	Jaguar Turftype Tall Fescue	∇								∇			∇									∇				∇											∇		
Festuca rubrum ‘Pennlawn’	Pennlawn Red Fescue	∇								∇			∇									∇				∇											∇		
Lolius perenne	Perennial Rye Grass	∇								∇			∇									∇				∇											∇		
Poe pratensis	Kentucky Bluegrass	∇								∇			∇									∇				∇											∇		

PLANT SELECTION LIST Plant Material Suitability Matrix		Plant Type			Shape							Growth Rate			Flowering			Special Interest			Soil Conditions					Exposure			Tolerance			Functional Uses							
PERMANENT PARTY BARRACKS * Indicates poisonous **Indicates thorned		Deciduous	Evergreen	Native	Conical	Columnar	Round/Oval	Weeping	Upright	Spreading	Irregular	Fast	Moderate	Slow	Spring	Summer	Fall	Foliage	Fruit	Fall Color	Moist	Average	Dry	Acidic	Alkaline	Sun	Part Shade	Full Shade	Pest Resistant	Drought Resistant	Pollution Tolerant	Specimen	Street Tree	Massing	Screen/Windbreak	Parking Lot	Park/Lawn	Barrier	
Botanical Name	**Common Name**	**Plant Characteristics**																			**Plant Culture**											**Landscape Use**							**Notes**
LARGE TREES																																						
Acer saccharum	Sugar Maple	∇		∇			∇							∇						∇		∇		∇			∇	∇				∇	∇	∇	∇		∇		Specify ‘Legacy’
Celtis laevigata	Sugar Hackberry	∇		∇			∇						∇							∇	∇			∇	∇	∇			∇	∇	∇		∇	∇	∇	∇	∇		Specify ‘All Season’ or ‘Magnifica’
Fraxinus americana	White Ash	∇		∇			∇						∇							∇	∇					∇							∇	∇		∇	∇		Specify ‘Autumn Applause’ or ‘Autumn Purple’
Fraxinus pennsylvanica	Green Ash	∇		∇							∇	∇								∇	∇	∇	∇	∇		∇				∇	∇		∇	∇	∇	∇	∇		Specify ‘Summit’ or ‘Marshall Seedless’
Ginkgo biloba*	Ginkgo (male)	∇									∇			∇				∇		∇	∇	∇		∇	∇	∇			∇	∇	∇	∇		∇	∇		∇		
Liquidambar s. 'Rotundiloba'	Fruitless Sweetgum	∇		∇			∇					∇								∇	∇			∇		∇						∇		∇	∇		∇		
Quercus palustris *	Pin Oak	∇		∇	∇							∇								∇	∇			∇		∇							∇	∇					Develops iron chlorosis in high pH soils
Quercus phellos *	Willow Oak	∇		∇			∇						∇							∇	∇	∇				∇	∇		∇			∇	∇	∇	∇	∇	∇		
Quercus rubra *	Northern Red Oak	∇		∇			∇					∇								∇		∇		∇		∇			∇			∇	∇	∇	∇	∇	∇		Develops iron chlorosis in high pH soils
Picea glauca	White Spruce		∇		∇								∇					∇			∇	∇				∇	∇			∇	∇	∇		∇	∇		∇		
Pinus strobus	White Pine		∇	∇	∇							∇									∇	∇		∇		∇	∇						∇	∇		∇		Develops iron chlorosis in high pH soils
Taxodium distichum	Bald Cypress	∇		∇	∇								∇								∇	∇	∇	∇		∇				∇	∇		∇	∇		∇		
MEDIUM TREES																																						
Acer platanoides	Norway Maple	∇				∇							∇		∇					∇	∇	∇	∇	∇	∇	∇				∇			∇	∇		∇		Specify ‘Columnare' or 'Summershade'
Acer rubrum*	Red Maple	∇		∇			∇						∇		∇					∇	∇	∇		∇			∇				∇		∇	∇		∇		Specify ‘Red Sunset', 'October

PLANT SELECTION LIST Plant Material Suitability Matrix		Plant Type			Shape							Growth Rate			Flower-ing			Special Interest			Soil Conditions					Expos-ure			Toler-ance			Functional Uses							
PERMANENT PARTY BARRACKS * Indicates poisonous **Indicates thorned		Deciduous	Evergreen	Native	Conical	Columnar	Round/Oval	Weeping	Upright	Spreading	Irregular	Fast	Moderate	Slow	Spring	Summer	Fall	Foliage	Fruit	Fall Color	Moist	Average	Dry	Acidic	Alkaline	Sun	Part Shade	Full Shade	Pest Resistant	Drought Resistant	Pollution Tolerant	Specimen	Street Tree	Massing	Screen/Windbreak	Parking Lot	Park/Lawn	Barrier	
Botanical Name	**Common Name**	**Plant Characteristics**																			**Plant Culture**											**Landscape Use**							**Notes**
																																							Glory', or 'Armstrong'
Gleditsia triacanthos 'inermis' *	Thornless Honeylocust	∇		∇						∇		∇								∇	∇	∇				∇				∇	∇		∇	∇		∇	∇		Specify ‘Moraine' or 'Shademaster'
Koelreuteria paniculata	Goldenrain Tree	∇					∇						∇			∇			∇	∇		∇	∇		∇	∇			∇	∇	∇	∇	∇	∇	∇	∇			
Picea abies	Norway Spruce		∇		∇								∇									∇				∇	∇				∇			∇	∇		∇		
Pyrus calleryana 'Bradford'	Bradford Pear	∇					∇					∇			∇					∇		∇	∇			∇			∇	∇	∇			∇	∇	∇	∇		Also 'Capital', 'Redspire', or ‘Aristocrat’, Susceptible to wind damage
Tilia americana	Basswood	∇		∇			∇						∇			∇						∇				∇	∇							∇	∇		∇		Specify ‘Rosehill', 'Douglas' or 'Redmond'
Tilia cordata	Littleleaf Linden	∇					∇						∇		∇							∇				∇					∇		∇	∇	∇	∇		Specify ‘June Bride’ or ‘Greenspire’
SMALL TREES																																							
Cercis canadensis	Redbud	∇		∇						∇			∇		∇					∇		∇		∇	∇	∇	∇					∇		∇	∇		∇		‘Forest Pansy’ purple leaf form
Cornus florida	Flowering Dogwood	∇		∇						∇				∇	∇				∇	∇		∇				∇					∇					∇		Specify ‘Cherokee Princess' or 'Rubra'
Cornus kousa	Kousa Dogwood	∇					∇							∇	∇				∇	∇		∇		∇			∇		∇	∇		∇		∇		∇		Specify var. ‘chinensis’ or ‘Milky Way’
Crataegus crus-galli inermis	Thornless Cockspur Hawth.	∇		∇			∇							∇	∇				∇	∇		∇	∇	∇	∇	∇					∇	∇		∇	∇		∇		Red berries
Crataegus phaenopyrum**	Washington Hawthorn	∇		∇			∇							∇	∇				∇	∇		∇	∇	∇	∇	∇					∇	∇		∇	∇		∇	∇	Red berries, Thorns
Crataegus viridis 'Winter King'**	Winter King Hawthorn	∇		∇			∇							∇	∇				∇	∇		∇	∇	∇	∇	∇					∇	∇		∇	∇		∇		Red berries, Thorns
Ilex opaca*	American Holly		∇	∇	∇						∇			∇	∇			∇	∇			∇		∇		∇	∇				∇	∇		∇			∇		Requires 1 male and 2 females for fruit. Not wind tolerant, Avoid high pH soils

PLANT SELECTION LIST Plant Material Suitability Matrix		Plant Type			Shape							Growth Rate			Flower-ing			Special Interest			Soil Conditions					Expos-ure			Toler-ance			Functional Uses							
PERMANENT PARTY BARRACKS * Indicates poisonous **Indicates thorned		Deciduous	Evergreen	Native	Conical	Columnar	Round/Oval	Weeping	Upright	Spreading	Irregular	Fast	Moderate	Slow	Spring	Summer	Fall	Foliage	Fruit	Fall Color	Moist	Average	Dry	Acidic	Alkaline	Sun	Part Shade	Full Shade	Pest Resistant	Drought Resistant	Pollution Tolerant	Specimen	Street Tree	Massing	Screen/Windbreak	Parking Lot	Park/Lawn	Barrier	
Botanical Name	**Common Name**	**Plant Characteristics**																			**Plant Culture**											**Landscape Use**							**Notes**
SMALL TREES																																							
Magnolia x soulangiana	Saucer Magnolia	∇					∇						∇		∇						∇	∇		∇		∇					∇	∇					∇		Prefers soil pH between 5,0 to 6.5
Malus x 'Bob White'	Bob White Crabapple	∇					∇						∇		∇				∇			∇		∇		∇								∇	∇		∇		
Malus x 'Mary Potter'	Mary Potter Crabapple	∇								∇			∇		∇				∇			∇		∇		∇			∇					∇	∇		∇		
Malus x 'Prairiefire	Prairiefire Crabapple	∇									∇		∇		∇				∇			∇		∇		∇			∇					∇	∇		∇		
Malus x 'Red Jewel'	Red Jewel Crabapple	∇				∇							∇		∇				∇			∇		∇		∇								∇	∇		∇		
Malus x 'Donald Wyman'	Donald Wyman Crabapple	∇									∇		∇		∇				∇			∇		∇		∇			∇					∇	∇		∇		
Malus x 'Sugar Tyme'	Sugar Tyme Crabapple	∇				∇							∇		∇				∇			∇		∇		∇			∇					∇	∇		∇		
LARGE SHRUBS																																							
Euonymous alatus 'Compactus' *	Dwarf Burning Bush	∇								∇				∇						∇		∇	∇			∇	∇	∇	∇					∇	∇	∇	∇	∇	Favorite for deer
Viburnum x dentatum	Arrowwood Viburnum	∇		∇						∇			∇		∇				∇	∇		∇		∇		∇	∇							∇		∇			Makes a good hedge
Viburnum dilatatum	Linden Viburnum	∇							∇					∇	∇				∇	∇	∇	∇		∇			∇		∇			∇		∇	∇		∇		Specify ‘Asian Beauty’ or ‘Eric’
Viburnum plicatum var. toment.	Doublefile Viburnum	∇					∇						∇		∇				∇	∇		∇					∇		∇					∇			∇		Specify ‘Lanarth’, ‘Mariesii’, ‘Cascade’
Viburnum x rhytid. ' Willowwood'	Willowwood Viburnum	∇								∇			∇		∇		∇		∇			∇					∇	∇							∇	∇		∇		
MEDIUM SHRUBS																																							
Berberis mentorensis**	Mentor Barberry	∇					∇					∇			∇					∇		∇	∇			∇	∇		∇					∇	∇	∇	∇	∇	Good hedge plant
Berberis thunbergii atropurpurea**	Japanese Red Barberry	∇					∇						∇					∇	∇	∇		∇	∇			∇				∇	∇			∇	∇	∇	∇	∇	Specify ‘Crimson Pygmy’ or ‘Rose Glow’
Buxus microphylla var.	Korean Boxwood		∇				∇							∇	∇							∇				∇	∇							∇			∇		Needs sheltered site

PLANT SELECTION LIST
Plant Material Suitability Matrix

PERMANENT PARTY BARRACKS

* Indicates poisonous **Indicates thorned

Botanical Name	Common Name	Plant Type: Deciduous	Plant Type: Evergreen	Plant Type: Native	Shape: Conical	Shape: Columnar	Shape: Round/Oval	Shape: Weeping	Shape: Upright	Shape: Spreading	Shape: Irregular	Growth Rate: Fast	Growth Rate: Moderate	Growth Rate: Slow	Flowering: Spring	Flowering: Summer	Flowering: Fall	Special Interest: Foliage	Special Interest: Fruit	Special Interest: Fall Color	Soil Conditions: Moist	Soil Conditions: Average	Soil Conditions: Dry	Soil Conditions: Acidic	Soil Conditions: Alkaline	Exposure: Sun	Exposure: Part Shade	Exposure: Full Shade	Tolerance: Pest Resistant	Tolerance: Drought Resistant	Tolerance: Pollution Tolerant	Functional Uses: Specimen	Functional Uses: Street Tree	Functional Uses: Massing	Functional Uses: Screen/Windbreak	Functional Uses: Parking Lot	Functional Uses: Park/Lawn	Functional Uses: Barrier	Notes
koreana*																																							
Cotoneaster divaricata	Spreading Cotoneaster	∇								∇			∇		∇				∇	∇		∇	∇	∇	∇	∇	∇		∇					∇			∇		
Ilex glabra 'Compacta'*	Compact Inkberry Holly		∇	∇			∇							∇	∇				∇		∇					∇	∇	∇						∇	∇	∇	∇		Avoid high pH soils
Pinus mugo var. mugo	Mugo Pine		∇							∇				∇								∇			∇	∇	∇							∇	∇		∇		Tolerates calcareous soils
Taxus x media 'Densiformis' *	Densiformis Yew		∇							∇				∇								∇				∇	∇	∇						∇		∇	∇		
SMALL SHRUBS																																							
Cotoneaster apiculatus	Cranberry Cotoneaster	∇								∇				∇	∇				∇	∇		∇	∇	∇	∇	∇	∇			∇	∇			∇			∇		
Juniperus horizontalis spp.	Horizontal Juniper		∇							∇				∇				∇				∇	∇		∇	∇				∇	∇			∇		∇	∇		
Juniperus procumbens	Japgarden Juniper		∇							∇				∇				∇				∇	∇	∇	∇	∇				∇	∇			∇		∇	∇		Specify ‘Nana’ or ‘Greenmound’
Spirea x bumalda	Anthony Waterer Spirea	∇				∇						∇				∇				∇		∇	∇			∇								∇		∇	∇		Also ‘Goldflame’
Spirea japonica	Japanese Spirea	∇				∇						∇				∇				∇		∇	∇			∇								∇		∇	∇		‘Little Princess’, ‘Shirobana’,’Gold Mound’
GROUND COVERS																																							
Euonymus fortunei 'Coloratus' *	Purpleleaf Wintercreeper		∇							∇		∇						∇		∇		∇	∇	∇	∇	∇	∇	∇						∇		∇	∇		
Hedera helix x 'Baltic'*	Baltic Ivy		∇							∇		∇									∇	∇		∇	∇	∇	∇	∇						∇		∇	∇		Also ‘Bulgaria’
Vinca minor	Common Periwinkle		∇							∇			∇		∇						∇	∇					∇	∇						∇			∇		
GRASSES																																							
Festuca elatior 'Jaguar' *	Jaguar Turftype Tall Fescue	∇								∇			∇									∇				∇											∇		

Appendix J

Drawings

PDF Drawings are provided in this RFP.
Microstation or CAD Drawings, if available, will be provided to the winning Contractor

Civil

Permanent Party Barracks	Title Page
Vicinity Location and Site Maps	GI002
Project Location Map	

Architectural

Typical 1st Floor Plan	DI-1
Typical 2nd Floor Plan	DI-2
Typical Furniture Plan	DI-3

As-Built Data – Previous Phase

Overall Grading Plan	C-300
Beneficial Fill Grading Plan	C303

Topographic Plans

Site Survey	001
Site Survey	002
Site Survey	003
Site Survey	004
Site Survey	005
Site Survey	006
Site Survey	007
Site Survey	008
Site Survey	009

US Army Corps
of Engineers
Kansas City District
You Matter - We Care

PERMANENT PARTY BARRACKS

FORT LEONARD WOOD, MISSOURI

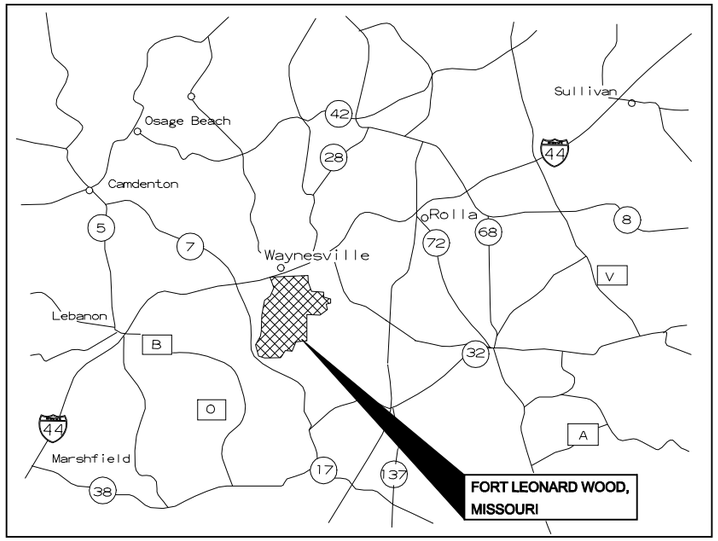
OCTOBER, 2010

% SUBMITTAL

PN 57194 FY2011

W912DQ-XX-X-XXXX

VICINITY MAP
SCALE: NOT TO SCALE



LOCATION MAP
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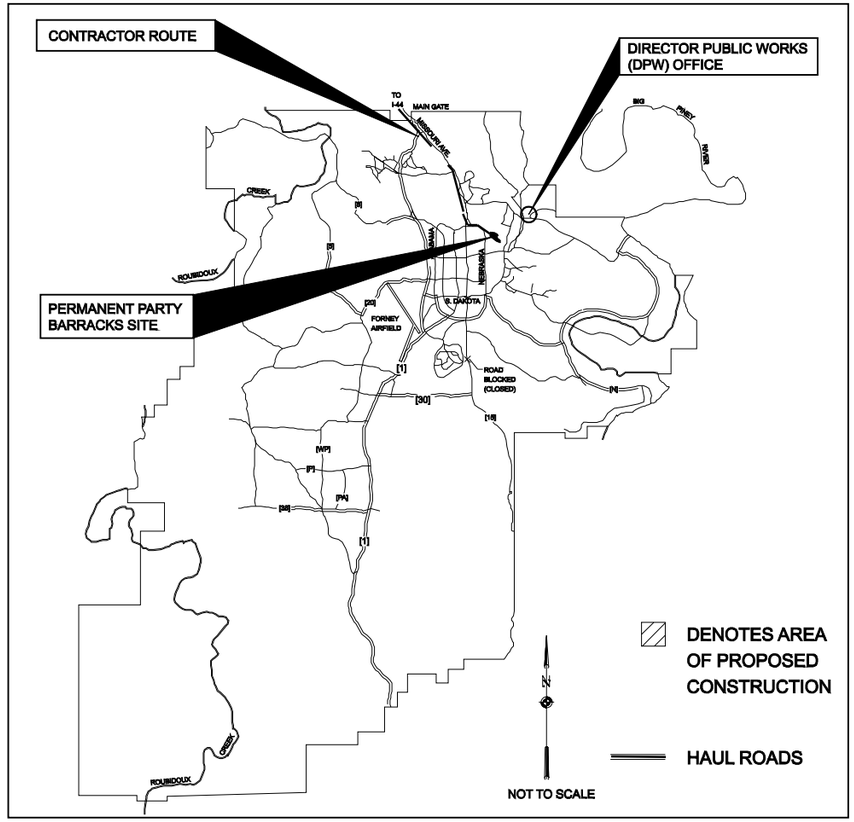


SITE MAP
SCALE: NOT TO SCALE

US Army Corps of Engineers
Kansas City District

SYM	DESCRIPTION	DATE	APPR

Date: OCTOBER, 2010
Drawing code: X
Plot scale:
CADD File Name:

Designed by: DESIGNER
Drawn by: R. CAUTHEN
Checked by: PEER
Submitted by: H. MUDSENBERGER

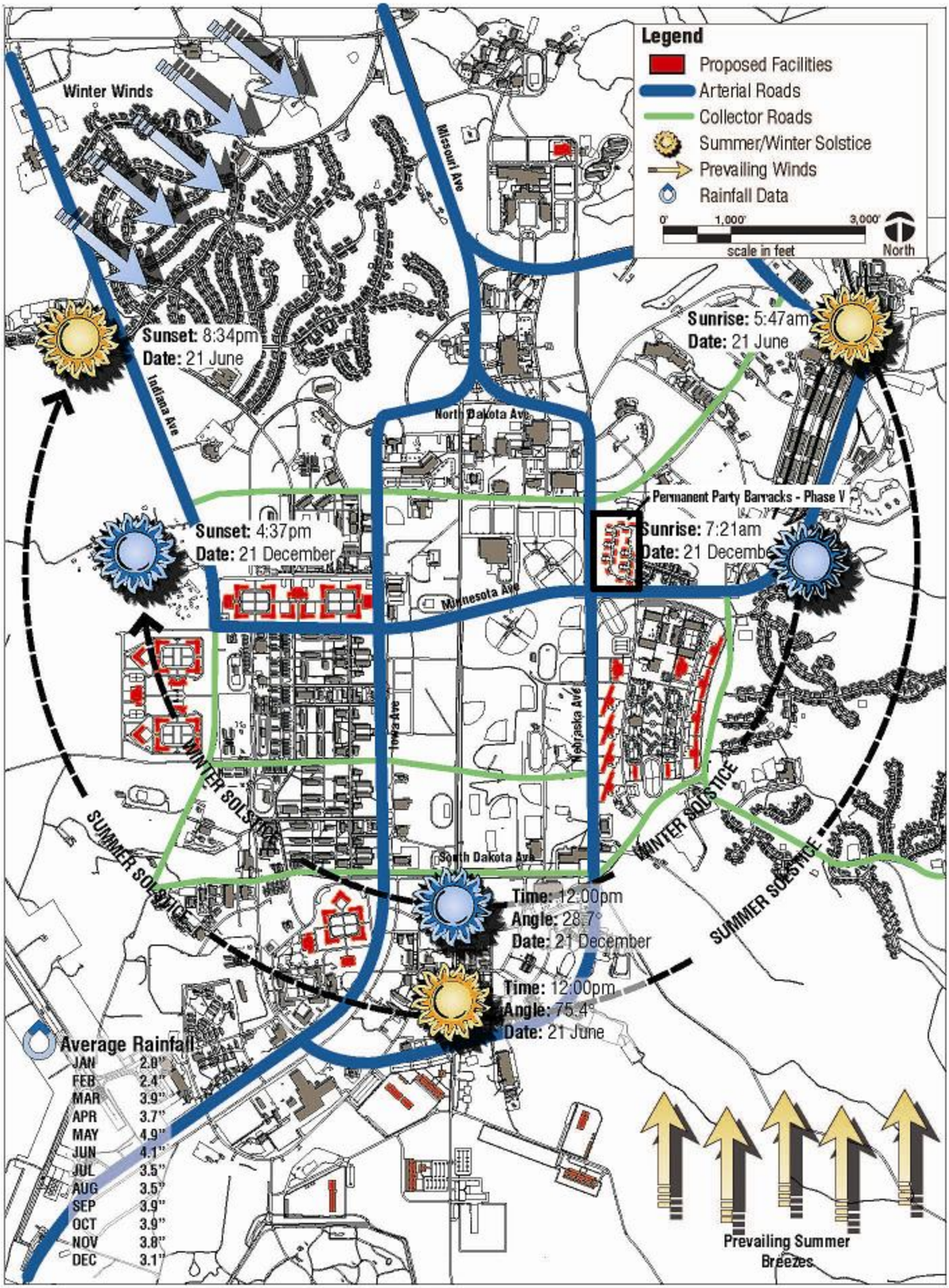
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
KANSAS CITY, MISSOURI

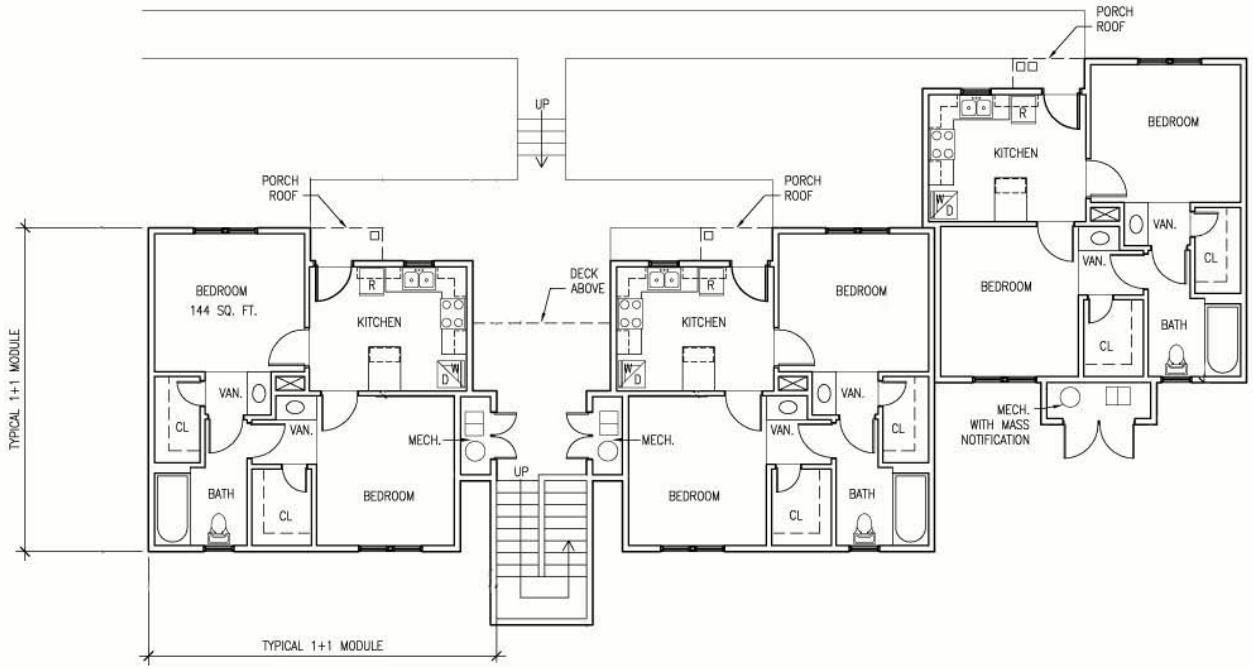
FORT LEONARD WOOD, MISSOURI
PERMANENT PARTY BARRACKS
PN 67184, FY2011

VICINITY, LOCATION, AND SITE MAPS

Sheet Reference Number:

GI002


Legend
Proposed Facilities
Arterial Roads
Collector Roads
Summer/Winter Solstice
Prevailing Winds
Rainfall Data
0'
1,000'
3,000'
scale in feet
North
Winter Winds
Missouri Ave
Indiana Ave
North Dakota Ave
Minnesota Ave
Iowa Ave
Nebraska Ave
South Dakota Ave
Sunset: 8:34pm
Date: 21 June
Sunrise: 5:47am
Date: 21 June
Sunset: 4:37pm
Date: 21 December
Sunrise: 7:21am
Date: 21 December
Permanent Party Barracks - Phase V
WINTER SOLSTICE
SUMMER SOLSTICE
WINTER SOLSTICE
SUMMER SOLSTICE
Time: 12:00pm
Angle: 28.7°
Date: 21 December
Time: 12:00pm
Angle: 75.4°
Date: 21 June
Average Rainfall:
JAN 2.8"
FEB 2.4"
MAR 3.9"
APR 3.7"
MAY 4.9"
JUN 4.1"
JUL 3.5"
AUG 3.5"
SEP 3.9"
OCT 3.9"
NOV 3.8"
DEC 3.1"
Prevailing Summer Breezes



EACH SOLDIER IS LIMITED TO 366 G.S.F. A TEN(10) SOLDIER BUILDING CANNOT EXCEED 3,660 G.S.F. ANY OUTSIDE SPACE (AREA WITHOUT ROOF, WALLS) MUST BE COUNTED @ ½ G.S.F./G.S.F.

THIS DESIGN INTENT DRAWING INDICATES THE APPROVED LAYOUT OF THE 1+1 MODULE

1/16" = 1'-0"

0' 4' 8' 16'

Sheet reference number: DI-1

PERMANENT PARTY BARRACKS, PHASE 1
NEW CONSTRUCTION
FORT LEONARD WOOD, MISSOURI

Typical 1st Floor Plan

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
KANSAS CITY, MISSOURI

GouldEvans

4041 Mill Street
Kansas City, Missouri 64111
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www.gouldevans.com

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Dwn by: / Ckd by:	Design file no. 0206-3005	
Reviewed by:	Drawing code: PREFINAL RFP SUBMITTAL	
Submitted by:	File name: Plot date: Plot scale:	

Symbol	Description	Date	Appr.

US Army Corps of Engineers
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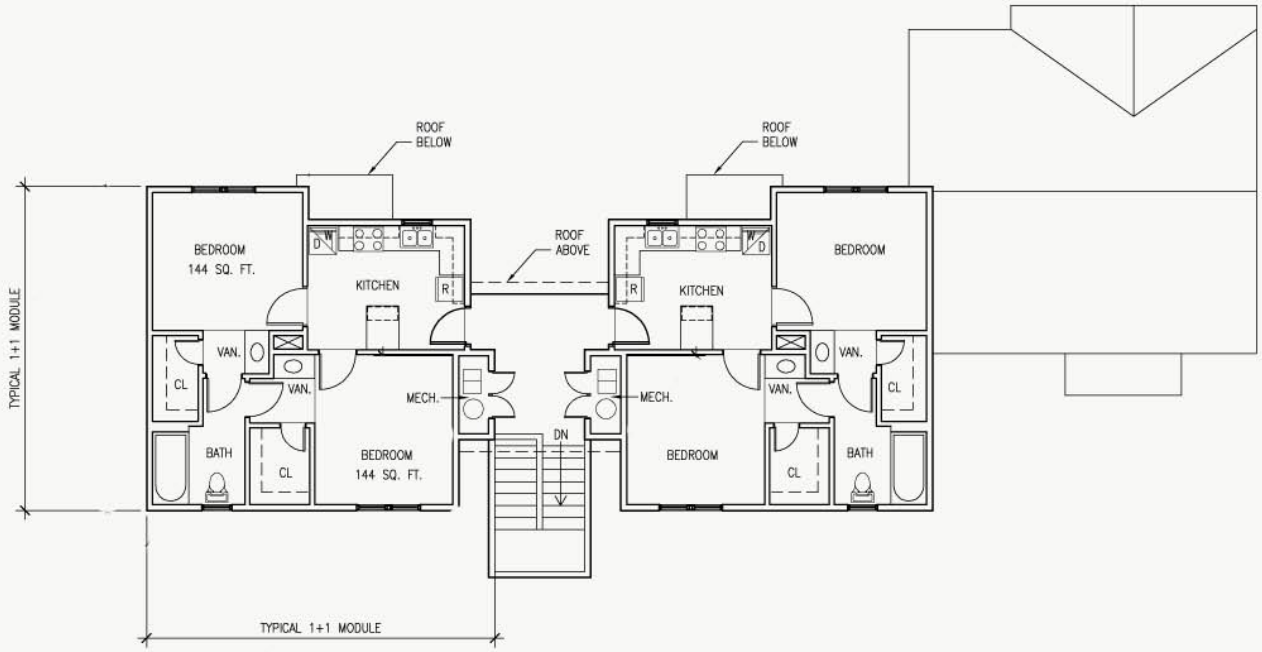

EACH SOLDIER IS LIMITED TO 366 G.S.F. A TEN(10) SOLDIER BUILDING CANNOT EXCEED 3,660 G.S.F. ANY OUTSIDE SPACE (AREA WITHOUT ROOF, WALLS) MUST BE COUNTED @ ½ G.S.F./G.S.F.

THIS DESIGN INTENT DRAWING INDICATES THE APPROVED LAYOUT OF THE 1+1 MODULE

1/16" = 1'-0"

0' 4' 8' 16'

Sheet reference number: DI-2

PERMANENT PARTY BARRACKS, PHASE 1
NEW CONSTRUCTION
FORT LEONARD WOOD, MISSOURI

Typical 2nd Floor Plan

U.S. ARMY ENGINEER DISTRICT
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KANSAS CITY, MISSOURI

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Reviewed by:	Drawing code: PREFINAL RFP SUBMITTAL	
Submitted by:	File name: Plot date: Plot scale:	

Symbol	Description	Date	Appr.

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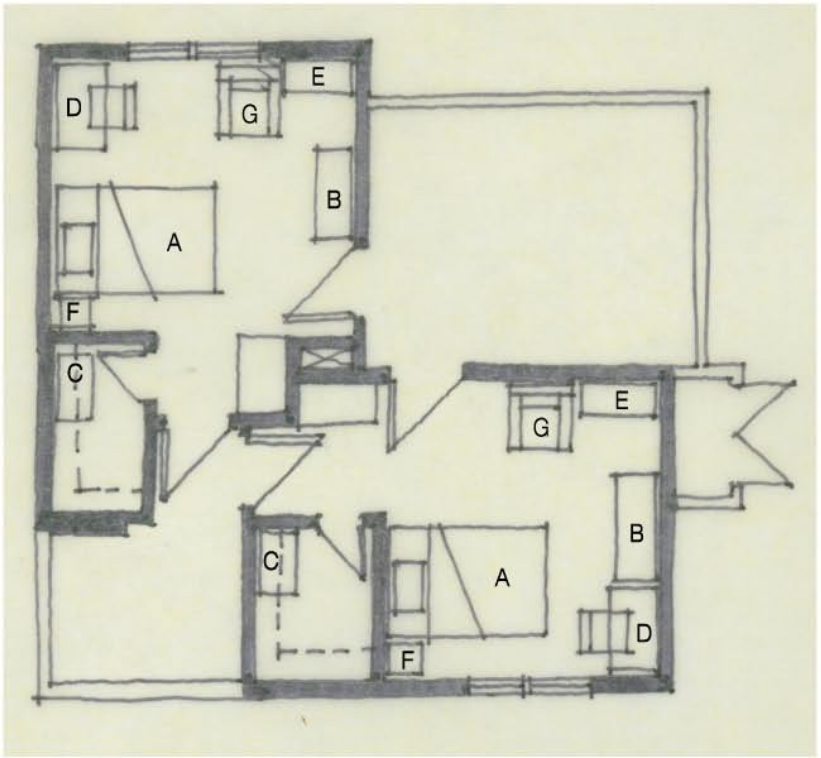
UEPH Furniture

A - Bed Frame & Headboard - 54" W x 80" L x 38" H
B - 6 Drawer Chest/Dresser - 48"W x 20" D x 30" H
C - 3 Drawer Chest - 30" W x 20" D x 30"H
D - Computer / Entertainment Center - 36"W x 24"D x 76"H
E - Bookcase - 36"W x 18"D x 30"H
F - Endtable - 20"W x 20"D x 22"H
G - Chair, Easy Chair - 32"W x 36"D x 35"H



THIS DESIGN INTENT DRAWING INDICATES THE TYPICAL FURNITURE TO BE ACCOMODATED IN EACH BEDROOM/CLOSET AREA.

1/8" = 1'-0"

0' 2' 6' 12'

Sheet reference number: DI-3

PERMANENT PARTY BARRACKS, PHASE 1
NEW CONSTRUCTION
FORT LEONARD WOOD, MISSOURI

Typical Furniture Plan

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
KANSAS CITY, MISSOURI

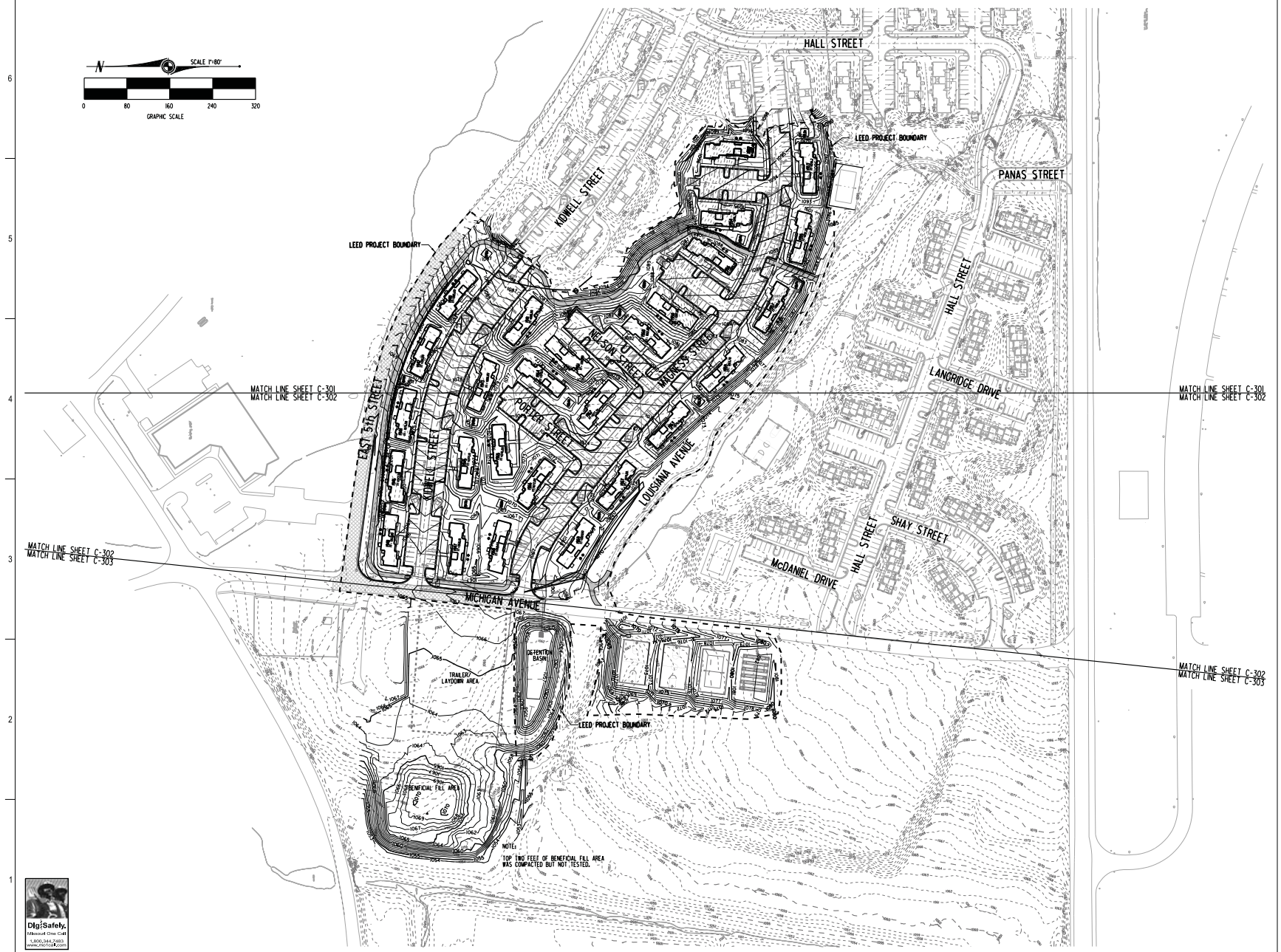
GouldEvans

4041 Mill Street
Kansas City, Missouri 64111
Voice 816.931.6655
Fax 816.931.9640
www.gouldevans.com

Designed by: GOULD EVANS	Date: 1/23/07	Rev.
Dwn by: / Ckd by:	Design file no. 0206-3005	
Reviewed by:	Drawing code: PREFINAL RFP SUBMITTAL	
Submitted by:	File name: Plot date: Plot scale:	

Symbol	Description	Date	Appr.

US Army Corps of Engineers
Kansas City District



US Army Corps of Engineers
Kansas City District

BLOOMSDALE
ENGINEERING

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
KANSAS CITY, MISSOURI

PERMANENT PARTY BARRACKS - PHASE 3
FORT LEONARD WOOD, MISSOURI
Project Number: 3808800, FY2008

OVERALL GRADING PLAN
C-300

Sheet reference number:
C-300
Sheet: of:

US Army Corps of Engineers
Kansas City District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
KANSAS CITY, MISSOURI

BLOOMSDALE
ENVIRONMENTAL

PERMANENT PARTY BARRACKS - PHASE 3
FORT LEONARD WOOD, MISSOURI
Project Number: 3808800, FY2008

BENEFICIAL FILL GRADING PLAN
C-303

Sheet reference number:
C-303
Sheet: of:

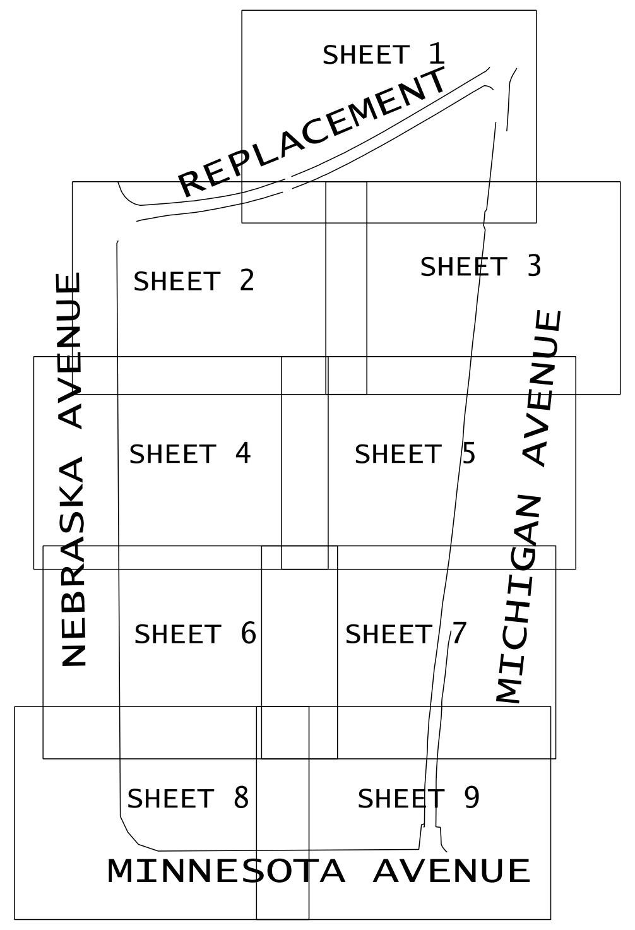
LEGEND

ⓢ	SANITARY SEWER MANHOLE
Ⓓ	STORM DRAIN MANHOLE
○	OVERHEAD UTILITY POLE
CB	CATCH BASIN CURB INLET
☐ C	COMMUNICATION LINE JUNCTION BOX
FLOW	DIRECTION OF PIPE FLOW
+ 1066.67	SPOT ELEVATION
OAK 24"	TREE WITH SPECIES AND SIZE
△	CONTROL POINT
→	GUY WIRE
∘	WOOD POST
	LIGHT POLE

EX. SEWER LINE
EX. WATER LINE
EX. STORM LINE
GUARDRAIL
EX. UG ELEC.
FENCE
TREELINE
EX. UG COMMUNICATION
EX. GAS LINE

CMP = CORRUGATED METAL PIPE
CI = CAST IRON PIPE
PVC = POLY VINYL CHLORIDE PIPE
RCP = REINFORCED CONCRETE PIPE

KEY MAP



HORIZONTAL DATUM

THE HORIZONTAL CONTROL DATUM FOR THIS SURVEY IS NAD83, MISSOURI CENTRAL ZONE (2402) STATE PLANE COORDINATE SYSTEM DERIVED FROM A VIRTUAL REFERENCE SYSTEM NETWORK.

VERTICAL DATUM

THE VERTICAL CONTROL DATUM FOR THIS SURVEY IS NAVD88, GEOID03

NOTES

THIS DRAWING WAS PREPARED BY WOOLPERT INC., BASED ON FIELD WORK PERFORMED IN SEPTEMBER OF 2010

THE UNITS ARE U.S. SURVEY FEET

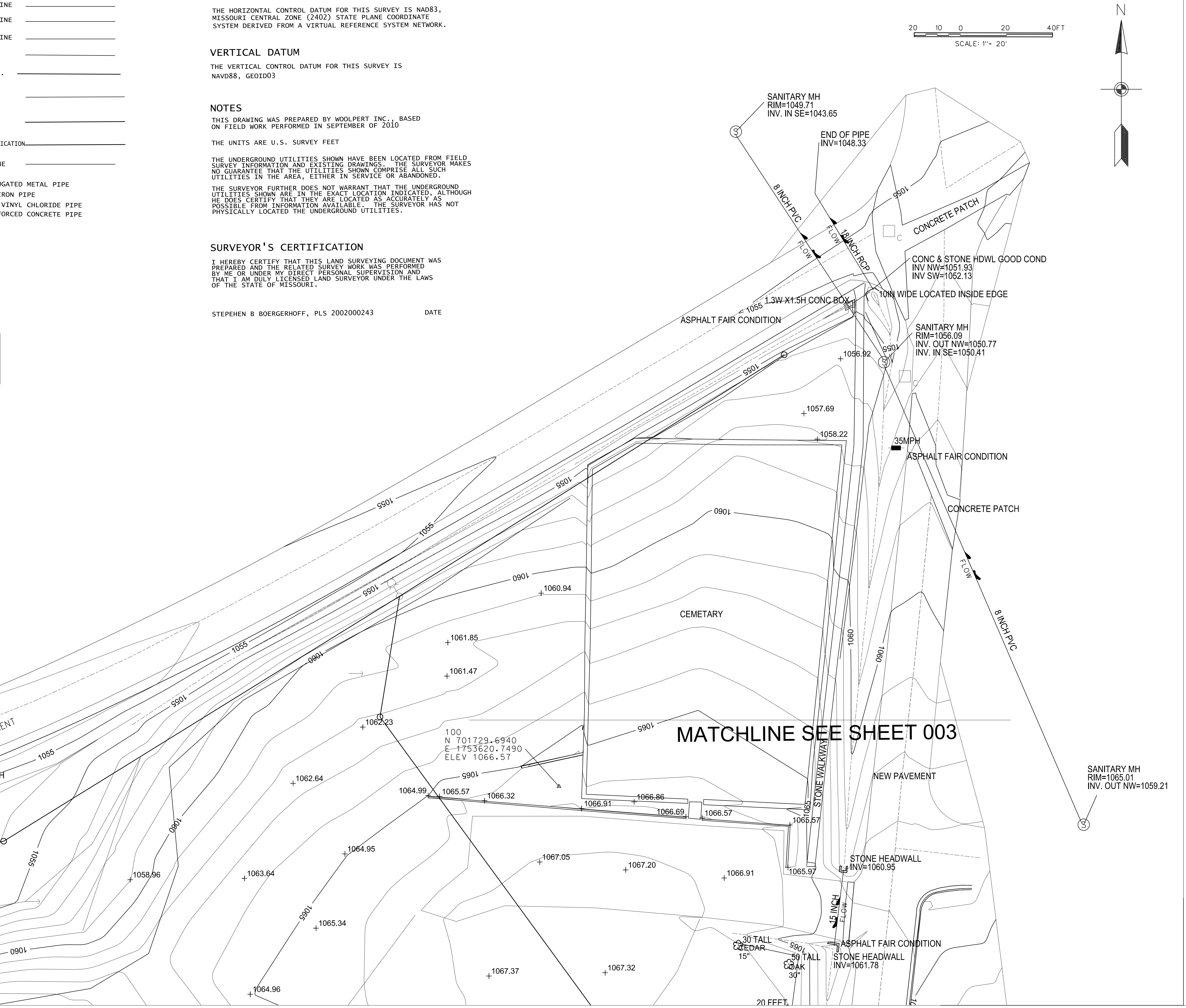
THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED.

THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED, ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

SURVEYOR'S CERTIFICATION

I HEREBY CERTIFY THAT THIS LAND SURVEYING DOCUMENT WAS PREPARED AND THE RELATED SURVEY WORK WAS PERFORMED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM DULY LICENSED LAND SURVEYOR UNDER THE LAWS OF THE STATE OF MISSOURI.

STEPEHEN B BOERGERHOFF, PLS 2002000243 DATE



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MARK	DATE	APPR.	DESCRIPTION

MARK	DESCRIPTION	DATE	APPR.

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KANSAS CITY DISTRICT
MISSOURI

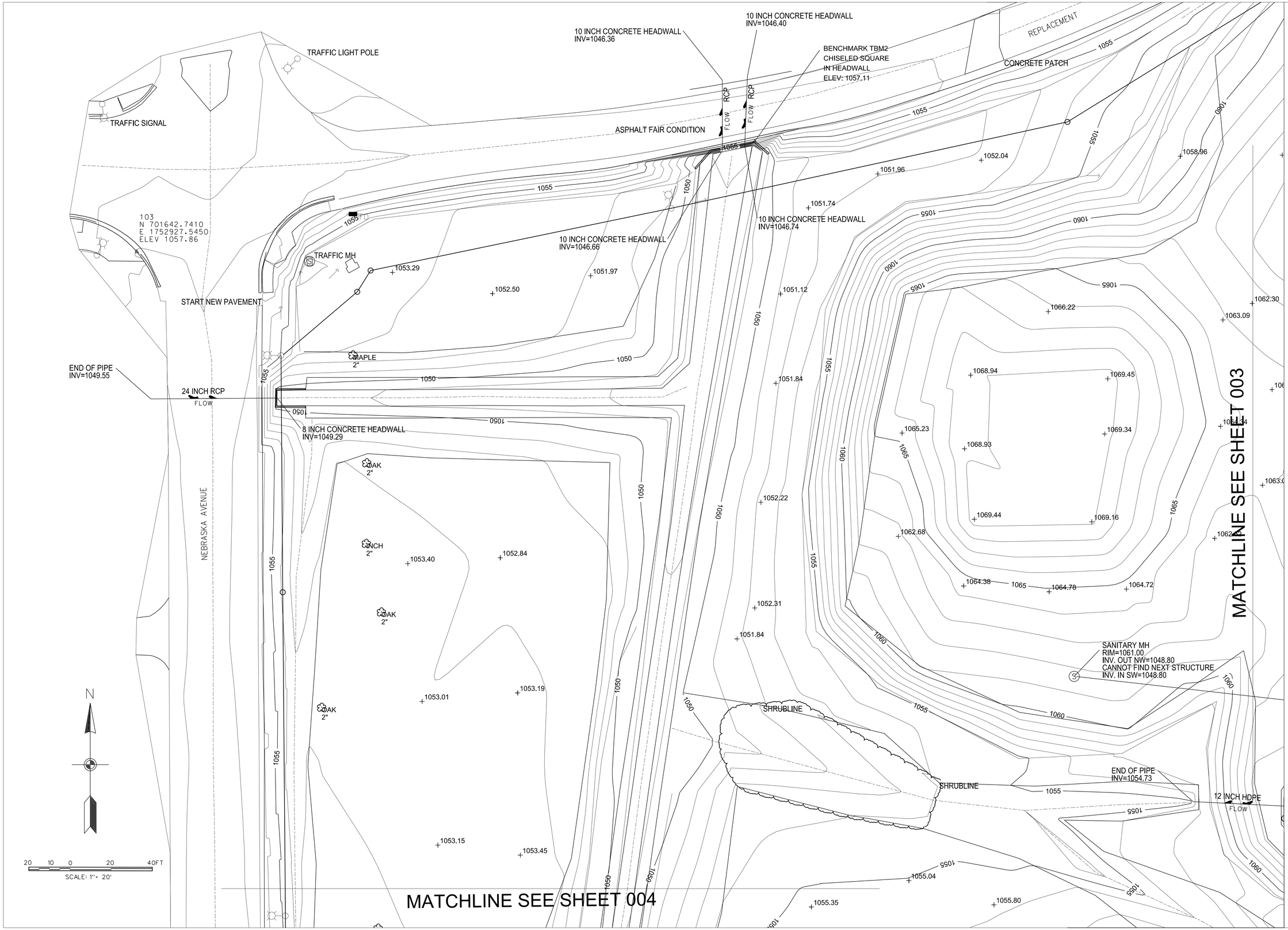
WOOLPERT, INC.
343 FOUNTAINS PKWY, STE 100
FAIRVIEW HEIGHTS, IL 62208

DESIGNED BY:		DATE: 2010/09/20	
DWN BY: ADW	CKD BY: CRR	SOLICITATION NO.: -	
SUBMITTED BY: STEVE BOERGERHOFF, PLS		CONTRACT NO.: W912DQ-09-D-1003	
PLOT SCALE: 1" = 20'	PLOT DATE: 09/20/2010	FILE NUMBER: -	
SIZE: 24X36	FILE NAME: W912DQ-09-1003 SHEET 1.dgn		

SITE SURVEY
PERMANENT PARTY BARRACKS, PHASE V
FORT LEONARD WOOD, MISSOURI

SHEET
IDENTIFICATION
001

auto_time



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DESIGNED BY:
DWN BY: ADW
CKD BY: CRR
SURVEYED BY: STEVE BERGERHOFF, PLS
PLOT SCALE: 1" = 20'
PLOT DATE: 09/20/2010
SIZE: 24X36
DATE: 2010/09/20
SOLICITATION NO.: -
CONTRACT NO.: W912DQ-09-D-3003
FILE NUMBER: -
FILE NAME: W912DQ-09-1003 SHEET 1.dgn

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FAIRVIEW HEIGHTS, IL 62208

SITE SURVEY
PERMANENT PARTY BARRACKS, PHASE V
FORT LEONARD WOOD, MISSOURI

SHEET IDENTIFICATION
002

auto_time

MATCHLINE SEE SHEET 001

MATCHLINE SEE SHEET 002

MATCHLINE SEE SHEET 005

100
N 701729.6940
E 1753620.7490
ELEV 1066.57

SCALE: 1"= 20'

SANITARY MH
RIM=1065.01
INV. OUT NW=1059.21

NEW PAVEMENT

STONE WALKWAY

STONE HEADWALL
INV=1060.95

15 INCH FLOW

ASPHALT FAIR CONDITION

STONE HEADWALL
INV=1061.78

1067.78
FINISH FLOOR AT DOOR

SANITARY MH
RIM=1065.98
INV. OUT S=1056.53

CURB INLET

20 TALL CEDAR 10"

1068.04
FINISH FLOOR AT DOOR

8 INCH PVC

STORM MH
RIM=1067.93
INV OUT S=1060.01

FLOW

SANITARY MH
RIM=1067.52
INV. OUT W=1055.60
INV. IN N=1055.72

24 INCH PVC

STORM MH
RIM=1067.55
INV OUT W=1058.64
INV IN N=1058.44

42 INCH CMP

END OF PIPE
INV=1057.20

END OF PIPE
INV=1060.56

TARY MH
:1061.00
OUT NW=1048.80
NOT FIND NEXT STRUCTURE
IN SW=1048.80

8 INCH PVC

STORM MH
RIM=1062.07
INV OUT W=1062.04
INV IN E=1059.12

ND OF PIPE
V=1054.73

12 INCH HDPE

END OF PIPE
INV=1058.78

GRATED

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DESIGNED BY:

DWN BY: ADW
CKD BY: CWR
SUBMITTED BY: STEVE BAGERHOFF, PLS

DATE: 20100920
SOLICITATION NO.: -
CONTRACT NO.: W912DQ-04-D-1003
FILE NUMBER: -

PLOT SCALE: 1" = 20'
PLOT DATE: 09/20/2010
SIZE: 24X36
FILE NAME: W912DQ-08-1003 SHEET 1.dgn

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SITE SURVEY
PERMANENT PARTY BARRACKS, PHASE V
FORT LEONARD WOOD, MISSOURI

SHEET IDENTIFICATION
003

20 10 0 20 40FT
SCALE: 1"= 20'

N

MATCHLINE SEE SHEET 002

MATCHLINE SEE SHEET 005

MATCHLINE SEE SHEET 006

1053.45
1054.17
1054.98
1055.03
1055.37
1055.95
1056.00
1055.86
1055.04
1055.35
1055.80
1056.39
1056.48
1056.54
1056.70
1056.62
1056.88
1057.60
1058.47
1057.35
1058.16
1057.04
1059.10
1056.94
1058.46
1063.51
1061.99
1058.47
1062.33
1058.11
1062.01
1067.89
1058.55
1059.28
1061.68
1068.51
1059.78
1061.68
1070.47
1059.48
1060.69
1074.53
1059.54
1061.33
1071.23
1077.51
1071.48
1077.84

SANITARY MH
RIM=1058.82
INV. OUT N=1050.36
CANNOT FIND NEXT STRUCTURE
INV. IN S=1050.42

MAPLE 2"
OAK 2"
ASH 2"
MAPLE 2"
ASH 2"
ASH 2"
OAK 2"
LINDEN 2"
ASH 2"
OAK 24"
MAPLE 2"

END OF PIPE
30 INCH CMP
INV=1052.02

END OF PIPE
24 INCH RCP
INV=1053.20

FLOW
FLOW

20 INCH PVC

1050
1055
1060
1065
1070
1075
1080

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MARK	DESCRIPTION	DATE	APPR. MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY:
DWN BY: ADW
CKD BY: CRR
REVIEWED BY: STEVE BUSSERHOFF, PLS
PLOT SCALE: 1" = 20'
SIZE: 24X36
PLOT DATE: 09/20/2010
FILE NAME: W912DQ-08-11003 SHEET 1.dgn
DATE: 2010/09/20
SOLICITATION NO.: -
CONTRACT NO.: W912DQ-08-D-1003
FILE NUMBER: -

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SITE SURVEY
PERMANENT PARTY BARRACKS, PHASE V
FORT LEONARD WOOD, MISSOURI

SHEET IDENTIFICATION
004

INV=1057.20

42 INCH CMP

FLOW

STORM MH
RIM=1067.55
INV OUT W=1058.64
INV IN N=1058.44

END OF PIPE
INV=1060.56

MATCHLINE SEE SHEET 005

24 INCH RCP

FLOW

END OF PIPE
INV=1064.23

END NEW PAVEMENT

1066.81

1068.40

ASPHALT GOOD CONDITION

10 INCH CONCRETE HEADWALL
INV=1062.65

SHRUBLINE

END OF PIPE
INV=1064.14

OUTFLOW 42 INCH RCP

END OF PIPE
INV=1064.97

12 INCH HDPE

FLOW

END OF PIPE
INV=1068.04

ASPHALT W/8IN CONC EDGE

BASKETBALL COURT

BASKETBALL COURT ASPHALT W/8IN CONC EDGE

BASKETBALL COURT

1075.41

MICHIGAN AVENUE

BEACH VOLLEYBALL COURT

HORSESHOE PITS

MATCHLINE SEE SHEET 007

MATCHLINE SEE SHEET 005

1055.80
1057.35
1058.16
1059.94
1057.04
1064.05
1059.00
1064.20
1063.51
1064.55
1058.46
1061.99
1063.51
1062.33
1067.89
1068.45
1068.35
1067.89
1068.51
1070.34
1070.31
1070.87
1070.47
1073.42
1074.75
1073.33
1074.53
1075.95
1076.21
1076.05
1078.21
1078.22
1077.51
1071.23
1079.10
1078.44
1077.84

20 10 0 20 40FT

SCALE: 1"= 20'

N

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MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY:
DWN BY: ADW
CKD BY: DRR
SUBMITTED: A.D. SIEVE BURGERHOFF, PLS
PLOT SCALE: 1" = 20'
PLOT DATE: 09/20/2010
SIZE: 24X36
DATE: 2010/09/20
SOLICITATION NO.: -
CONTRACT NO.: W912DQ-09-D-3003
TASK ORDER: -
FILE NUMBER: -
FILE NAME: W912DQ-09-1003 SHEET 1.dgn

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SITE SURVEY
PERMANENT PARTY BARRACKS, PHASE V
FORT LEONARD WOOD, MISSOURI

SHEET IDENTIFICATION
005

auto_time

MATCHLINE SEE SHEET 004

MATCHLINE SEE SHEET 007

MATCHLINE SEE SHEET 008

1055.86
1056.00
1056.45
1059.54
1060.31
1060.34
1060.86
1059.55
1060.12
1059.23
1060.48
1059.50
1060.39
1059.25
1060.30
1059.44
1060.50
1057.24
1061.33
1061.32
1062.47
1061.98
1062.52
1071.23
1071.48
1073.32
1072.23
1074.71
1073.79
1073.50
1067.04
1066.03
1068.30
1072.34
1077.84
1078.27
1079.39
1079.76
1081.45
1081.87
1081.84
1075.80
1075.19

SANITARY MH
RIM=1059.38
INV. OUT N=1050.42
INV. IN S=1050.47

SANITARY MH
RIM=1059.87
INV. OUT N=1051.74
INV. IN S=1051.78

20 INCH PVC
FLOW

CONCRETE PAVED DITCH

ASH 2"
OAK 2"
MAPLE 2"
35 MPH
20 TALL ASH 6"
SHRUBLINE
50 TALL ELM 30"

20 10 0 20 40FT
SCALE: 1"= 20'

N

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MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY:
DWN BY: ADW
CKD BY: CRR
SUBMITTED BY: STEVE BISGARD
PLOT SCALE: 1" = 20'
SIZE: 24X36
PLOT DATE: 09/20/2010
FILE NAME: W912DQ-08-11003 SHEET 1.dgn
DATE: 2010/09/20
SOLICITATION NO.: -
CONTRACT NO.: W912DQ-08-D-1003
FILE NUMBER: -

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SITE SURVEY
PERMANENT PARTY BARRACKS, PHASE V
FORT LEONARD WOOD, MISSOURI

SHEET IDENTIFICATION
006

HORSESHOE PITS

MATCHLINE SEE SHEET 005

MATCHLINE SEE SHEET 006

MATCHLINE SEE SHEET 009

SCALE: 1" = 20'

GOOD CONDITION

FAIR CONDITION

SHRUBLINE

50 TALL ELM 30"

10" ELM

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MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: ——
DWN BY: ADW
CKD BY: DRR
SUBMITTED BY: STEVE BISGERHOFF, PLS
PLOT SCALE: 1" = 20'
SIZE: 24X36
DATE: 2010/09/20
SOLICITATION NO.: -
CONTRACT NO.: W912DQ-09-D-3003
FILE NUMBER: -
PLOT DATE: 09/20/2010
FILE NAME: W912DQ-08-11003 SHEET 1.dgn

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FAIRVIEW HEIGHTS, IL 62208

SITE SURVEY
PERMANENT PARTY BARRACKS, PHASE V
FORT LEONARD WOOD, MISSOURI

SHEET IDENTIFICATION
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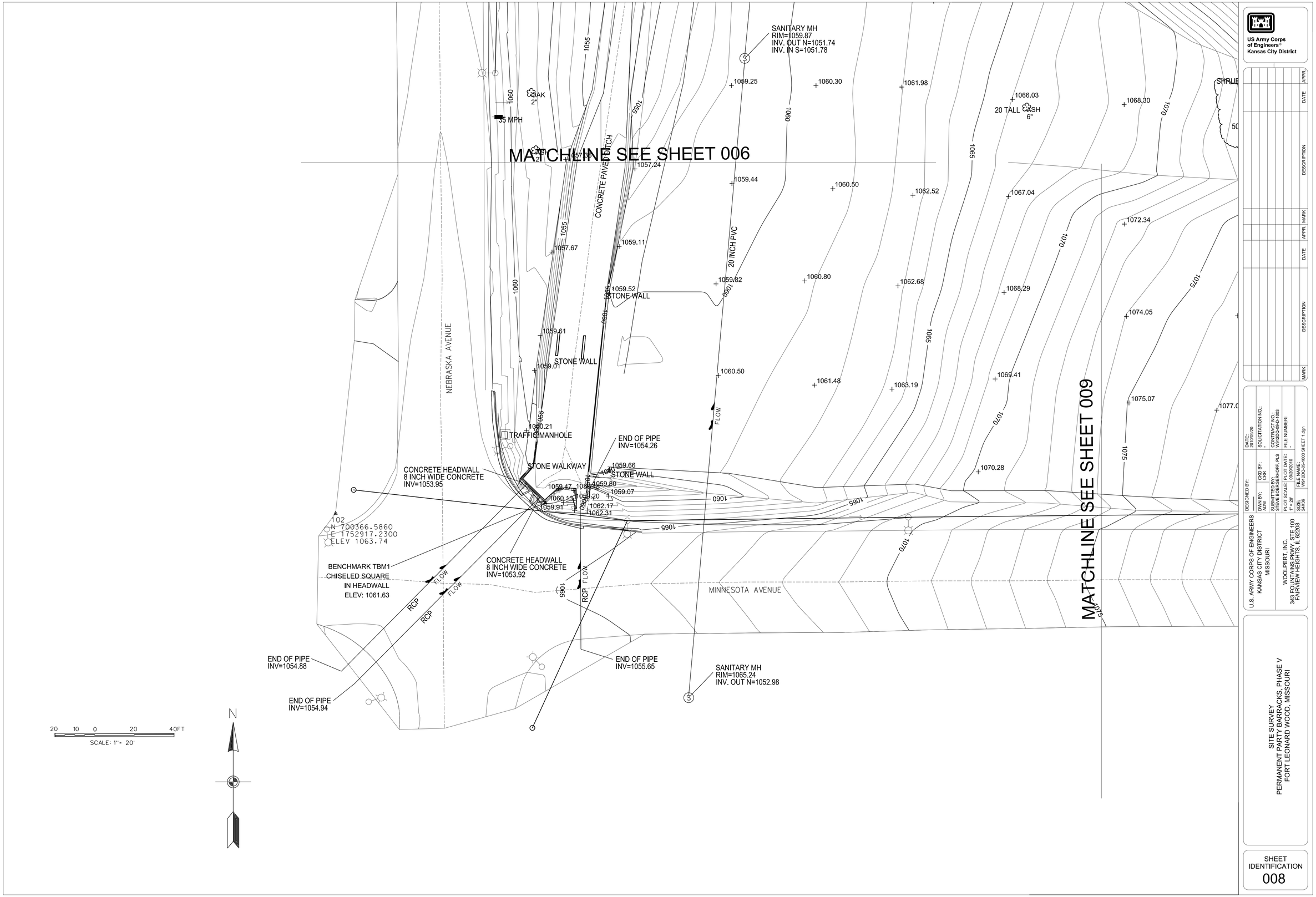

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MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY:
DWN BY: ADW
CKD BY: CRR
SURVEYED BY: STEVE BERGERHOF, PLS
PLOT SCALE: 1" = 20'
PLOT DATE: 09/20/2010
SIZE: 24X36
DATE: 2010/09/20
SOLICITATION NO.: -
CONTRACT NO.: W912DQ-09-D-3003
TASK ORDER NO.: -
FILE NUMBER: -
FILE NAME: W912DQ-09-D-3003 SHEET 1.dgn

U.S. ARMY CORPS OF ENGINEERS
KANSAS CITY DISTRICT
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WOOLPERT, INC.
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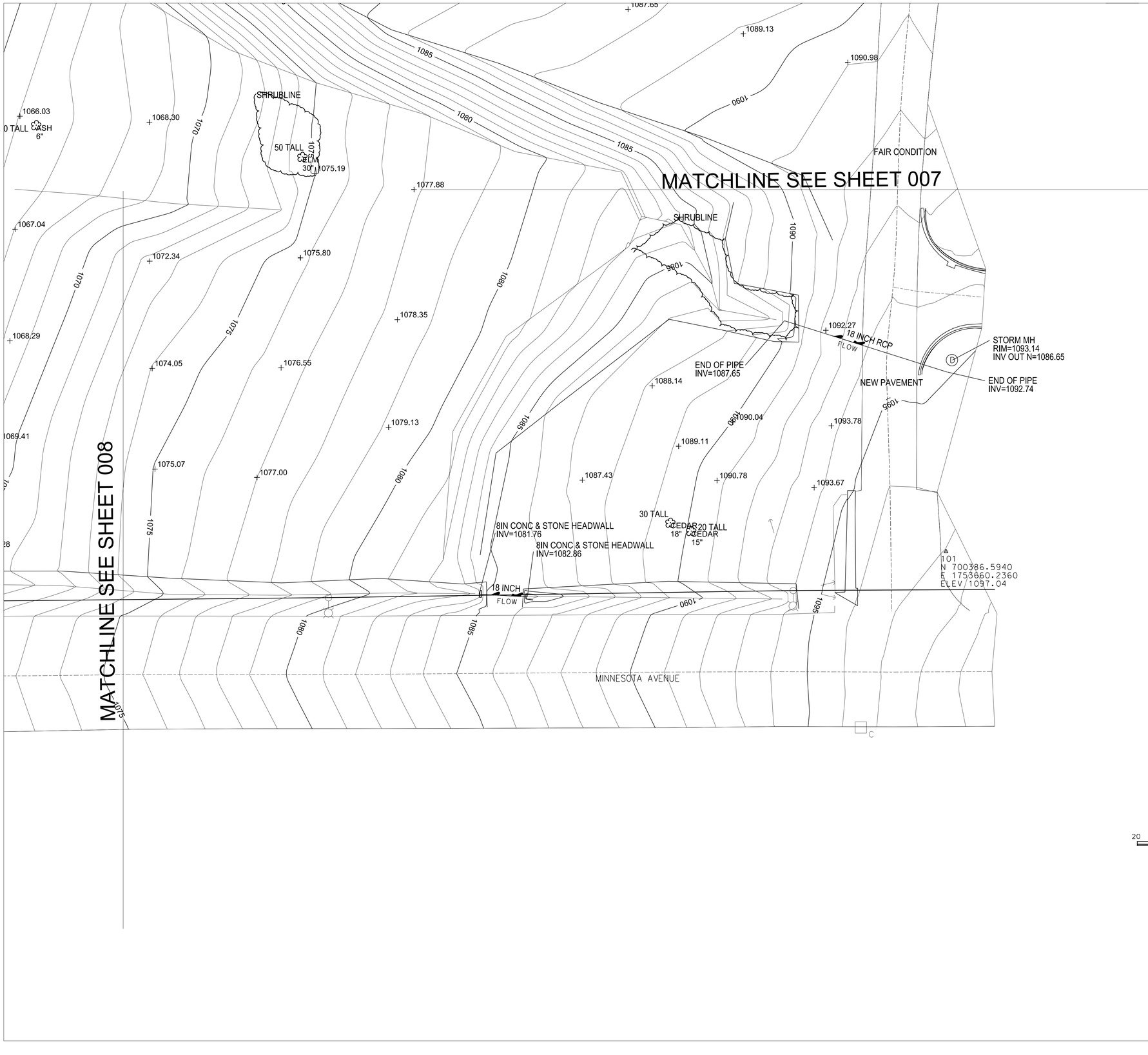
SITE SURVEY
PERMANENT PARTY BARRACKS, PHASE V
FORT LEONARD WOOD, MISSOURI

SHEET IDENTIFICATION
008

auto_time



20 10 0 20 40FT
SCALE: 1"= 20'

N

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MARK	DESCRIPTION	DATE	APPR. MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: -
DWN BY: ADW
CKD BY: DRR
SUBMITTED BY: STEVE BIGERHOFF, PLS
PLOT SCALE: 1" = 20'
PLOT DATE: 09/20/2010
SIZE: 24X36
DATE: 20100920
SOLICITATION NO.: -
CONTRACT NO.: W912DQ-09-D-1003
FILE NUMBER: -
FILE NAME: W912DQ-09-D-1003 SHEET 1.dgn

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SITE SURVEY
PERMANENT PARTY BARRACKS, PHASE V
FORT LEONARD WOOD, MISSOURI

SHEET IDENTIFICATION
009

auto_time

APPENDIX K
Utility Cost Information

The following utility rates for this installation are provided for the purpose of performing life cycle cost calculations in response to this solicitation and for design development in accordance with Section 01 33 16 Design After Award:

Utility "A" Rate		
Electric	0.0574	per kwh
LP Gas	1.8405	per gal
Water	0.9618	per Kgal
Sewer	1.1516	per Kgal
Trash	4.1929	per CuYd
Fuel Oil	2.8688	per gal
Natural Gas	12.4418	per mmbtu (Dth)

Appendix L

LEED Project Credit Guidance

APPENDIX L

LEED Project Credit Guidance (DEC 10)

This spreadsheet indicates Army required credits, Army preferred credits, project-specific ranking of individual point preferences, assumptions guidance for individual credits, and references to related language in the RFP for individual credits.

LEED 2009 Credit Paragraph	LEED Project Credit Guidance	**Army Guidance:** Required - Preferred - Avoid	**Project Preference Ranking**: (1=most preferred, blank=no preference, X=preference not applicable to this credit, Rqd=required)	
PAR	**FEATURE**			**REMARKS**
SUSTAINABLE SITES				
SSPR1	Construction Activity Pollution Prevention (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
SS1	Site Selection		1	See paragraph LEED CREDITS COORDINATION.

SS2	Development Density & Community Connectivity - OPTION 1 DENSITY			See paragraph LEED CREDITS COORDINATION.
	Development Density & Community Connectivity - OPTION 2 CONNECTIVITY		1	See paragraph LEED CREDITS COORDINATION.
SS3	Brownfield Redevelopment			See paragraph LEED CREDITS COORDINATION.
SS4.1	Alternative Transportation: Public Transportation Access		1	See paragraph LEED CREDITS COORDINATION.
SS4.2	Alternative Transportation: Bicycle Storage & Changing Rooms	Pref	1	Assume that non-transient building occupants are NOT housed on Post unless indicated otherwise.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 1			Requires provision of vehicles, which cannot be purchased with construction funds. Assume Government will not provide vehicles unless indicated otherwise. Assume that 50% of GOV fleet is NOT alternative fuel vehicles unless indicated otherwise.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 2	Pref		
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 3			Requires provision of vehicle refueling stations. Installation must support type of fuel and commit to maintaining/supporting refueling stations.
SS4.4	Alternative Transportation: Parking Capacity	Pref	1	

SS5.1	Site Development: Protect or Restore Habitat	Pref	1	
SS5.2	Site Development: Maximize Open Space	Pref	1	Assume AGMBC option for aggregated open space at another location on the installation is not available to the project unless indicated otherwise.
SS6.1	Stormwater Design: Quantity Control	Pref	1	See paragraph STORMWATER MANAGEMENT.
SS6.2	Stormwater Design: Quality Control	Pref	1	See paragraph STORMWATER MANAGEMENT.
SS7.1	Heat Island Effect: Non-Roof			
SS7.2	Heat Island Effect: Roof	Pref	1	Coordinate with nearby airfield requirements, which may preclude this credit.
SS8	Light Pollution Reduction	Pref		
WATER EFFICIENCY				
WEPR1	Water Use Reduction (Version 3 only)	Rqd	Rqd	All LEED prerequisites are required to be met.
WE1.1	Water Efficient Landscaping: Reduce by 50%	Pref		See paragraph IRRIGATION. Project must include landscaping to be eligible for this credit.
WE1.2	Water Efficient Landscaping: No Potable Water Use or No Irrigation	Pref	1	Project must include landscaping to be eligible for this credit.
WE2	Innovative Wastewater Technologies - OPTION 1			
WE2	Innovative Wastewater Technologies - OPTION 2			
WE3	Water Use Reduction	Pref	1	See paragraph BUILDING WATER USE REDUCTION.

ENERGY AND ATMOSPHERE				
EAPR1	Fundamental Commissioning of the Building Energy Systems (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EAPR2	Minimum Energy Performance (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EAPR3	Fundamental Refrigerant Management (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EA1	Optimize Energy Performance	Rqd	1	Earning of LEED EA1 points as indicated in paragraph ENERGY CONSERVATION, as a minimum, is required.
EA2.1	On-Site Renewable Energy	Pref		See paragraph ENERGY CONSERVATION.
EA3	Enhanced Commissioning	Rqd	Rqd	See paragraph COMMISSIONING. The Commissioning Authority may be provided through the Design-Build Contractor only if in accordance with USGBC Credit Interpretation Ruling (CIR) dated 9/15/06. Commissioning Authority activities begin during design phase and continue well beyond beneficial occupancy. Assume Government will not provide CxA post-occupancy activities unless indicated otherwise.
EA4	Enhanced Refrigerant Management			
EA5	Measurement & Verification			Assume Government will not provide post-occupancy activities unless indicated otherwise.
EA6	Green Power			See paragraph LEED CREDITS COORDINATION.

MATERIALS AND RESOURCES				
MRPR1	Storage & Collection of Recyclables (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met. Coordinate with Installation during design development on collection service and receptacles.
MR1	Building Reuse			
MR2.1	Construction Waste Management: Divert 50% From Disposal	Pref	1	See paragraph CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT.
MR2.2	Construction Waste Management: Divert 75% From Disposal	Pref		
MR3	Materials Reuse			
MR4.1	Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	Pref		See paragraph RECYCLED CONTENT.
MR4.2	Recycled Content: 20% (post-consumer + 1/2 pre-consumer)	Pref		
MR5.1	Regional Materials:10% Extracted, Processed & Manufactured Regionally			
MR5.2	Regional Materials:20% Extracted, Processed & Manufactured Regionally			

MR6	Rapidly Renewable Materials	Pref		See paragraph BIOBASED AND ENVIRONMENTALLY PREFERABLE MATERIALS and paragraph FEDERAL BIOBASED PRODUCTS PREFERRED PROCUREMENT PROGRAM.
MR7	Certified Wood	Pref		See paragraph BIOBASED AND ENVIRONMENTALLY PREFERABLE MATERIALS.
INDOOR ENVIRONMENTAL QUALITY				
EQPR1	Minimum IAQ Performance (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EQPR2	Environmental Tobacco Smoke (ETS) Control (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met. Assume all buildings are smoke free unless indicated otherwise (family housing, barracks and other lodging are facility types where smoking may be permitted in some cases). Except where indicated otherwise, provide an outdoor designated smoking area (with signage but no structure) which will be at least 50 feet from common points of ingress/egress, building air intakes and operable windows. Designated smoking area will not be located in an area that is commonly used by nonsmokers.
EQ1	Outdoor Air Delivery Monitoring			
EQ2	Increased Ventilation			
EQ3.1	Construction IAQ Management Plan: During Construction	Pref	1	See paragraph CONSTRUCTION IAQ MANAGEMENT.
EQ3.2	Construction IAQ Management Plan: Before Occupancy	Pref	1	See paragraph CONSTRUCTION IAQ MANAGEMENT.

EQ4.1	Low Emitting Materials: Adhesives & Sealants	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ4.2	Low Emitting Materials: Paints & Coatings	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ4.3	Low Emitting Materials: Carpet/Flooring Systems	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ4.4	Low Emitting Materials: Composite Wood & Agrifiber Products	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ5	Indoor Chemical & Pollutant Source Control	Pref		System requiring weekly cleaning to earn this credit is not a permitted option unless indicated otherwise.
EQ6.1	Controllability of Systems: Lighting			
EQ6.2	Controllability of Systems: Thermal Comfort			
EQ7.1	Thermal Comfort: Design	Rqd		See paragraph HEATING, VENTILATING AND AIR CONDITIONING.
EQ7.2	Thermal Comfort: Verification			Project must earn credit EQ7.1 to be eligible for this credit. Assume Government will not provide post-occupancy activities unless indicated otherwise.
EQ8.1	Daylight & Views: Daylight 75% of Spaces	Pref		See paragraph DAYLIGHTING.
EQ8.2	Daylight & Views: Views for 90% of Spaces	Pref		
INNOVATION & DESIGN PROCESS				
IDc1.1	Innovation in Design			See paragraph INNOVATION AND DESIGN CREDITS. Assume Government will not provide any activities associated with ID credits.
IDc1.2	Innovation in Design			
IDc1.3	Innovation in Design			
IDc1.4	Innovation in Design			
IDc2	LEED Accredited Professional	Rqd	Rqd	LEED AP during design

				and construction is required.
REGIONAL PRIORITY CREDITS (Version 3 only)				See paragraph LEED CREDITS COORDINATION.

Appendix M

LEED Owner's Project Requirements

No owner project requirements are provided at this time.

The winning Contractor is required to verify Owner and User Requirement Broad Goals, Environmental and Sustainability Goals, Indoor Environmental Quality Requirements, Equipment and System Expectations, and Building Occupant and O&M Personnel Requirements during the Initial Design Conference

Owner's Project Requirements Document for LEED Fundamental Commissioning

Project:_____

Approved: _____ _____ _____
Name Owner's Representative Date

_____ _____ _____
Name Design Agent's Representative Date

Overview and Instructions

The purpose of this document is to provide clear and concise documentation of the Owner's goals, expectations and requirements for commissioned systems, and shall be utilized throughout the project delivery and commissioning process to provide an informed baseline and focus for design development and for validating systems' energy and environmental performance.

The Owner's Project Requirements Document is a required document for LEED-NC EA Prerequisite Fundamental Commissioning of the Building Energy Systems. It shall be completed by the Corps District/Design Agent based on coordination with the Installation/User/Proponent and shall be approved by the Installation/User/Proponent representative.

The intent of the Owner's Project Requirements Document is to detail the functional requirements of a project and the expectations of the building's use and operation as it relates to commissioned systems. This template contains the basic recommended components indicated in the LEED Reference Guide. It should be adapted as needed to suit the project, remaining reflective of the LEED intent.

The Owner's Project Requirements Document should ideally be completed before the start of design and furnished to the design team. It must be completed prior to the approval of Contractor submittals of any commissioned equipment or systems to meet LEED requirements.

Updates to the Owner's Project Requirements Document throughout the course of project delivery shall be made by the Corps District/Design Agent based on decisions and agreements coordinated with and agreed to by the Installation/User/Proponent.

The Owner's Project Requirements Document shall be included in the project's LEED documentation file under EA PR1, Fundamental Commissioning of the Building Energy Systems.

Owner's Project Requirements Document for LEED Fundamental Commissioning

Table of Contents

1. Owner and User Requirements
   - Primary Purpose, Program and Use
   - Project History
   - Broad Goals
2. Environmental and Sustainability Goals
   - Energy Efficiency Goals
   - General
   - Siting
   - Building Façade
   - Building Fenestration
   - Building Envelope
   - Roof
   - Other
3. Indoor Environmental Quality Requirements
   - Intended Use
   - Occupancy Schedule
   - Accommodations for After-Hours Use
   - Lighting, Temperature, Humidity, Air Quality, Ventilation, Filtration
   - Acoustics
   - Occupant Ability to Adjust System Controls
   - Types of Lighting
4. Equipment and Systems Expectations
   - Space Heating
   - Ventilation
   - Air Conditioning
   - Refrigeration
   - HVAC Controls
   - Domestic Hot Water
   - Lighting Controls
   - Daylighting Controls
   - Emergency Power
   - Other
5. Building Occupant and O&M Personnel Requirements
   - Facility Operation
   - EMCS
   - Occupant Training and Orientation
   - O&M Staff Training and Orientation

TABLE 1

1. *Owner and User Requirements*

What is the primary purpose, program and use of this project? (example: office building with data center)

_____
_____
_____

Describe pertinent project history. (example: standard design development)

_____
_____
_____

Broad Goals

What are the broad goals relative to program needs?

_____
_____
_____

What are the broad goals relative to future expansion?

_____
_____
_____

What are the broad goals relative to flexibility?

_____
_____
_____

What are the broad goals relative to quality of materials?

_____
_____
_____

What are the broad goals relative to construction costs?

_____
_____
_____

What are the broad goals relative to operational costs?

_____
_____
_____

Other broad goals: *(Insert as applicable)*

_____
_____
_____

2. Environmental and Sustainability Goals

What are the project goals relative to sustainability and environmental issues? (example: LEED Silver rating)

_____
_____
_____

What are the project goals relative to energy efficiency? (example: Meet EPACT)

_____
_____
_____

What are the project goals and requirements for building siting that will impact energy use?

_____
_____
_____

What are the project goals and requirements for building facade that will impact energy use?

_____
_____
_____

What are the project goals and requirements for building fenestration that will impact energy use?

_____
_____
_____

What are the project goals and requirements for building envelope that will impact energy use?

_____
_____
_____

What are the project goals and requirements for building roof that will impact energy use?

_____
_____
_____

Other: *(Insert as applicable)*

_____
_____
_____

3. Indoor Environmental Quality Requirements

What is the intended use for all spaces? For all spaces that have an intended use that is not readily apparent from the space name, provide this information in Table 1.

_____
_____
_____

What is the anticipated occupancy schedule (numbers of occupants and time frames) for all occupied spaces? Indicate the default occupancy schedule below and for all spaces that have an occupancy schedule that differs from the default, provide this information in Table 1.

_____
_____
_____

What accommodations for after-hours use are required? (example: access control, lighting controls, HVAC controls) Indicate general accommodations required below and for all spaces that have special requirements, provide this information in Table 1.

_____
_____
_____

What are the lighting, temperature, humidity, air quality, ventilation and filtration requirements for all spaces? Indicate the default requirements below and for all spaces that have a requirement that differs from the default, provide this information in Table 1.

Lighting: _____
Temperature:_____

Humidity: _____
Air Quality:_____

Ventilation:_____

Filtration: _____

What are the acoustical requirements for all spaces? Indicate the default acoustical requirements below and for all spaces that have a requirement that differs from the default, provide this information in Table 1.

_____
_____
_____

What is the desired level of occupant ability to adjust systems controls? Indicate the default desired levels below and for all spaces that have a desired level that differs from the default, provide this information in Table 1.

Lighting: _____

Temperature: _____
Humidity: _____
Air Quality: _____

Ventilation: _____

What, if any, specific types of lighting are desired? (example: fluorescent in 2x2 grid, accent lighting, particular lamps)

_____
_____
_____

4. Equipment and System Expectations

(Complete for each category as applicable or indicate "none identified" or "N/A". Add desired features information for other anticipated commissioned systems as applicable)

Indicate desired features for the following commissioned system: Space Heating

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility: _____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Ventilation

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility: _____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Air Conditioning

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Refrigeration

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies:

Indicate desired features for the following commissioned system: HVAC Controls

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Domestic Hot Water

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Lighting Controls

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Daylighting Controls

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Emergency Power

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Other - _____

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

5. Building Occupant and O&M Personnel Requirements

How will the facility be operated? Who will operate the facility?

_____
_____
_____

Will the facility be connected to an EMCS? If so, what are the interface requirements? (example: monitoring points, control points, scheduling)

_____
_____
_____

What is the desired level of training and orientation for building occupants to understand and use the building systems?

_____
_____
_____

What is the desired level of training and orientation for O&M staff to understand and maintain the building systems?

Table 1

Space	Use / Activity	Num of Occs	Special Occupancy Schedule	After Hours Use Reqmt.	Special Cooling Reqmt.	Special Heating Reqmt.	Special Humidity Reqmt.	Special Ventil./Filtration Reqmt.	Special Acoustic Reqmt.	Special Lighting Reqmt.	Special Occup Adjustability Reqmt.

APPENDIX N
LEED Requirements for Multiple Contractor Combined Projects

Not Used

APPENDIX O
LEED Strategy Tables

Not Used

Section: APPENDIX P

APPENDIX P
USGBC Registration of Army Projects

Typical Registration Procedure

1. Complete the online registration form (see guidance below) at the USGBC website **http://www.leedonline.com.**
2. Pay the registration Fee.
3. The USGBC will follow up final invoice, the LEED-online passwords and template information.

Completing the Registration Form

BEFORE YOU BEGIN:

Create a personal account with USGBC if you do not have one.
You will need the following information:
Project name as it appears in P2 (obtain through USACE Project Manager)
Building number/physical address of project.
Zip code for Installation/project location
Total gross area of buildings in project
Total Construction cost for buildings only (see Project Details Section instructions below)

ACCOUNT/LOGIN INFORMATION SECTION

1. The person registering the project **must have an account with USGBS** (login and password) to complete the form. If you have an account, select "I already have a USGBC Web site account" and enter email and password (twice). If you do not have an account, you may select "Create a new USBGC website account" and follow the instructions. It is recommended that you create an account separately on the USGBC website before you start the form. IMPORTANT: USACE team members are members of USGBC and are eligible for Members price. USACE team members registering projects should be sure to include USACE Corporate Access ID on the form (if you do not have it contact **richard.l.schneider@usace.army.mil** or **judith.f.milton@usace.army.mil** for the number).
2. The Account/Login Information is filled out by the person registering the project. It may be a Contractor or a USACE staff member.

PROJECT TYPE SECTION

Self-explanatory.

GENERAL PROJECT INFORMATION SECTION

Project Title: Match the project name used in P2. Contact the USACE Project Manager for this information.
Is project confidential: Indicate NO except if the project has security sensitivity (elements that are FOUO are higher security) indicate YES.
Project Address 1 and 2: This is the physical location of the project. Provide building number, street address, or what ever is known to best describe the location of the project on the installation.

Project City: Installation Name
State, Country, Zip Code: Self-explanatory
How Did You Heat About LEED: USACE Requirement

Primary Contact Information

The Primary Contact may be a Contractor or a USACE staff member. USBGC considers this individual to be the primary contact for all aspects of the project.

PROJECT DETAILS

Project Owner, First Name, Last Name, email: The Project Owner is the USACE Project Manager.
Organization Name: U.S. Army Corps of Engineers. This field MUST be completed this way because it will be used as a search field for higher HQ to find all USACE registered projects.

PROJECT DETAILS

Owner Type: Military Base
Project Scope: Provide brief description (example: barracks complex)
Site Conditions: Provide brief description (example, wooded with steep grades)
Occupant Type: Provide brief description (example, military and civilian employees)
Owner Occupied: No
Gross Square Footage: Provide total area all buildings in project.
Project Budget: Do not include the cost for design, site work, demolition, abatement or other work,- do not include Government contingency or supervision cost. For design-build and construction projects registered after award, use the awarded contract cost for construction of buildings only. For projects prior to award of design-build or construction contract, use the total Primary Facility cost from the DD1391 or updated Primary Facility cost based on design development if available.
Current Project Phase: Identify phase at time of registration (example: design start, construction start)
Project Type: Self-explanatory

PAYMENT INFORMATION

Self-explanatory

APPENDIX Q
REV 2.1 – 30 SEP 2010
AREA COMPUTATIONS

Computation of Areas: Compute the "gross area" and "net area" of facilities (excluding family housing) in accordance with the following subparagraphs:

(1) Enclosed Spaces: The "gross area" is the sum of all floor spaces with an average clear height ≥6'-11" (as measured to the underside of the structural system) and having perimeter walls which are ≥4'-11". The area is calculated by measuring to the exterior dimensions of surfaces and walls.

(2) Half-Scope Spaces: Areas of the following spaces shall count as one-half scope when calculating "gross area":

- Balconies
- Porches
- Covered exterior loading platforms or facilities
- Covered but not enclosed spaces, canopies, training, and assembly areas
- Covered but not enclosed passageways and walks
- Open stairways (both covered and uncovered)
- Covered ramps
- Interior corridors (Unaccompanied Enlisted Personnel Housing Only)

(3) Excluded Spaces: The following spaces shall be excluded from the "gross area" calculation:

- Crawl spaces
- Uncovered exterior loading platforms or facilities
- Exterior insulation applied to existing buildings
- Open courtyards
- Open paved terraces
- Uncovered ramps
- Uncovered stoops
- Utility tunnels and raceways
- Roof overhangs and soffits measuring less than 3'-0" from the exterior face of the building to the fascia

(4) Net Floor Area: Where required, "net area" is calculated by measuring the inside clear dimensions from the finish surfaces of walls. If required, overall "assignable net area" is determined by subtracting the following spaces from the "gross area":

- Basements not suited as office, special mechanical, or storage space
- Elevator shafts and machinery space
- Exterior walls
- Interior partitions
- Mechanical equipment and water supply equipment space
- Permanent corridors and hallways
- Stairs and stair towers
- Janitor closets
- Electrical equipment space
- Electronic/communications equipment space

APPENDIX R
Preliminary Submittal Register

RMS SUBMITTAL REGISTER INPUT FORM

CONTRACT NUMBER | DELIVERY ORDER

TITLE AND LOCATION

Button <-----Right click for Instructions

			TYPE OF SUBMITTAL											CLASSIFICATION						REVIEWING OFFICE						
SECTION	PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	01 - PRECON SUBMITTALS	02 - SHOP DRAWINGS	03 - PRODUCT DATA	04 - SAMPLES	05 - DESIGN DATA	06 - TEST REPORTS	07 - CERTIFICATES	08 - MFRS INSTRUCTIONS	09 - MFRS FIELD REPORT	10 - O&M DATA	11 - CLOSEOUT SUBMITTALS	FIO - FOR INFORMATION ONLY	GA - GOVERNMENT APPROVED	DA - DESIGNER OF RECORD APPROVAL	CR - CONFORMANCE REVIEW	DA / CR	DA / GA	DO - DISTRICT OFFICE	AO - AREA OFFICE	RO - RESIDENT OFFICE	PO - PROJECT OFFICE	DR - DESIGNER OF RECORD	AE - ARCHITECT / ENGINEER
00 72 00	52.236-13	Accident Prevention Plan	X														X				X				
00 73 00	1.11	Dev. From Accept. Design. No Deviation from Contract					X											X			X			X	
00 73 00	1.11	Dev. From Accepted Design - Deviates from Contract					X												X		X			X	
00 73 00	1.17	Supplemental Price Breakdown	X											X								X				
00 73 00	1.18	SSHO Qualifications	X												X							X				
01 10 00	5.2.3.1	(if concrete pavement) Joint Layout Plan with design drawings					X										X								
01 10 00	5.5.2	Building Envelope Sealing Performance Testing						X						X								X			
01 10 10	***	Tests as Req by Codes - DOR Develops Test Program						X						X								X		X	
01 10 00	5.8.3	BAS Review Information		X														X			X	X		X	
01 10 00	5.8.3	BAS Performance Verification Test						X						X								X		X	
01 10 00	5.8.4	Testing Adjusting and Balancing						X						X								X		X	
01 10 00	5.8.5	Commissioning						X						X								X		X	
01 10 00	6.15	Environmental As Required for Site Specific					X										X					X		X	
01 10 00	6.16	Permits as required for Site specific					X										X					X		X	
01 10 00	5.10.2	Fire Protection Tests						X	X					X								X		X	
01 32 01.00 10	3.4.1	Preliminary Project Schedule	X												X							X			
01 32 01.00 10	3.4.2	Initial Project Schedule	X												X							X			
01 32 01.00 10	3.4.3	Design Package Schedule	X												X							X			
01 32 01.00 10	3.6.1	Periodic schedule updates from the Contractor	X												X							X			
01 32 01.00 10	3.7	Time Extension Request (Schedule)	X												X							X			
01 33 00	1.8	Submittal Register - DOR Input Required	X												X							X		X	
01 33 00	1.8	Submittal Register Updates (Design Packages, etc.)	X												X							X		X	
01 33 00	1.3.1	Substitution of Manuf or Model Named in Proposal		X	X													X				X		X	
01 33 16	1.2	Identify Designer(s) of Record	X												X							X			
01 33 16	1.1.2 / 3.2.4	Fast Track Design Package(s)					X										X				X	X			
01 33 16	1.2	Identification of all Designers of Record	X														X					X			
01 33 16	3.2.1	Site and Utility Des Package, incl. Substantiation					X										X				X	X			
01 33 16	3.2.2/3.5	Interim Des Subm Package(s), incl. Substantiation					X										X				X	X			
01 33 16	3.5.1	Drawings					X										X				X	X			
01 33 16	3.5.2.2	Sitework Design Analyses					X										X				X	X			
01 33 16	3.5.2.3	Structural Design Analyses					X										X				X	X			
01 33 16	3.5.2.4	Security Design Analyses					X										X				X	X			
01 33 16	3.5.2.5	Architectural Design Analyses					X										X				X	X			
01 33 16	3.5.2.6	Mechanical Design Analyses					X										X				X	X			
01 33 16	3.5.2.7	Life Safety Design Analyses					X										X				X	X			
01 33 16	3.5.2.8	Plumbing Design Analyses					X										X				X	X			
01 33 16	3.5.2.9	Elevator Design Analyses (as Applicable)					X										X				X	X			
01 33 16	3.5.2.10	Electrical Design Analyses					X										X				X	X			
01 33 16	3.5.2.11	Telecommunications Design Analyses					X										X				X	X			
01 33 16	3.5.2.12	Cathodic Protection Design Analyses					X										X				X	X			
01 33 16	3.5.3	Geotechnical Investigations and Reports					X										X				X	X			
01 33 16	3.5.4	LEED Submittals					X										X				X	X			
01 33 16	3.5.5	Energy Conservation Documentation					X										X				X	X			
01 33 16	3.5.6	Specifications					X										X				X	X			
01 33 16	3.5.7	Building Rendering					X										X				X	X			
01 33 16	3.2.4/3.7	Final Des Submittal Package(s), incl. Substantiation					X										X				X	X			
01 33 16	3.7.5	DD Form 1354 (Transfer of Real Property)											X				X					X			
01 33 16	3.7	Independent Technical Review					X										X				X	X			
01 33 16	3.2.5/3.8	Design Complete Submittal Package(s)					X										X				X	X			
01 33 16	3.3.3	Design and Code Review Checklists					X										X				X	X			
01 33 16	A-2.0	SID - Interim and Final (as applicable)			X	X	X								X							X			
01 33 16	B-2.0	FFE (as Applicable)					X								X							X			
01 33 16	F-3.1.3	BIM Model and data					X										X				X	X			
01 45 04.00 10	3.2	Design and Construction QC Plan	X														X					X			
01 57 20.00.10	1.2	Environmental Protection Plan	X														X					X			
01 78 02.00 10	1.2.1	Final as-Built Drawings/ BIM Model											X		X										
01 78 02.00 10	1.2.3.11	Non-Hazardous Solid Waste Diversion Reports							X					X								X			
01 78 02.00 10	1.2.7	Provide final as-built CADD and BIM Model files											X		X							X			
01 78 02.00 10	1.2.9	Provide scans of all other docs in Adobe.pdf format											X		X							X			
01 78 02.00 10	1.3.1	Equip-in-Place list of all installed equip and cost											X		X							X			
01 78 02.00 10	1.3.2	Data on equip not addressed in O&M manuals											X		X							X			
01 78 02.00 10	1.3.3	Final as-built specs - electronic files											X		X							X			
01 78 02.00 10	1.4.2.1	Warranty management plan - FAR 52.246-21											X		X							X			
01 78 02.00 10	1.4.2.1	Certificates of Warranty for extended warranty items											X		X							X			
01 78 02.00 10	1.4.2.1	Contractor's POCs for implementing warranty process											X		X							X			
01 78 02.00 10	1.4.2.1	List of each warranted equip, item, feature or system											X		X							X			
01 78 02.00 10	1.5	See also Section 01 10 00 par. 5.8.4 and 5.8.5											X		X							X			
01 78 02.00 10	1.6.1.2	Equipment O&M Manuals - 1 electronic / 2 hard copies											X		X							X			
01 78 02.00 10	1.7	Field Training DVD Videos										X		X								X			
01 78 02.00 10	1.8	Pricing of CF/CI and GF/CI Property											X	X								X			
01 78 02.00 10	1.11	List of Completed Cleanup Items											X					X				X			
01 78 02.00 10	1.12	Interim Form DD 1354											X					X				X			
Appendix T	A. 1	Life Cycle Analysis for Light Level Tuning					X											X			X	X			
Appendix T	A. 4.	Lif Cycle Analysis Automated Sahing.					X											X			X	X			
Appendix T	B.1.	Qualifications of Testing Agent						X										X			X	X			
Appendix T	B. 1.	Functional area Lighting Control Tests						X										X			X	X			

Appendix S

REV 1.1 JUL 2011.

Manufacturing Performance Requirements for Plumbing Fixtures From The Energy Policy Act of 1992 (PL 102-486) (Including Exceptions for Projects Registered for LEED 3.0 or higher)

Note: This information is for use in establishing the Baseline to calculate flow rate reductions from said Baseline, where required by the contract.

Subtitle C--Appliance and Equipment Energy Efficiency Standards

SEC. 123. ENERGY CONSERVATION REQUIREMENTS FOR CERTAIN LAMPS AND PLUMBING PRODUCTS.

… (j) STANDARDS FOR SHOWERHEADS AND FAUCETS- (1) The maximum water use allowed for any showerhead manufactured after January 1, 1994, is 2.5 gallons per minute when measured at a flowing water pressure of 80 pounds per square inch. Any such showerhead shall also meet the requirements of ASME/ANSI A112.18.1M-1989, 7.4.3(a).

`(2) The maximum water use allowed for any of the following faucets manufactured after January 1, 1994, when measured at a flowing water pressure of 80 pounds per square inch, is as follows:

`Lavatory faucets: 2.5 gallons per minute **(BUT SEE BELOW**)**

`Lavatory replacement aerators: 2.5 gallons per minute

`Kitchen faucets : 2.5 gallons per minute

`Kitchen replacement aerators: 2.5 gallons per minute

`Metering faucets: 0.25 gallons per cycle

`(k) STANDARDS FOR WATER CLOSETS AND URINALS- (1)(A) Except as provided in subparagraph (B), the maximum water use allowed in gallons per flush for any of the following water closets manufactured after January 1, 1994, is the following:

`Gravity tank-type toilets --1.6 gpf.

`Flushometer tank toilets --1.6 gpf.

`Electromechanical hydraulic toilets --1.6 gpf.

`Blowout toilets --3.5 gpf.

`(B) The maximum water use allowed for any gravity tank-type white 2-piece toilet which bears an adhesive label conspicuous upon installation consisting of the words `Commercial Use Only' manufactured after January 1, 1994, and before January 1, 1997, is 3.5 gallons per flush.

`(C) The maximum water use allowed for flushometer valve toilets, other than blowout toilets, manufactured after January 1, 1997, is 1.6 gallons per flush.

`(2) The maximum water use allowed for any urinal manufactured after January 1, 1994, is 1.0 gallon per flush.

**** EXCEPTIONS for Projects Registered under LEED 3.0 or higher.**

1. Any exceptions identified in the applicable LEED criteria.

2. Public lavatory faucets shall deliver a maximum flow rate of 0.5 gallons per minute, when tested in accordance with ASME A 112.18/CSA B125. Use that flow rate as the Baseline figure for calculating any required reductions from the Baseline.

APPENDIX T
FUNCTIONAL AREA LIGHTING CONTROL STRATEGY (FALCS)

A. GENERAL LIGHTING CONTROL SYSTEM ENERGY MANAGEMENT STRATEGIES

SUMMARY: This appendix describes various lighting energy management strategies to utilize across functional areas. These strategies are intended to supplement and NOT supersede the requirements of ASHRAE 90.1.

1. Consider LIGHT LEVEL TUNING to maintain the appropriate light level for a given space. Initial light levels are set high to compensate for light depreciation over time. Where dimming ballasts or dimmable LED drivers are used, they shall be digital and addressable in nature (where available) that can provide individual fixture light level tuning and reconfigurability that dims the light level to the target level, saving the energy that otherwise would be used to compensate for future light depreciation. Provide a life-cycle cost-benefit analysis (LCCBA) of light level tuning for all spaces where the general lighting luminaires are equipped with digital addressable dimming ballasts or LED drivers. The LCCBA shall follow the methodology contained in the IESNA Lighting Handbook. Provide light level tuning where the LCCBA shows it to be economical.

2. Use OCCUPANCY/VACANCY SENSORS to automatically turn off lighting a specified time after all occupants leave the space. The off time shall be adjustable settable to 1, 5, 15, or 30 minutes. Select the type (single or dual technology, wired or wireless) based on the use and configuration of the space. Lighting control system shall have the capability to manage both hard-wired and wireless sensors where applicable. Single technology solutions shall incorporate signal processing technology that distinguishes between background noise and actual motion without automatically changing their sensitivity threshold. To maximize energy savings potential, all occupancy sensors shall be either MANUAL ON – AUTOMATIC OFF (vacancy sensor) or AUTOMATIC ON (to a specified light level of 50% or less) – AUTOMATIC OFF to maximize energy savings. Occupancy/Vacancy sensors properly located in the space and set appropriately can offer typical lighting energy savings of 15% or more.

3. Use DAYLIGHT HARVESTING to control lighting in areas within at least two window head heights (head height is the distance from the floor to the top of the glazing) adjacent to exterior view windows. Typical daylight penetrates three times the window head height into the space. To maximize energy savings, daylight dimming strategies need to penetrate beyond the first row of luminaires (first daylight zone). When daylighting installed fluorescent or LED luminaires, accomplish daylight harvesting by digitally addressable dimming ballasts or drivers. As the natural light in the space increases, the artificial light level should dim gradually to maintain a uniform light level and prevent disruption to the occupants. One daylight sensor must be able to control multiple daylighting zones (cross-zoning) without the need of adding more sensors. All controls (daylight sensors, occupancy sensors, wall stations) shall have the capability to connect to the system via hard wire or wireless. Apply the same daylighting strategies to areas where skylights are available (refer to ASHRAE 189.1 daylight zone definitions). Daylighting systems properly tuned and calibrated can offer typical lighting energy savings of 15% or more.

4. Consider AUTOMATED SHADING in spaces utilizing daylight harvesting to maximize the energy savings of the day lighting system. The shades shall be controlled to reduce glare and unwanted heat gain while still allowing natural light to enter the space. When utilizing automated shading consider the following :

    A. For ease of use and space aesthetics, operate the automated shades by common controls, wired or wireless (i.e. same appearance and design) with the lighting control system.
    B. For maximum energy savings the automated shading system shall predictably position the shades based on a combination of time of day, façade direction, and sky conditions.
    C. For maximum design flexibility and ease of installation, shade system should have the capability to address and control each shade individually.
    D. The shading system shall have a manual override that allows the occupant to temporarily adjust the shades to any desired position. The system will revert back to automatic control after a specified period of time.

    Provide a life-cycle cost-benefit analysis (LCCBA) of automated shading for all spaces where daylight harvesting is provided. The LCCBA shall follow the methodology contained in the IESNA Lighting Handbook. Provide automated shading where the LCCBA shows it to be economical.

5. Use SCENE BASED DIMMING in multiple-use areas including auditoriums, conference rooms and classrooms. Also provide scene based dimming in dining rooms and gymnasiums with multiple functions. One button preset touch recall shall allow multiple zones of light within a space to go to the appropriate light levels, known as a scene, for a specific task or use. Scene based control shall allow the integration of AV controls, shading/projection screens and lighting to work seamlessly with one button preset touch (i.e. lights dim, projection screen lowers, and shades go down). If dimming ballasts or LED drivers are used, they shall also be digital and addressable in nature (where available) to take advantage of installation and life-cycle reconfiguration benefits.

6. Provide PERSONAL CONTROL of lighting in spaces to allow the user of the space to vary the general light level based on the task at hand. Personal control can be achieved by wall mounted controls (hard wired or wireless), Infrared or Radio Frequency (RF) wireless devices, or via computer. Digital addressable ballasts and LED drivers allow the control flexibility of personal dimming of installed lighting on the occupant's work area (i.e. dim the luminaire over their cubicle to the appropriate light level).

7. Consider WIRELESS lighting control options for all installations, including retrofit projects (easy installation, lower installed cost, no power packs necessary). Wireless products shall include but not be limited to occupancy / vacancy sensors, daylight sensors, local wall controls, plug in switching and dimming appliance and parasitic load modules. To avoid interference, wireless products should communicate in an FCC frequency band that does not allow continuous transmissions and is free of Wi-Fi devices.

B. FUNCTIONAL TESTING AND MANUFACTURER SUPPORT

SUMMARY: This section describes functional testing to be performed on the lighting control system and the support required from the lighting control manufacturer.

1. Hire an independent agent with no less than three years experience in testing of complex lighting control systems to conduct and certify functional testing of lighting control devices and control systems. The testing agent shall not be directly involved in either the design or construction of the project and shall certify the installed lighting controls meet or exceed all requirements of ASHRAE 90.1 and all documented performance criteria. The lighting control manufacturer's authorized technical representative may serve as the testing agent. Submit qualifications of the testing agent for approval. Submit copies of test results to the Government.

2. LIGHTING CONTROL MANUFACTURER SUPPORT shall include technical phone support located in the United States. The technical phone support shall be available 24 hours a day, 365 days a year.

APPENDIX AA - INSTALLATION REQUIREMENTS

INDEX

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INSTALLATION REQUIREMENTS

a. DPW Work Management Branch Policy Memorandum-Excavation

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IMNE-LNW-PWB 20 May 2009

MEMORANDUM FOR Contractors, Reserve Units, Tenant Units, Directorates and Family Housing occupants

SUBJECT: DPW Work Management Branch Policy on the Execution of Excavation Permits

1. DIGGING OR DRIVING POSTS WITHOUT PROPER APPROVAL COULD RESULT IN SERIOUS INJURY. It could also cause damage to underground utilities (gas, water, electric, TV cables, etc.) for which you may be held liable.

2. All excavation that exceeds six inches in depth or the driving of fence posts more than six inches in depth, an excavation permit (FLW Form 364, Rev Aug 08) must be requested with a map and relevant information to the Work Management Section, Bldg 2222, DPW, 10 days prior to the planned start of the excavation.

3. Any person or contractor making or beginning the excavation must initiate the excavation permit by contacting 1-800-DIG-RITE (1-800-344-7483) or MISSOURI ONE CALL SYSTEM, DPW Maintenance Contractor, Army telephone, Directorate of Logistics and Sprint Barracks Telephone Company. When all utilities are located, return the form to DPW Work Management Section for a final approval signature. The requestor is to ensure that the permit is on the job site equipment being used and readily available to operator at all times.

4. The excavation permit is valid for ten working days from the time signed and dated by DPW. All extended projects must have the old permit updated by notifying all pertinent utilities and requesting a re-fresh. This process is to be continued until the completion of the project.

5. It is the responsibility of the contractor to ensure all utilities are clearly marked before excavation begins. Proposed excavations must be marked with white flags or paint to eliminate confusion with other marked utilities. If excavation begins before all utilities are located, it is the responsibility of the contractor to repair or replace damaged utilities. When the work is completed, the requestor must remove all flags still in place and discard.

6. Family Housing occupants must submit the excavation permit through the Balfour Beatty Communities Maintenance Office, 329-0118.

7. Project Development Personnel: As your contract or IJO packages are being developed, that would be an excellent time to request permits for your projects so that they can be ready when the contracts are awarded.

8. Questions please call 596-0900 or 596-0928.

Mr. Brian E. Nelson, P.E.
Chief, Business Operations Division
Directorate of Public Works

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INSTALLATION REQUIREMENTS

b. Sample Excavation Permit

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EXCAVATION PERMIT
Fort Leonard Wood, Missouri
(FLW Suppl 1 to AR 420-17)

REQUESTED BY (Unit/Activity doing Excavation):

POINT OF CONTACT NAME:

Fax:
Phone:

DESCRIPTION AND LOCATION OF PROPOSED EXCAVATION: ** **MUST BE MARKED IN WHITE** **
(Include a detailed map or drawing showing location.)

GAS (NATURAL) – FOR APPROVAL CALL 1-800-DIG-RITE ** 48 HOURS NOTICE ** TICKET #:

METHOD LOCATED	FLAGS		MAIN		NOTIFY BEFORE CROSSING		WILL NOT AFFECT	
	PAINT		SERVICE		DISTANCE REQUIRED FROM GAS LINE			

Reviewer Signature Date

EXTERIOR ELECTRICAL UTILITY (High Voltage) FOR APPROVAL CALL 1-800-DIG-RITE ** 48 HOUR NOTICE **

Reviewer Signature Date

CENTURYLINK (Commercial Telephone Company) FOR APPROVAL CALL 1-800-DIG-RITE ** 48 HOUR NOTICE **

Reviewer Signature Date

CABLE TV COMPANY FOR APPROVAL CALL 1-800-DIG-RITE ** 48 HOUR NOTICE ** LOCAL: 573-336-5538

Reviewer Signature Date

BALFOUR BEATTY (Family Housing Areas only) FOR APPROVAL CALL 1-800-DIG-RITE ** 48 HOUR NOTICE **

Reviewer Signature Date

DPW MAINTENANCE CONTRACTOR FOR APPROVAL CALL 573-596-0922 OR FAX 573-596-5387 - BLDG 2203

Heat/AC _____ Date _____ Water/Sewer _____ Date _____

Electrical (Secondary) Date Fuel Date

SECURITY CAMERA(S) & ARMY TELEPHONE (NEC) TEL 573-596-5373 OR FAX 573-596-5715

Reviewer Signature Date

DIRECTORATE OF LOGISTICS (J-SIDDS) 573-596-0874

Reviewer Signature Date

SPRINT BARRACKS TELEPHONE COMPANY (Commercial – Cantonment Area Only)
FOR APPROVAL CALL 1-800-924-7941 OR FAX 561-775-7877

Reviewer Signature Date

BASE COM CONSTRUCTION (Lodging CATV / Internet – Cantonment Area Only)
FOR APPROVAL CALL 573-329-8046 OR FAX 573-329-8284

Reviewer Signature Date

DIRECTORATE OF PUBLIC WORKS (DPW) 573-596-0900 OR 573-596-0928 OR FAX 573-596-1370

Final Reviewer Signature Date

Subject: Supplement to FLW 364, Excavation Permit

12 October, 2010

1. Excavators shall submit excavation permits and provide notification to all underground facility owners/operators at least three (3) but not more than ten (10) working days in advance of beginning any excavation. The excavator shall exercise reasonable care not to unnecessarily disturb or obliterate markings provided for location of underground facilities, and to maintain such markings by refreshing or other approved methods as required for the duration of the project. Excavators may continue to work within the permit area as along as the markings are visible. If markings become unusable due to weather, construction or other causes, the excavator shall request renewal of the original permit within the same time frame as required for the original. If remarking is required due to the excavator's failure to exercise reasonable care, or if repeated unnecessary requests for remarking are made the excavator may be liable for the reasonable cost of such remarking.

2. All personnel requesting a form FLW 364, Excavation Permit, must in addition to all other requirements, read and acknowledges by signature the following DPW requirements. Refusal to comply with these requirements will void future requests for an Excavation Permit.

3. All roads shall be bored under, unless prior approval has been granted by the Chief of the Business Operations Division, DPW, Building 2202.

4. All disturbed turf areas shall be restored by placing 4" of topsoil, fertilizing with 13-13-13 fertilizer at a rate of 4 pounds per 1000 square feet, seeding with a mixture of 90% Turf Type Tall Fescue and 10% annual rye at a rate of 4 pounds per 1000 square feet, and mulching four ways, with clean, weed free, cereal straw. Turf areas are considered all areas that are unsurfaced grounds. Disturbed areas are not limited to areas of the excavation. They also include ruts, gouges, etc. caused by a contractor's vehicles or equipment.

5. All buried utilities shall include a tracer wire with the utility and, in addition, magnetic tracer tape above the utility, but 12 inches below ground level. The tracer wire shall be terminated in a manner that makes them accessible at all manholes, handholes, pedestals, or other termination points.

6. Magnetic tracer tape shall be placed above any buried communication line, 12 inches below ground level.

7. At the finish of work, as-built drawings shall be delivered to the Engineer Design Branch, DPW, Building 2200.

8. Use of Fire Hydrants – The temporary use of fire hydrants as sources of water is not authorized without prior approval by the Fire Department, 596-0886. Fire hydrant connections shall include an approved backflow preventer. Use of backflow preventers must comply with Missouri Department of Natural Resources, Division 60, Public Drinking Water Program, Chapter 11 – Backflow Prevention, Title 10CSR60-11. Government furnished backflow preventers shall be utilized and are available at Building 1601, Water Treatment Plant on a first come basis. The Contractor shall be required to sign a hand receipt prior to obtaining a backflow preventer. The Contractor shall be accountable to return the checked out backflow preventer equipment undamaged and as soon as possible. The Contractor shall furnish and use an approved fire plug wrench to open and close the hydrant. Pipe wrench shall not be used. When the hydrant is not being used it shall be shut off. When the need for the hydrant is finished, the hydrant shall be shut off, the temporary connection and backflow preventer shall be removed, the fire hydrant caps shall be replaced and the Fire Department shall be notified that the hydrant will no longer be used.

9. Digging, driving or trenching is not permitted within the drip line of any tree.

Signature of permit requestor: _____ Date _____

INSTALLATION REQUIREMENTS

c. Sewer Construction Requirements

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DPW SEWER CONSTRUCTION REQUIREMENTS

1. The Contractor shall ensure the Missouri Department of Natural Resources (MDNR), Code of State Regulations are followed. Division 20 - Clean Water Commission, Chapters 6 Permits and Chapters 8 Design Guides etc. Reference: **http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-8.pdf**

2. The Contractor shall ensure required Missouri Department of Natural Resources (MDNR), Construction Permit is obtained if applicable. Extension of the sewer main or installation of a manhole requires a MDNR Sewer Construction Permit. **Project Plans requiring MDNR Construction Permit Application must be routed through CORPS for approval. After signature, approval letter, copy of permit application, 2 final sets of plans and specs shall be provided to DPW Environmental, Carl Stenger 573-596-3723. Contractor shall submit permit to MDNR.**

3. The CORPS Contractor shall ensure the DPW sewer collection system can handle flow from new Construction. The CORPS shall obtain approval from the DPW Engineering Division Chief.

4. The Contractor shall install and provide tracer wire on force sewer mains for locating purposes. Tracer wire shall run for entire length of sewer pipe.
   a. Provide #12 awg xlpe insulated copper tracing wires for entire length of pressure pipe. Secured to top of pipe, every five feet with plastic tie straps so that the wire remains in place during embedding of pipe.
   b. Where tracer wire terminates, tracing wire shall be brought to the surface in a tracer wire test station with a minimum three feet of wire rolled up for testing and locating purposes.
   c. **Tracer wire test station shall be a tracer wire access box part# MC-22408 from USA Bluebook, phone # 800-548-1234.** Tracer wire access box shall terminate flush with finished grade with a concrete collar 12” X 12” X 6” to protect it.
   d. Tracer wire test stations shall be located where new pipe starts and terminates and a minimum of every 500 feet. Current is to be passed thru the wire to demonstrate that the wire is capable of locating the pipe. If wire will not pass current, locate break in circuit and test until tracer wire works in accordance with its intended use. Provide copy of testing results to DPW Operations Branch Keith Pendleton, Bldg. 2222, 573-596-0946.
   e. Splicing shall be performed per National Electrical Code.

f. When installed, notify DPW Operations Branch Keith Pendleton, Bldg. 2222, 573-596-0946 so he can coordinate with DPW Base Maintenance Contractor to check tracer wire.

5. The Contractor shall install detectable metallic underground tape 12 inches below grade above sewer mains and laterals, tape marked “SEWER”.

6. Request that Flyght Submersible Pumps be installed in pump stations to match existing FLW collection system pumps for maintenance and operational purposes.

7. Lift stations shall be equipped with new satellite high level and power outage alarm telemetry to match the FLW existing telemetry alarm system. Contact DPW Electrircal Section, Allen Busiek at allen.busiek@us.army.mil for alarm specification details

8. All new Lift stations shall be provided with backup generators see info below from DPW Environmental Chief, Scott Murrell.

The state of Missouri requires, in Missouri Clean Water Commission Regulation 10 CSR 20-8.130: "Over flow prevention methods. A satisfactory method shall be provided to prevent or minimize overflows. The following methods should be evaluated on an individual basis. The choice should be based on least cost and least operation problems of the methods providing an acceptable degree of reliability. The methods are-"
1) Storage capacity including trunk sewers for retention of wet weather flows. (must drain back after water recedes) 2)In place or portable pump, driven by internal combustion engine, capable of pumping from wet well to discharge side of station.
3) Two (2) independent public utility sources or engine-driven equipment.
"
Since FLW lacks option 1, and does not have the ability to execute, in a realistic timeframe, option 2, our only feasible course is option 3, using an engine driven generator to back up utility power to each lift station. FLW's Capacity, Maintenance, and Operations plan for the sanitary sewer collection system, accepted by MDNR, states all new installations of lift stations will be equipped with emergency backup power.
To be in conformance with state law, All projects which involve installation of sewer lift stations will include emergency generators.

9. Exterior lateral cleanouts shall be a minimum **6 inch** with brass threaded cap to include a minimum12”X12”X6”concrete collar around cleanout.

10. Where sewer and water lines cross, Reference Missouri Dept of Natural Resources (MDNR) Regulation 10 CSR 20-8.120 (11)
http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-8.pdf

11. http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-8.pdf
Reference 10 CSR 20-8.120 Design of Sewers (7)(A)

(7) Manholes.

(A) Location. Manholes shall be installed at the end of each line; at all changes in grade, size or alignment; at all intersections; and at distances not greater than four hundred feet (400') (120 m) for sewers fifteen inches (15") (38 cm) or less and five hundred feet (500') (150m) for sewers eighteen inches to thirty inches (18"—30") (46 cm—76 cm), except that distances up to six hundred feet (600') (180m) may be approved in cases where adequate modern cleaning equipment for such spacing is provided. Greater spacing may be permitted in larger sewers. **Cleanouts may be used only for special conditions and shall not be substituted for manholes nor installed at the end of laterals greater than one hundred fifty feet (150') (46m) in length.**

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INSTALLATION REQUIREMENTS

d. Water Construction Requirements

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DPW WATER CONSTRUCTION REQUIREMENTS

1. The Contractor shall ensure Missouri Department of Natural Resources (MDNR) Water Construction Permit is obtained if applicable. Reference Code of State Regulations Division 60 – Chapter 3 Permits. http://www.sos.mo.gov/adrules/csr/current/10csr/10csr.asp#10-10

2. Contractors shall install new water systems per State of Missouri Design Guide for Community Water Systems @ http://www.dnr.mo.gov/env/wpp/dw-index.htm

3. The Contractor shall ensure required Missouri Department of Natural Resources (MDNR), Construction Permit is obtained if applicable. An extension of the water main or installation of a fire hydrant requires a MDNR Water Construction Permit. **Project Plans (up to 6 copies possible, determined on a Task Order by Task Order basis) requiring MDNR Construction Permit Application must be routed to the CORPS. After signature, by DPW, approval letter, copy of permit application, 2 final sets of plans and specs shall be obtained from DPW Mechanical, Keith Pendleton 573-596-1179. Contractor shall then submit permit to MDNR.**

4. The CORPS Contractor shall ensure the DPW water distribution system can provide sufficient flow and pressure for the new facilities. The Corps shall obtain approval from the DPW Engineering Division Chief.

5. The DPW Base Maintenance Contractors DSIII Certified Operator must provide oversight during any taps or direct connections to the existing water mains on Fort Leonard Wood. No Contractor shall open/close any valves on the FLW distribution system. All requests for support to coordinate work shall be through the DPW Operations Branch, POC: Keith Pendleton at 573-596-0946. Contractors **must provide minimum 7 calendar days notice for all requests** through the CORPS.

6. The Contractor is responsible for and shall ensure AWWA C651-05 disinfection requirements for Water Mains are followed.

C651-05.pdf

7. Contractors disinfecting water lines shall familiarize themselves with AWWA Standard. After super chlorination is completed. Water line shall be flushed thoroughly to remove super chlorinated water. Super chlorinated water above 4.0 ppm shall not be discharged on ground without neutralizing the chlorine. Other

option is to flush to sanitary sewer with DPW Operations approval. DPW Operations requires new water line shall be flushed and filled by temporary connection to fire hydrant and backflow unit to prevent cross contamination with existing main water supply. If no hydrant is available, Contractor must haul water to fill new line for testing. **Reference Section 4.3.9 Figure 1 and 4.4.3.3, from AWWA Standard C651-05 for details.**

8. **Reference AWWA Standard 5.1**. *Standard conditions*. After final flushing and before the new water main is connected to the distribution system, **two consecutive sets of acceptable samples, taken at least 24 hrs apart** shall be collected from new main. At least one set of **samples shall be collected from every 1200 feet of new water main, plus one set from end of line and at least one set from each branch**. If trench water has entered new main during Construction, Reference Section 5.1.2. Reference optimum sampling procedures and locations in Section 5.1.3. **Bacteriological sample results collected by Contractor shall be provided to DPW Operations and CORPS Inspector. Contractor shall use State of Missouri Department of Health Certified Laboratory for total coliform analysis. Contractor shall notify and provide a water main disinfection date and time line schedule to DPW Operations POC Keith Pendleton @ 573-596-1179 and Preventive Medicine POC Wayne Foster @ 329-1909.**

9. Interior building plumbing shall be super chlorinated per International Plumbing Code. **Contractor is responsible for obtaining microbiological analysis inside building after lines are super chlorinated and flushed before DPW accepts any building. The CORPS shall notify Preventive Medicine POC Wayne Foster @ 329-1909 when all sampling takes place. Contractor shall use State of Missouri Department of Health Certified Laboratory for total coliform analysis and provide results to CORPS Inspector and DPW Operations Branch.**

10. The Contractor shall install and provide tracing wire for locating purposes on all exterior water mains and services. The tracer wire shall be attached to top of pipe and run the full length of the utility line and shall be terminated at dead-ends.
    a. Provide #12 awg xlpe insulated copper tracing wires for entire length of pressure pipe. Secured to top of pipe, every five feet with plastic tie straps so that the wire remains in place during embedding of pipe.
    b. Where tracer wire terminates, tracing wire shall be brought to the surface in a tracer wire test station with a minimum three feet of wire rolled up, next to all valve boxes, hydrants, buildings etc.
    c. **Tracer wire test station shall be a tracer wire access box part# MC-22408 from USA Bluebook, phone # 800-548-1234.** Tracer wire access box shall terminate flush with finished grade with a concrete collar 12" X 12" X 6" to protect it.
    d. Tracer wire test stations shall be located where new pipe starts and terminates and a minimum of every 500 feet. Current is to be passed thru the wire to demonstrate that the wire is capable of locating the pipe. If wire will not pass current, locate break in circuit and test until tracer wire works in

accordance with its intended use. Provide copy of testing results to DPW Operations Branch Keith Pendleton, Bldg. 2222, 573-596-1179.

e. Splicing shall be performed per National Electrical Code.
f. When installed, notify DPW Operations Branch Keith Pendleton, Bldg. 2222, 573-596-1179 for coordination with DPW Base Maintenance Contractor to check tracer wire.

11. Contractor shall install detectable metallic underground locating tape 12" below finished grade on all water lines. Tape to be 3" wide and marked "WATER".

a. Plastic marking tape shall be installed directly above the waterlines. The tape shall be placed 12" below finished grade for the full length of the line. Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6-inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be of a type specifically manufactured for marking and locating underground utilities. Tape color to be blue for water and green for sewer and shall bear a continuous printed inscription describing the utility line.

12. Double check backflow preventer is required by DPW on all potable water service lines where water service enters building. DPW requires that potable water service come into the building with a common line then to fire system (with backflow prevention) and a branch line (with low hazard application double check valve - example Watts' Series 007) to the domestic water. See attachment "A" at end of Attachment d.

DPW Engineering Design reference concerning backflow preventers. Backflow prevention is application specific –Missouri Department of Natural Resources (MDNR) ambiguous words like 'potential' and 'threatens' are ambiguous and offer little direction. Barrack's or buildings where water entrances are Low Hazard and a Double Check Valve Assembly provides acceptable protection. RPZs are only required for High Hazard locations - if one is needed locate it prior to the equipment such as make up water lines for boilers, hospital equipment, lab equipment, waste digesters and car washes; not at the water entrance. RPZs have high pressure losses and are expensive. Application specific helps reduce the size of RPZs where required. Watts Regulator Company offers multiple types of backflow preventers and may be consulted for selection criteria and application specific issues. Do not install RPZs everywhere to cover all possible situations. Backflow Prevention device must be approved by MDNR. Reference Code of State Regulation for correct Backflow Prevention device, Chapter 11, Backflow Prevention at http://www.sos.mo.gov/adrules/csr/current/10csr/10csr.asp#10-10

a. Backflow prevention device must be mounted per Manufacturer's Instructions and be **easily accessible for testing**. After installation Backflow Preventer must be certified and tagged by MDNR Certified Backflow Tester

13. Use 5 1/4" Mueller Centurion 250 three way fire hydrants or approved equal, with isolation valve for each hydrant. Hydrants to be **painted** with two coats of Nutmeg **Brown** paint. Use Federal color #10080 brown or Sherwin Williams color # SW6090 JAVA.

14. All yard hydrants installed on FLW shall be a sanitary yard hydrant, Woodford Model S4H or model determined by proper bury depth. Yard hydrants shall be provided at no expense to FLW DPW.

15. Top of water mains shall be a minimum 42" below finished grade.

16. All buildings shall have a water isolation valve and cast iron water valve box with lid marked "WATER" within 10 feet of buildings.

17. All water mains shall have a water isolation valve and cast iron water valve box with lid marked "WATER" located every 500 feet.

18. Reference Missouri Department of Natural Resources Design Guide For Community Water Systems Section 8.6, Separation of water mains, sanitary sewers and combined sewers @ http://www.dnr.mo.gov/pubs/pub417.pdf

19. Due to many past CORPS Projects over last 10 years with leaks on the **domestic hot water return piping, do not exceed 4 fps.** See attachment "B" at end of Attachment d.

Recirculation design and operation velocities shall not exceed 4fps. FLW wants to stop erosion corrosion. Require mechanical system balancer to set a circuit setter to 4fps at circulation pump discharge and provide report.

Joe Gillardi, Mechanical Engineer
573-596-0913, FAX: 573-596-0868
Email: joe.gillardi@us.army.mil
ATZT-DPW-ED, 1334 1st Street, Bldg 2200
Fort Leonard Wood, MO 65473

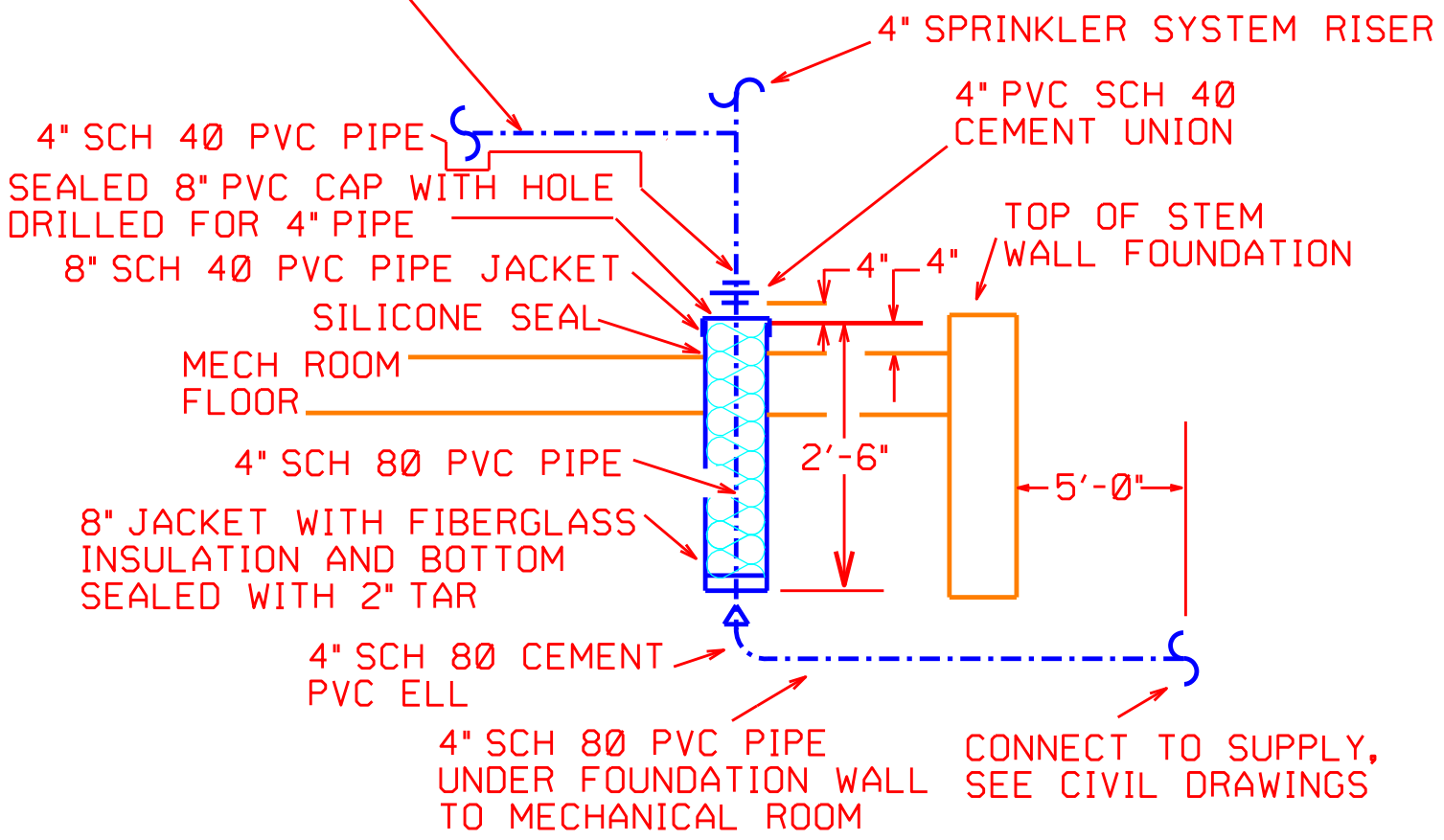
ATTACHMENT A

DPW WATER LINE ENTRANCE DETAIL

URN PIPING
FITTINGS

ELBOW
OOR.

PVC TRANSITION, 2" BALL VALVE, TEE WITH SAMPLING HOSE BIBB, 2" STRAINER, 2" DOUBLE CHECK VALVE ASSEMBLY, COPPER TRANSITION WITH DIELECTRIC UNION. PROVIDE CLEARANCE TO MAINTAIN STRAINER. SEE PIPING FLOW DIAGRAM SHEET M5.



WATER LINE ENTRANCE DETAIL

NO SCALE

DESIGNED: J GILLARDI
DRAWN: J GILLARDI
CHECKED: DK ROBERTSON
SUBMITTED: M MUELLER

BUILDING HVAC PLAN

COORDINATION: DATE DATE DATE

CONSTRUCT BUILDING FOR DPW

SCALE AS SHOWN

DATE 1 APR 09

PROJECT NO: ENG 22240-9J

DRAWING NO: C7433.22

SHEET M5 OF 7

ATTACHMENT B

PIPING EROSION AND CORROSION CONTROL

Piping Erosion and Corrision Control

Prevention of piping damage depends upon one or more of many things such as:

- **Fluid Velocity**
- **Type of Pipe**
- **Connections of different pipe materials (dielectric couplings or Unions)**
- **Entrained oxygen**
- **Surface condensation**
- **Water hardness**
- **Water corrosivity**
- **Pressure of fluid contained**
- **Etc.**

Corrosion in Domestic Hot Water Recirculation Systems

John J. Rix, P.E., Hydro-Flo Products, Inc.

Several mechanisms affect the corrosion of copper piping systems, particularly domestic hot water systems and specifically the recirculation piping.

- Velocity and Turbulence
- Water Quality
- Workmanship of Installer

Velocity and Turbulence

Excessive water velocity-induced turbulence, as well as turbulence caused by poor piping installation practices, i.e. burrs on the ends of piping at elbows and other fittings, removes the natural protective film and exposes the underlying copper to corrosion. This is termed erosion corrosion. A visual inspection of the interior wall of the copper tubing would reveal gouges, grooves and/or pits in the tubing wall. This type of attack is usually found when water velocities exceed 4 fps.

Water Quality

Water analysis will determine how aggressive or protective the water is. A Langlier Index determines the pH at which calcium carbonate is saturated in the water (Fs) and compares that with the actual pH of the water by the formula LI-pH-pHs. If the LI index is negative the water tends of be aggressive. If the stability index, calculated from the formula SI=2pHs-pH, exceeds 6.8, the water is corrosive; if it exceeds 8.5, it is very corrosive.

The presence of oxygen accelerates corrosion. If oxygen collects on the piping surface, it leads to an oxygen concentration cell with the copper under the oxygen cell becoming the anode. The result is pitting of the copper. Other types of corrosion deposits that attach themselves to the pipe wall cause similar pitting.

Water softened to zero hardness by sodium zeolite is often very aggressive and should be avoided whenever possible. Manually by-passing enough hard water around the softener to increase the hardness to 2 - 3 grains is normally sufficient.

Workmanship of Installer

The installer can help reduce turbulence by using good piping installation practices. Properly reaming copper tubing ends before making joints as well as proper fluxing and soldering is important. Flushing and cleaning the system to remove any flux residue eliminates pitting around the flux periphery.

Recommendations

- Size recirculating return piping for a maximum 4 fps velocity.
- Don't oversize recirculation pumps.
- Install circuit setter flow meters in all recirculation branches and use them. This means the plumbing designer must show the recirculation flow rates on the plan. Insist upon a written balancing report from the contractor.
- Insist on good installation practices.
- Clean and flush the piping and fill the system as soon as possible.

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INSTALLATION REQUIREMENTS

e. Environmental Division Environmental Requirements

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ENVIRONMENTAL REQUIREMENTS

ENVIRONMENTAL DIVISION

STANDARD CONTRACT LANGUAGE (revision of 21 December 2009)

1. **NATIONAL ENVIRONMENTAL POLICY ACT (NEPA):** NEPA requires that all Army facilities complete an environmental impact analysis according to 32 Code of Federal Regulations Part 651 and Army Regulation 200-2, for proposed actions. This analysis considers the anticipated direct, indirect, and cumulative impacts of the specific proposed action on the natural, human, and socioeconomic environment. This project was reviewed by the DPW Environmental Division and a NEPA document prepared which contains a site analysis and site specific requirements. This is a legally binding document and the requirements contained in it must be adhered to in addition to the Standard Environmental Contract Language. The contractor shall reference the NEPA review documents and shall contact the Environmental Division (596-0882) for clarification of any requirement: The documentation will be at the Environmental Division if none is available in the contract, and the contractor shall seek out that information if it has not otherwise been provided prior to the beginning of any contracted activities.

2. **NATURAL RESOURCES:**

2.1. **Forest Products** – If the work area contains trees that must be removed, the area must be surveyed for salvageable forest products, which must be disposed of in accordance with AR 405-90, Disposal of Real Estate, and AR 200-1, Environmental Protection and Enhancement. At such time as the project limits are established, the DPW Natural Resource Branch (NRB) must conduct a survey and provide a map and fair market value of the timber.

2.2. **Threatened & Endangered Species** – If the area contains potential roost trees (dead or dying trees with sloughing bark) for the Indiana bat, a federally endangered species, these trees may only be removed during the period of 01 November through 31 March of the following year.

2.3. **Cultural Resources** – The Contractor shall protect existing historical, archaeological, and cultural resources within the work area and shall be responsible for their preservation during the life of the Contract. Work affecting these resources is not allowed unless prior approval is received by the Fort Leonard Wood DPW Natural Resources Branch. If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered of found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this include but are not limited to any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other unexpected constructed feature; and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made.

3. **WATER QUALITY:**

3.1. **Spill Prevention and Response Plan** – A Spill Prevention and Response Plan is required and shall include the procedures, instructions, and reports to be used in the event of a spill of a substance regulated by 40 CFR 112, 40 CFR 265, and/or regulated under State or Local laws and regulations. This plan shall include the name of the individual who will report any spills or hazardous substance releases, and the individual who will follow up with complete documentation.

3.2. **Spill Response** – Spills of hazardous materials/wastes, and spills of petroleum/oil/lubricants, shall be immediately reported and cleaned up to the satisfaction of the Fort Leonard Wood Environmental Branch at the Contractor's expense. Spills must be reported immediately to the local Fire Department (911), the Fort Leonard Wood Environmental Branch (573/596-0882), and the Contracting Officer (CO/COR). The Contractor shall cease all activity in the area of the spill or in the area of discovered contamination and shall not commence work in that area until so directed by the CO/COR. Contractor shall provide verification, as required, that Contractor employees are properly trained in spill response and cleanup in accordance with all Federal, State, Local, and Fort Leonard Wood laws and regulations and guidance. The

Contractor shall prepare the “Fort Leonard Wood Spill Report” form, Attachment f. The completed form shall be submitted to the Environmental Branch via the CO/COR.

3.3. **Secondary Containment** – All petroleum, oil, lubricants, hazardous materials, and hazardous wastes in 55-gallon containers or larger must have secondary containment capable of holding at least 110% of the capacity of the single largest container. This also applies to animal-based and vegetable-based grease commonly associated with dining facilities.

3.4. **Rinsate –** Rinsate from cement trucks must be contained on site and not allowed to discharge from the site.

3.5. **Backflow Preventers** – All facilities must have backflow preventers on service lines plus potential cross contamination sources.

3.6. Stormwater Runoff and On-site Erosion and Sediment Control – All sites with land disturbing activities, regardless of size, must install erosion and sediment control measures to prevent erosion and sediment from leaving the land disturbance site. Land disturbing activities 1-acre or greater require a Permit from the Missouri Department of Natural Resources. All sites must be final stabilized through re-vegetation or medium such as gravel or rock.

3.6.1. **Stormwater Runoff** – Section 438 of the Energy Independence and Security Act of 2007 requires "The sponsor of any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 square feet shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow.”

3.6.2. **On-site Erosion and Sediment Control** – All sites with land disturbing activities less than 1-acre must install erosion and sediment control measures to prevent erosion and sediment from leaving the land disturbance site and be restored per the approved FLW Excavation Permit, (“Dig Permit”) FLW Form 364. Land disturbing activities 1-acre or greater require a Land Disturbance Permit from the Missouri Department of Natural Resources. Refer to Section 6.6 for the Land Disturbance Permit requirements.

4. TOXIC SUBSTANCES:

4.1. **Lead-Based Paint** – No lead-based paint (LBP) or materials containing LBP may be used at Fort Leonard Wood. With a demolition or renovation, if the presence of lead-based paint (LBP) is unknown, it should be assumed to be present, especially in structures built prior to 1980. Demolition of structures containing LBP must be done using precautions to prevent the release of the hazardous substance, such as whole component removal. If whole components containing LBP are removed or if a building is demolished, Missouri Department of Natural Resources (MDNR) Solid Waste Regulations require disposal in a State-permitted demolition or sanitary landfill. Or, a structure may be remediated by removing the lead-based paint using lead-safe work practices; however, any lead-based paint removed or recovered from the site must be handled as Hazardous Waste IAW Federal, State, Local, and FLW Regulations. For additional information, contact the DPW Environmental Branch (573/596-0882).

4.1.1. For any lead-based paint remediation performed by a Contractor other than the Base Maintenance Contractor, all lead-based paint and/or other hazardous wastes must be packaged, labeled, marked, and disposed of by the Contractor performing the work according to Federal, State, Local, and FLW Regulations. All hazardous waste manifests must be signed by the FLW Hazardous Waste Program Manager. Manifests shall be provided at least 48 hours prior to the expected shipment date. Under no circumstances will hazardous waste be handled or removed from the site without first consulting with the FLW Hazardous Waste Program Manager. The appropriate test method to make a non-hazardous determination, should the Contractor elect to have the waste tested, is the Toxicity Characteristic Leaching Procedure (TCLP), EPA Method 1311, which is described in Appendix 11, 40 CFR Part 261. All test results shall be provided to the FLW Hazardous Waste Program Manager for review. This includes TCLP testing and any other analytical testing performed that impacts the determination of wastes from this site.

4.2. **Non-Liquid Polychlorinated Biphenyls** – PCBs may be present in the caulk used in windows, door frames, masonry columns and other masonry building materials in many buildings, including schools, built

or renovated between 1950 and 1978. The contractor shall coordinate all potential NLPCB related work (i.e., work on such facilities and structures as described above) with the FLW environmental office, who must approve all sampling and work. No PCBs may be used at Fort Leonard Wood. If building materials containing PCBs are to be removed, a PCB Removal Plan shall be submitted to the Fort Leonard Wood Environmental Branch for approval prior to commencement. Contact the Fort Leonard Wood Environmental Branch at 573/596-0882 for further clarification.

4.3. **Asbestos Containing Materials –** No Asbestos Containing Materials (ACMs) may be used at Fort Leonard Wood. All 9-square-inch floor tile is assumed to contain asbestos and some 12-square-inch tile contains asbestos, therefore, floor tile that is broken, in poor condition, or is to be disturbed needs to be tested for asbestos content prior to beginning work. Furthermore, if any suspect ACMs are discovered, the project must stop, and the suspect material must be tested for asbestos content. If applicable, the Contractor is responsible for testing and must coordinate the testing with the Fort Leonard Wood DPW Environmental Branch. The testing may be done only by certified individuals. If testing confirms that asbestos is present, then the ACMs may be removed only by individuals certified to remove ACMs, and the ACMs must be disposed of in accordance with all applicable Federal, State, and Local regulations, including Fort Leonard Wood policies. Upon conclusion of the Asbestos removal, the Contractor is required to complete the "Fort Leonard Wood Asbestos Project Compliance and Completion" form, Attachment n, and submit the completed form to the Environmental Branch via the CO/COR. Contact the Fort Leonard Wood DPW Environmental Branch at 573/596-0882 for more information.

5. WASTE MANAGEMENT:

5.1. **Debris Burning** – Fort Leonard Wood restrictions do not allow construction materials, demolition materials, or any debris to be burned.

5.2. **Solid Wastes –** Solid wastes (excluding land clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill shall be the minimum acceptable off-site solid waste disposal. The Contractor shall verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. The Contractor shall comply with Federal, State, local laws and regulations and Fort Leonard Wood guidance pertaining to the use of landfill areas.

5.3. **Contractor Generated Hazardous Wastes/Excess Hazardous Materials** – Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable State and local regulations. Hazardous materials are defined in 49 CFR 171 – 178. The Contractor shall, at a minimum, manage and store hazardous waste in compliance with 40 CFR 262. The Contractor shall take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. The Contractor shall segregate hazardous waste from other materials and wastes, shall protect it from the weather by placing it in a safe covered location, and shall take precautionary measures such as berming or other appropriate measures against accidental spillage. The Contractor shall be responsible for storage, describing, packaging, labeling, marking, and placarding of hazardous waste and hazardous material in accordance with 49 CFR 171 – 178, State, and local laws and regulations. The Contractor shall transport Contractor generated hazardous waste off Government property in accordance with the Environmental Protection Agency and the Department of Transportation laws and regulations. The Contractor shall dispose of hazardous waste in compliance with Federal, State, and local laws and regulations. Spills of hazardous or toxic materials shall be immediately reported to the local Fire Department (911), the Fort Leonard Wood Environmental Branch (573-596-0882), and the Contracting Officer Representative. Cleanup and cleanup costs due to spills shall be the Contractor's responsibility. The disposition of Contractor generated hazardous waste and excess hazardous materials are the Contractor's responsibility.

5.4. **Disposition of Materials –** All materials removed and not reused or designated as salvage material in this project shall become the property of the Contractor. The Contractor shall dispose of such materials at a State and Resource Conservation and Recovery Act approved Treatment, Storage, and Disposal Facility or permitted off-post landfill licensed by the state of Missouri. The Contractor shall lawfully dispose of such materials at the Contractor's sole expense in accordance with the following rules. On a case by case basis, and only with written permission from DPW Environmental Branch and also direction from the

Contracting Officer (CO) or Contracting Officer's Representative (COR), natural land clearing wastes and or clean fill may be allowed to remain on Fort Leonard Wood (FLW) property. Any costs contained in the contract for off site (FLW) disposal shall be reimbursed to the government when disposition of natural land clearing waste and or clean fill is authorized for use on FLW property.

5.5. Recyclable Materials – The Contractor shall recycle products whenever possible and to the fullest extent practicable. Recycling shall be in accordance with all Federal, State, Local, and Fort Leonard Wood laws and regulations and guidance. The Contractor shall deliver all uncontaminated recyclable materials to the Fort Leonard Wood Recycling Center, Building 2549 during normal business hours M-F 0800-1630. Current recyclable materials include clean corrugated and non-corrugated cardboard, plastic and aluminum. Wood pallets in good condition shall be recycled during normal business hours M-F 0800-1630 (see Recycle Center attendant before unloading pallets). Unusable pallets shall be broken up and placed in dumpsters. Materials not currently recyclable by the Fort Leonard Wood Recycling Center shall be disposed of as provided below.

5.6. Disposal of Waste, Natural Materials.

5.6.1. Burning of Woody Natural Materials. Burning of woody natural materials, logs, stumps, limbs etc is allowed only with an Air Curtain Destructor or equivalent high efficiency equipment and only with written approval by the DPW Environmental Branch. The DPW Environmental Branch will review the proposal to determine the potential impact to the Installation's Air Quality Permit and Air Monitors. If authorization is granted, the Contractor will still be subject to shut-down if deemed necessary by the DPW Environmental Branch in order to prevent impacts to training and operations and/or avoid Air Quality Permit compliance impacts. Tonnage of woody natural materials burned will be recorded on the FLW Construction and Demolition waste management report, Attachment g. All ash generated will be disposed of in accordance with all federal, state, local and FLW guidance and regulations at the contractors expense.

5.6.2. Cantonment – The Contractor shall dispose of leaves and grass clippings (removed from bags) generated by this project at the Fort Leonard Wood Compost Area or off of FLW property and in accordance with all federal, state, local laws and FLW regulations and guidance. The Contractor shall dispose of logs greater than 6 inches in diameter either by disposal at a Fort Leonard Wood Fire Wood Cutting Site (or other designated location on Fort Leonard Wood after written approval is provided by the DPW Environmental Branch and direction is provided by the CO or COR), or by sale or retention for sale, or off of FLW property in accordance with all federal, state, local laws and FLW regulations and guidance. The Contractor shall dispose of wood chips, tree stumps and logs, limbs and brush less than 6 inches in diameter and all other natural waste material off of FLW property, in accordance with all federal state local laws and Fort Leonard Wood regulations and guidance. Or on a case by case basis a site on FLW property may be provided for disposition. Written permission from DPW Environmental must be obtained prior to disposition which will only be done at the direction of the CO or COR. Natural chipped materials may also be beneficially reused on the project site to include permanent on-site erosion control berms only per the NPDES permit not to exceed three (3) feet high by six (6) feet wide, or for disposition or sale as mulch.

5.6.3. **Range and Training Areas, potentially containing metal residue from munitions firing** - As determined by DPW Environmental Branch and DPTM, all waste natural materials potentially containing metal residue from munitions firing shall remain on site and shall not be mulched, chipped or placed in drainage ways. Any other disposition of materials from these areas shall be in accordance with all federal, state, local laws and FLW regulations and guidance.

5.6.4. **Range and Training Areas, without metal residue from munitions firing** - Logs greater than 6 inches in diameter *may b*e sold or placed at a designated location on Fort Leonard Wood after written approval is provided by the DPW Environmental Branch and direction is provided by the CO or COR). Stumps and Brush less than 6 inches in diameter shall be disposed off of FLW property and in accordance with all federal, state, local laws and FLW regulations and guidance. Wood chips may be used for onsite erosion control berms not to exceed (3) feet high by (6) feet wide, used as mulch or sold. Whole Stumps may be used on site for erosion control in drainage areas or as project design features such as lane markers. No natural Materials listed in 5.6.3 may be brought on to the Training Areas (TAs) or Ranges from other sites for disposition unless they are to be used on site for erosion control or project design features. The Contractor shall remove and dispose of all unused natural waste material from FLW property in accordance with all federal, state, local laws and FLW regulations and guidance before the contract is completed.

5.7. **Disposal of Waste, Fill Materials –** The Contractor shall dispose of clean waste fill materials (unpainted cinder block, brick and concrete with no exposed steel, rock, asphalt, and clean soil with no organic material) at a landfill off-Post licensed by the State of Missouri to accept such waste, or on a case by case basis and only with written approval by DPW Environmental Branch and also with direction from the CO or COR may use the Fort Leonard Wood Clean Fill site or other sites on FLW approved for use by the DPW and DPW Environmental Branch. Concrete shall have no exposed or protruding steel. The Contractor shall dispose of contaminated waste fill materials at al landfill off-post licensed by the State of Missouri to accept such waste. The Contractor shall provide all necessary information for disposal to the landfill operator, including any required testing of materials and completion of forms required by the Missouri Department of Natural Resources (MDNR).

5.8. **Disposal of Demolition Waste –** The Contractor shall recycle all construction and demolition waste to the fullest extent possible. The Contractor shall complete the "Fort Leonard Wood Construction and Demolition Waste Management Report", Attachment g, as specified in the document and comply with all guidance contained in the document. The completed form shall be submitted to the Environmental Branch via the CO/COR. In accordance with Executive Order 13423 "Strengthening Federal Environmental, Energy and Transportation Management" January 24, 2007 a minimum of 50% by weight of the total project solid waste shall be diverted from the landfill. The Contractor shall dispose of demolition waste at a landfill off-post licensed by the State of Missouri to accept such waste. Disposal of demolition waste shall be in accordance with 10 CSR Chapter 80-4. The Contractor shall provide all necessary forms and information for the disposal to the landfill operator and MDNR.

5.9. **Disposal of Hazardous Waste** – The contractor shall be responsible for the costs of testing and disposal of hazardous waste; all hazardous wastes must be packaged, labeled, marked and disposed of by the contractor performing the work IAW Federal, State, Local, and FLW Regulations. All hazardous waste manifests must be signed by the FLW Hazardous Waste Program Manager. Manifests shall be provided at least 48 hours prior to the expected shipment date. Under no circumstances will hazardous waste be handled or removed from the site without first consulting with the FLW Hazardous Waste Program Manager. The appropriate test method to make a non-hazardous determination, should the contractor elect to have the waste tested, is the Toxicity Characteristic Leaching Procedure (TCLP), EPA Method 1311, which is described in Appendix 11, 40 CFR Part 261. All test results shall be made available to the FLW Hazardous Waste Program Manager for review. This includes TCLP testing and any other analytical testing performed which impacts the determination of wastes from this site. The Contractor shall dispose of any wastes classified as hazardous wastes under the Resource Recovery and Conservation Act (RCRA) in accordance with all Federal, State, local, and Fort Leonard Wood laws and regulations and guidance regarding storage, manifesting, shipment, treatment and disposal of such materials. The storage, containerization, characterization, labeling, placarding, documentation, transportation and final disposition of all hazardous waste will be accomplished in accordance with all Federal, State, local, and Fort Leonard Wood laws and regulations and guidance. The Contractor will procure all necessary licenses, permits and authorizations. All mercury containing thermostats and switches, PCB ballasts and fluorescent lighting will be disposed of through the Fort Leonard Wood base maintenance Contractor according to the Fort Leonard Wood SOP "Lighting and Thermostat Recycle/Disposal Guidance." The Contractor shall lawfully dispose of materials at the Contractor's sole expense. Notification and approval by the Contracting Officer and the Fort Leonard Wood Environmental Coordinator is required 10 business days prior to any action related to the disposal of hazardous waste. The Government will have and exercise full and complete control over determining suitability of the Treatment, Storage, and Disposal Facility (TSDF).

5.10. **Disposal of Other Waste** – The Contractor shall dispose of any wastes not specifically covered here at a landfill off-post licensed by the State of Missouri to accept such waste.

5.11. **Waste Management Documentation** – The Contractor shall document all wastes disposed of outside of Fort Leonard Wood by delivering to the CO/COR a landfill disposal form signed and dated by the landfill operator which shows the nature, amount and location of materials delivered to the landfill. In case of sale of logs or retention for sale of logs, the Contractor shall provide a signed statement indicating the disposition of the logs. Construction and Demolition debris will be documented on the Fort Leonard Wood Construction and Demolition Waste Management Report form, attached.

5.11.1. When applicable, the Contractor shall provide the generator, at each site, a properly prepared, typed and error-free, hazardous/special waste manifest and the Toxic Characteristic Leaching Procedure (TCLP) EPA method 1311 analysis appropriate to the waste and current waste profile from

the TSDF each time waste is offered for transportation off site. A written Land Disposal Restriction Notice shall accompany each hazardous/special waste manifest, as required. The Contractor shall ensure the completed manifest is returned to the generator within 35 days from the initial transporter's date of signature. The Contractor shall provide the generator at each site a certification of disposal statement for each hazardous/special waste manifest initiated. The Contractor shall also document all waste disposals by delivering to the CO/COR copies of the landfill disposal form signed and dated by the landfill operator which shows the nature, amount, and location of materials delivered to the landfill. In case of sale of logs or retention for sale of logs, the Contractor shall provide a signed statement indicating the disposition of the logs. Copies of this documentation shall be provided to the Contracting Officer prior to requesting final payment on the affected order(s). The work outlined above is a subsidiary portion of the contract work, and is assigned a value of 5% of the value of each affected project. The Contractor shall assign a value of that amount in the breakdown for progress payments. If the Contractor fails to maintain and provide environmental documentation as required herein, the Government will consider that satisfactory progress has not been achieved, thereby requiring the retention of 5% from any request for progress payment, on top of any other retainage applied for cause.

6. **PERMITS:** It shall be the responsibility of the Contractor to obtain *all* permits/licenses required for performance of the contract. The Contractor shall be responsible for determining the fee basis and paying all filing fees and taxes. Payment of fines, penalties, and associated fees for noncompliance or improper performance of applicable work shall be the responsibility of the Contractor. The Contractor shall perform all work in compliance with the Permit. The Contractor shall allow entry to State and Federal regulatory agency inspectors. The Contractor shall be responsible for any fines and penalties associated with non-compliance. The Contractor Copies of the permit applications and associated documentation shall be routed through the Contracting Officer/Contracting Officer Representative to the appropriate DPW Divisions for review and approval prior to submittal. A transmittal letter signed by the current DPW Director will be provided as the Missouri Department of Natural Resources (MDNR) will not accept or process the application for the associated permit without the signed transmittal letter. This is a time consuming effort and the Contractor should begin the permit process well in advance of the Notice to Proceed in order to avoid delaying the start of the project. A copy of all approved permits shall be submitted to the Contracting Officer/Contracting Officer Representative and the Environmental Branch (573/596-0882).

6.1. **Drinking Water Permits** – Should a water main extension or a fire hydrant be installed required as part of this contract, or any modification to the water system that would require a permit as outlined in 10 CSR 60-3, the Contractor is responsible for obtaining that permit from MDNR. Water permits are issued from the Jefferson City Office. In addition to the permit application, eight sets of DRAFT professional engineer stamped plans and specifications must be submitted for the DPW to review prior to final approval from the Director. Government comments must be resolved prior to preparation of final documents. Once approved, two sets of Final Missouri Professional Engineer stamped plans and specifications, along with the completed permit application forms, are submitted to the DPW Operations Division. Once the cover letter has been signed by the DPW Director, the Contractor will then forward plans/specs/permit application/fees to MDNR. Should MDNR require additional information, the same procedures will be followed prior to forwarding to the State. A copy of the permit must be provided to the DPW Environmental Branch for official records within five (5) business days of receipt. Any permit application fees are to be paid by the Contractor. The Contractor is responsible for full compliance with all terms and conditions of the permit. This work may not proceed until the State issued permit is provided and posted at the job site as required by the permit. Once the project is complete, the Contractor's Professional Engineer will complete the "Statement of Work Completed" form, furnished with the permit and provide the signed form to the DPW Environmental Branch for forwarding to MDNR.

6.2. **Waste Water Permits** – Should a waste water main extension or a Lift Station be installed as part of this contract, or any modification to the wastewater system that would require a permit as outlined in 10 CSR 20-6.010, the Contractor is responsible for obtaining that permit from MDNR. Waste water permits are issued from the Rolla Satellite Office. In addition to the permit application, eight sets of DRAFT professional engineer stamped plans and specifications must be submitted for the DPW to review prior to final approval from the Director. Government comments must be resolved prior to preparation of final documents. Once approved, two sets of Final Missouri Professional Engineer stamped plans and specifications, along with the completed permit application forms, are submitted to the DPW Operations

Division. Once the cover letter has been signed by the DPW Director, the Contractor will then forward plans/specs/permit application/fees to MDNR. Should MDNR require additional information, the same procedures will be followed prior to forwarding to the State. A copy of the permit must be provided to the DPW Environmental Branch for official records within five (5) business days of receipt. Any permit application fees are to be paid by the Contractor. The Contractor is responsible for full compliance with all terms and conditions of the permit. This work may not proceed until the State issued permit is provided and posted at the job site as required by the permit. Once the project is complete, the Contractor's Professional Engineer will complete the "Application for Letter of Authorization" form, furnished with the permit, and provide the form to the DPW Environmental Branch to be submitted to MDNR. If a waste water Lift Station is required as part of this contract, a backup generator is required for support in the event electrical power becomes unavailable.

6.3. **Air Permits** – Air emissions sources require construction permits in Missouri. Air permits are issued for the specific design and equipment (stacks, vents, exhaust systems, open vats, storage tanks (sources of evaporation), incinerators, boilers, generators (i.e., any combustion equipment), etc.). It is the Contractor's responsibility to obtain permits before construction starts and ensure compliance with the permit. Route all air permit requests through the CO/COR.

6.4. **Land Disturbance Permits (National Pollutant Discharge Elimination System Permits)** – Land disturbance is defined as any activity that disturbs the root zone of vegetation or disturbs compacted soil to an erodible state such as clearing, grubbing and grading. Should the project entail land disturbance of 1-acre or greater, but less than 5-acres, State Form O must be completed (in accordance with 10 CSR 20-6.200) and provided to the Contracting Officer/Contracting Officer Representative. For projects that cause land disturbance of 5 acres or more, State Forms E and G must be completed (in accordance with 10 CSR 20-6.200) and provided to the Contracting Officer/Contracting Officer Representative (CO/COR). In addition, a Storm Water Pollution Prevention Plan (SWPPP) must be provided (in accordance with 10 CSR 20-6.200) that includes a site specific sketch/drawing showing all planned erosion control devices. In addition to the appropriate State forms, a USGS 1" = 2,000' scale map showing the exact location of the project is required. Once approved, a signed cover letter from the Director of Public Works will be provided to the Contractor to include with the application. The Contractor will forward the permit application/drawings/fees to the MDNR. Any permit application fees are to be paid by the Contractor.

6.4.1. The Contractor is responsible for compliance with all terms and conditions contained in the permit until the Permit is formally terminated by the Missouri Department of Natural Resources. Earth disturbing activities may not proceed until the State issued permit is obtained and posted at the job site as required by the permit. Attachment h provides a sample copy of a Permit.

6.4.2. Each site with a Land Disturbance Permit must provide copies of the completed weekly inspection reports and completed inspection reports no more than 48-hours after a rain event. The Contractor must also complete and submit monthly the "Fort Leonard Wood Land Disturbance Permit Compliance Self Certification" form, Attachment h. All inspection reports and monthly Compliance Certification submittals are required until the Permit is terminated by the Missouri Department of Natural Resources. All submittals are to be provided within 5-days of completion to the DPW Environmental Branch via the CO/COR.

6.4.3. Interim soil stabilization is required until final stabilization is met. All sites must be final stabilized as per the Missouri Permit: "The project is considered to be stabilized when perennial vegetation, pavement, buildings, or structures using permanent materials cover all areas that have been disturbed. With respect to areas that have been vegetated, vegetative cover shall be at least 70% of fully established plant density over 100% of the disturbed site." Use of Missouri native perennial vegetation is highly encouraged.

6.5. Missouri Separate Storm Sewer (MS4) Permit – Construction activities occurring on Department of Army Fort Leonard Wood property are regulated by a Municipal Separate Storm Sewer System (MS4) Permit. This is a permit, regulated by the Environmental Protection Agency under the Clean Water Act and administered by the Missouri Department of Natural Resources, legally mandates that Fort Leonard Wood decrease the quantity and increase the quality of stormwater runoff through improved site design, and

selection and maintenance of Best Management Practices that minimize point and non-point pollution sources. This permit requires that Fort Leonard Wood maintain a rigorous land disturbance oversight program that proactively enforces adherence to land disturbance permit requirements regulating pre- and post-construction runoff from permitted activity, and report the status of compliance annually.

7. **ENERGY AND SUSTAINABILITY:** The Federal government is committed to designing, locating and constructing, maintaining, and operating its facilities in an energy efficient and sustainable manner. It shall be the responsibility of the Contractor to comply with all of the following federal energy and sustainability executive orders and policies. The Contractor shall be responsible for determining the applicability of each of these for their project. Copies of each of these requirements can be obtained from the Contracting Officer/Contracting Officer Representative or the Environmental Branch (573/596-0882).

7.1. **Heating, Ventilation, Air Conditioning (HVAC)** – The Army standard is that no Class I or Class II ozone-depleting substances (ODSs) may be used and that any alternative refrigerants must have a Toxicity Clearance through the Center for Health Promotion and Preventive Medicine (CHPPM). Contractors may access the list of CHPPM Toxicity Clearances at the following website: http://chppm-www.apgea.army.mil/tox/product.aspx

7.2. **DoD Green Procurement Program (GPP) –** The DoD GPP requires green products and services to be purchased to the maximum extent practicable. The Contractor shall comply with applicable Federal Acquisition Regulations (FARs). The Contractor shall consult with the contracting official to determine the applicability of the GPP to their project.

7.3. **Executive Order 13423 – Strengthening Federal Environmental, Energy, and Transportation Management, 26 Jan 07 –** The Federal Government is required to adhere to the environmental, energy and transportation requirements outlined in the state executive order. Therefore, Contractors must be able to work with the federal government to comply with these requirements. Examples of required goals include improved energy efficiency and reduced green house gas emissions, reduced water consumption, green procurement, and high performance building requirements.

7.4. **Energy Policy Act of 2005** – The Contractor shall support the Federal Energy Reduction Goals as required by the Energy Policy Act of 2005. Contractor must adhere to the regulations and specifications contained within this Act. Contractor must consider the cost of required energy reductions when preparing Request for Proposal.

7.5. **Energy Independence and Security Act of 2007** – The Contractor shall support the Federal requirement that all lighting in Federal Buildings use Energy Star products. The Contractor shall ensure compliance with Subtitle C – High-Performance Federal Buildings. This requirement has applications to building energy use and HVAC systems as well as the following stormwater requirements. Refer to Section 3.6.1 for the stormwater requirements.

7.6. **Army's Sustainable Design and Development (SDD) Policy**

7.6.1. Military Construction Program – All vertical construction projects with climate-controlled facilities (mechanically heated or cooled for human comfort) must achieve the SILVER level of Leadership in Energy and Environmental Design – New Construction (LEED-NC). This requirement applies to all construction on Ft. Leonard Wood, including Army Reserve, Army Readiness Centers and Armed Forces Reserve Centers, regardless of funding source and including BRAC. All LEED projects must be registered with the US Green Building Council and must be certifiable by the USGBC. Five percent of Army building projects are chosen for validation, in which case, certification is required. Associated costs shall be captured in the DD Form 1391.

7.6.2. Garrison-level Approved Projects – Projects authorized to be approved by the Garrison Commander - shall incorporate SDD features to the maximum extent possible but are exempt from meeting the minimum score requirement for the SILVER level of LEED. Incorporating SDD can increase energy efficiency and reduce energy costs, increase the tonnage recycled minimize pollution

7.6.3. Exemptions

7.6.3.1. Horizontal construction projects (ranges, roads, airfields, etc.) shall incorporate SDD features to the maximum extent possible, but are exempt from meeting the minimum score requirement for the SILVER level of LEED.

7.6.3.2. The requirement to achieve the SILVER level of LEED applies to permanent facility construction only; required interim facilities are exempt. An interim facility requirement is a short-term urgent requirement for facilities lasting three years or less, normally.

7.6.3.3. Renovation and Repair projects are required to incorporate SDD features and be scored using LEED-NC, but are exempt when they do not exceed the garrison commander authority or they have a repair to replacement ratio less than or equal to 25%.

7.7. **Conformance with the Fort Leonard Wood ISO 14001 Environmental Management System** - The Contractor shall perform work under this contract consistent with the policy and objectives identified in the Fort Leonard Wood ISO 14001 Environmental Management System (EMS). The Contractor shall perform work in a manner that conforms to all appropriate Environmental Management Programs and Operational Controls identified by the Fort Leonard Wood EMS. In the event of an environmental nonconformance or noncompliance associated with the contracted services, the Contractor shall take corrective and/or preventative actions. In the case of a noncompliance, the Contractor shall respond and take corrective action immediately. In the case of a nonconformance, the Contractor shall respond and take corrective action based on the time schedule established by the EMS Coordinator. In addition, the Contractor shall ensure that their employees are aware of the roles and responsibilities identified by the SMS and how these requirements affect their work performed under this contract. Information can be found in the Contractor Section of the DPW Environmental Division Website.

7.7.1. All on-site Contractor personnel shall complete FLW EMS awareness training, and as is identified in the Training Requirements of the Contractor Section of the DPW Environmental Division Website (www.wood.army.mil/dpwenv).

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INSTALLATION REQUIREMENTS

f. Fort Leonard Wood DPW Spill Report Form

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Fort Leonard Wood
Directorate of Public Works
Environmental Division

Spill Report

Any spill or release of POLs, hazardous waste, or hazardous material into the environment must be reported immediately by calling 911. Within 3 days of the incident, complete and submit this Spill Report Form to the DPW Environmental Branch in Building 2101, which is located at the intersection of 2nd Street and Replacement Avenue. The form may also be submitted via fax (573-596-0869) or email (angela.rinck@us.army.mil). For more information, call 573-596-0882 during duty hours.

Report to DPW made by:

Name: _____ Signature: _____

Title: _____ Location: _____

Date: _____ Time: _____

Material spilled: _____

Volume spilled: _____

Location of spill: _____

Date, time, and duration of spill: _____

Cause of spill (Attach additional pages if necessary):

Corrective action taken to control and/or mitigate the effects of the spill (Attach additional pages if necessary):

Plan for preventing recurrence (Attach additional pages if necessary):

Other contacted, i.e. Fire Department:

Name: _____ Date/Time: _____

Name: _____ Date/Time: _____

Name: _____ Date/Time: _____

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INSTALLATION REQUIREMENTS

g. Fort Leonard Wood DPW Construction and Demolition Waste Management Report

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Fort Leonard Wood
Directorate of Public Works
Environmental Division

Construction and Demolition (C&D) Waste Management Report

The contractor shall make all reasonable efforts to recycle and recover C&D waste from this project. A minimum of 50%, by weight, of total project solid waste shall be diverted from the landfill in accordance with Executive Order 13423 "Strengthening Federal Environmental, Energy, and Transportation Management", 24 January, 2007. Waste management consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project mandates. Companies and facilities used for recycling, reuse, and disposal shall be appropriately permitted for the intended use to the extent required by federal, state, and local regulations. The contractor shall provide on-site instructions for separating, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project. Records shall be maintained to document the quantity of waste generated, the quantity of waste diverted through sale, reuse, or recycling, and the quantity of waste disposed of by landfill or incineration. This form shall be used to record the information. The contractor shall submit this report of all non-hazardous C&D waste generation no later than 10 days after each fiscal quarter ends, starting the first quarter that C&D waste is generated. This report shall be submitted through the contracting officer or representative to the Directorate of Public Works Solid Waste Program Manager 573-596-0882, Building 2101. Contractor shall provide an electronic or paper copy.

Project name: _____ Location: _____

Contract number: _____ Report period covered: _____ to _____

Contractor: _____ Prepared by: _____

Gov't contract inspector: _____ Date: _____

Email: _____ Phone: _____

Waste Type	Total Generated (by weight in tons)	Management Method (by weight in tons)	
		Recycled or Salvaged	Disposed
Examples: Concrete	505,000	500,000 crushed for reuse at _____	5,000 to landfill
Mixed debris	1,000	0	1,000 to landfill
Scrap metal	10	10 recycled to A1 metals	0
Wall board/Sheet Rock			
Stumps, Brush, Wood Chips (beneficially reused on site)			
Stumps, Brush, Wood Chips (off FLW)			
Scrap Metal			

Waste Type	Total Generated (by weight in tons)	Management Method (by weight in tons)	
		Recycled or Salvaged	Disposed
Concrete			
Clean fill (FLW clean fill)			
Clean fill (off FLW)			
Compost (FLW compost)			
Compost (off FLW)			
Other			
TOTAL			

Landfill name:

Comments:

Example Waste Types:

Wallboard	Recycled to manufacturer.
Stumps & Brush	Logs less than 6 inches in diameter, all limbs, twigs, stumps and other brush.
Concrete	Contaminated concrete will be disposed of at an off-post authorized landfill.
Clean fill	Uncontaminated soil, rock, sand, gravel, concrete unpainted and with no exposed steel, unpainted brick, unpainted cinderblock, asphalt, and NO organic material.
Compost	Leaves, grass, and straw removed from trash bags (absolutely no trash or trash bags).
Scrap metal	Turned in as recyclable material.
Wood chips	

Specific guidance for disposition of C&D and Land Clearing materials is contained in the Environmental Requirements section of each project contract.

INSTALLATION REQUIREMENTS

h. Fort Leonard Wood DPW Land Disturbance Permit Compliance Self Certification

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Fort Leonard Wood
Directorate of Public Works
Environmental Division

Land Disturbance Permit Compliance Self Certification

The permit below is in compliance with all stipulations of the State of Missouri Land Disturbance Permit:

Permit number: _____

Project name or description: _____

Project building number or location: _____

Contract number (if applicable): _____

I certify that all of the Best Management Practices, including performing Weekly Site Inspections, under this State of Missouri Land Disturbance Permit are currently maintained in compliance with applicable federal law (40 CFR Section 319 of the Federal Clean Water Act) and the site specific Storm Water Pollution Prevention Plan.

Check only one:

☐ There is **no** outstanding compliance issues remaining on this site.

☐ There are compliance issues which will be corrected within seven days per the Permit.

_____ _____

Print and Sign
Land Disturbance Permit
Continuing Authority

Compliance Self Certification Date

_____ _____

Print and Sign
Land Disturbance Site Manager
(if applicable)

Compliance Self Certification Date

This certification must be submitted to the following address within 15 days from the end of each month until the permit is terminated by the Missouri Department of Natural Resources.

Fort Leonard Wood Directorate of Public Works
Environmental Compliance Branch (LMNE-LNW-PWEE)
Storm Water Program Manager
1334 First Street
Fort Leonard Wood, MO 65473

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INSTALLATION REQUIREMENTS

i. Fort Leonard Wood DPW Construction Permit Application Review Process

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Fort Leonard Wood
Directorate of Public Works
Environmental Division

Construction Permit Application Review Process

The following is Directorate of Public Works review process for all permit applications. This process must be followed to ensure timely review of permit applications.

1. Contractor shall provide the completed application and supporting documentation (including the Professional Engineer stamped drawings for water and waste water main extensions) to the Contracting Officer Representative (COR). Note this is a time consuming effort and the contractor should begin the permit process well in advance of the NTP in order to avoid delaying the start of the project.

2. The COR will submit the above to the Fort Leonard Wood Directorate of Public Works (DPW).

3. Appropriate staff of Fort Leonard Wood DPW (Planning Division, Operations Division, Engineering Division, and Environmental Division) will review.

4. DPW staff comments and/or approves.

5. DPW returns plans/specifications to COR/Contractor with the application transmittal letter signed by the Director of Public Works. This letter serves as the official Permit request. The Missouri Department of Natural Resources (MDNR) *will not* process any permit application for projects located on Fort Leonard Wood without this DPW transmittal letter.

6. Contractor submits documents, application, and Permit fee to the MDNR.

7. MDNR reviews/comments/issues Permit. Note: MDNR will not issue a Permit until their comments, if any, are adequately addressed.

8. Contractor provides copy of correspondence and Permit to the Fort Leonard Wood DPW Environmental Branch to maintain in the compliance file.

9. Construction may begin.

10. All permitted activities will be inspected for compliance by staff from Fort Leonard Wood, the Missouri Department of Natural Resources, and/or the Environmental Protection Agency, Region VII.

11. As the Permit holder, the Contractor is responsible for full compliance, and all fines, penalties, or other stipulations.

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INSTALLATION REQUIREMENTS

j. Fort Leonard Wood DPW State Permit – Review Processing

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Fort Leonard Wood
Directorate of Public Works
Environmental Division

State Permit – Review Processing

The following table provides a short list of contracted actions that generally require an additional environmental compliance review or require a permit or other document. This is not an all-inclusive list. If in doubt, please contact the Environmental Division for assistance at 573-596-0882 or visit the Environmental Division Web page at www.us.army.mil/dpwenv

REGULATORY AREA	DOCUMENT, PERMIT or NOTIFICATION	COST (estimated)	STATE PROCESSING TIME (estimated)	FLW CONTACT
Asbestos Work: Required for all Friable Asbestos projects	Notification 10-days prior to work start	$0	none	Keith Duncan
Land Disturbance- Erosion Control: Any earth disturbance 1-acre or greater	Erosion Control Permit	$300	Up to 6-months from date State receives application and fee payment	Shannon Kelly
Drinking Water: New/changes to the systems to include distribution system	Water Permit to "Construct"	$50-$3K	Up to 6 months from date State receives application, with plans/specs, and fee payment. PE stamp required	Carl Stenger
Waste Water: New/changes to: systems to include collection system	Water Permit to "Construct"	$50-$3K	Up to 6 months from date State receives application, with plans/specs, and fee payment. PE stamp required	Carl Stenger
Tanks- Underground: New/changes to: Underground Storage Tanks	Notification required	$100	Minimum 30-days upon receipt of notice and fee payment, prior to work start	Carl Stenger
Tanks-Aboveground: New/changes to Aboveground Storage Tanks	Permit to "Construct"	$150	Approx 60-days from date State receives request for permit determination and receives fee payment	Carl Stenger
Tanks: Install new fuel storage tanks	Permit to "Construct"	$150-$10K	Up to 9-months from date State receives application with plans/specs and fee payment	Carl Stenger
Utilities: Install new/replace emergency generators	Air Permit to "Construct"	$150-$10K	Up to 9-months from date State receives application with plans/specs and fee payment	Steve Flier
Utilities: New/changes to: large facility HVAC systems	Air Permit to "Construct"	$150-$10K	Up to 9-months from date State receives application with plans/specs	Steve Flier
Utilities: Replace Boiler or install new boiler(s)	Air Permit to "Construct"	$150-$10K	Up to 9-months from date State receives application with plans/specs	Steve Flier

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INSTALLATION REQUIREMENTS

k. Procedure for Coordination of Tree Removal

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APPENDIX

PROCEDURE FOR COORDINATION OF TREE REMOVAL

FORT LEONARD WOOD, MISSOURI

The following is a process for the coordination of tree removal on all Fort Leonard Wood projects.

- During the charette an initial discussion on the removal of trees shall be conducted. As the site plan is developed during the charette a preliminary determination shall be made on the removal of trees. The civil design engineer is responsible for coordinating this issue with FLW DPW personnel. At a minimum this shall include Dan James (573-596-2814), Brian Nelson (573-596-0901), and Thomas Glueck (573-596-2814) of the FLW DPW staff.

- Early in the design process (10-35%) the civil designer shall conduct a site visit to verify the survey shows all trees and their location.

- Upon completion of the 35% design the civil engineer shall coordinate closely with FLW DPW in regards to the removal of trees. This will require a site visit, which at a minimum will include Dan James, Brian Nelson, and Thomas Glueck of the DPW staff. The civil engineer shall ensure that FLW DPW fully understands the trees to remain and the trees to be removed during construction. Any site plan changes recommended based on the site visit shall be coordinated through the project manager for coordination with all stake holders and PDT members.

- At the 65% design submittal the civil engineer will coordinate any changes from the 35% submittal with the appropriate DPW personnel. This includes adjustments to the site layout, final grading, storm drainage, and utility impacts on the removal of trees. A site visit shall be conducted if deemed necessary.

- At the final design submittal the civil engineer will coordinate any changes from the 65% submittal with the appropriate DPW personnel. This includes adjustments to the site layout, final grading, storm drainage, and utility impacts on the removal of trees. A final plan-in-hand shall be conducted by the civil engineer to ensure that DPW personnel are in agreement on trees to be removed and those to remain. The site visit shall include DPW personnel and a representative from the Corps construction office. This shall be coordinated with Jesse Vance (816-389-3529).

- Prior to the start of construction one final site visit shall be held by the Corps construction office (Jesse Vance) to mark trees for removal. This shall include all necessary DPW staff to include at a minimum Dan James and Thomas Glueck.

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INSTALLATION REQUIREMENTS

l. Missouri Department of Natural Resources Solid Waste Management Program Fact Sheet

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Missouri Department of Natural Resources

Managing Construction and Demolition Waste

Solid Waste Management Program fact sheet 7/2006

This guidance is provided primarily for construction and demolition contractors, construction and demolition waste haulers, roofing contractors, remodeling businesses, homebuilders and homeowners. Cities and counties that issue building permits may also find the information helpful. The guidance covers only those residuals commonly produced during building construction and demolition. You may obtain information about managing other wastes by contacting the sources listed on the last page of this fact sheet.

This fact sheet is not intended for guidance on the management of surface coatings removed from bridges, water towers or other similar outdoor structures.

Waste types

During building construction and demolition, you may produce one or more of the following types of residuals:

1. Clean fill
2. Recovered materials
3. Regulated construction and demolition waste
4. Hazardous materials and hazardous wastes, or
5. Asbestos-containing materials.

Management requirements differ for each of these.

1. Clean fill is “uncontaminated soil, rock, sand, gravel, concrete, asphaltic concrete, cinder blocks, brick, minimal amounts of wood and metal and inert (nonreactive) solids...for fill, reclamation or other beneficial use” [§260.200(4), RSMo].

Minimal means the smallest amount possible. For example, concrete containing wire mesh or rebar may be used as clean fill. However, exposed rebar should be removed before use. Under no circumstances are roofing shingles, sheet rock, wood waste or other construction and demolition wastes defined as clean fill.

Concrete, cinder blocks, bricks or other clean fill materials that are painted with non-heavy metal-based paints are also considered clean fill. Before use as clean fill, it is the generator’s responsibility to determine if the painted materials are hazardous wastes. The most typical contaminants are lead and other heavy metals. This determination can be made by representative sampling or by applying historical knowledge of the materials in question. If asphaltic concrete is to be used as clean fill; it is generally recommended that it not be crushed or ground any smaller than necessary. This will help to minimize the leaching of chemicals found within the asphaltic material. Although not regulated as waste, placement of clean fill materials may be subject to requirements of the department’s Water Protection Program if it is placed in contact with surface or subsurface waters of the state, or would otherwise violate water quality

PUB002045

standards. Contact the department's Water Protection Program at (573) 751-1300 if you have any questions regarding this approval. Local requirements concerning the use of clean fill may apply as well. Contact the Hazardous Waste Program at (573) 751-3176 for questions on determining whether materials intended as clean fill may be hazardous and disposal options.

2. Recovered materials are those removed for reuse (lumber, doors, windows, ceramic tile and glass) and those removed to be recycled into new products.

Potentially recyclable construction and demolition wastes may include scrap metals, asphalt shingles, sheet rock, lumber, glass and electrical wire. However, it is important to remember that recovered waste must be used in some way. Separating out certain wastes to be recycled into new products without having a market for them is expensive and pointless. Storing recovered materials indoors is expensive. Storing them outdoors may lower their value, since most will degrade or deteriorate when exposed to the weather. Depending on how they are stored, they may harbor rodents, provide breeding grounds for insects or be a potential fire hazard. Recyclables may not be collected and dumped on the ground while waiting for markets to develop. Therefore, before you deliver recyclable materials to a processing or recovery facility, be sure the facility is legitimate. The Planning Unit of the department's Solid Waste Management Program (SWMP) has information about many recycling facilities in Missouri. You may contact the Planning Unit at (573) 751-5401.

If you plan to remove reusable or recyclable materials from construction and demolition waste, the sorting must take place at the construction or demolition site.

The wastes cannot be hauled from the site and dumped for later sorting, except at a permitted processing facility or at a facility that has received a permit exemption from SWMP. Although the Missouri Department of Natural Resources strongly encourages the recovery of potential waste materials whenever possible, these activities must be done legally.

3. Regulated construction and demolition wastes are those that are not classified as clean fill and that are not being reused or recycled. Regulated non-hazardous construction and demolition wastes must be disposed of at a permitted landfill or transfer station. They must not be burned to avoid violating air and solid waste laws. They must not be buried (except at a permitted landfill). They must not be hauled to private or public property and dumped or buried, even with the landowner's permission. If that happens, everyone involved, including the contractor(s), subcontractor(s), the hauler(s) and the landowner(s) can and will be held liable for the illegal disposal (§§260.210, 260.211 and/or 260.212, RSMo). If you are a building contractor, you need to know that burying construction waste from a building anywhere on the property is illegal (§260.210.1, RSMo). See page four for a description of penalties for illegal disposal of construction and demolition waste.

4. Hazardous Materials and Hazardous Wastes. Although you may find a variety of hazardous materials in old buildings, lead-based paint and asbestos are the most common ones that demolition contractors need to deal with. Asbestos is discussed in the next section of this document.

Recent studies conducted by the U.S. Agency for Toxic Substances and Disease Registry, and by independent researchers, show that the health effects of lead exposure are greater than previously thought. Children are especially vulnerable to the effects of lead poisoning. Because lead and other toxic heavy metals may be contained in the wastes noted above, they require careful management and disposal.

For many years, lead-based paint was used in residences and businesses for its stable coating properties. Although lead-based paint was virtually banned by the Consumer Product Safety Commission in 1978 for residential application, it is often encountered when buildings are renovated or demolished. Also, lead-based paint is still manufactured and sold for corrosion or rust inhibition on steel structures and for other industrial purposes. In older buildings, lead was also used for roofs, cornices, tank linings, and electrical conduits. In plumbing, soft solder, an alloy of lead and tin, was used for soldering tinplate and copper pipe joints.

Additional guidance for handling demolition waste containing lead-based paint or other heavy metals (such as cadmium or chromium) is available by calling the department's Hazardous Waste Program at (573) 751-3176.

Hazardous waste requirements for demolition wastes - Demolition-related waste categories typically include

- Paint Residue - Paint chips, paint scrapings, and paint-contaminated blast residue from building renovations or demolition projects,
- Demolition Debris - Masonry, metal and boards that have been painted with lead-based (or other heavy metal-based) paint, and
- Scrap Metal - Metal objects that contain lead or other heavy metals.

For households, the following management options apply, whether or not a contractor is doing the work for you.

- Paint Residue - Paint residue may be placed in the household trash. Before disposal, wrap tightly in a plastic bag or other container. It will be picked up by your trash hauler and taken to a sanitary landfill for disposal.
- Demolition Debris - May be placed in your household trash. It may be picked up by your trash hauler and taken to a sanitary or demolition landfill for disposal.
- Scrap Metal - Scrap metal should be taken to a salvage yard operator for recycling. If this is not possible, the metal may be placed in your household trash and picked up by your waste hauler for disposal at a sanitary or demolition landfill.

For generators other than households - This category includes commercial and business enterprises, institutions and industrial buildings, and other structures not specifically identified.

Paint Residue - Paint residue must be laboratory tested before disposal. The appropriate test method is the Toxicity Characteristic Leaching Procedure (TCLP), EPA Method 1311, which is described in Appendix 11 of the Code of Federal Regulations, Title 40, Part 261 (40 CFR Part 261). The test must include the eight metals noted in 40 CFR Part 261.24 (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver).

Environmental laboratories capable of conducting a TCLP may be found in the telephone Directory's *Yellow Pages*. If one or more of analytical limits meets or exceeds the regulatory limit, the waste is hazardous. Hazardous wastes must be managed, transported, and disposed of according to the Missouri Hazardous Waste Management Law and Regulations.

This may require that the generator send paint residue to a permitted hazardous waste disposal facility. In some cases, a lead smelter may accept lead-based paints for use in their lead production processes.

If laboratory analysis shows that the paint residue is non-hazardous, it must be disposed of at a sanitary landfill as "special waste". Paint residue may not be disposed of in a demolition landfill.

Procedures for managing special wastes are included in the guidance, titled *Special Waste* technical bulletin (PUB2050). The landfill may require you to complete a special waste disposal request form, and provide the results of testing on the paint waste to show that it is not hazardous before accepting the waste.

Demolition Debris - Demolition debris painted with heavy metals need not be tested before disposal. Such wastes may be disposed of in either a sanitary or a demolition landfill in Missouri.

Scrap Metal - Scrap metal painted with heavy metals may be sent to a salvage yard for recycling. If this is not possible, the metal may be disposed of at a sanitary or demolition landfill.

5. Asbestos. All public, institutional, or commercial buildings (and in some instances, residential structures) must be inspected for asbestos before renovation or demolition activities begin. Before planning a demolition project, bidding a project, letting a bid or beginning the demolition, it is important to know if the building has any asbestos-containing materials (ACM) and who is responsible for removing them. Buildings may contain asbestos in materials such as ceiling or floor tile, as insulation or soundproofing on ceilings, pipes, ductwork or boilers, or on the outside as transite siding or in shingles. The presence of ACM cannot be confirmed just by looking. A thorough inspection of any regulated building must be conducted by a Missouri certified asbestos inspector to determine the presence and condition of ACM. Depending upon the results of the inspection, a registered asbestos abatement contractor may be required. Contact the department's Air Pollution Control Program's Asbestos Unit at (573) 751-4817 for more specific information about managing ACM. Visit www.dnr.mo.gov/env/apcp/Asbestos.htm for more information about asbestos requirements.
If the ACM is to go to a landfill or transfer station, contact the facility in advance to see if they accept ACM and if they have any special handling or packaging requirements.

Penalties for illegal disposal of construction and demolition wastes The Missouri Solid Waste Management Law provides for civil penalties for persons who dispose of or allow the disposal of regulated construction and demolition wastes in unpermitted areas.

The law also contains criminal provisions for some types of illegal construction and demolition waste disposal. There may be additional penalties for violations of Air and Hazardous Waste Laws depending on the situation and means of disposal. For Solid Waste Management Law violations alone:

1. Civil Penalties: Any person who disposes of construction and demolition waste or allows the disposal of construction and demolition waste in an area not permitted for such disposal may be assessed a civil penalty of up to $1,000 per day per violation (§260.240, RSMo).
2. Criminal Penalties: Any person who purposely or knowingly disposes of or causes the disposal of regulated quantities of construction and demolition waste or other solid waste may be prosecuted for violating the criminal provisions of §§260.211 and 260.212, RSMo. Convictions may include fines of $20,000 or more, community service, and/or clean up of the illegally dumped waste. In some cases, persons convicted of illegal dumping have served time in jail.
3. The Missouri Air Conservation Law and regulations provide for civil penalties of up to $10,000 per day per violation for persons who violate the requirements for handling, packaging, transporting or disposing of ACM. The federal Clean Air Act also contains civil and criminal penalties for violations. The same penalties apply for persons who illegally dispose of construction and demolition waste by burning.

Other requirements

Other legal requirements related to managing construction and demolition wastes include:

1. Anyone engaged in building construction, modification or demolition must maintain a record of all sites used for construction and demolition waste disposal for one year. The records must be made available to department staff upon request (§260.210.7, RSMo).
2. Cities and counties that issue building permits are required to notify each permittee, in writing, of the legal requirements for construction and demolition waste disposal (§260.210.8, RSMo).
3. A person shall be guilty of conspiracy...if he knows or should have known that his agent or employee has violated the civil or criminal provisions of the law related to illegal disposal of construction and demolition waste or other solid waste (§260.212.9, RSMo).
4. Anyone selling, conveying or transferring property that contains construction and demolition waste or other solid waste (whether buried or not), must disclose the existence and location of the waste disposal site to a potential buyer early in the negotiation process (§260.213, RSMo).
5. Anyone hauling materials that could fall or blow off a vehicle, including construction and demolition waste, must cover the load or secure it so that none of it can become dislodged and fall from the vehicle (§307.010, RSMo). In addition, many landfills and transfer stations in Missouri require all incoming loads to be covered. Some facilities accept open loads, but may charge you extra for them.
6. A person commits the crime of littering if they throw or place, or cause to be thrown or placed, any garbage, trash, refuse or rubbish of any kind on the right-of-way of any public road or highway, in or on any waters of the state or the stream banks, and on any public or private property (owned by another without their consent) (§577.070, RSMo).

Additional information

You may obtain additional information about properly managing construction and demolition wastes from the sources listed below.

Missouri Department of Natural Resources

Air Pollution Control Program (573) 751-4817
Hazardous Waste Program (573) 751-3176
Solid Waste Management Program (573) 751-5401
Water Protection Program (573) 751-1300

Regional Offices

Kansas City Regional Office (816) 622-7000
Northeast Regional Office (Macon) (660) 385-8000
St. Louis Regional Office (314) 416-2960
Southeast Regional Office (Poplar Bluff) (573) 840-9750
Southwest Regional Office (Springfield) (417) 891-4300
Solid Waste Management Program (573) 751-5401

On the Web

Construction and Demolition information is available from the Solid Waste Management Program at www.dnr.mo.gov/env/swmp/index.html.
Environmental publications are available at www.dnr.mo.gov/pubs/.

Additional considerations and sources

Hazardous waste requirements are found in the Missouri Hazardous Waste Management Laws, Sections 260.345 through 260.575 of the Revised Statutes of Missouri (RSMo).

The Missouri Hazardous Waste Regulations are found in Title 10, Division 25 of the Code of State Regulations (CSR). Most of the federal environmental requirements in Title 40 of the Code of Federal Regulations (CFR) is adopted by reference into the Missouri regulations.

Solid waste requirements are found in the Solid Waste Management Law in Sections 260.200 through 260.345 RSMo, and the regulations in Title 10, Division 80 in the CSR. Copies of the Revised Statutes of Missouri are available through the Reviser of Statutes at (573) 526-1288, or are available online at www.moga.mo.gov.

Copies of the Missouri Code of State Regulations are available through the Missouri Secretary of State at (573) 751-4015, or are available online at www.sos.missouri.gov/adrules/csr/csr.asp.

Federal regulations may be viewed at federal depository libraries or may be purchased from a U.S. Government Bookstore, the U.S. Government Printing Office, or from a commercial information service such as the Bureau of National Affairs. Federal Regulations are also available online at www.gpoaccess.gov/cfr/index.html.

Other Guidance

The Missouri Department of Health and Senior Services - Office of Lead Licensing and Accreditation may be contacted for information regarding training, licensure and work practice standards for lead abatement activities. Disposal is an abatement activity. See Missouri Revised Statutes 701.300 and 701.338.

Please note that many municipalities have their own additional requirements that might be more strict than those discussed above.

For more information, call or write

Missouri Department of Natural Resources
Hazardous Waste Program
P.O. Box 176, Jefferson City, MO 65102-0176
1-800-361-4827 or (573) 751-7560 office
(573) 751-7869 fax
www.dnr.mo.gov/env/hwp/index.html

Missouri Department of Natural Resources
Solid Waste Management Program
P. O. Box 176, Jefferson City, MO 65102-0176
1-800-361-4827 or (573) 751-5401 office
(573) 526-3902 fax
www.dnr.mo.gov/env/swmp/index.html

Missouri Department of Natural Resources
Air Pollution Control Program
P.O. Box 176, Jefferson City, MO 65102-0176
1-800-361-4827 or (573) 751-4817 office
(573) 751-2706 fax
www.dnr.mo.gov/env/apcp/index.html

Missouri Department of Health and Senior Services
Office of Lead Licensing and Accreditation
P.O. Box 570, Jefferson City, MO 65102-0570
1-888-837-0927 or (573) 526-5873
(573) 526-0441 fax
www.dhss.mo.gov/Lead/

INSTALLATION REQUIREMENTS

m. Fort Leonard Wood Daily Pesticide Report Sheet

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Fort Wood Daily Pesticide Report Sheet

Agency/Company:
Applicator:
Building or Area:

Date:
Building or Exterior Control Type:
Building Construction Type:

Page: ____ of ____

Control Area Description	Area Size or Acres	Target Pest	Infestation Level	Control Operation/& Work Origin	Pesticide Used-EPA #	Formul-ation Type & %	Application Rate per Unit Area	Gals. H_2O	Finish Spray Concen-tration %	Amount of Spray Solution	Labor Time	Total of Chemical Concen-trate Used	Product Unit

Measurement Units: a x b = Feet x Feet
AC = Acres MSF = 1000 Square Feet
LF = Linear Feet MCF = 1000 Cubic Feet

Work Origin: SW = Scheduled Work
WR = Work Request TC = Trouble Call
RI = Routine Inspection

Formulation: A = Aerosol B = Bait
D = Dust E = Emulsion F = Fumigant
GL = Gel GR = Granules W = Wetable Pwdr.
L = Liquid S = Solution WG = Wetable Granule

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INSTALLATION REQUIREMENTS

n. Fort Leonard Wood Asbestos Project Compliance and Completion Certification

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Fort Leonard Wood
Directorate of Public Works
Environmental Division

Asbestos Project Compliance and Completion Certification

The below project removed Asbestos Containing Material (ACM).

Work Order or Project Number: _____

Contract Number: _____

Project Name or Description: _____

Project Bldg Number or Location: _____

ACM Removal Date: _____

I certify that all ACM specified for removal in this project was properly removed and disposed in accordance with applicable federal law (40 CFR Part 61, Subpart M, National Emission Standard for Hazardous Air Pollutants (NESHAP)) and industry best practices. There is no ACM debris resulting from this project remaining on site.

Signature of ACM Removal Representative: _____Date:_____

Name of Asbestos Abatement Company: _____

I inspected the completed asbestos removal project and certify that the asbestos abatement is complete and meets the terms of the government contract:

Signature of Government Contract Inspector:

_____Date:_____

I accompanied the government contract inspector on this ACM removal project and certify that I witnessed no ACM remaining and that it appears to be a complete removal project.

Signature of DPW Asbestos Inspector:

_____Date:_____

Phone (573) 596 0882
www.wood.army.mil/dpwenv

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INSTALLATION REQUIREMENTS

o. Missouri Department of Natural Resources State Operating Permit Information

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STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION

MISSOURI STATE OPERATING PERMIT

GENERAL PERMIT

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo. as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No.	< MO-R101000 for existing sites or MO-R10A000 for new sites >
Owner:	< name >
Address:	< address >
Continuing Authority:	< name, or Same as above >
Address:	< address, or Same as above >
Facility Name:	< name >
Facility Address:	< physical address >
Legal Description:	¼, ¼, ¼, Sec. xx, TxxN, RxxW, < county > County
Receiving Stream:	< receiving stream > < (U, C, P, L1, L2, L3) >
First Classified Stream and ID:	< 1st classified stream > < (U, C, P, L1, L2, L3) > < (ID number) >
USGS Basin & Sub-watershed No.:	< (USGS HUC14 #) >

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein:

FACILITY DESCRIPTION

All Outfalls

Construction or land disturbance activity (e.g., clearing, grubbing, excavating, grading, and other activity that results in the destruction of the root zone and/or land disturbance activity that is reasonably certain to cause pollution to waters of the state).

This permit authorizes only wastewater, including storm waters, discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System; it does not apply to other regulated areas. This permit may be appealed in accordance with Section 644.051.6, RSMO.

February 8, 2007
Issue Date

Effective Date

Doyle Childers, Director, Department of Natural Resources
Executive Secretary, Clean Water Commission

February 7, 2012
Expiration Date

Director of Staff, Clean Water Commission

APPLICABILITY

1. This general permit authorizes the discharge of storm water and certain non-storm water discharges from land disturbance sites that disturb one (1) or more acres over the life of the project or are part of a larger common plan of development or sale that will disturb one (1) or more acres over the life of the project. This general permit also authorizes the discharge of storm water and certain non-storm water discharges from smaller projects where the Department has exercised its discretion to require a permit [10 CSR 20-6.200 (1)(B)].

   A Missouri State Operating Permit that specifically identifies the project must be issued before any site vegetation is removed or the site disturbed.

   Any site owner/operator subject to these requirements for storm water discharges and who disturbs land prior to permit issuance from the MDNR is in violation of both State and Federal laws.

2. This permit authorizes non-storm water discharges from the following activities provided that these discharges are addressed in the permittee's specific Storm Water Pollution Prevention Plan (SWPPP) required by this general permit:
   a. Dewatering activities if there are no contaminants other than sediment present in the discharge, and the discharge is treated as specified in Requirements, Section 8.j. of this permit.
   b. Flushing water hydrants and potable water lines;
   c. Water only (i.e., without detergents or additives) rinsing of streets and buildings, or
   d. Site watering to establish vegetation.

3. This permit does not apply to storm water discharges within 1000 stream feet of:
   a. Streams identified as a losing stream*;
   b. Streams or lakes listed as an outstanding national or state resource water*;
   c. Reservoirs or lakes used for public drinking water supplies*;
   d. Streams, lakes, or reservoirs identified as critical habitat for endangered species*;or
   e. Streams, lakes, or reservoirs listed as impaired for sediment and/or an unknown pollutant by standard MDNR methodology*.

4. This permit does not apply to storm water discharges:
   a. Within 100 stream feet of a permanent stream (class P) or major reservoir (class L2)*; or
   b. Within two stream miles upstream of biocriteria reference locations*.

   (For the purpose of this permit, "stream feet" shall be defined as: The measurement of the distance between the land disturbance site and the valuable resource water by means of the nearest drainage course.)

5. This permit does not apply to storm water discharges where:
   a. Any of the disturbed area is defined as a wetland (Class W) by 10 CSR 20-7.031(1)(F)7*; or
   b. The storm water discharges to a sinkhole or other direct conduit to groundwater.

6. This general permit does not authorize the placement of fill materials in flood plains, the obstruction of stream flow, directing storm waters across private property not owned or operated by the permittee, or changing the channel of a defined drainage course. This general permit is intended to address only the quality of the storm water runoff and minimize off-site migration of sediments and other water contaminants.

7. This general permit does not authorize any discharge to waters of the state of sewage, wastewaters, or pollutants such as:
   a. Hazardous substances or petroleum products from an on-site spill or improper handling and disposal practices. (All containers must be properly closed to prevent spillage.);
   b. Wash and/or rinse waters from concrete mixing equipment including ready mix concrete trucks unless such discharges are adequately treated and addressed in the Storm Water Pollution Prevention Plan;
   c. Wastewater generated from air pollution control equipment or the containment of scrubber water in lined ponds; or
   d. Domestic wastewaters, including gray waters.

* Identified or described in 10 CSR 20, Chapter 7. These regulations are available at many libraries and may be purchased from MDNR by calling the Water Pollution Control Program at (573)751-1300. The regulations are also available from the Missouri Secretary of States Office.

APPLICABILITY (continued)

8. MDNR reserves the right to deny coverage under this general permit to applicants for storm water discharges from land disturbance activities at sites that have contaminated soils that will be disturbed by the land disturbance activity or where such materials are brought to the site to use as fill or borrow. Such activities are normally covered by a site specific permit.

9. If at any time the Missouri Department of Natural Resources determines that the quality of waters of the state may be better protected by requiring the owner/operator of the permitted site to apply for a site specific permit, the Department may require any person to obtain a site specific operating permit [10 CSR 20-6.010 (13) and 10 CSR 20-6.200(5)].

   The Department may require the permittee to apply for and obtain a site specific or different general permit if:

   a. The permittee is not in compliance with the conditions of this general permit;
   b. The discharge no longer qualifies for this general permit due to changed site conditions and regulations; or
   c. Information becomes available that indicates water quality standards have been or may be violated.

   The permittee will be notified in writing of the need to apply for a site specific permit or a different general permit. When a site specific permit or different general permit is issued to the authorized permittee, the applicability of this general permit to the permittee is automatically terminated upon the effective date of the site specific or different general permit, whichever the case may be. The permittee shall submit the appropriate forms to the Department to terminate the permit that has been replaced.

10. Any owner/operator authorized by a general permit may request to be excluded from the coverage of the general permit and apply for a site specific permit [10 CSR 20-6.010 (13) and 10 CSR 20-6.200(6)].

11. This permit does not authorize land disturbance activity in jurisdictional waters of the U. S. as defined by the Army Corps of Engineers unless the permittee has obtained the required 404/401permits.

12. This permit is not transferable to other owners or operators.

EXEMPTIONS FROM PERMIT REQUIREMENTS

1. Facilities that discharge all storm water runoff directly to a combined sewer system are exempt from storm water permit requirements.

2. Linear, strip, or ribbon construction (as described in 10 CSR 20-6.200,1.B.) on maintenance operations meeting one of the following criteria provided that water quality criteria are not exceeded:
   a. Grading of existing dirt or gravel roads which does not increase the runoff coefficient and the addition of an impermeable surface over an existing dirt or gravel road;
   b. Cleaning or routine maintenance of roadside ditches, sewers, waterlines, pipelines, utility lines or similar facilities.
   c. Trenches two (2) feet in width or less; or
   d. Emergency repair or replacement of existing facilities as long as best management practices are employed during emergency repairs.

3. Sites that disturb less than one acre of total land area that are not part of a common plan or sale and that do not cause any violations of water quality standards and are not otherwise designated by the department as requiring a permit, where water quality standards are not exceeded.

4. Agricultural storm water discharges and irrigation return flows. Animal Feeding Operations (AFO) are not included in the agricultural exemption.

REQUIREMENTS

Note: These requirements do not supersede nor remove liability for compliance with county and other local ordinances.

1. The discharge of storm water from these facilities shall not cause a violation of the state water quality standards, 10 CSR 20-7.031, which states, in part, that no water contaminant, by itself or in combination with other substances, shall prevent the waters of the state from meeting the following conditions:
   a. Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses;
   b. Waters shall be free from oil, scum and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses;
   c. Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses;
   d. Waters shall be free from substances or conditions in sufficient amounts to have a harmful effect on human, animal or aquatic life;
   e. There shall be no significant human health hazard from incidental contact with the water;
   f. There shall be no acute toxicity to livestock or wildlife watering;
   g. Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community; or
   h. Waters shall be free from used tires, car bodies, appliances, demolition debris, used vehicles, or equipment and solid waste as defined in Missouri's Solid Waste Law, Section 260.200, RSMo, except as the use of such materials is specifically permitted pursuant to Section 260.200 to 260.247 RSMO.

2. Good housekeeping practices shall be maintained on the site to keep solid waste from entry into waters of the state.

3. All fueling facilities present on the site shall adhere to applicable federal and state regulations concerning underground storage, above ground storage, and dispensers.

4. Hazardous wastes that are transported, stored, or used for maintenance, cleaning or repair shall be managed according to the provisions of the Missouri Hazardous Waste Laws and Regulations.

5. An individual shall be designated by the permittee as responsible for environmental matters. The individual responsible for environmental matters shall have a thorough and demonstrable knowledge of the site's SWPPP and sediment and erosion control practices in general. The individual responsible for environmental matters or a designated inspector knowledgeable in erosion, sediment, and stormwater control principles, shall periodically inspect all structures that function to prevent pollution of waters of the state. These inspections shall be conducted in accordance with paragraph 10 of the Requirements.

6. All paint, solvents, petroleum products and petroleum waste products, and storage containers (such as drums, cans, or cartons) shall be stored according to Best Management Practices (BMPs). The materials exposed to precipitation shall be stored in watertight, structurally sound, closed containers. All containers shall be inspected for leaks or spillage during the once per week inspection of Best Management Practices.

7. The primary requirement of this permit is the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). A copy of the SWPPP must be available on site when land disturbance operations are in progress, or other operational activities that may affect the maintenance or integrity of the BMP structures. The SWPPP must be made available to a department representative upon request. The SWPPP should not be submitted to the Department unless it is requested. The SWPPP must:

   a. Incorporate required practices identified below;
   b. Incorporate erosion control practices specific to site conditions; and
   c. Provide for maintenance and adherence to the plan.

   Before disturbing earth, or submitting an application, the permittee shall develop a SWPPP that is specific to the land disturbance activities at the site. This plan must be developed before a permit can be issued and made available as specified under the RECORDS section of this permit.

REQUIREMENTS (continued)

The permittee shall fully implement the provisions of the SWPPP required under this part as a condition of this general permit throughout the term of the land disturbance project.

The purpose of the SWPPP is to ensure the design, implementation, management, and maintenance of Best Management Practices in order to reduce the amount of sediment and other pollutants in storm water discharges associated with the land disturbance activities; comply with the Missouri Water Quality Standards; and ensure compliance with the terms and conditions of this general permit.

The permittee shall select, install, use, operate, and maintain appropriate BMPs for the permitted site. The following manuals are acceptable resources for the selection of appropriate BMPs.

Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices, (Document number EPA 832-R-92-005) published by the United States Environmental Protection Agency (USEPA) in 1992. **This manual is available at The USEPA internet site;** and

The latest version of ***Protecting Water Quality: A field guide to erosion, sediment and storm water best management practices for development sites in Missouri,*** published by the Missouri Department of Natural Resources. This manual is available on the department's internet site at: http://www.dnr.mo.gov/env/wpp/wpcp-guide.htm

The permittee is not limited to the use of these guidance manuals. Other guidance publications may be used to select appropriate BMPs. However, all BMPs should be described and justified in the SWPPP. EPA and DNR continue to update BMP information on their web sites. It is recommended that the permittee review this information when developing a SWPPP.

8. SWPPP Requirements: The following information and practices shall be provided for in the SWPPP.
   a. Site Description: In order to identify the site, the SWPPP shall include the facility and outfall information provided in the application form.
   b. The SWPPP: The SWPPP shall have sufficient information to be of practical use to contractors and site construction workers to guide the installation and maintenance of BMPs. Site boundaries and outfalls shall be marked on a site map included as part of the SWPPP.
   c. Selection Of Temporary And Permanent Non-Structural BMPs: The permittee shall select appropriate non-structural BMPs for use at the site and list them in the SWPPP. The SWPPP shall require existing vegetation to be preserved where practical. The time period for disturbed areas without vegetative cover shall be minimized to the maximum extent practicable. For sites that will be inactive six months or more, establishing a vegetative cover is a highly recommended choice for a proper BMP.

      Examples of non-structural BMPs which the permittee should consider specifying in the SWPPP include: preservation of trees and mature vegetation, protection of existing vegetation for use as buffer strips (especially along drainage courses), mulching, sodding, temporary seeding, final seeding, geotextiles, stabilization of disturbed areas, preserving existing stream channels as overflow areas when channel straightening or shortening is allowed, soil stabilizing emulsions and tackifiers, mulch tackifiers, stabilized site entrances/exits, and other appropriate BMPs.
   d. Selection Of Temporary And Permanent Structural BMPs: The permittee shall select appropriate structural BMPs for use at the site and list them in the SWPPP. Examples of structural BMPs that the permittee should consider specifying in the SWPPP include: diverting flows from undisturbed areas away from disturbed areas, silt (filter fabric and/or straw bale) fences, earthen diversion dikes, drainage swales, sediment traps, rock check dams, subsurface drains (to gather or transport water for surface discharge elsewhere), pipe slope drains (to carry concentrated flow down a slope face), level spreaders (to distribute concentrated flow into sheet flow), storm drain inlet protection and outlet protection, reinforced soil retaining systems, gabions, temporary or permanent sediment basins, and other appropriate BMPs.
   e. Description Of Best Management Practices: The SWPPP shall include a description of both structural and non-structural BMPs that will be used at the site. The SWPPP shall provide the following general information for each BMP which will be used one or more times at the site:
      i. Physical description of the BMP;
      ii. Site and physical conditions that must be met for effective use of the BMP;
      iii. BMP installation/construction procedures, including typical drawings; and
      iv. Operation and maintenance procedures for the BMP.

The SWPPP shall provide the following information for each specific instance where a BMP is to be installed:

i. Whether the BMP is temporary or permanent;
ii. Where, in relation to other site features, the BMP is to be located;
iii. When the BMP will be installed in relation to each phase of the land disturbance procedures to complete the project; and
iv. What site conditions must be met before removal of the BMP if the BMP is not a permanent BMP.

f. Disturbed Areas: Slopes for disturbed areas must be defined in the SWPPP. A site map or maps, defining the sloped areas for all phases of the project, must be included in the SWPPP. Where soil disturbing activities cease in an area for 14 days or more, the permittee shall construct BMPs to establish interim stabilization. Interim stabilization shall consist of well established and maintained BMPs that are reasonably certain to protect waters of the state from sediment pollution over an extended period of time. This may require adding more BMPs to an area than is normally used during daily operations. These BMPs may include a combination of sediment basins, check dams, sediment fences, and mulch. The types of BMPs used must be suited to the area disturbed, taking into account the number of acres exposed and the steepness of the slopes. If the slope of the area is greater than 3:1 (3 feet horizontal to 1 foot vertical) or if the slope is greater than 3% and greater than 150 feet in length, then the permittee shall establish interim stabilization within 7 days of ceasing operations on that part of the site.

g. Installation: The permittee shall ensure the BMPs are properly installed at the locations and relative times specified in the SWPPP. Peripheral or border BMPs to control runoff from disturbed areas shall be installed or marked for preservation before general site clearing is started. Storm water discharges from disturbed areas, which leave the site, shall pass through an appropriate impediment to sediment movement, such as a sedimentation basin, sediment traps, silt fences, etc. prior to leaving the land disturbance site. A drainage course change shall be clearly marked on a site map and described in the SWPPP. The location of all BMPs must be indicated on a site map, included in the SWPPP.

h. Sedimentation Basins: The SWPPP shall require a sedimentation basin for each drainage area with 10 or more acres disturbed at one time. The sedimentation basin shall be sized to contain a volume of at least 3600 cubic feet per each disturbed acre draining thereto. Accumulated sediment shall be removed from the basin as needed to ensure proper operation. Discharges from the basin shall not cause scouring of the banks or bottom of the receiving stream. The SWPPP shall require the basin be maintained until final stabilization of the disturbed area served by the basin.

Where use of a sediment basin of this size is impractical, the SWPPP shall evaluate and specify other similarly effective BMPs to be employed to control erosion and sediment delivery. These similarly effective BMPs shall be selected from appropriate BMP guidance documents authorized by this permit. The BMPs must provide equivalent protection. The SWPPP shall require both temporary and permanent sedimentation basins to have a stabilized spillway to minimize the potential for erosion of the spillway or basin embankment.

i. Additional Site Management BMPs: The SWPPP shall address other BMPs, as required by site activities, to prevent contamination of storm water runoff. Such BMPs include:

i. Solid and hazardous waste management including: providing trash containers and regular site clean up for proper disposal of solid waste such as scrap building material, product/material shipping waste, food containers, and cups; and providing containers and proper disposal of waste paints, solvents, and cleaning compounds, etc.;
ii. Provision of portable toilets for proper disposal of sanitary sewage;
iii. Storage of construction materials away from drainage courses and low areas; and
iv. Installation of containment berms and use of drip pans at petroleum product and liquid storage tanks and containers.

j. Dewatering: The SWPPP shall require a description of any anticipated dewatering methods, including the anticipated volume of water to be discharged and the anticipated maximum flow discharged from these dewatering activities, expressed in gallons per minute. Maximum flow may be stated in the SWPPP as an estimate based on the type and capacity of equipment being used for dewatering. The SWPPP shall call for specific BMPs designed to treat water pumped from excavations and in no case shall this water be pumped off site without being treated by the specified BMPs.

k. Roadways: Where applicable, upon installation of or connection to roadways, all efforts should be made to prevent the deposition of earth and sediment onto roadways through the use of proper BMPs. Where sediment is present on roadways all storm water curb inlets shall have inlet protection. Where storm water will flow off the end of where a roadway terminates, a sediment catching BMP (ex. gravel berm, silt fence, etc.) shall be provided. Roadways and curb inlets shall be cleaned weekly and following a rainfall that generates a run-off. Stabilized construction entrances shall be used to prevent sediment track-out.

9. Amending/Updating the SWPPP: The permittee shall amend and update the SWPPP as appropriate during the term of the land disturbance activity. The permittee shall amend the SWPPP, at a minimum, whenever the:
   a. Design, operation, or maintenance of BMPs is changed;
   b. Design of the construction project is changed that could significantly affect the quality of the storm water discharges;
   c. Permittee's inspections indicate deficiencies in the SWPPP or any BMP;
   d. MDNR notifies the permittee in writing of deficiencies in the SWPPP;
   e. SWPPP is determined to be ineffective in significantly minimizing or controlling erosion and sedimentation (e.g., there is visual evidence, such as excessive site erosion or excessive sediment deposits in streams or lakes);
   f. Settleable Solids from a storm water outfall exceed 2.5 mg/L/hr;
   g. MDNR determines violations of Water Quality Standards may occur or have occurred.

10. Site Inspections Reports: The permittee (or a representative of the permittee) shall conduct regularly scheduled inspections at least once per seven calendar days. These inspections shall be conducted by the person responsible for environmental matters at the site, or a person trained by and directly supervised by the person responsible for environmental matters at the site. For disturbed areas that have not been finally stabilized, all installed BMPs and other pollution control measures shall be inspected for proper installation, operation and maintenance. All storm water outfalls shall be inspected for evidence of erosion or sediment deposition. Any structural or maintenance problem shall be noted in an inspection report and corrected within seven calendar days of the inspection. If a rainfall event results in storm water runoff on site, the BMPs must be inspected within a reasonable time period (not to exceed 48 hours) after the rainfall event has ceased. The SWPPP must explain how the person responsible for erosion control, will be notified when storm water runoff occurs. If weather conditions make it impossible to correct the problem within seven days, a detailed report, including pictures, must be filed with the regular inspection reports. The permittee shall correct the BMP problem as soon as weather conditions allow. Parts of the site that have been finally stabilized must be inspected at least once per month.

    A log of each inspection and copy of the inspection report must be retained on the construction site while on-site construction workers are present, and made available to the Department upon request. The inspection report is to include the following minimum information: inspector's name, date of inspection, observations relative to the effectiveness of the BMPs, actions taken or necessary to correct the observed problem, and listing of areas where land disturbance operations have permanently or temporarily stopped. The inspection report shall be signed by the person designated in the SWPPP to conduct the inspections.

11. Proper Operation and Maintenance: The permittee shall at all times maintain all pollution control measures and systems in good order to achieve compliance with the terms of this general permit.

12. Notification to All Contractors: The permittee shall be responsible for notifying each contractor or entity (including utility crews and city employees or their agents) who will perform work at the site of the existence of the SWPPP and what action or precautions shall be taken while on site to minimize the potential for erosion and the potential for damaging any BMP. The permittee is responsible for any damage a subcontractor may do to established BMPs and any subsequent water quality violation resulting from the damage.

13. Public Notification: The permittee shall post a copy of the public notification sign described by the MDNR at the main entrance to the site. The public notification sign must be visible from the public road that provides access to the site's main entrance. The public notification sign must remain posted at the site until the permit has been terminated.

OTHER DISCHARGES

1. Hazardous Substance and Oil Spill Reporting: Refer to Section B, #14 of Part I of the Standard Conditions that accompany this permit.

2. Removed substances: Refer to Section B, #6 of Part I of the Standard Conditions that accompany this permit.

3. Change in discharge: In the event soil contamination or hazardous substances are discovered at the site during land disturbance activities, the permittee shall notify the MDNR regional office by telephone as soon as practicable and no later than 24 hours after discovery. The permittee must also notify the MDNR regional office in writing no later than 14 calendar days after discovery.

SAMPLING REQUIREMENTS AND EFFLUENT LIMITATIONS

1. Discharges shall not violate General Water Quality Standards 10 CSR 20 7.031(3).
   Settleable Solids shall not exceed a maximum of 2.5 ml/L/hr. for each storm water outfall.

2. There are no regular sampling requirements in this permit. However, the Department may require sampling and reporting as a result of illegal discharges, compliance issues, complaint investigations, or other such evidence of off site contamination from activities at the site. If such an action is needed, the Department will specify in writing any additional sampling requirements, including such information as location, extent, and parameters.

RECORDS

1. The permittee shall retain copies of this general permit, the SWPPP and all amendments for the site named in the State Operating Permit, results of any monitoring and analysis, and all site inspection records required by this general permit. The records shall be accessible during normal business hours. The records shall be retained for a period of at least three years from the date of the Letter of Termination.

2. The permittee shall provide a copy of the SWPPP to MDNR, USEPA, or any local agency or government representative if they request a copy in the performance of their official duties.

3. The permittee shall provide those who are responsible for installation, operation, or maintenance of any BMP a copy of the SWPPP. The permittee, their representative, and/or the contractor(s) responsible for installation, operation, and maintenance of the BMPs shall have a current copy of the SWPPP with them when on the project site.

LAND PURCHASE AND CHANGE OF OWNERSHIP

1. Individual Lot or Lots: Federal and Missouri storm water regulations (10 CSR 20-6.200) require a storm water permit and erosion control measures for one (1) or more acres of land disturbance that is a part of a common plan or sale. If the permittee sells less than 1 acre of the permitted site to an entity for, commercial, industrial, or residential use, (unless sold to an individual for the purpose of building his/her own private residence) this land remains a part of the common sale and regulated by this permit. Therefore, the permittee is still responsible for erosion control on the sold property until termination of the permit.

2. If the permittee sells 1 or more acres of the permitted site to an entity, the new owner of the property must obtain a land disturbance permit for the purchased property. The original permittee must amend the SWPPP to show that the property (one acre or more) has been sold and therefore no longer under the original permit jurisdiction.

3. If a lot is sold to an individual for purposes of building his/her own private residence, the permittee is no longer responsible for erosion control on the lot. However, Section 644.051.1(1) RSMO still gives the department the authority to hold the individual owner responsible for erosion control measures on the lot if it is deemed necessary to protect waters of the state.

4. Entire Tract: If the entire tract is sold to a single entity, then this permit shall be terminated when the new owner obtains a new land disturbance permit for the site.

TERMINATION

This permit may be terminated when the project is stabilized. The project is considered to be stabilized when either perennial vegetation, pavement, buildings, or structures using permanent materials cover all areas that have been disturbed. With respect to areas that have been vegetated, vegetative cover shall be at least 70% of fully established plant density over 100% of the disturbed area.

In order to terminate the permit, the permittee shall notify MDNR by submitting Form H, included with the State Operating Permit. The permittee shall complete Form H and mail it to MDNR at the address noted in the cover letter of this permit.

This general permit will expire five years from the effective date of the permit (see page 1). The issue date is the date the State Operating Permit is issued to the applicant. The expiration date may or may not coincide with the date the authorized project or development is scheduled for completion.

If the project or development completion date will be after the expiration date of this general permit, then the permittee must reapply to the Department for the permit to be re-issued. The permittee will receive notification of the expiration date of the permit before the expiration date listed on page 1 of this permit. In order for the permit to be re-issued, the permittee should submit the appropriate application form(s) at least 180 days before the expiration of the permit if land disturbance activity is expected to continue past the expiration date of this general permit.

If the permittee does not apply for the renewal of this permit, this permit will automatically terminate on the expiration date. Continued discharges from a site that has not been fully stabilized are prohibited beyond the expiration date; unless the permit is reissued or the permittee has filed a timely application for the reissuance of this permit. Failure to maintain a valid permit for the life of the project until permit termination, is a violation of the State and Federal Clean Water Law.

DUTY TO COMPLY

The permittee shall comply with all conditions of this general permit. Any noncompliance with this general permit constitutes a violation of Chapter 644, Missouri Clean Water Law, and 10 CSR 20-6.200. Noncompliance may result in enforcement action, termination of this authorization, or denial of the permittee's request for renewal.

MAILING ADDRESS

The permittee shall send all written correspondence and forms, which are to be submitted to MDNR to the address listed in the cover letter that accompanies this permit.

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INSTALLATION REQUIREMENTS

p. As-Built Instructions

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KEYED INSTRUCTIONS FOR AS-BUILT DRAWINGS (ARMY)

A. The words "REVISED FOR AS-BUILT CONDITIONS" Shall be placed on 1 st line in the revision blocks. ON ALL SHEETS .

B. Delete all previous revision triangles and text of amendments, mods. etc. in the revision block. ON ALL SHEETS.

C. Delete all revision clouds and revision triangles in the drawing. ON ALL SHEETS.

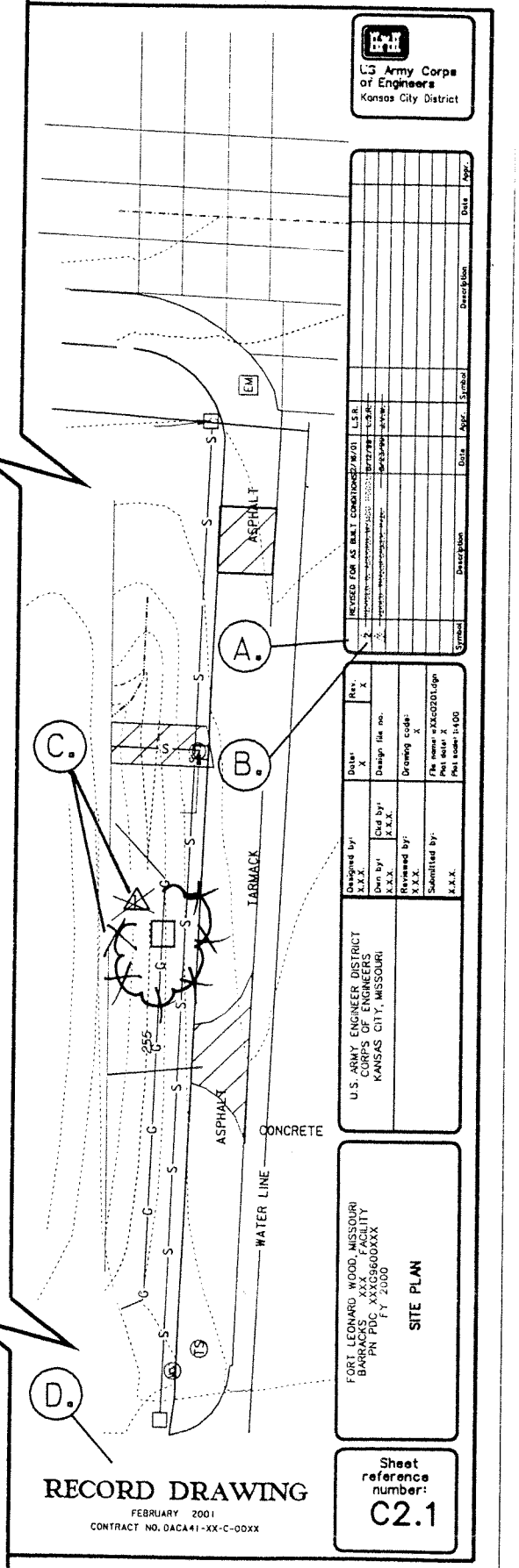
D. The "RECORD DRAWING" label with date & contract number shall be placed in the area of the lower right corner of drawing. ON ALL SHEETS.

GENERAL INSTRUCTIONS FOR AS-BUILT DRAWINGS (ARMY)

1. Delete all previous amend. text and symbology that was placed during amend./mod/building phase.

2. Date in revision block and Rec.Dwg.label should be the same.

3. The completed as-built drawing should reflect a clean drawing showing only a "finished" product with all changes incorporated.



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INSTALLATION REQUIREMENTS

q. Fort Leonard Wood Flushing Requirements

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EXECUTION

NOTE: Contractor shall ensure all Boilers are off before starting flushing.

Pre-Cleaning Phase

1. While system is circulating, Contractor shall establish multiple points of water loss throughout (lowest, middle, highest) the closed system. It is critical water loss is established in the lower elevation of the closed system. Water loss streams should be established to maintain a minimum continuous positive flow.

2. Contractor shall pull strainers; blow out separators, dead-headed piping, low flow and/or isolated flows areas.

Cleaning Phase

1. While system is circulating, Contractor shall add the following products via pumping them into the system.

AC-6160 -- 1 gallon per 100 gallons of system volume
AC-7112 -- 1 gallon per 1,000 gallons of system volume

2. Contractor shall circulate the cleaning solution for 72 hours.

Post-Cleaning Phase
1. Following the 72 hour cleaning phase, while system is circulating, Contractor shall establish multiple points of water loss throughout (lowest, middle, highest) the closed system. It is critical water loss is established in the lower elevation of the closed system. Water loss streams should be established to maintain a minimum continuous positive flow.

2. Contractor shall pull strainers; blow out separators, dead-headed piping, low flow and/or isolated flows.

3. After 48 hours of flushing, AquaComp WTS will measure water cleanliness. Targeted bulk water total iron level is less than 0.50 ppm. **DPW inspector shall verify the 0.5 ppm or less before proceeding.**

4. Once the bulk water iron level has written confirmation (by AquaCompWTS) to be less than 0.50 ppm, the Pre-Glycol Addition Phase will be initiated.

Pre-Glycol Addition Phase

1. Following completion of the Post-Cleaning Phase, a 10% by volume of inhibited propylene glycol should be added and circulated for 48 hours.

2. After 48 hours of circulating, AquaComp WTS will measure water cleanliness. Targeted bulk water total iron level is less than 0.50 ppm. **DPW inspector shall verify the 0.5 ppm or less before proceeding.**

3. Once the bulk water iron level has written confirmation (by AquaCompWTS) to be less than 0.50 ppm, the Glycol Addition Phase will be initiated.

4. After 48 hours of circulation, **should iron levels rise above the 0.50 ppm targeted level,** while system is circulating, multiple points of water loss should be established throughout (lowest, middle, highest) the closed system. It is critical water loss is established in the lower elevation of the closed system. Water loss streams should be established to maintain a minimum continuous positive flow. Strainers, separators, dead-headed piping, low flow and/or isolated flows must be blown out. After 48 hours of flushing, AquaComp WTS will measure water cleanliness. Targeted bulk water total iron level is less than 0.50 ppm. **DPW inspector shall verify the 0.5 ppm or less before proceeding.**

5. Once the bulk water iron level has written confirmation (by AquaCompWTS) to be less than 0.50 ppm, the Glycol Addition Phase will be initiated.

Glycol Addition Phase

1. Contractor shall add Glycol within 24 hours of the written confirmation. The targeted inhibited propylene glycol % by volume (minimum of 20% by volume) should be added to the closed system. If the targeted inhibited propylene glycol % by volume is below 30%, additional opp inhibitor is to be added to bring inhibitor level to the inhibitor level of a 30-35% by volume inhibited propylene glycol solution. Written analysis of the final inhibitor level must be provided to the customer for review and confirmation the targeted DDP levels are within targeted range.

2. Installation has used Glycol from UNIVAR in Springfield, Mo. POC is Bill Bowler cell # 417-838-8871 or they have used Performance Boiler and Mechanical LLC. Sparta Mo. POC is Ron Zorn Cell # 417-693-6085.

INSTALLATION REQUIREMENTS

r. Fort Leonard Wood Electric Service Request Requirements

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To: Electric Design Engineers for any projects at Fort Leonard Wood Mo.
Subject: Electrical Power to New Facilities and Temporary Construction Power

Electric Power Procedures to New or Upgraded Facilities at FLW:

New overhead and underground primary electric distribution is provided though a contract with Laclede Electric Cooperative (LEC) as an expansion to the current electrical distribution system service points. To provide primary electric to your new facilities a filled out FLW request form is required. At that point, a RFP will be generated through the DPW Operation Division Electrical Section and OPS DIV will coordinate the new electric utilities to the new facilities. The DPW Operation Division Electrical Section POC is Larry Slinkard Phone 573-596-0936 Email larry.slinkard@us.army.mil.

The following information is required on the FLW Electric Service request form at the time of development of the RFP for your new facilities; the sooner this information can be compiled and sent to Mr. Slinkard, the sooner you will have power provide to your site.

1. Voltage Requirement
2. Phasing Requirement (Either 1 or 3)
3. Pad or Pole mounted Transformer requirement
4. Service Equipment Type (Panelboard/Switchboard/Safety Switch – Fuse or Circuit Breaker, Ect)
5. Service Equipment Over-Current Protective Devise Ampacity
6. Service Entrance Type (Either Overhead or Underground)
7. Service Lateral Conductor and Raceway Schedule
8. Service Drop Conductor and Entrance raceway Schedule (To be use outside of cantonment only unless DPW Approved)
9. Estimated kVA Demand
10. Estimated Facility Power Factor
11. Estimated Facility Motor and Inductive Load Efficiency
12. Final Site Grade/Elevation Plan

Note: Funding for commercial power to a government facility on FLW shall come from a government agency to the FLW DRM. Not though a contractor.

Temporary Power Procedures on FLW:

Temporary electric power for construction projects, coordination's with the DPW Energy Branch Jeannie Barnett at 573-596-0645. The following steps are required to receive temporary power.

1. You must contact Ms. Barnett to establish a utility sales contract.

Information needed at time of contact is:

Company Name
POC onsite
POC for signing of contract (must be an authorized person to sign a legal document on behalf of company)
Company Address

Company Phone Number
Onsite Phone Number
Email address
Location of work

2. Once contract is signed, Ms. Barnett will email Laclede Electric with authorization to provide utilities to your company.

3. You will then contact Laclede Electric at 1(800) 299-3164. If you contact them prior to notification from Ms. Barnett, they will not connect your power.

4. When you are ready to disconnect power, once again contact Ms. Barnett and she will notify Laclede Electric. You will continue to be billed for all power consumed on the meter until it is removed.

If you already have a utility sales contract with DPW Energy Branch, you will only need to call with the location that the power is needed.

Thanks for your cooperation with this matter

FLW DPW Staff

FLW Electric Service Request Form

GENERAL INSTRUCTIONS

1. Form Shall be Prepared for each Service Location and type.
2. Please Fill-in Information in the Highlighted Areas.
3. Provide Site Plans with Final Grade Elevations and other services.
4. Provide Site Plans with Proposed service location.
5. Early Coordination is Required to verify Service will be available when needed. Delays due to insufficiant time for service availability is not the responsibility of this agency.

Submitted By:	**Name:**	
	Company:	
Contract Number with Government:		
Corps of Engineers or DPW Contract:		
Contact Information including e-mail and telephone numbers:		

Reason for Request:

New Permanent Service:	YES		NO
Upgrade Service:	YES		NO
Temporary Construction Service:	YES		NO
Service Part of Multiple requests for same contract:	YES		NO
(Attach all together when submitting)		of	

General Service Information:

Project Name:	
Project Locations:	
Building Number	
Occupancy Type (NEC 220.12)	
Square Footage:	

Service Voltage *(Please Check One)*	120		120/240		208Y/120	
	480Y/277		480		240	
	Others:					
Phase	Single		Poly			
Estimated Demand KVA						

FLW Electric Service Request Form

Connected Load Breakout Information:

Largest Motor:

Horsepower:		**LRA:**	
Voltage:		**FLA:**	
Phase:		**Starting PF:**	
Starting Method:		**Running PF:**	
VFD controlled / Style:		**NEMA Code:**	

Cooling Load:	**KVA**		**Power Factor**	
Heating Load:	**KVA**		**Type:**	
Interior Lighting:	**KVA**		**Power Factor**	
Exterior Lighting	**KVA**		**Type:**	
Receptacle Load:	**KVA**			
Kitchen Load:	**KVA**			
General Load:	**KVA**			
Total Connected Load:	**KVA**			

Below Information is required for Installation Coordination

Service Type
(Please Check One)

Underground ☐
Overhead ☐ With DPW APPROVAL ONLY

Service

Raceway Size			
Number of Raceway Sets		Spares	
Conductors Size		Insulation Type	
Number of Conductors			
Conductor Type	AL ☐	CU	☐

Service Equipment Type

NEMA TYPE				
Switchboard	CB	☐	Fuse	☐
Panelboard	CB	☐	Fuse	☐
Safety Switch (SE Rated)	CB	☐	Fuse	☐
Over Current Protection Device Ampacity				
AVG Motor and other Equipment Efficiency				
Ground Fault Protection	Yes	☐	No	☐

INSTALLATION REQUIREMENTS

s. Fort Leonard Wood Gas Service Requirements

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FLW Gas Service Request Form

GENERAL INSTRUCTIONS

1. Form Shall be Prepared for each Service Location and type.
2. Please Fill-in Information in the Highlighted Areas.
3. Provide Site Plans with Final Grade Elevations and other services.
4. Provide Site Plans with Proposed service location.
5. Early Coordination is Required to verify Service will be available when needed. Delays due to insufficient time for service availability are not the responsibility of this agency.

Submitted By: **Name:**

Company:

Contract Number with Government:

Corps of Engineers or DPW Contract:

Contact Information including e-mail and telephone numbers:

Reason for Request:

New Permanent Service:	YES	NO
Upgrade Service:	YES	NO
Temporary Construction Service:	YES	NO
Service Part of Multiple requests for same contract:	YES	NO
(Attach all together when submitting)		of

General Service Information:

Project Name:

Project Locations:

Building Number

xxx

Square Footage:

x

(Please Check One)

Others:

Estimated Demand

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INSTALLATION REQUIREMENTS

t. Geographic Information System (GIS)

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Appendix
Spatial Data Standard for Facilities, Infrastructure and Environment (SDSFIE) Guide for GIS Deliverables Created as Part of Military Design and Construction Projects

Fort Leonard Wood, Missouri

Introduction

This Appendix provides guidance for implementing Engineering and Construction Bulletin (ECB) No. 2006-15, "Standardizing Computer Aided Design (CAD/CADD) and Geographic Information Systems (GIS) Deliverables for all Military Design and Construction Projects" (http://www.wbdg.org/ccb/ARMYCOE/COEECB/ecb_2006_15.pdf). This guidance establishes the requirements for geospatial data deliverables produced as part of design, design-build, or design-bid-build contracts for Fort Leonard Wood, Missouri. It includes description of the:

- Coordinate System and Datums;
- Data Quality Standard;
- Deliverables;
- SDSFIE-Compliant GIS Deliverable Specification; and
- Metadata.

Coordinate System and Datums

All geospatial deliverables (CADD or GIS format), whether obtained via survey or any other data collection process, shall be measured in meters. The coordinate system for all geospatial data will be UTM Zone 15. The vertical datum, if applicable, will be North American Vertical Datum 1988 (NAVD 88). The horizontal datum will be WGS84.

Precise specifications of the UTM Coordinate System, are as follows:

Grid Coordinate System Name: Universal Transverse Mercator

UTM Zone Number: 15

Transverse Mercator Projection

Scale Factor at Central Meridian: 0.999600

Longitude of Central Meridian: -93.000000

Latitude of Projection Origin: 0.000000

False Easting: 500000.000000

False Northing: 0.000000

Planar Coordinate Information

Planar Distance Units: meters

Coordinate Encoding Method: coordinate pair

Coordinate Representation

Abscissa Resolution: 0.000032

Ordinate Resolution: 0.000032

Geodetic Model

Horizontal Datum Name: D_WGS_1984

Ellipsoid Name: WGS_1984

Semi-major Axis: 6378137.000000

Denominator of Flattening Ratio: 298.257224

Data Quality Standard

As Built Survey

An as-built condition survey should be performed to capture the information listed in this Appendix. All relevant features shall be identified on as-built drawings and shall be GPS or conventional surveyed to the level of accuracy specified below.

Coordinate Accuracy

The Contractor shall use conventional surveying and other methods, such as a total station or GPS for field data collection at an accuracy level in accordance with "Geospatial Positioning Accuracy Standards, Part 4: Architecture, Engineering Construction, and Facilities Management. Published by the FGDC and available at http://www.fgdc.gov/standards/standards_publications/index_html.

Horizontal and vertical accuracy of features, where vertical coordinates are collected, shall be +/- 2cm.

Surveyor Certification Requirement

The surveyor shall verify the survey for accuracy and a statement will be provided to the government stating the level of accuracy for the data being reported (in metric units). In addition to the accuracy statement, the following information should be provided in a survey report:

- Coordinate system & datum used;
- Projection;

- Units of measure (vertical and horizontal);
- Attribute description (GPS data dictionary—features, attributes and attribute values);
- Source - Receiver type, antenna type, receiver settings, number of positions per point feature, correction method and any field other relevant field procedures utilized;
- Survey method;
- Equipment list;
- Calibration documentation;
- Description of control points and control diagrams;
- Field notes; and
- Field-collected data (in addition to the post-processed final data used to prepare the geospatial data deliverable).

Utilities

Underground and aboveground utility lines shall be surveyed at a minimum of two points along every straight run, at every change of direction, at every tie in point, and at any change in line size.

Deliverables

The intent of the deliverable set is to provide the Installation with comprehensive geospatial information about the facility footprint and site features that exist outside the building(s). The electronic deliverables must be in the file format and data standard used by the Installation's Operations and Maintenance System (as noted in "Coordinate System and Datums", above).

The Installation requires deliverables in the following software formats:

- GIS Files
    - ESRI geodatabase file.
    - The coordinate system, projection, datum(s) and units will be defined for the layer and will be documented in the metadata.
    - Where captured, vertical coordinate information will be stored as a feature attribute as meters above mean sea level. Polygon-z, polyline-z, and point-z formatted files are not requested.
- CADD Files
    - MicroStation DGN files in A/E/C CADD format, using the coordinate system, projection, datum, and units specified in the RFP.

100% Design (Design Complete)

Final design deliverables for each design package should consist of (A) the drawings and specifications, and (B) the GIS file(s):

- 100% complete drawings, specifications, calculations/design analysis, and a list of all comments and their resolution for that work package. All final design drawings will be in the A/E/C CADD Standard format, current version as agreed upon by the government and the contractor. The A/E/C CADD Standard is available at https://tsc.wes.army.mil/products/standards/aec/aecstdweb.asp. Metadata shall be delivered with each CADD file, and will meet the standard specified in this Appendix.
- A corresponding SDSFIE-compliant GIS deliverable for the feature layers listed in Table 1 of this Appendix. For each listed layer the contractor should provide either a GIS deliverable or a statement that no features in that layer will be constructed, be modified, or pose a design constraint for the project. The SDSFIE standard is available at http://www.sdsfie.org. Metadata shall be delivered with each GIS data layer and will meet the standard specified in this Appendix.

As-Built (Construction Complete)

Final construction deliverables shall consist of (A) the as built drawings and specifications, and (B) the GIS file(s). The contractor will provide a submittal of the CADD and GIS files that depict the as-built condition of the site. The data layers to be delivered, the coordinate accuracy of the features, the required attribution, and the metadata will meet the standards specified in this Appendix.

For each layer listed in Table 1, the contractor will provide either a GIS deliverable or a statement that no features in that layer were constructed or modified. The tie in to a utility main line is considered a modification of the utility main line, and the portions of main lines that were exposed should therefore be included in the deliverable.

SDSFIE-Compliant Deliverable Specification

Geodatabase Template

Upon request the government will provide the contractor with an SDSFIE-compliant GIS layer template to be used for populating the GIS deliverables required under the contract. The contractor shall populate the layers without modifying the template. The contractor shall ensure that layers to be delivered but not included in the template, should the template not be complete, are fully compliant with the current SDSFIE standard.

There may be circumstances in which SDSFIE compliance cannot be maintained. In such circumstances, proposed deviations with the standard must be communicated by the contractor and reviewed by the government. Approval for the deviation shall be documented.

Data Integrity Check

The contractor shall utilize a topology build and clean routine and assure the following:

- No erroneous overshoots, undershoots, dangles or intersections in the line work;
- Lines should all be continuous, i.e. do not create dashed lines with many small line segments;
- Point features should be digitized as points, not graticules, cells, symbols or icons;
- No sliver polygons;
- All polygons completely close and have a single unique centroid; and
- Digital representation of the common boundaries for all graphic features must be coincident, regardless of feature layer.

Required GIS Data Layers and Required Attributes

Table 1 lists the SDSFIE-compliant GIS data layers that are to be delivered as part of this contract. The list is based on a review of the type(s) of facility(s) being constructed. However, it is possible that some layers in the list will not be used.

Metadata

The contractor shall prepare metadata conforming to the most current version of the Federal Geospatial Data Committee's (FGDC) Content Standard for Digital Geospatial Metadata (CSDGM) at http://www.fgdc.gov/standards/standards_publications. Appendix A of the ECB, http://www.wbdg.org/ccb/ARMYCOE/COEECB/ecb_2006_15.pdf, is the FGDC metadata profile for Army Installations and should be followed as closely as possible. An ESRI Metadata Stylesheet for Army Geospatial Data is posted at https://gis.hqda.pentagon.mil. Metadata content will accompany all electronic geospatial data submissions. This includes both CADD and GIS formats. A metadata file shall accompany, at minimum, each CADD data set and/or each GIS data set. Metadata should be prepared to FGDC standards and delivered in XML format readable by software applications that use the FGDC XML format standard (such as ESRI ArcMap 9.x).

Table 1. SDSFIE Layer Names and Required Attributes.

Note: Required attributes, where specified, are listed following the SDSFIE layer name. Elevation information, reported as meters above mean sea level, is required for layers where "coord_z" is listed as a required attribute.

airfield_light_point
airfield_surface_centerline
airfield_surface_edge_line
airfield_surface_marking_area
airfield_surface_marking_line
airfield_surface_site
area_size (acres); area_u_d (area unit of measure, acres); perim (meters); perim_u_d (perimeter unit of measure, meters); coord_x (centroid, WGS84 UTM); coord_y (centroid, WGS84 UTM); paved_d (paved code, Yes/No); feat_name (airfield name)
athletic_court_area
athletic_field_area
athletic_miscellaneous_area
borrow_area
breakline
building_floor_area
building_room_area
building_space_area
canopy_pavilion_site
communications_amplifier_point
communications_antenna_site
coord_X (WGS84 UTM), coord_y (WGS84 UTM), area_size(acres), area_u_d(area unit of measure), perim(perimeter dimension, meters), perim_u_d(perimeter unit of measure, meters)
communications_coaxial_line
communications_device_point
communications_equip_point
communications_fiberoptic_line
communications_handhole_point
communications_manhole_site
communications_pedestal_site
communications_splitter_point
communications_telephone_point
communications_terminator_point
communications_twisted_pair_line
communications_vault_site

Table 1. Continued

compressed_air_pipe_line
control_point
culvert_centerline
curb_line
digital_elevation_model_point
easement_right_of_way_area
electrical_cable_line
dispostn_d (disposition code, domain); instl_ty_d (installation type code, domain)
electrical_capacitor_point
electrical_ductbank_line
electrical_generator_point
electrical_junction_site
electrical_meter_point
electrical_motor_point
electrical_pedestal_point
electrical_regulator_point
electrical_substation_site
dispostn_d (disposition code, domain); sst_ty_d (type of service label, domain)
electrical_switch_point
electrical_transformer_bank_point
electrical_transformer_vault_point
elevation_contour_line
fence_line
fuel_fitting_point
fuel_flow_direction_arrow
fuel_hydrant_point
fuel_junction_site
fuel_line
fuel_meter_point
fuel_pump_booster_station_point
fuel_source_point
fuel_tank_site
gate_line
gate_point
hazardous_materiels_storage_area
hsb_cat_d (the general nature of hazardous waste, domain); area_size (acres);
area_u_d(area unit of measure, acres); perim (perimeter dimension), perim_u_d (meters);
coord_x (WGS84 UTM); coord_y (WGS84 UTM);

Table 1. Continued

hazardous_materiels_storage_location_site
heat_cool_anchor_point
heat_cool_flow_direction_arrow
heat_cool_junction_site
heat_cool_line
heat_cool_marker_point
heat_cool_meter_point
heat_cool_plant_area
heat_cool_pump_point
heat_cool_rectifier_point
heat_cool_regulator_point
heat_cool_valve_point
hospital_structure_site
industrial_waste_fitting_point
industrial_waste_flow_direction_arrow
industrial_waste_grit_chamber_point
industrial_waste_junction_point
industrial_waste_lagoon_area
industrial_waste_line
industrial_waste_meter_point
industrial_waste_neutralizer_point
industrial_waste_oil_water_separator_site
industrial_waste_tank_point
industrial_waste_treatment_plant_area
industrial_waste_valve_point
natural_gas_fitting_point
natural_gas_flow_direction_arrow
natural_gas_junction_point
natural_gas_light_point
natural_gas_line
natural_gas_marker_point
natural_gas_meter_point
natural_gas_rectifier_point
natural_gas_regulator_reducer_point
natural_gas_valve_point
pedestrian_sidewalk_centerline
pipeline_line
piprod_d (pipeline product code, domain); oper_nm (operator name, mixed case)

Table 1. Continued

radar_site
railroad_bridge_centerline
railroad_centerline
tot_len (total length of track, meters); length_u_d (length unit of measure, meters); feat_name (name of railroad, mixed case); cond_d (condition code, domain); traf_vol_d (traffic volume code, domain)
railroad_feature_point
railroad_station_site
railroad_yard_area
recreation_park_area
recreation_trail_centerline
regulated_aboveground_storage_tank_site
regulated_storage_tank_farm_area
regulated_underground_storage_tank_site
road_bridge_area
road_bridge_centerline
road_centerline
category_d; num_lanes; feat_len; length_u_d; feat_name; road_name; alt_name; rou1_typ_d; rou1_name; rou2_typ_d; rou2_name; rou3_typ_d; rou3_name
road_feature_point
road_guardrail_line
road_site
slab_area
solid_waste_compactor_point
solid_waste_dump_area
solid_waste_incinerator_point
solid_waste_landfill_area
solid_waste_material_recovery_facility_point
solid_waste_stockpile_area
solid_waste_transfer_station_point
spill_containment_feature_area
spill_containment_tank_point
spot_elevation_point
storm_culvert_site
storm_sewer_armor_point
storm_sewer_culvert_line
storm_sewer_downspout_point
storm_sewer_fitting_point

Table 1. Continued

storm_sewer_flood_area
storm_sewer_flow_direction_arrow
storm_sewer_headwall_line
storm_sewer_inlet_point
storm_sewer_junction_point
storm_sewer_line
storm_sewer_oil_water_seperator_site
storm_sewer_open_drainage_area
storm_sewer_open_drainage_line
storm_sewer_pump_point
storm_sewer_reservoir_point
structure_existing_site
structure_future_site
tower_site
tunnel_centerline
utility_electric_utility_site
utility_pole_guy_point
utility_pole_tower_point
utility_pole_tower_site
vehicle_parking_area
wastewater_discharge_point
wastewater_filtration_bed_area
wastewater_fitting_point
wastewater_flow_direction_arrow
wastewater_grease_trap_point
wastewater_grit_chamber_point
wastewater_junction_point
wastewater_lagoon_area
wastewater_line
wastewater_neutralizer_point
wastewater_oil_water_separator_site
wastewater_pump_ejector_station_site
wastewater_pump_point
wastewater_septic_tank_point
wastewater_treatment_plant_site
wastewater_valve_point
water_fire_connection_point
water_fitting_point

Table 1. Continued

water_hydrant_point
water_junction_point
water_line
water_marker_point
water_meter_point
water_pump_point
water_regulator_reducer_point
water_reservoir_area
water_tank_site
water_valve_point
water_vent_point

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INSTALLATION REQUIREMENTS

dz. Fort Leonard Wood Fire Department Inf ormation

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INFORMATION FOR CONSTRUCTION OF

FIRE DETECTION AND FIRE SUPPRESSION

4 May 2010 Update

FLW FIRE PROTECTION & PREVENTION DIVISION STAFF POC.

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Introduction

The purpose of these specifications is to describe information, references and recommended practices relating to Life Safety, Fire Protection, and Mass Notification. It was developed to standardize the design and construction of fire protection and mass notification systems at facilities throughout the Fort Leonard Wood, Missouri. These guidelines are intended to convey the minimum standards to successfully provide reliable fire protection and mass notification systems. It is further intended that design engineers tailor this document with respect to specific project requirements at Fort Leonard Wood while maintaining a standardized system configuration as required by the latest edition of the UFC 3-600-01 Fire Protection Engineering for Facilities and UFC 4-021-01 Mass Notification Systems. UFC 3-600-01 is the primary fire protection reference for all DOD facilities, followed by the NFPA Codes and Standards. In the event of a conflict between any UFC and other criteria, the UFC shall govern.

Application

This document has been developed as a guideline; it is not the intent of this document to limit, restrict, or discourage anyone from enhancing the specifications to fit specific requirements in a given area or situation. However, the minimum standards shall not be compromised.

Scope of UFC3-600-01:

"This UFC establishes fire protection engineering policy and criteria for all DOD components. The provisions of this UFC are applicable to all new and existing DOD facilities located on or outside of the DOD installations, whether acquired or leased, by appropriated or non-appropriated funds, or third party financed and constructed. Facilities covered by this document include all types of buildings and their contents, structures, whether considered temporary or permanent, mobile and stationary equipment, waterfront facilities, outside storage and shore protection for ships and aircraft."

Orientation/Pre-design Meeting

The A/E orientation and/or pre-design meetings are crucial to any part of a project to ensure a full understanding of the fire protection and mass notification goals and expectations. The Fire

Protection Engineer shall play an integral part of the design team, and shall be involved in every aspect of the design as it relates to fire protection. During orientation/pre-design, the project scope should be secured and a design strategy established. Expectations unique to the facility will be conveyed by the Fire Prevention Plan Review Staff.

Design Analysis

A fire protection design analysis is required for all designs and shall address the fire protection and mass notification requirements of the project as required by UFC 3-600-01 Sec 1-4 and UFC 4-021-01. The name and qualification of the fire protection engineer who supervised/prepared the design analysis shall be provided IAW UFC 3-600-01 Section 1-5 for services and qualifications.

The contractor shall verify and confirm in writing at shop drawing submittal that fire alarm and mass notification systems will meet intelligibility requirements per UFC 4-021-01. A test of intelligibility will be performed per the UFC.)

Code Analysis

Utilize the latest version of applicable codes and standards. Unified Facilities Criteria (UFC) UFC 3-600-01 Fire Protection Engineering, UFC 4-021-01 Mass Notification, the National Fire Protection Association Codes (NFPA) and the International Building Code (IBC) are the principal codes used. UFC 3-600-01, and UFC 4-021-01, Mass Notification Systems, provide detailed guidance for incorporating fire protection and mass notification engineering measures in the design and construction of Department of Defense (DOD) facilities. NFPA 101, Life Safety Code is the primary code pertaining to all life safety issues. The IBC should be used primarily to determine allowable building construction sizes for the specific occupancy and construction type. The IBC should also be used to address other building code criteria not covered by UFC 3-600-01 or NFPA standards (i.e. building separation requirements, minimum construction standards, etc.). Other applicable codes and standards include, but are not limited to, ADA requirements. All equipment and material shall comply with the applicable provisions of NEMA, FM, UL, and CSA. ***NOTE:*** *In the event of a conflict between any Unified Facilities Criteria's (UFC) and other criteria, the UFC shall govern.*

Fire Alarm Reporting Systems

The FLW Fire Alarm Central Station Radio Receiving System is a Monaco D-21 system that operates using VHF bandwidth (138.925Mhz) and FSK protocol. The fire alarm central system is located off the Installation at the Pulaski County (PC) E-911 Center and Bldg 580, Fire Station 1 on FLW.

All buildings shall be equipped with Monaco BT-XF transceiver and shall have at least 60 zones reporting, unless there are less than 56 devices in the building. If less than 56 devices, one zone

shall report for each device plus 4 spare zones. Each zone is a relay in the fire alarm control panel with a pair of wires rerouted to the BT-XF. Sixty zones will have sixty sets of wires routed between the FACP and BT-XF, and 60 relay contactors in the FACP. Each FACP initiating device, supervisory device and a system trouble shall be zoned. The contractor shall provide the wiring location contact points between the FACP and BT-XF with the fire alarm submittals for review and for FLW Fire Department use in programming of the Monaco D-21 System.

MASS NOTIFICATION (MNS)

The FLW Wide-Area Mass Notification Central Control Station is a Wheelock / ATI CCSWH system that operates using UHF bandwidth (407.870MHz) and FSK protocol. The mass notification central system is located at building 3200 on the Installation within the Emergency Operations Center (EOC). EOC uses a React-4000 computer system for local MNS. The switch over between the mass notification (MNS) and fire alarm system (FAS) shall be automatic. The systems must be user friendly and shall not require resetting by the user in the buildings. ***Note:*** *Separate wireless transmitters/receivers (transceivers) are required for the fire alarm and mass notification central systems. When local MNS micro-phone is required, a remote secured panel or keyed micro-phone lock-out shall be required next to the annunciator panel unless location is specified.*

Programming EOC Mass Notification Computer: The programming is a contractual agreement. Call the EOC at 573-563-5157 for details. Coordination with Fire Alarm/Mass Notification Acceptance Testing by the FLW Fire Protection & Prevention Division is required.

FIRE ALARM SYSTEMS (FAS)

Fire Alarm Control Panel shall be an intelligent addressable panel. The system shall be activated into alarm mode by the actuation of any alarm initiating device. The system shall remain in the alarm mode until the initiating device is reset through the fire alarm control panel manually restored or through a supervised automated reciever to the normal operating mode. Main fire alarm control panel and auxiliary panels shall be colored red and marked for the fire alarm system. Each building shall be required a fire alarm control panel (FACP). Multiple buildings may share a BT-XF. Lesson Learned: Multiple buildings sharing the same FACP has created maintenance issues, lost of systems and repairs from ground faults, improper wiring methods and lightning from weather. Power surges from lightning can transverse the ground causing electrical shorting of system. *Note: The fire department would prefer intelligent addressable panel with a integral radio alarm transceiver compatible with the base fire alarm receiving system when applicable for space savings, training of fire alarm repair technician,standardization of alarm maintenance, and reduce overall cost.*

Fire Reporting System Programming. The fire alarm designer shall provide the Fire Prevention Plan Review Staff upon submittal of plans; specifications and the addressing data of the point of contact for the fire alarm control panel to determine the number of zone-id's that will be required for programming the BT-XF and the installation fire reporting system.

Fire Alarm System Performance and Integrity:

(1) **Notification Appliance Circuits:** The notification appliance circuits (NACs) shall be Class A per NFPA 72 Chapter 6.4 and perform per NFPA 72 Chapter 6.7. The fire alarm system amplifiers, circuits, wiring shall not be more than 75% loaded. If a mass notification system fails the intelligibility test, then it easy for a contractor to add more speakers provided the circuit is not fully loaded. Many speakers each at low power increases intelligibility. Few speakers each at high power results in less intelligibility. Contractors should be advised to put a speaker in every occupied room. If not, then he must be ready to add speakers if the intelligibility test fails.

(2) **Initiating Device Circuit:** The initiating device circuits (IDCs) shall be Class A per NFPA 72 Chapter 6.4 and perform per NFPA 72 Chapter 6.5. All addressable initiating devices shall be of the intelligent bi-directional type and listed for use with applicable control panels. Conventional initiating devices are to be used only in conjunction with addressable interface modules where environmental conditional prevent intelligent devices to be installed.

(3) **Signal Line Circuits:** The signal line circuits (SLCs) shall be a class A Style 7 per NFPA 72 Chapter 6.4 and perform per NFPA 72 Chapter 6.6.

Wiring Method of Fire Alarm System: The wiring method used shall comply with applicable codes i.e. NFPA 70, 72, 101 be approved by the local FLW AHJ prior to installation. All terminal and junction locations used for fire alarm circuits shall be labeled and provided with specific identifying characteristics (i.e. painted red) and the fire alarm circuit identification shall be accomplished in accordance with NFPA 70 Art 760.30. Wiring method used shall be installed in such fashion that outgoing and return conductors, exiting and returning to control units, respectively, are separately routed and encased (both wire sets shall be enclosed in separate conduit lines where each conduit line is also geographically separate). The outgoing and return (redundant) circuit conductors shall not run in the same cable assembly, enclosure or raceway per NFPA 72 Chapter 6.

Fire Alarm System Remote Display (Graphic Annunciator) located in the lobby/vestibule shall be used in large buildings, multi-story buildings, and secured buildings. Graphic annunciator shall have a plan view of the building. Indicator lamps shall be shown on the plans. LEDs shall be red for alarm condition, amber for supervisory malfunction condition, and yellow for trouble condition. Plan views shall be approximately to scale and in no case smaller than 15 inches in length or width. Annunciator shall have a door with piano hinge and two point cylinder lock or two cylinder locks. Lock shall be operable using the same key as the FACP to lock out switches. Annunciator shall contain a LED test switch, audible trouble signal and a trouble switch to silence the audible alarm, but not extinguish the trouble LED. Annunciator shall be surface mounted.

For other buildings a remote annunciator panel will be required in the lobby/vestibule shall have a minimum of a reset switch, trouble switch, silence switch, and LED test switch with indicating

lights and addressable visual monitor. Lock shall be operable using the same key as the FACP to lockout switches.

Notification Appliances Device Specification. Strobes with clear lens & red housing shall be used for building equipped with Fire Alarm System. Strobes for MNS shall be Amber lens with white housing. The MNS strobes shall be synchronized with the fire alarm strobes. Strobes will be located as required by ADAAG and NFPA 72. Strobes will be provided in common areas, restrooms, meeting areas, and other spaces required by the ADAAG. Provide plans with ceiling mounted appliances. This is expected for an Army facility and clearly allowed by ADA. Wall mounted appliances are not desired and any shown shall be required on wall elevations with all the interior elevations including systems furniture, screens, etc. See attached standard design direction for FLW. File FLW_6-13. *Note: One piece notification device with red housing is permitted for FAS/MNS.*

Initiating Devices Specification: Initiating Devices shall be analog addressable unless environmental conditions warrant otherwise the initiating devices shall be in according to their specific application for protection and as required by applicable codes and references.

(1). Manual Pull Stations. Dual action manual pull stations shall be installed in gymnasiums, schools and similar areas where they may be subject to false activation or mechanical jarring. Single action pull stations should be used in other areas as required. Do not use manual pull stations with break-glass rods. All pull stations will be key accessible.

(2). Photo Electric Smoke Detector shall be used when such detectors are required. Under floor detectors shall be indicated on the graphic annunciator panel showing the detector location in respect to the floor plan. Detectors shall be application specific to the facilities and equipment being protected.

(3). Heat Detectors when required shall be combination rate of rise heat detectors for wide temperature range changes are expected (i.e. over ovens, fuel-fired equipment, attic areas, etc.). Fixed temperature heat detectors shall be installed where wide temperature range changes are not expected. The temperature rating of fixed temperature detectors shall be based on the maximum ambient temperature expected in the facility in conjunction with manufacturer's recommendations. Heat detectors shall be resettable from FACP. NFPA 72 will be followed.

(4). Duct Detectors and spot type smoke detectors shall be installed on separate zones. Duct detection will not be used to replace open area detectors. Each duct smoke detector shall have a remote indicator/or test station located in an accessible space.

(5). Beam Detectors may be utilized in areas susceptible to false alarms and other areas where conventional detection is not feasible i.e. industrial operations, high ceilings, etc. and shall have a remote indicator/or test station located in an accessible space.

Acceptance Testing. Fire detection and suppression systems shall be tested in accordance with applicable NFPA codes and manufacture requirements. Prior to starting operational testing of a fire alarm system, notify the Contracting Officer and Fire Prevention Plan Review Staff at least five days in advance for scheduling this event. A Fire Prevention representative must be present during all test phases and procedures. Use applicable NFPA and manufactures checklists to accomplish testing of these systems. Upon full acceptance of testing on a fire detection/suppression systems, the installing contractor shall provide a written record of test completion verifying that NFPA and manufacture's requirements have been met. Voice intelligibility (CIS readings) for mass notification per the UFC 4-021-01 shall be required as part of acceptance testing. Provide all documentation for testing, to include manufacture data and installed equipment sheets.

Fire Alarm Control & Mass Notification Panels and Sprinkler Riser Location

All panels and sprinkler risers shall be located in electrical rooms and/or mechanical room near the outside mechanical room door. User not permitted access to these rooms. All equipment shall have a minimum 36 inches separation from other mechanical room equipment. Spacing required for firefighter access.

Contractor Training

The Contractor shall provide Government maintenance personnel the capability to operate, maintain, test, repair, and expand the system, to include as a minimum, the following.

(1) Contractor shall provide all software: database with complete identification and addresses for all programmable system equipment and devices, and all other systems programming data on all modes of the system: connecting cables; and proprietary equipment necessary for the operation, maintenance, testing, repair, and reprogramming, etc. of the system, to include that which may be required for implementation of future changes to the fire alarm system (additional and/or relocated initiating devices, notification devices, etc).
(2) Contractor shall provide all system and equipment technical data and computer software with the requisite tights to use by the government.
(3) Contractor shall provide fire department personnel two basic training sessions on the operation of the fire alarm and mass notification.

TEMPORARY BUILDING NUMBERS

The contractor shall be required to obtain the assigned Building Number from DPW. A temporary building sign will be required at each entrance to the building and shall be Brown background with white letters. The sign shall be visible from the road. This is required for EMS & Fire response.

HOT WORK PERMITS

FLW Fire Protection & Prevention Division Prevention Unit issues the "HOT WORK PERMIT". A permit will be issued for each building under construction or renovation. It shall be the responsible of the contractor to provide copies furnished to each sub-contractor and check the site after hot work activity. The contractor shall provide an electronic copy of all hot work permits issues at the end of each month to the Fire Department Fire Prevention Unit.

FIRE HYDRANTS

The FLW Fire Protection & Prevention Division recommends the use of Mueller Centurion as per the Installation Design Guild (IDG), or a Clow Medallion, when fire hydrants are part of the project. If existing fire hydrants are to provide coverage for a new project or major renovation, that the existing fire hydrants that provide protection to that building shall be replaced. The contractor shall paint the fire hydrants Nutmeg Brown in color as per the IDG. The fire hydrant shall be color coded per UFC 3-600-01 section 3-7.3.1 Fire Flow and Marking of Hydrants shall be accomplished by marine type reflective tape around the brim of the bonnet. The contractor shall provide flow test results to the fire department for updating DPW and Fire Department records.

SPRINKLER SYSTEMS

If required shall be installed in accordance to UFC 3-600-01 and NFPA 13.

(1) Post Indicator Value shall be required on Sprinkler systems. Tamper switch is required.
(2) Fire hydrants shall be required within 150 feet of the fire department pre-connection.
(3) Fire Department connections because of force protection 25 meter requirements and fire department accessibility shall be three to eight feet curb/sidewalk side of streets and parking lots where applicable. UFC 3-600-01 Sec 1-3.9 "Antiterrorism requirements (i.e. Force Protection) must not preclude any fire protection requirements."
(4) Hydrostatic Testing and Acceptance Testing shall be witnessed by the Fire Prevention Unit Staff.
(5) FLW Installation in some areas has a spiking problem with the water system. So a pressure reducer maybe required on the sprinkler system.
(6) Backflow preventers are required on the sprinkler systems and jockey pumps.
(7) Strainers shall be required IAW NFPA 13.

STANDPIPES

Wet or Dry Standpipes shall be required on projects as needed in relation to Force Protection and fire department access. UFC 3-600-01 Section 4-5.1. Contractor shall contact the Fire Prevention Unit Plan Review Staff for determination.

REMOTE FIRE DEPARTMENT CONNECTIONS

Remote Fire Department Connections (FDC's) shall be required on all buildings with sprinkler systems and standpipes when force protection and fire department access is limited. Fire Department connections shall three to eight feet curb/sidewalk side of streets and parking lots where applicable.

PENETRATION

Fire Wall penetrations shall be sealed as per application and code. Fire wall penetration for DOIM cable trays and wiring, Cable TV, and Phone Service shall use an EZ-PATH type system that permits installers to install wiring under normal conditions, but will seal in case of fire.

FLOW TESTING

FLW Fire Protection & Prevention Division shall provide flow testing results of water supply for projects requiring sprinkler systems upon written request or Email request. It will be responsibility of the Fire Protection Engineer to determine if the flow test shall be a witness test.

FIRE DEPARTMENT ACCESS.

Knox Box is required on all permanent buildings. The type of Knox Box (recess or surface mount) and color will be determined during the design review. The Knox Box must be keyed to the FLW Fire Protection & Prevention Division account. An approved application will be furnished to contractor upon request. Note: When contractor receives the Knox Box, Fire Prevention Staff will need to verify the keying of the lock before installation.

The Knox Box will be installed at the nearest exit to the annunciator panel or at an approved fire department location. The Knox box will have tamper switches connected to the supervisory side of the fire alarm system that transmits a supervisory (Fire Auxiliary) signal to the E-911 center if the Knox Box is tampered with. Generally, on building with brick exterior finish, a recess mounted Knox Box will be required. Knox Box #3275 Dark Bronze with tamper switches and #3290 recessed mounting kits will be required. For building that need surface mounting, Knox Box #3266 Dark Bronze with tamper switches will be required.

GATED/FENCED FACILITIES

(1) Knox Key Switch override keyed to the FLW Fire Protection & Prevention Division Knox Box account shall be required on all electric control gates.

(2) For non-electric gates and force protection requirements a residential Knox Box keyed to the Fire Department Knox Box account shall be required on the gate post or bollards at each entrance.
(3) FLW Fire Protection & Prevention Division may furnish to contractors a lock box for the contractor keys when the building is enclosed for emergency access.

CONTRACTORS SITE OFFICE AND STORAGE TRAILERS.

(1) Construction Site Offices will be installed to ACOE standards. At least one 5 lb ABC Dry Powder Fire Extinguisher will be visible and accessible in each trailer.
(2) Separation between office trailers and storage trailer will be 10 feet. Storage trailer/Conex may sit next to each other.
(3) A 20 LB ABC Fire Extinguisher shall be accessible in the storage trailer/Conex area.
(4) 20 Lb ABC Fire Extinguishers shall be required within 75 feet travel distance on all levels of building construction and renovation.

FIRE EXTINGUISHERS

Fire Extinguisher is considered real property by FLW with the required fire extinguisher cabinet IAW UFC 3-600-01.. The size and location shall be determined during design analysis; 20 lb extinguishers are not appropriate for business type occupancies (NOT USER FRIENDLY) and should only be placed in higher hazard areas. Fire extinguishers shall be installed in accordance IAW NFPA 10, except where modified by UFC 3-600-01. *Note: Issues have arisen in the past where the fire extinguisher cabinets are the wrong size for the fire extinguishers used.*

HOOD & DUCT SYSTEMS

Hood and duct systems for commercial cooking equipment that produces smoke or grease-laden vapors must comply with IAW NFPA 96. System will be a Class K wet extinguishing system and will also include a class K portable fire extinguisher located per IAW NFPA 96. Openings in duct shall be provided at the sides or the top of the duct whichever is more accessible, and at changes in direction. Horizontal ducts require access every 12 feet; vertical ducts require access at each floor and at every change of direction.

O & M and As-Built Drawings.

COE Projects: Provide through the COE to the Fire Protection & Prevention Division in Micro Station CADD format and PDF one copy of CD's As-builds' and one copy of O & M and ½ size prints of plans for the Fire Alarm, and Mass Notification System. This is need for fire preplanning, programming the Fire Reporting System and fire alarm/mass notification repairs.

Other Projects: Provide through the Contracting Officer to the Fire Protection & Prevention Division in Micro Station CADD format and PDF two copies of CD's As-builts and one copy of O & M and ½ size prints of plans for the Fire Alarm, and Mass Notification System. This is need for fire preplanning, programming the Fire Reporting System and fire alarm/mass notification repairs.

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KCD CADD STANDARD 3.0
FOR
MILITARY AND CIVIL WORKS PROJECTS

1. APPLICABILITY. For military and Civil projects, KCD and it's A/E contractors will use, as a guide, the sheet numbering and CADD file naming system as shown in the latest version of the A/E/C CADD Standard as published by The CADD/GIS Technology Center. This document will provide specific guidance as to the implementation of the standard as used in the Kansas City District. Any issue covered in this document is developed within guidelines of the AEC CADD Standard and supersedes that document It also addresses some of the items not delineated in the CADD standards, which are required to provide uniformity among disciplines and consistency with current and future projects.

2. REFERENCE: BQP 5.6.07, Management of Electronic Files **,** Project File Structure, A/E/C CADD Standard (Release 2.0)

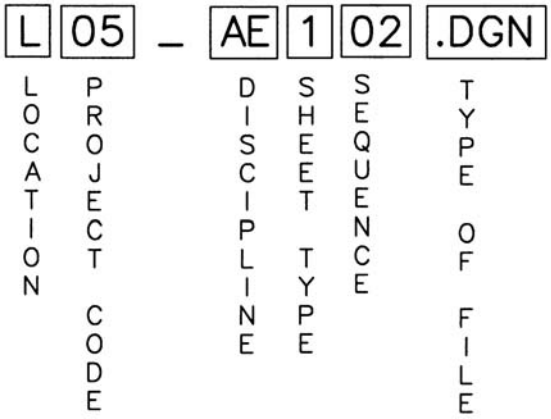
3. DRAWING FILE CREATION. The following steps are required in order to create a new drawing file:

STEP 1: Determine CADD file type. All drawing files are either "sheet" files or "model" files. The use of Model Files is mandatory for any drawing that may be used as a reference file by another discipline. In vertical construction all floor plans and elevations (architectural, structural, mechanical, electrical etc) shall be drawn in model files. Each floor of a building shall be in a separate model file. All model files shall be registered one directly above another. The border file shall be considered a model file. Elevations may be located in a single model file or as separate model files for each elevation view, as determined by the Project Development Team (PDT). For Model File application, see Option 2(Use of Design Model Only), and Figure 2-3, pgs.10 & 11, Ch.2 A/E/C CADD Standard 3.0. File naming convention is different for model files and sheet files (*See Step 2 below*).

STEP 2: Determine and assign a file name.

A. Standard Sheet File Naming (*for one building, one volume drawing set*):

Each CADD sheet file will be given a unique file name that is derived from the project location, project code, discipline, sheet type, and the sequential number of sheets within the type. Drawing names will contain 9 characters with a three (3) character extension. *(See paragraph 5 for file and sheet naming conventions regarding multiple building/multiple volume drawing sets)*. An example format for a standard sheet file is a follows: **L05_AE102.DGN**



LOCATION.

Military Location codes are as follows:

G	GRAND FORKS AFB, NORTH DAKOTA
K	LAKE CITY ARMY AMMUNITION PLANT
L	FORT LEONARD WOOD, MISSOURI
M	MCCONNELL AFB, KANSAS
R	FORT RILEY, KANSAS
U	US Army Reserve
V	FORT LEAVENWORTH, KANSAS
W	WHITEMAN AFB, KANSAS

Civil Works Location codes are as follows:

BC	BRUSH CREEK
BR	BLUE RIVER
BS	BLUE SPRINGS
CL	CLINTON LAKE
DC	DAVID CITY
HA	HARLAN COUNTY
HL	HILLSDALE LAKE
HT	HARRY S. TRUMAN
KA	KANOPOLIS
KC	KANSAS CITY
KR	KANSAS RIVER
LT	LITTLE BLUE
LB	LONGBRANCH
LV	LONGVIEW LAKE
ME	MELVERN LAKE
MI	MILFORD LAKE
MK	MILL CREEK
MO	MISSOURI RIVER
OS	OSAGE
PA	PAOLA
PE	PERRY LAKE

PO	POMONA LAKE
RA	RATHBURN
SM	SMITHVILLE LAKE
ST	STOCKTON LAKE
TK	TURKEY CREEK
TT	TUTTLE CREEK
WA	WAYNESVILLE
WE	WELDON SPRINGS
WI	WILSON LAKE

PROJECT CODE. Project codes are assigned by IM to the Project Manager (PM), who will distribute this project code to all team members at the time of Project creation on the server. The code is sequential as projects are created. The subdirectory created for a project will consist of the project location and code and the name of the project. In the past, project folders on the server (E drive) were identified with only 3 digits (i.e., R27, L06, etc.) It is now common to see project folders with additional descriptive letters as shown in the examples below. Although the project folder (directory name) is permitted to have a longer name, CADD file names within a directory will use only the first 3 digits (i.e., R27). Examples :

CIVIL WORKS:
BC05 (*PROSPECT BRIDGE on Brush Creek*)

MILITARY:
R16_CDC (*CHILD DEVELOPMENT CENTER, Fort Riley*)
L36_FY08BARRACKS (FY08 Barracks, Fort Leonard Wood)

DISCIPLINE. Disciplines (general) are designated by the following codes:

AE	ARCHITECTURAL
B-	GEOTECHNICAL
C-	CIVIL
E-	ELECTRICAL
G-	TITLE, LEGEND, AND BORDERS
IN	INTERIOR DESIGN
S-	STRUCTURAL
M-	MECHANCAL
P-	PLUMBING
V-	SURVEY

Each discipline requires 2 characters. Therefore designators using only one letter, such as “E” must be followed by a dash (“-“) so the completed discipline code is “E-“. The designer or sheet originator shall determine the correct discipline designator for each sheet based on drawing content. See the following appendices for each discipline’s designators:

Site (Survey, Civil, Landscaping)
Structural
Architectural
Interiors
Fire Protection
Mechanical (Plumbing and HVAC)
Electrical (Lightning Protection/Grounding, Lighting, Power, Telecommunications, and Special Systems)

SHEET TYPE. See KCD CADD Standards spreadsheets, that follow, for sheet type descriptions and designators used in this district.

SEQUENCE. The drawing sequence number within the discipline and sheet type: Sequences less than 10 are padded with zeroes in the file name.

CADD SYSTEM FILE TYPE. CADD system file types are as follows:

DGN MICROSTATION DESIGN FILES
DWG AUTOCAD DESIGN FILES

The CADD file type designator is provided only in the CADD directory file name and on the project index sheet. It is not required in the file name block on the border sheet.

Page 6: B. Model File Naming:

Model files contain the design elements for numerous sheet files. Model file naming conventions are very similar to sheet file conventions with some exceptions. The word "MODEL_" must be inserted immediately after the project code to indicate model files. Sheet type codes are different from regular sheet files and are provided in the A/E/C CADD Standard in Chapter 2, Table 4. An example file name format for a model file is a follows: **L05MODEL_A-FP102.DGN** *(architectural floor plan model file.)*

L	**05**	**V1**	**MODEL**	**-A**	**_**	**A-**	**FP**	**01**	**.DGN**
LOCATION	PROJECT CODE	VOLUME		BUILDING		DISCIPLINE	SHEET TYPE	SEQUENCE	FILE TYPE

Location column and project code column are assigned by the Project Manager.
This is the project directory.

Volume is only used with projects using multiple volumes to separate large quantities of sheets. i.e. Large Site package with large building having 200-300 sheets can be subdivided into manageable volumes (bound sets) of drawings.

Building column is only used with multiple buildings being submitted. i.e. Range projects have a GIB and Control Tower. One would be building A and the other building B.

Discipline is as indicated in the matrices submitted or AEC 3.0 Cadd Standards

Sheet type is based on common terms. FP is Floor Plan, RP is roof plan, PP is power plan, LP is lighting Plan, GP is grounding plan, etc.

Sequence number is based on the sheet files. i.e. if multiple sheet files use the floor plan then use the root numbers of that group. A model file for sheets 101,102,103 and 104 would be 100. If

3 digit sheet files are used then 2 digit model files are possible. i.e. Sheet 101 with model fie 01 is OK since the first "1" is designating "plan" sheet.

Enter file name here

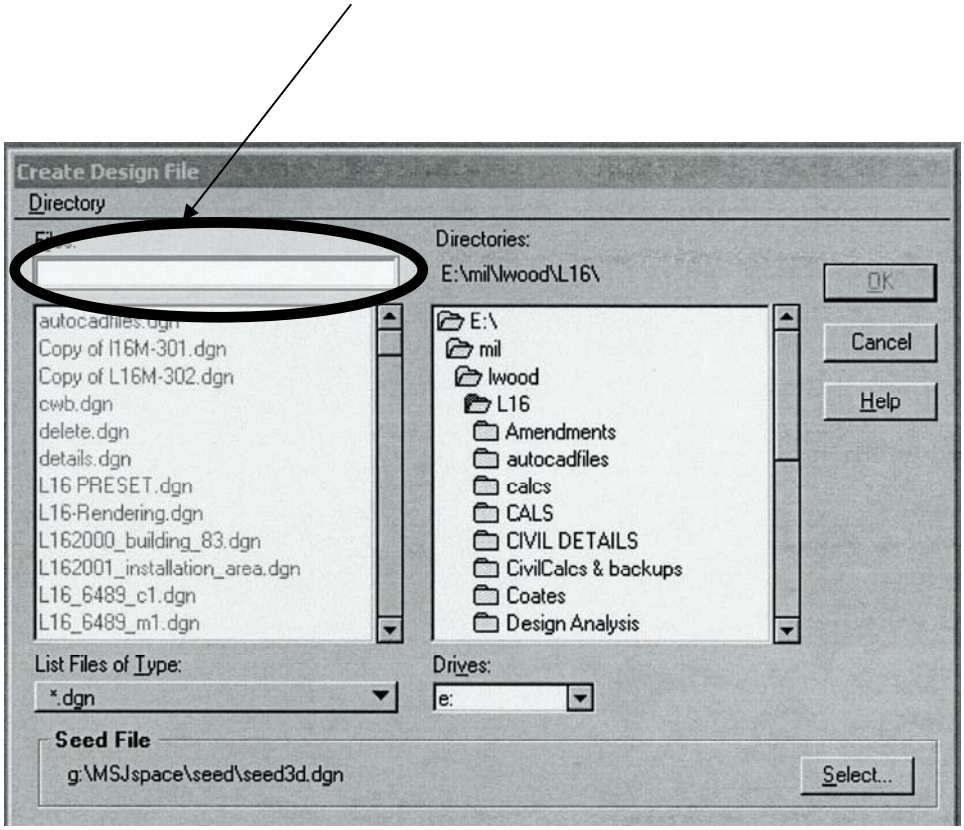


Figure 1.1

STEP 3: Determine drawing working units.

Vertical Construction projects may be designed in either English (inch-pound) or metric units. Project unit of measure will be determined by the PM (project manager) in concert with the PDT before design process begins, based on customer preference and the unit of measure most advantageous to the government.

Remodel and rehabilitation work, including vertical construction, levee's, channels, etc. may be done in English units, if the original construction and as-built drawings are in English units.

Working Units for MicroStation:

	MU	SU	PU
English AEC	1ft	12 inch	8000
English Civil	1ft	100	10
Metric AEC	1mm	1	100
Metric Civil	1M	1000	1

AEC working units are used primarily for vertical construction or design features requiring a high level of CADD precision. Civil working units are primarily used by civil disciplines for site, survey, and mapping files. It is typical to have both AEC and Civil working unit files in the same project, however, the PDT should develop a plan to determine which working units will be used to maintain compatibility.

STEP 4: Select and attach seed file.

SEED FILES: Seed files automatically set sheet file defaults for dimensioning, color table, view attributes, locks, AEC global positioning, display depth, active depth, etc. in accordance with the A/E/C CADD Standard and KCD standards. Although these defaults can be changed by the designer/engineer, it is highly recommended that the defaults remain in place to provide consistency from drawing sheet to drawing sheet. This is especially important with regard to referencing of files from one sheet to another. Seed files are available in both 2d and 3d files. Select seed file based on 2d vs. 3d and required working units. Design files should typically be selected as 3d. 3d files ensure compatibility with other CADD features and programs such as INROADS, 3D rendering, and fly-throughs. 2d files should be limited to schedules and text-type files.

Available AEC seed files are:

Arch_2d_E.dgn	AEC 2 dimension foot-pound (English)
Arch_3d_E.dgn	AEC 3 dimension foot-pound (English)
Arch_2d_M10.dgn	AEC 2 dimension metric 10pu
Arch_3d_M10.dgn	AEC 3 dimension metric 10pu
Arch_2d_M100.dgn	AEC 2 dimension metric 100pu
Arch_3d_M100.dgn	AEC 3 dimension metric 100pu

Civil seed files: are based on the survey file.

Seed files are selected by “hitting” the SELECT button in the CREATE DESIGN FILE dialog box *(See Figure 1.2)*

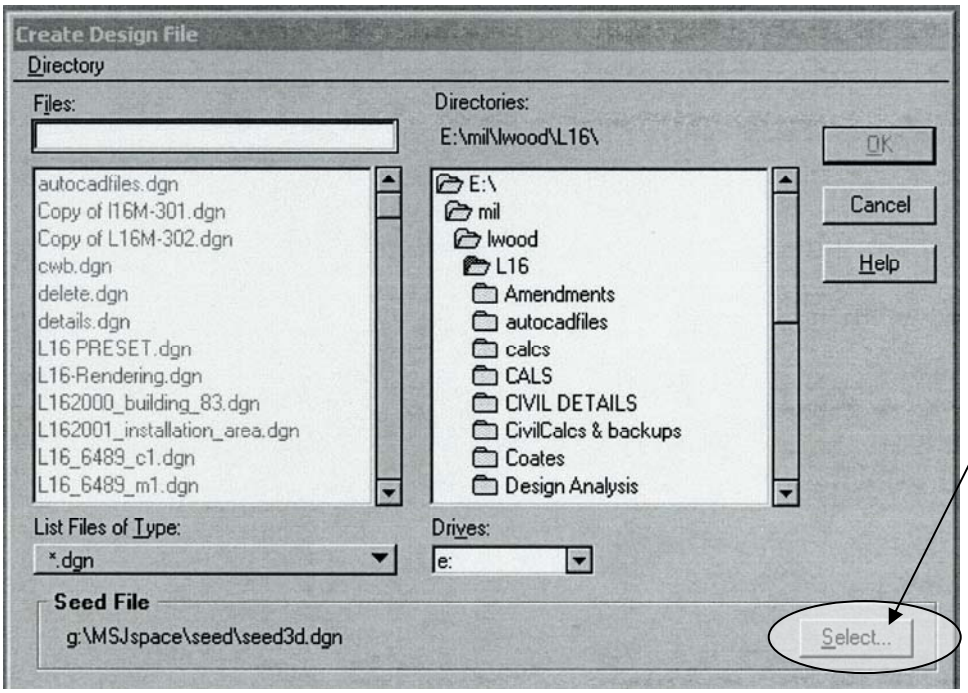


Figure 1.2

STEP 5: Attach border (reference) file.

The Border file shall be created as a 2 dimensional (2d) model file and placed in the project directory. This allows it to be attached as a reference file to both 2d and 3d project sheet files. The border shall be placed in the file life size, English (2'-0"x 3'-0"), Metric (609.6mm x 914.4mm). Generic project border files for both English and metric units of measure and for both AEC and civil drawings have already been created as cells and are currently located in the following cell library:

G:\MSJspace\cell\MilCon\Borders.cel

IMPORTANT NOTE: It is recommended that at the beginning of the project design phase, a single team member be assigned to create the required project border file by abstracting the correct border file cell from the cell library and creating a project border model file. With input from the PM, the border sheet originator shall make the necessary changes in the title block information (project name, number, date, drawing code, etc.) that will be common to all drawing sheets. Example of a border sheet file name:

R13MODEL_G-BS01.DGN

There should never be more than one border model file per volume per project.

4. SHEET NUMBERING CONVENTION. (Sheet Identifiers) In accordance with the A/E/C CADD Standard, each drawing sheet in a contract set shall be numbered according to the discipline, subject, and sequence within that subject, according to the following syntax examples:

AE502 where "AE" is the discipline designator (Architectural elements), "5" is the sheet type designator (Details), and the "02" is the sequence number.

M-403 where "M-" is the discipline designator (Mechanical elements), "4" is the sheet type designator (Large Scale Views), and the "03" is the sequence number.

This is the correct format for the sheet number entry of drawing title blocks. Note that only the sequence numbers are padded with zeroes when they are less than 10. Specific designators for disciplines and sheet types for KCD drawing files provided are based on those shown in the A/E/C CADD Standard.

5. SPECIAL RULES FOR PROJECTS WITH MULTIPLE BUILDINGS.

Often, a contract will include the design of multiple buildings or features which are to be packaged together as a single project under a single contract. Examples are the UEPH and Barracks projects, which included barracks buildings, soldier community buildings, dining facilities and COFs within a single project. Under these circumstances, it is desirable to number the drawing sheets and name the CADD files in a manner which identifies the building or feature to which each drawing applies.

5.1 File Naming. There are two ways to handle file naming for this type of project. The project could be published with one volume and multiple features/buildings within that volume. It is also permissible to publish multiple volumes with buildings in each volume. The PDT should develop a strategy at the beginning of the project to determine how the project design should be packaged. The PDT should also determine volume contents and letters designated to each building and feature.

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Example: Project L05 –MODEL FILE NAMING

L	05	V1	-A	_	A-	101	.DGN
LOCATION	PROJECT CODE	VOLLUME	BUILDING		DISCIPLINE	SEQUENCE	FILE TYPE

Location column and project code column are assigned by the Project Manager. This is the project directory.

Volume is only used with projects using multiple volumes to separate large quantities of sheets. i.e. Large Site package with large building having 200-300 sheets can be subdivided into manageable volumes (bound sets) of drawings.

Building column is only used with multiple buildings being submitted. i.e. Range projects have a GIB and Control Tower. One would be building A and the other building B.

Discipline is as indicated in the matrices submitted or AEC 3.0 Cadd Standards

Sequence number is based on the matrices or AEC 3.0 Cadd Standards. Always start with a sheet number ending in 1 unless sheet is an overall sheet with areas identified by a key plan. i.e AE100 that keys sheets AE101,AE102, etc. As long as the Architectural (for building) and Civil (for Site) utilize these overall sheets, the sub-disciplines do not need to provide an overall sheet. i.e. AE100 does not need to have a matching EP100 sheet. EP can start with EP101. Key plans are required for these types of plans.

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5.2 Sheet Naming & Project Directory Naming. For multi-building projects, a building prefix will be added to the sheet number. Each drawing sheet in a contract set will be numbered according to the building, discipline, subject, and sequence within that subject, according to the following syntax:

B_AE101

where B is the building identifier, and all other characters are the same as described in paragraph 4. Building identifiers should be identified and assigned by the PM and PDT prior to commencement of design work.

All files in a project will reside in the same drawing directory. Subdirectories for different buildings under the same volume will not be used.

Comprehensive examples of file naming conventions for single building, multiple building, multiple volume, and multiple building/multiple volume are located in Appendix G.

6. ENTERING TITLE BLOCK INFORMATION.

Upon completion of referencing in the border sheet for a new sheet file, the title block should be filled in as completely as possible. Examples of the correct text font ands attributes for each block are provided as part of the border sheet file just outside the border. These examples should be copied in and edited.

IMPORTANT NOTE: Do not change the text font or attributes without consulting with the project PDT team for concurrence.

Input the following:

Sheet Reference Number. Use naming convention as described in paragraph 4. Use the same text size for both projects having one building (See Figure 1.3) and those projects having multiple buildings (See Figure 1.4).

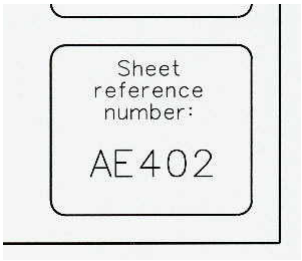


Figure 1.3

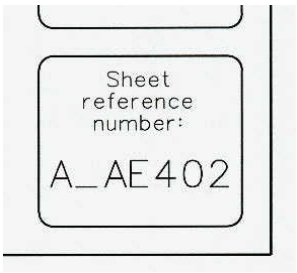


Figure 1.4

Sheet Title *(See Figure 1.5).* Provide a brief title that describes the sheet content.

IMPORTANT NOTE: The title provided in the title block must match, exactly, the title listed on the project index sheets. Any abbreviations used in one location must be used in the other. KCD uses third-party software to create CD's and the title information must match at both locations.

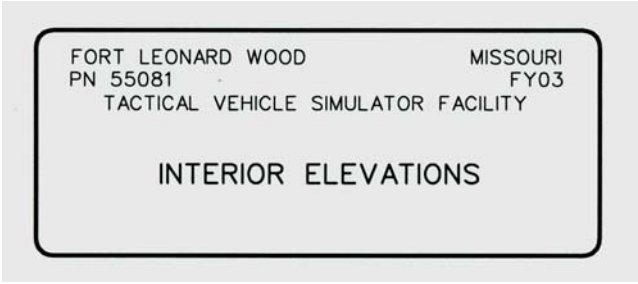


Figure 1.5

Designed By *(See Figure 1.6).* Provide designer/engineer's first initial /last name that developed the information shown on the sheet.

Date *(See Figure 1.6).* Information is to show up in All Border Sheets. The date will be provided and inputted by the border sheet originator and will appear as part of the border reference file sheet. Format is Month and Year.

Drawn By *(See Figure 1.6).* Provide first initial /last name of person who did the actual CADD work on the drawing. This may be the designer/engineer.

File No. *(See Figure 1.6).* Information is to show up in All Border Sheets. The drawing file number will be provided and inputted by the border sheet originator and will appear as part of the border reference file sheet. It can be found in the 1391 next to the Project number. The PM will provide this information to the Design Team.

Checked By *(See Figure 1.6).* Provide first initial /last name of the individual who performed the peer review for the drawing. Initials should be entered only after peer review is completed. For A/E's this is your Quality Control Reviewer.

Plot Scale *(See Figure 1.6).* Provide the plot scale selected for the drawing. Example: 1/8" = 1'-0" equals a plot scale of 8:1.

Submitted By *(See Figure 1.6).* In House Provide first initial /last name of the designer's supervisor. A/E's to provide initials of Professional of Record here.

CADD File Name *(See Figure 1.6).* Provide the file name developed as per naming conventions provided in paragraphs 3 & 5. Do not include the CADD type extension ".dgn" or ".dwg".

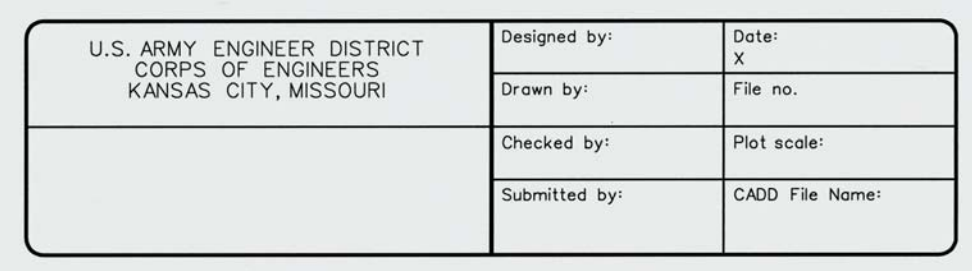


Figure 1.6

7. AMENDMENTS & MODIFICATIONS TO DRAWING SHEETS.

Changes to drawings as a result of amendments or modifications shall be clearly indicated and highlighted on the drawings. All symbols and text used to indicate modifications and amendments shall appear on the sheet file (not the model file). Use the following standard conventions to indicate amendments and modifications:

A. Clouds. Each change on the drawing sheet shall be surrounded by a "cloud" symbol. This symbol can be generated using an MDL command in Microstation by typing in "MDL L CLOUD". The correct color, line weight and level shall be indicated by an example shown on the right side of the border sheet.

B. Numbered Triangles. Each cloud shall include a corresponding small triangle with a number such as "1" within the triangle. An example, which can be copied into the drawing, is shown on the right hand side of the border sheet in the proper size, level and color. The triangle should be placed close to the appropriate cloud or attached to the cloud with a line (same weight, color and level as the cloud). *The numbering system is provided in paragraph 7.1.*

C. Text Description (Optional). Provide a brief text description of the change if it is not obvious. Use standard (note) text size, color, and line weight. Level shall be the same as the triangle.

D. Revision Block Entries (*See Figure 1.7*). Amendments and modifications shall also be indicated in the revision block, in the upper right-hand corner of the border sheet. Sample text and triangles, in the required color, line weight, and level, shall be provided to the right hand of the border sheet and should be copied into the active drawing file and edited. Note that all entries in the revision block shall be on Level 5 and shall always be shown (turned on). Entries in the revision block should be made starting at the top of the block and working downwards with successive entries. Entries in the columns shall be as follows:

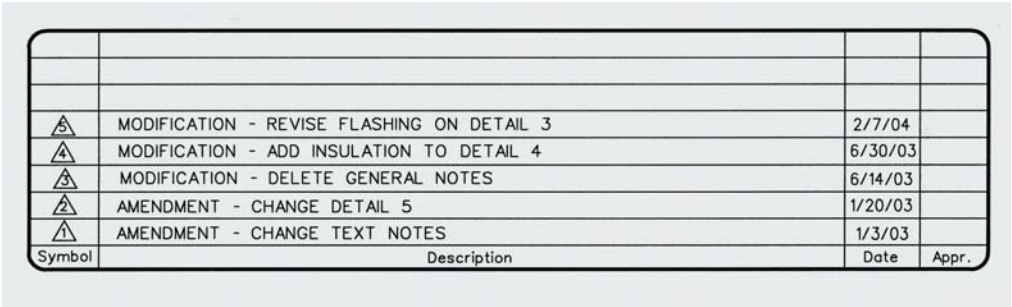
Symbol Entry: Triangle with corresponding number of modification or amendment. Number should match the triangle number used on the clouded areas (changes) that correspond to the amendment or modification.

Description Entry: Indicate whether it is an amendment or modification provided by a general description of changes if applicable. DO NOT enter any amendment or modification number unless so directed by the project manager. The description must be general but specific enough to provide some information regarding the changes. Examples of good and bad descriptions are as follows:

Bad Examples: “Amended Sheet”
“Modifications as Shown”

Good Examples: “Amendment – Change Note 4 & Add Notes 6-7”
“Modification – Delete Detail C & D”

Date Entry: Provide a date as agreed upon by the PDT and project manager.



Symbol	Description	Date	Appr.
5	MODIFICATION - REVISE FLASHING ON DETAIL 3	2/7/04	
4	MODIFICATION - ADD INSULATION TO DETAIL 4	6/30/03	
3	MODIFICATION - DELETE GENERAL NOTES	6/14/03	
2	AMENDMENT - CHANGE DETAIL 5	1/20/03	
1	AMENDMENT - CHANGE TEXT NOTES	1/3/03	

Figure 1.7

7.1 Multiple Amendments and/or Modifications.

A. Most Current Amendment and/or Modification.

All elements of the most current change to include bubbles, leaders, triangles, and text associated with the change shall be placed on a level 63, with the exception of the revision block text and graphics (triangle) which shall always be placed on level 5 and shall always remain visible on the drawing.

B. Preceding (Previous) Amendments and Modifications.

Each time an amendment/modification is followed by a succeeding amendment/modification on a drawing sheet, the preceding amendment/modification identification graphics and text shall have the level changed or be deleted from the drawing so that only the most current amendment/modification identification graphics and text information are visible. It shall be the responsibility of the discipline's section chief or the individual designer of the drawing sheet to determine if the changes are to be retained on a separate level or deleted from the drawing.

Acceptable options are as follows:

Option 1: Retain all changes. Place most current change on Level 63. Place all previous changes on Level 62. Turning on both levels 62 and 63 would show all amendments and modifications. In summary:

Current Change	LV 63
Previous Changes	LV 62
Revision Block Information	LV 05

Option 2: Retain only most recent change (amendment or modification). Delete all references to previous changes except for the revision block. In summary:

Current Change:	LV 63
Previous Changes:	Delete All Changes
Revision Block Information	LV 05

C. Revision Block Entries.

As noted previously, all amendment and modification changes shall be entered in the revision block and these entries shall always be turned on (LV 05). Each succeeding amendment or modification made to a drawing sheet shall be given a new (the next consecutive) number (1, 2, 3, 4, etc.) within the corresponding triangle. This numbering is independent for each drawing sheet and has no corollary with other drawing sheets even though the amended change may be part of the same amendment or modification. In other words, a change as a part of Amendment XYZ could appear as a "1" on drawing sheet no. A-02 because it is the first amended change on that sheet, but a change that is part of Amendment XYZ on drawing sheet no. A-04 could be labeled as "2" because there was a previous change recorded on that sheet.

Succeeding amendments and/or modifications shall be entered in the revision block above the preceding entries using the same format so that they appear in the order in which the changes were made with the most current change appearing on top. (*See Figure 1.7*)

Upon notification that the project contract has been awarded, all amendment graphics and corresponding text information on the drawing shall be deleted from the drawings. Information regarding amendments in the revision block shall always remain.

8. Cell Library Names: Each discipline group is responsible for the maintenance of their individual cell libraries. Existing cell libraries can be found at G:\MSJspace\cell. Cell library

"mst8000" is provided as a general library of symbols, etc. used buy multiple disciplines. Libraries should be named in the following manner:

Discipline_cell type_eng.cel
Discipline_cell type_met.cel

Example:

Arch_doors_eng.cel (This is an architectural cell library containing cells relating to doors and is in English units)

9. COMMENTS. **Comments should be directed to the Project Manager.** All comments or proposed changes shall be coordinated with the CADD standards committee members. Members are as follows:

Jim Turner, ED-D
Mike Coates, ED-DA
John Hunt, ED-DA
Dan Winkel, ED-DM
Hank Mildenberger, ED-GC

APPENDIX CC

Project Specific Requirements

PROJECT SPECIFIC REQUIREMENTS

1. Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Contractor employee parking shall not interfere with existing and established parking requirements of the military installation.

2. AVAILABILITY AND USE OF UTILITY SERVICES

a. Payment for Utility Services

All temporary utility connections and services for site trailers, field offices, construction power, etc., shall be at the Contractor's expense. The utility usage during construction, and until the time of beneficial occupancy by the Government, shall be paid for by the Contractor at the prevailing rates charged by the Government, or where the utility is produced by the Government, at reasonable rates as determined by the Contracting Officer. The Contractor shall carefully conserve utilities, if any, that are furnished without charge. The Contractor shall establish a Utilities Sales Agreement with the DPW Energy Branch 15 working days before final connection of any utility is desired. Contractor must contact the DPW Energy Branch at 573-596-0645 with the following information to establish a utility sales contract:

a. Company Name
b. POC on-site
c. POC for signing contract (must be an authorized person to sign a legal document on behalf of the company.
d. Company Address
e. Company Phone Number
f. On-site Phone Number
g. E-mail Address
h. Location of Work

Once contract is signed the DPW Energy Branch will email the utility company with authorization to provide utilities to your company.

b. Meters and Temporary Connections

The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall provide and maintain necessary temporary connections, distribution lines, and meter bases and meters required to measure the amount of each utility used for the purpose of determining charges. The Contractor shall make arrangements with the post Utilities Officer before final electrical connection is desired so that a utilities contract can be established. The Contractor shall provide a meter and make the final hot connection after inspection and approval of the Contractor's temporary wiring installation. The temporary plan shall be submitted for approval in accordance with EM 385-1-1.

c. Advance Deposit

An advance deposit is not required for the utilities usage that is to be paid to the Government. However, a deposit, or upfront payment, may be required by the Utility for the connection fee to a non-Government distribution system.

d. Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, the Contractor shall notify the Contracting Officer, in writing, 5 working days before termination is desired. The Government will take a final meter reading, disconnect service, and remove the meters. The Contractor shall then remove all the temporary distribution lines, meter bases, and associated paraphernalia. The Contractor shall pay all outstanding utility bills before final acceptance of the work by the Government.

3. Project and Safety Signs

The requirements for the signs, their content, and location shall be as shown on the examples provided at the end of this section. The signs shall be erected within 15 days after receipt of the notice to proceed. The data required by the safety sign shall be corrected daily, with light colored metallic or non-metallic numerals. Upon completion of the project, the signs shall be removed from the site.

4. CONTRACTOR'S TEMPORARY FACILITIES

a. Administrative Field Offices

The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

b. Storage Area

The Contractor shall construct a temporary 6 foot high chain link fence around trailers and materials. The fence shall include plastic strip inserts so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Trailers, materials, or equipment shall not be placed or stored outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the military boundaries. Trailers, equipment, or materials shall not be open to public view with the exception of those items which are in support of ongoing work on any given day. Materials shall not be stockpiled outside the fence in preparation for the next day's work. Mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within the fenced area at the end of each work day.

c. Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but shall be within the military boundaries. Fencing of materials or equipment will not be required at this site; however, the Contractor shall be responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

d. Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on the military property.

e. Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the Contractor's discretion. Grass located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly.

f. New Building

In the event a new building is constructed for the temporary project field office, it shall be a minimum 12 feet in width, 16 feet in length and have a minimum of 7 feet headroom. It shall be equipped with approved electrical wiring, at least one double convenience outlet and the required switches and fuses to provide 110-120 volt power. It shall be provided with a work table with stool, desk with chair, two additional chairs, and one legal size file cabinet that can be locked. The building shall be waterproof, shall be supplied with heater, shall have a minimum of two doors, electric lights, a telephone, a battery operated smoke detector alarm, a sufficient number of adjustable windows for adequate light and ventilation, and a supply of approved drinking water. Approved sanitary facilities shall be furnished. The windows and doors shall be screened and the doors provided with dead bolt type locking devices or a padlock and heavy duty hasp bolted to the door. Door hinge pins shall be non-removable. The windows shall be arranged to open and to be securely fastened from the inside. Glass panels in windows shall be protected by bars or heavy mesh screens to prevent easy access to the building through these panels. In warm weather, air conditioning capable of maintaining the office at 50 percent relative humidity and a room temperature 20 degrees F below the outside temperature when the outside temperature is 95 degrees F, shall be furnished. Any new building erected for a temporary field office shall be maintained by the Contractor during the life of the contract and upon completion and acceptance of the work shall become the property of the Contractor and shall be removed from the site. All charges for telephone service for the temporary field office shall be borne by the Contractor, including long distance charges up to a maximum of $75.00 per month.

g. Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. The Contractor shall be responsible for the security of its own equipment; in addition, the Contractor shall notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

5. GOVERNMENT FIELD OFFICE

a. Resident Engineer's Office

The Contractor shall furnish bottled drinking water with cooler.

There shall be two private offices, one at each end of the facility. Each private office shall be furnished with one desk, two office chairs, two cushioned fold up chairs, and one four drawer legal size file cabinet.

The center area between the offices shall be a conference area furnished with a minimum 16' x 3' conference table and 12 chairs. The center area will also have one

desk with office chair. The center area shall also be provided with one plans rack with a minimum of 10 rack clips and a minimum 6' x 2.5' plan table.

The entire facility including the furniture provided by the Contractor will remain the property of the Contractor and shall be removed from the site no sooner than 30 calendar days after completion of the work.

6. TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, the Contractor shall furnish and erect temporary project safety fencing at the work site. The safety fencing shall be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 42 inches high, supported and tightly secured to steel posts located on maximum 10 foot centers, constructed at the approved location. The safety fencing shall be maintained by the Contractor during the life of the contract and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site.

7. CLEANUP

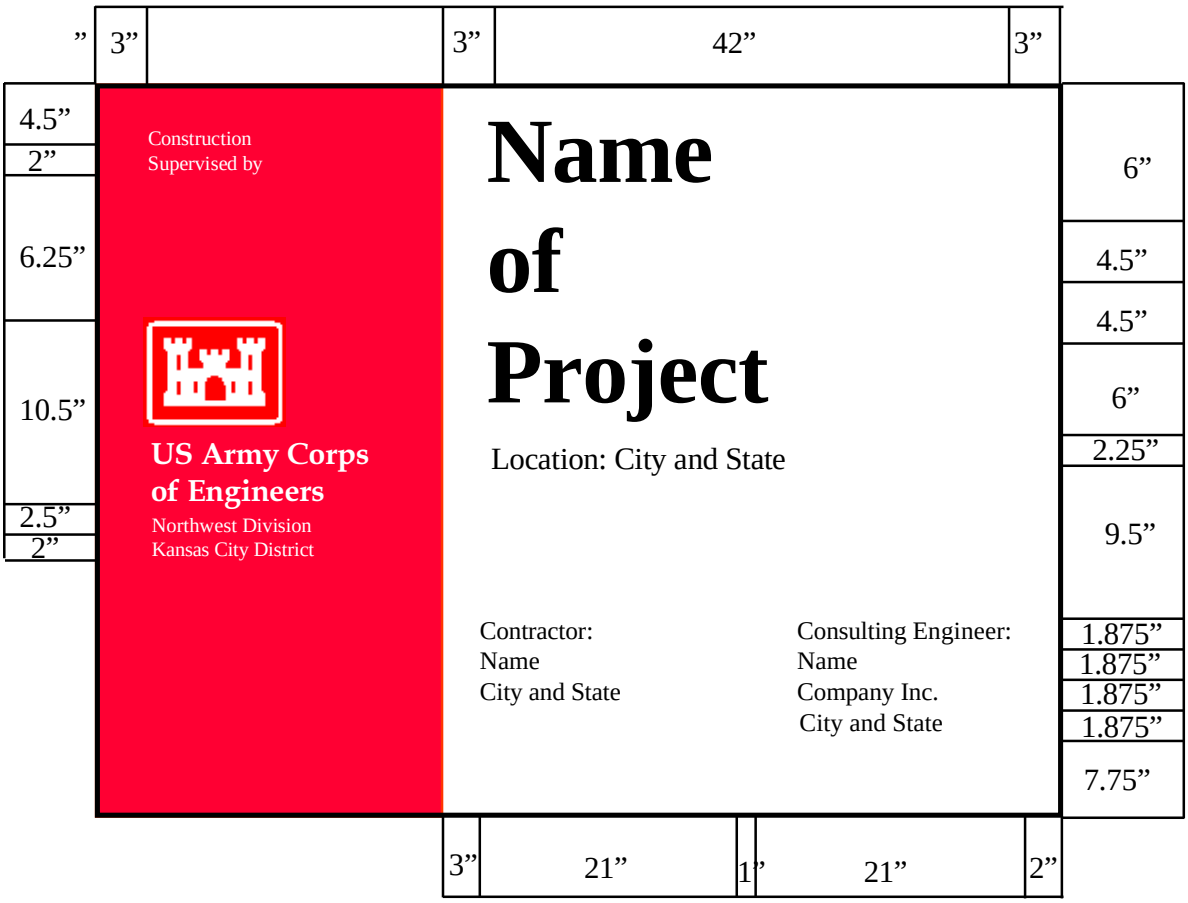
Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away. Materials resulting from demolition activities which are salvageable shall be stored within the fenced area described above or at the supplemental storage area. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored.

8. RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

The graphic format for this 4'x 6' sign panel follows the legend guidelines and layout as specified below. The large 4'x 4' section of panel on the right is to be white with black legend. The 2'x 4' section of the sign on the left with with the full Corps signature (reverse version) is to be screen printed Communications Red on the White background.

This sign is to be placed with the Safety Performance Sign (See Fig. 2).



Legend Group 1: One to two-line description of Corps relationship to project
Color White
Typeface 1.25" Helvehca Regular
Maximum line lenth: 19"

Legend Group 2: Division\ District Name Placed below 10.5" Reverse Signature (6" Castle).
Color: White
Typeface: 1.25" Helvetica Regular

Legend Group 3: One- to three-line project title legend describes the work beging done under this contract.
Color: Black
Typeface: 3" Helvetica Bold
Maximum line length: 42"

Legend Group 4: One- to two-line identification of project or facility (civil works) or name of sponsoring department (military).
Color: Black
Typeface: 1.5" Helveticia Regular
Maximum line length: 42"

Cross-align the first line of Legend Group 4 with the first line of the Corps Signature (US Army Corps) as shown.

Legend Groups 5a-b: One- to five-line identification of prime contractors including: type (arcthitect, general contractor, etc.), corporate or firm name, city, state. Use of Legend Group 5 is optional.
Color: Black
Typeface: 1.25" Helvetica Regular
Maximum line length: 21"

All typography is flush left and rag right, upper and lower case with initial capitals only as shown.
Letter- and word-spacing to follow Corps standards

Sign Type	Legend Size	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
CID-01	Various	4' x 6'	4" x 4"	HDO-3	48"	WH-RD/BK

CONSTRUCTION SIGN (CORPS OF ENGINEERS DESIGN)
(Use with Fig 2)

Fig. 1

SAFETY PERFORMANCE SIGN

Each contractor's safety record is to be posted on Corps managed or supervised construction projects and mounted with the construction project identification sign.

The graphic format, color, size and typefaces used on the sign are to be reproduced exactly as specified below. The title with First Aid logo in the top section of the sign and the performance record captions are standard for all signs of the type. Legend Groups 2 and 3 below identify the project and the contractor and are to be placed on the sign as shown.

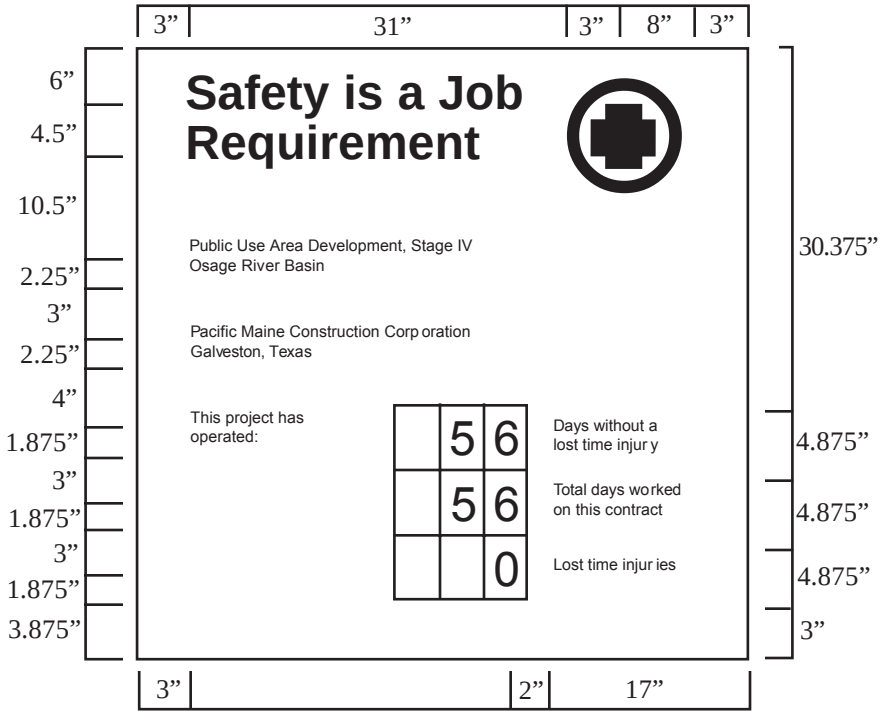
Safety record numbers are mounted on individual metal plates and are screw mounted to the background to allow for daily revisions to posted safety performance record.

Legend Group 1: Standard two-line title "Safety is a Job requirement" with (8 od.) Safety Green First Aid logo.
Color: to match PMS 347
Typeface: 3" Helvetica Bold
Color: Black

Legend Group 2: One to two-line project title legend describes the work being done under this contract and name of host project.
Color: Black
Typeface: 1.5" Helvetica Regular
Maximum line length: 42"

Legend Group 3: One to two-line identification; name of prime contractor and city, state address.
Color: Black
Typeface: 1.5" Helvetica Regular
Maximum line length: 42"

Legend Group 4: Standard safety record captions as shown.
Color: Black
Typeface: 12.5" Helvetica Regular



Sign Type	Legend Size	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
CID-02	Various	4' X 4'	4" X 4"	HDO-3	48"	WH/BK - GR

Replaceable numbers are to be mounted on white .060 aluminum plates and screw-mounted to background.
Color: Black
Typeface: 3" Helvetica Regular
Plate size: 2.5" X 5"

All typography is flush left and rag right. Upper and lower case with initial capitals only as shown. Letter - and word - spacing to follow Corps standards.

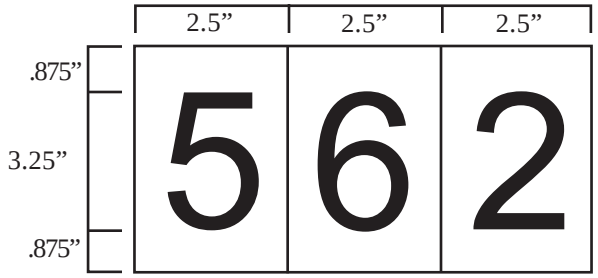


Fig. 2

U.S. Army Corps of Engineers
Kansas City District Office

Project Number: 068728

Trainee Barracks III/Co. Ops.
Ft. Leonard Wood, Missouri

October 2008

Draft
BCT III Sewer Evaluation

Contents

Figures

Section 1
Introduction and Project Assumptions

1.1 Introduction

CDM Federal Programs Corporation (CDM) has been contracted by Watts-Weitz JV (W-W) to provide services for the design, permitting, and construction of Trainee Barracks Complex III at Ft. Leonard Wood (FLW), Missouri for the United States Army Corps of Engineers (USACE). The project involves the construction of a new training complex that will discharge into the existing sewer feeding into the Middle Branch interceptor. CDM completed a limited sewer evaluation study to determine if there is capacity in the existing sewer system. CDM subcontracted with TREKK Design Group (TREKK) to collect field data including flow monitoring services at eight locations on the existing system.

1.2 Study Limitations

The scope of this sewer evaluation study had several limitations. The following limitations of this study are:

- Interpretation of the dry flow meter data was limited to a 7 day monitoring period. In addition, there was only 5 days of dry weather monitoring because of the wet weather event on September 14, 2008.
- Flow meter data evaluation is limited to the dry weather flow analysis as described in the scope
- No rain gauge was installed as part of this study
- Limited meter gauge calibration because of the short monitoring period
- Base population relating to training activities was not made available for this study
- Study does not include an Inflow & Infiltration (I&I) evaluation of wet weather flow

Section 2
Field Data Collection Procedures

2.1 Flow Meter Locations

CDM sub-contracted with TREKK to provide flow monitoring services of the existing sewer system at eight locations. Flow meter locations were determined using available GIS data of the sewer system. The XPSWMM model network was also used to identify the best locations for flow monitoring to depict existing conditions. Figure 2-1 shows the general site area as well as the location of flow meters 1-8. Table 2-1 provides further information on the location of each flow meter as well as pipe size and type.

Table 2-1
Flow Meter List

Flow Meter #	Meter Location US MH_DS MH	GIS Data Pipe Size (in)	Field Measurement Pipe Size (in)	Sewer Type
1	3878_3868	20	18	Branch
2	2894_3910	18	18	Main collector
3	2897_3910	18	18	Branch
4	3802_2913	18	18	Main collector
5	2911_2913	12	12	Branch
6	3334_4109	10	10	Branch
7	3006_4128	12	12	Branch
8	3175_3174	24	24	Main collector

US MH = Upstream Manhole

DS MH = Downstream Manhole

Meter placed at DS Manhole

Flow Meter 1

Flow meter 1, the most upstream flow meter, was installed on the South BCT Branch at manhole #3868 along Arkansas Avenue. Figure 2-2 shows the location of flow meter 1.

Flow Meter 2 & 3

Flow meter 2 was installed on the main sewer collection system at manhole #3910 and is located just upstream of the connection of the South BCT Branch to the main collection system. Flow meter 3 was installed at manhole #3910 to capture the South BCT Branch flows before entering the main collection system. Figure 2-3 shows the location of flow meters 2 and 3.

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Figure 2-2
Flow Meter 1

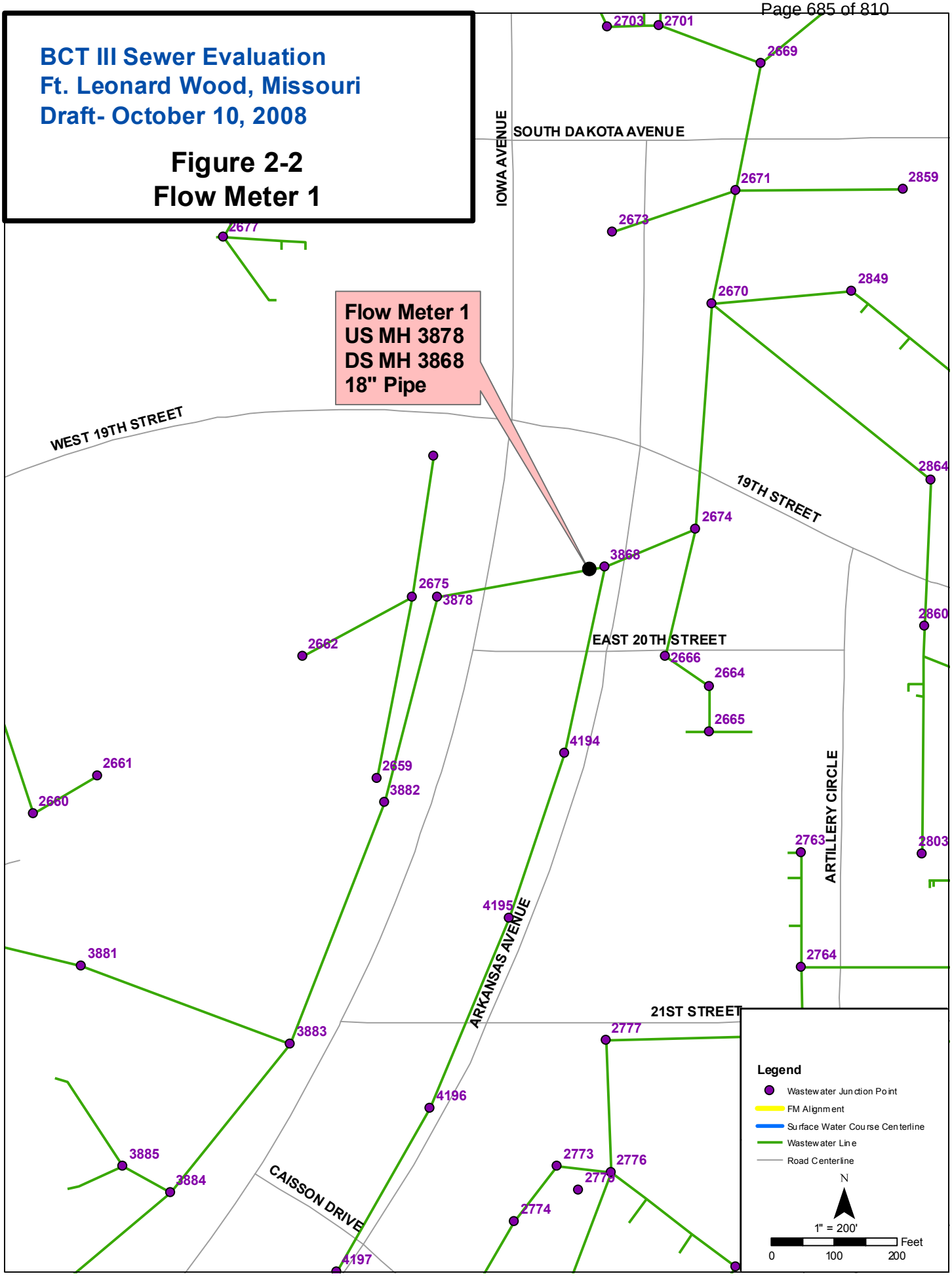

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Figure 2-1
Flow Monitoring Locations

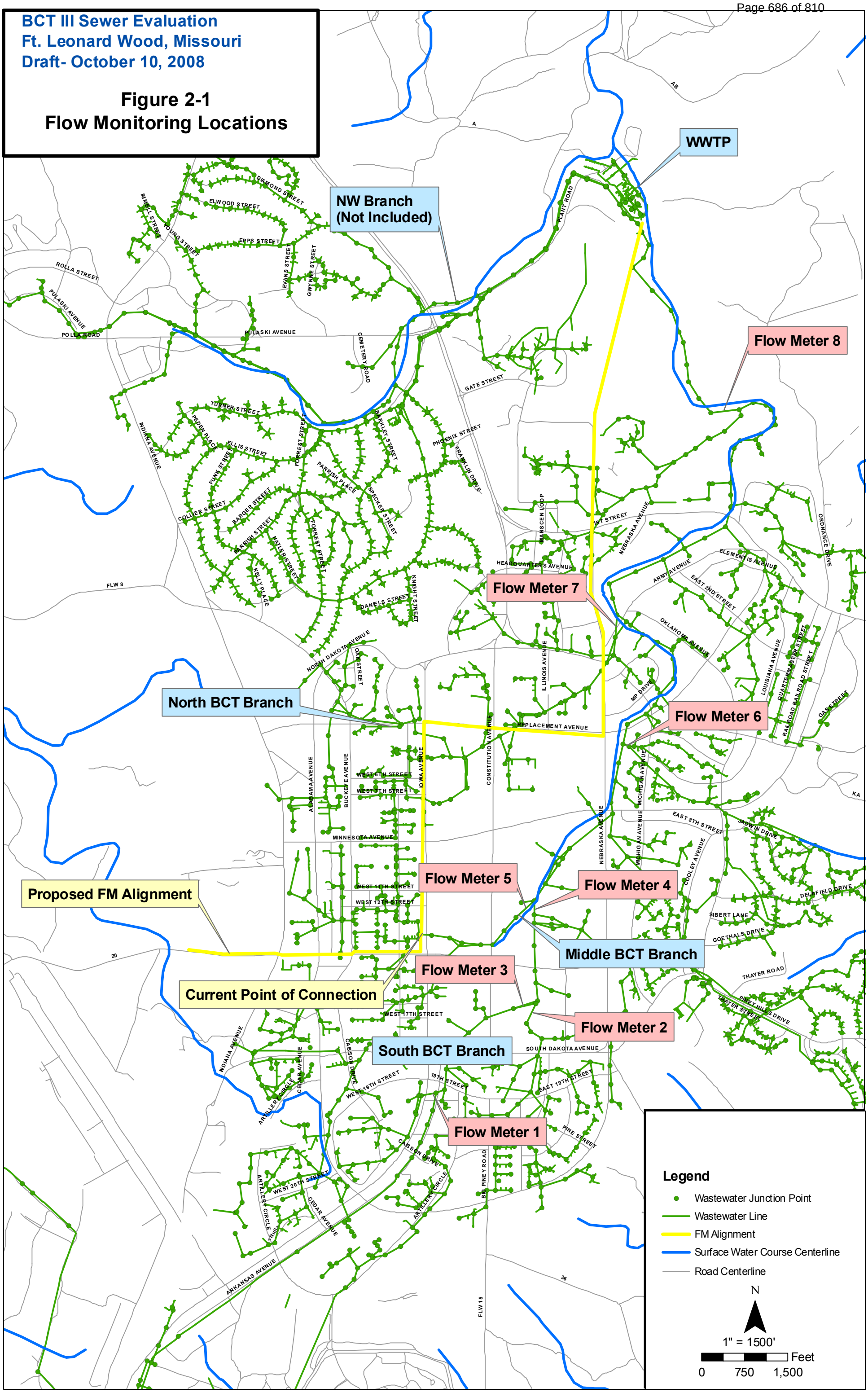

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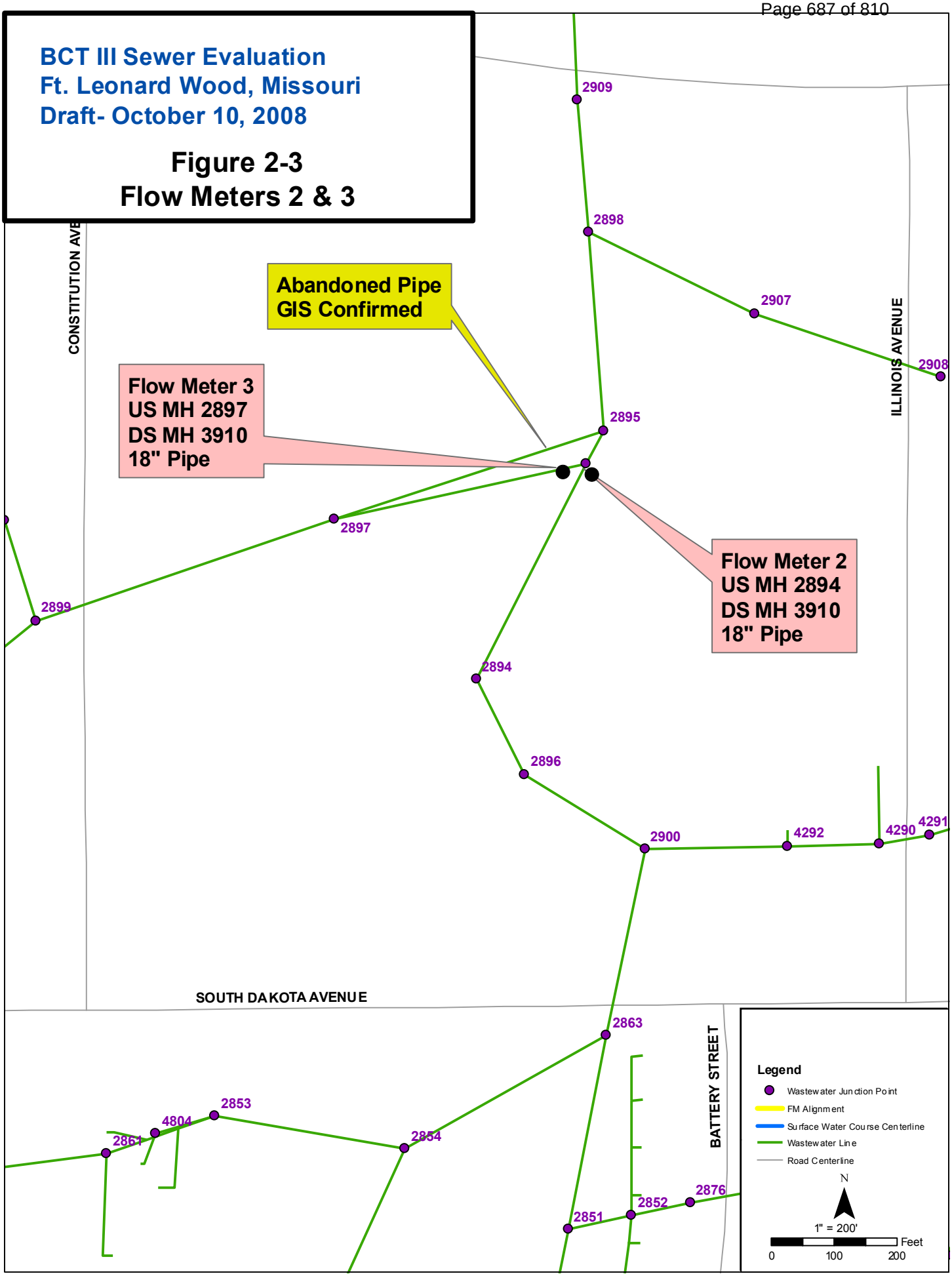
Figure 2-3
Flow Meters 2 & 3



Flow Meter 4 & 5

Flow meter 4 was installed on the main sewer collection system at manhole #2913 and is located just upstream of the connection of the Middle BCT Branch to the main collection system. Flow meter 5 was installed at manhole #3910 to capture the Middle BCT Branch flows before entering the main collection system. Flow meter 5 also provides information on the BCT III proposed point of connection into the Middle BCT Branch. Figure 2-4 shows the location of flow meters 4 and 5.

Flow Meter 6

Flow meter 6 was installed on a branch line at manhole #4109, located west of Michigan Avenue. Figure 2-5 shows the location of flow meter 6.

Flow Meter 7

Flow meter 7 was installed on the North BCT Branch at manhole #4072 at the connection to the main sewer collection system. Figure 2-6 shows the location of flow meter 7.

Flow Meter 8

Flow meter 8, the most downstream flow meter, was installed on the main collection system upstream of the Waste Water Treatment Plant (WWTP). The flow meter captures flow from flow meters 1-7, depicting existing conditions of the project area. Figure 2-7 shows the location of flow meter 8.

2.2 Field Procedures

TREKK installed eight electronic ISCO 2010 Area/Velocity flow meters on Monday, September 8, 2008 in the locations shown in Figure 2-1. These monitoring devises had four components: (1) depth of flow and velocity sensors, (2) a central processing unit, (3) solid-state memory for data storage, and (4) an on-board clock to synchronize sensor recordings. User-defined interval of 15-minutes stored depth of flow and velocity readings. Flow metering was performed during the period of September 9 to September 17, 2008. During the monitoring period, field crews visited the temporary metering locations on September 9 and September 12, 2008, to download data and document field conditions. The flow monitoring data and field notes provided by TREKK can be found in Appendix A.

2.3 Field Observations & Other Issues

The installed flow meters preformed as expected during the majority of the monitoring duration. However, there was a significant rain event on September 14, 2008, during the hours of 02:00 to 09:00.

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Figure 2-6
Flow Meter 7

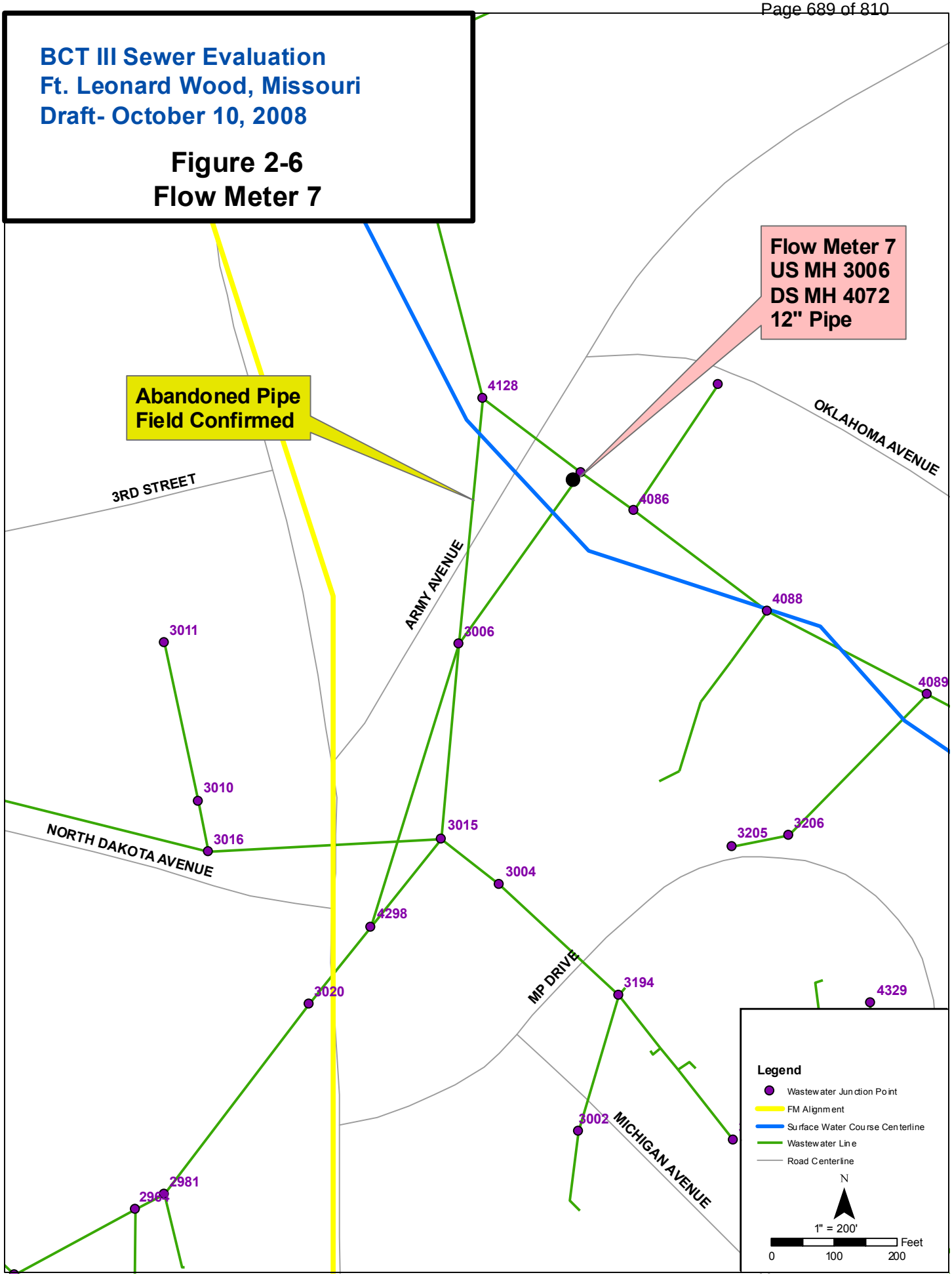

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Figure 2-5
Flow Meter 6

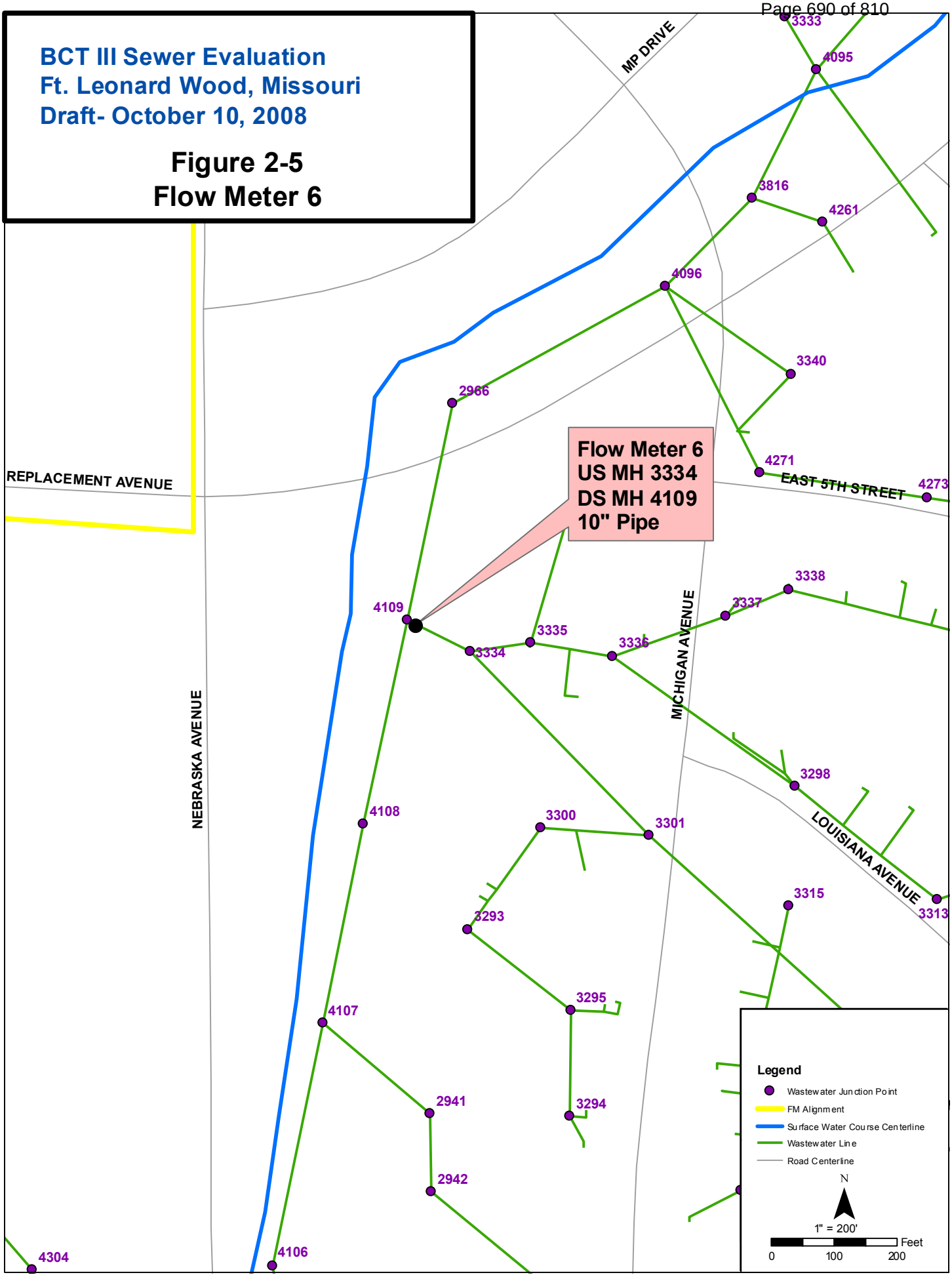

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Figure 2-4
Flow Meters 4 & 5

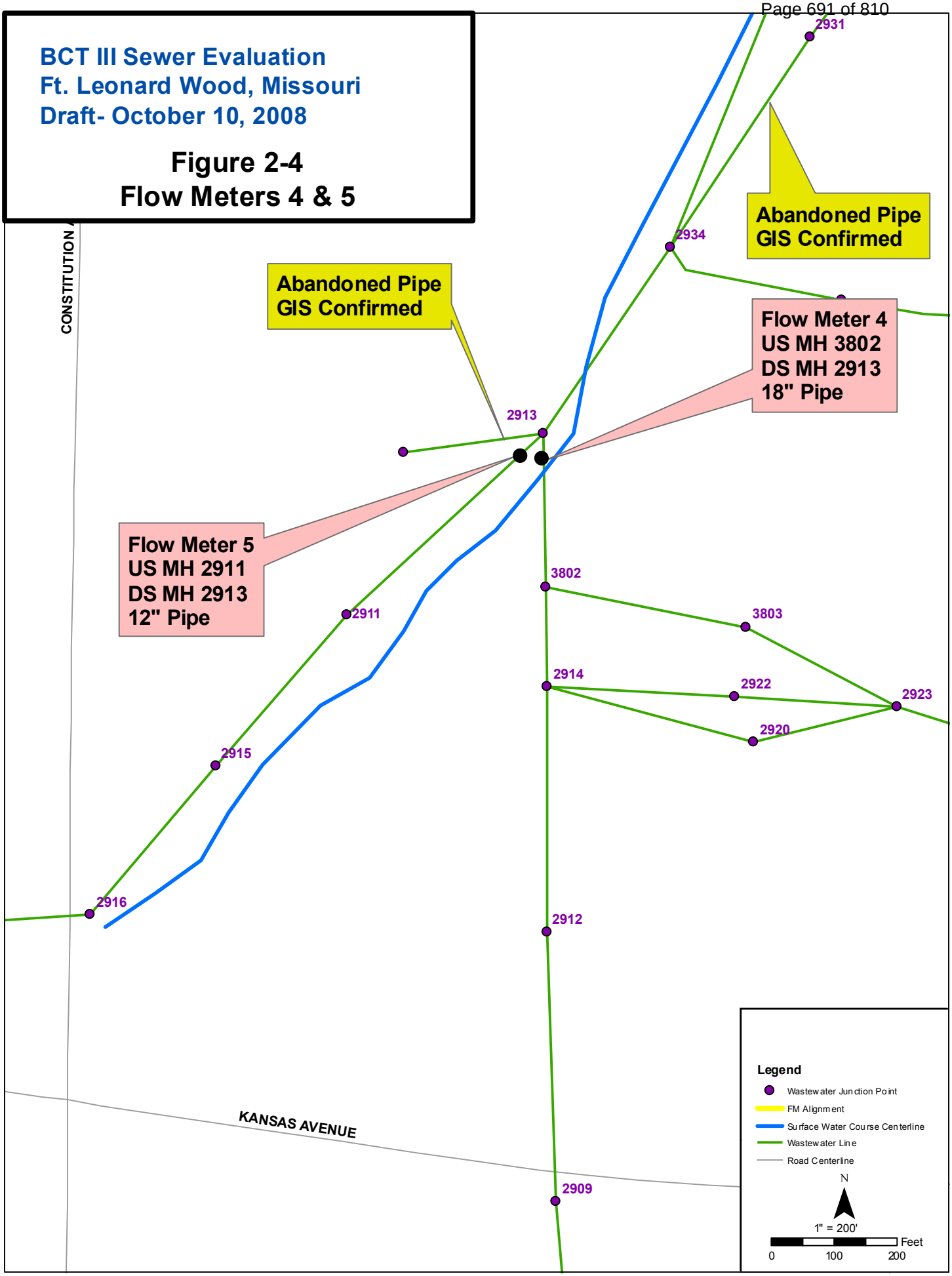

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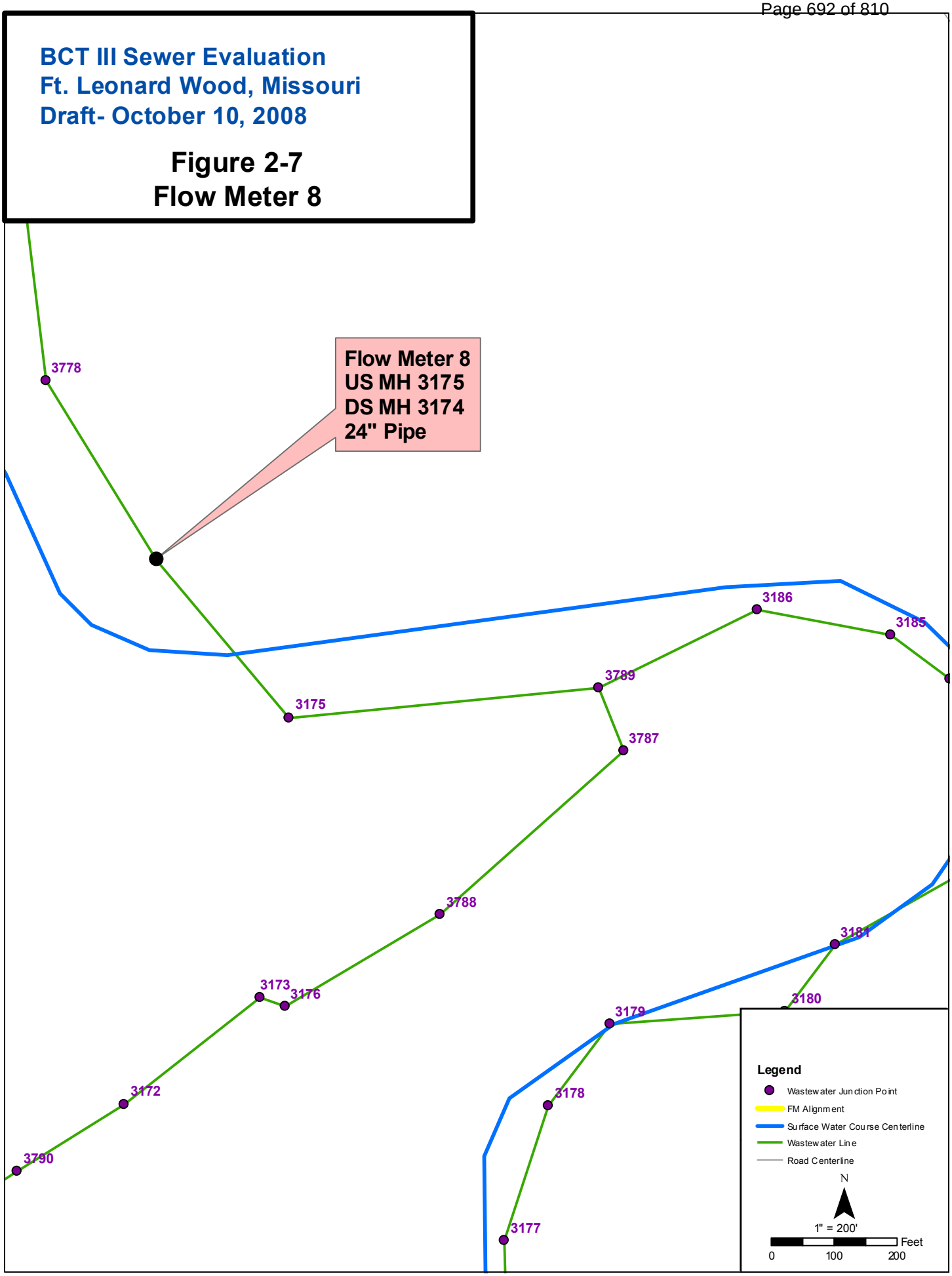
Figure 2-7
Flow Meter 8



Rainfall Data

Rainfall data was collected from the rain gauge at the Ft. Leonard Wood airport, approximately 1 mile from the study area. Values were downloaded from Weather Underground, *www.weatherunderground.com*, and are listed in Table 2-2. In addition, National Weather Service radar indicated rainfall totals of 2.5 to over 3 inches for September 14, 2008. (Figure 2-8)

Table 2-2
Daily Rainfall Data, Ft. Leonard Wood, MO

Daily Rainfall, in	9/8/2008	9/9/2008	9/10/2008	9/11/2008	9/12/2008	9/13/2008	9/14/2008	9/15/2008
Ft. Leonard Wood Airport	0.00	0.00	0.00	0.09	0.01	0.04	4.80	0.00

Sanitary Sewer Overflow (SSO)

Following the review of the submitted data, it was concluded that during the rainfall event on Sunday, September 14, 2008 there was evidence of a Sanitary Sewer Overflow (SSO) at two metered locations. There was heavy rainfall during the hours of 2:00- 9:00 that caused an extreme spike in the flow data, indicating significant inflow of stormwater into the sanitary sewer system. Flow meters 4 and 5 data indicated an SSO which was also confirmed during the site visit on Monday, September 15, 2008 by TREKK.

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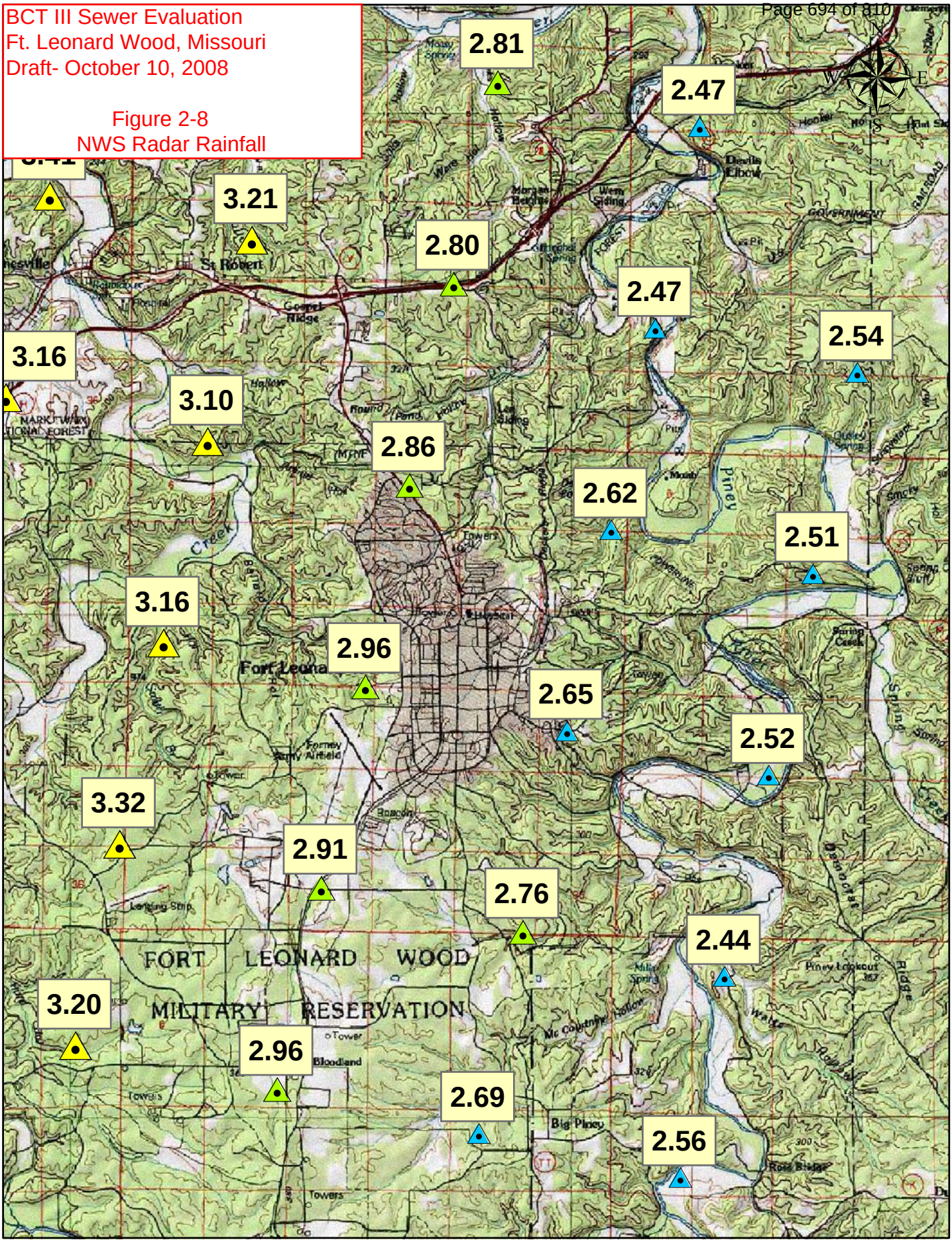
Figure 2-8
NWS Radar Rainfall



September 14, 2008 Rainfall Totals (24 hr)
National Weather Service Radar Rainfall Totals
Ft. Leonard Wood, Missouri
Friday, October 10, 2008

Section 3
Flow Meter Results

Field data collected during the flow monitoring duration was analyzed for the 8 flow meters. For each installed flow meter, a table with average daily flow, maximum daily flow, and minimum daily flow was tabulated and is shown in Tables 3-1 to 3-8. Due to the significant rain event on September 14, 2008 that indicated significant inflow data was omitted for September 14 and September 15 in the final dry weather flow (DWF) results. This was necessary to accurately represent existing DWF. Data was also deleted if indication of flow meter malfunction was present. Raw flow data was also compiled into flow charts, shown in Figures 3-1 to 3-8.

Flow Meter 1

Figure 3-1
Meter 1 Hydrograph

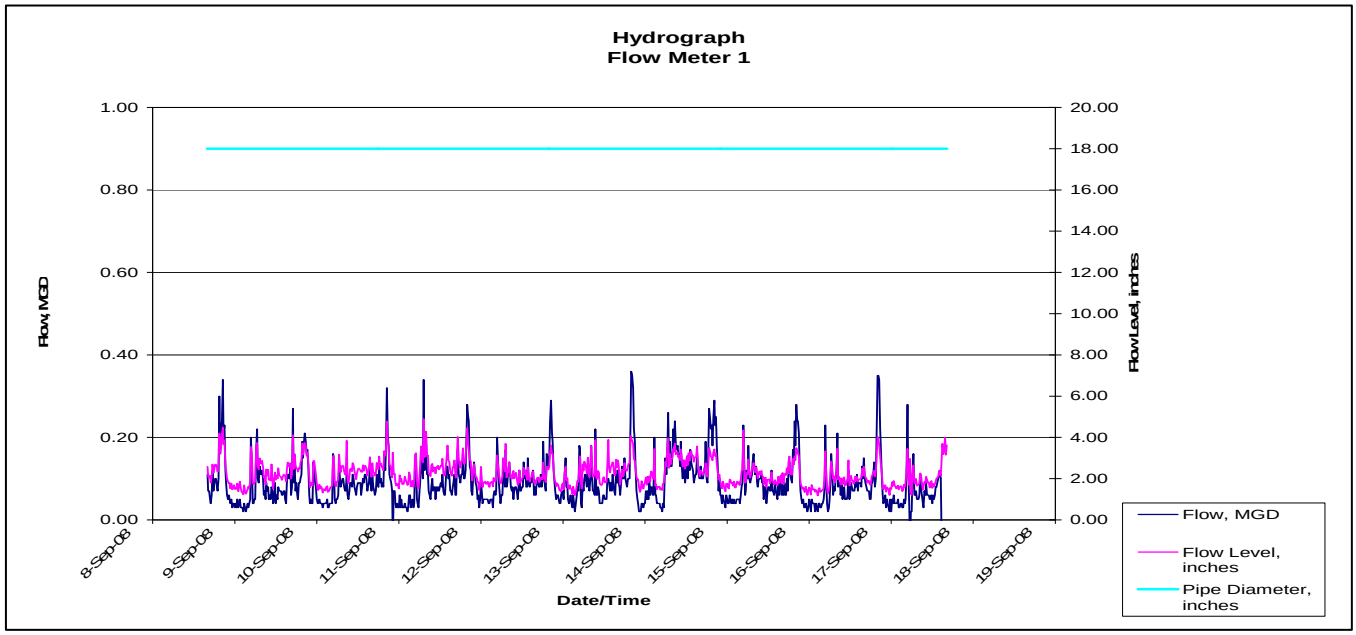


Table 3-1
Meter 1 Statistics

Date	Daily Avg. Flow		Daily Max. Flow		Daily Min. Flow	
	MGD	CFS	MGD	CFS	MGD	CFS
9/8/2008	0.0989	0.1531	0.3400	0.5261	0.0300	0.0464
9/9/2008	0.0826	0.1278	0.2700	0.4178	0.0200	0.0309
9/10/2008	0.0817	0.1264	0.3200	0.4951	0.0300	0.0464
9/11/2008	0.0909	0.1407	0.3400	0.5261	0.0200	0.0309
9/12/2008	0.0904	0.1399	0.2900	0.4487	0.0300	0.0464
9/13/2008	0.0901	0.1394	0.3600	0.5570	0.0200	0.0309
9/15/2008	0.0972	0.1504	0.2800	0.4333	0.0200	0.0309
9/16/2008	0.0846	0.1309	0.3500	0.5416	0.0200	0.0309
9/17/2008	0.0650	0.1006	0.2800	0.4333	0.0200	0.0309

Summary

Flow meter data indicates a well exhibited dry weather diurnal curve with very limited to no response during the wet weather event.

Flow Meter 2

Figure 3-2
Meter 2 Hydrograph

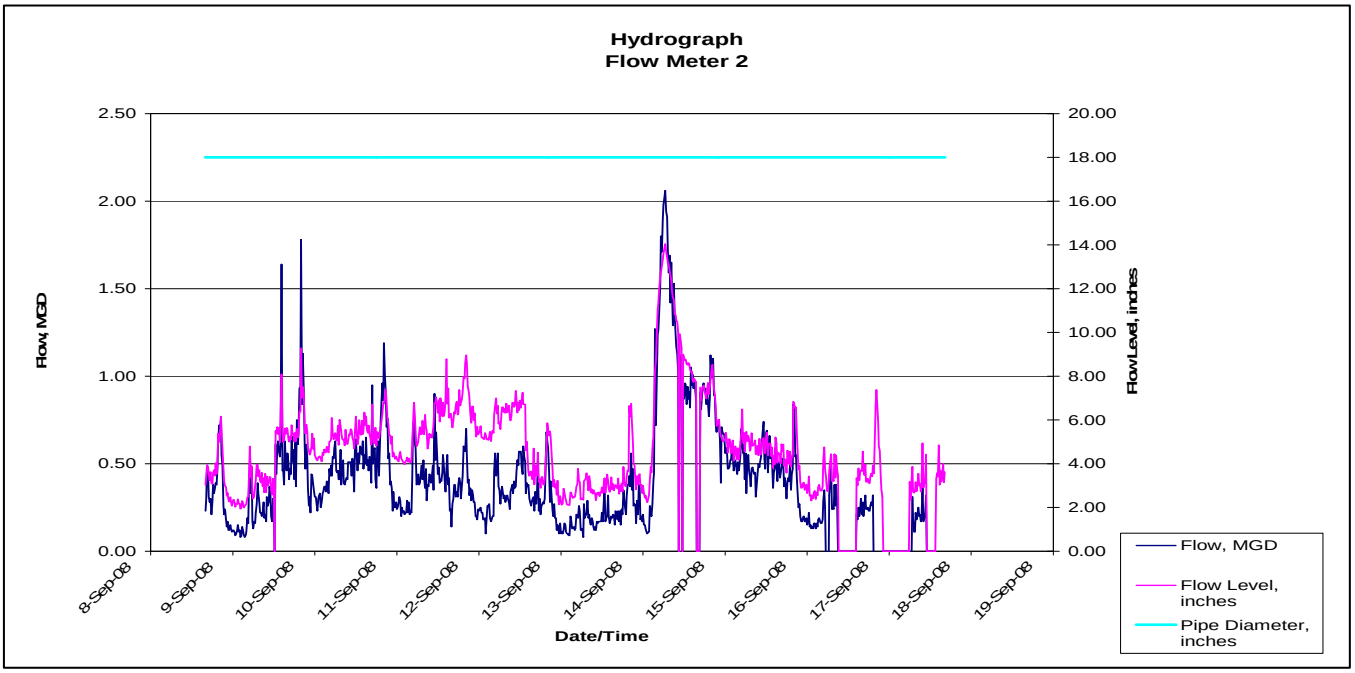


Table 3-2
Meter 2 Statistics

Date	Daily Avg. Flow		Daily Max. Flow		Daily Min. Flow	
	MGD	CFS	MGD	CFS	MGD	CFS
9/9/2008	0.3977	0.6154	1.7800	2.7543	0.0800	0.1238
9/10/2008	0.4945	0.7651	1.1900	1.8413	0.2300	0.3559
9/11/2008	0.3851	0.5959	0.9000	1.3926	0.1400	0.2166
9/12/2008	0.3272	0.5063	0.6800	1.0522	0.1000	0.1547
9/13/2008	0.2077	0.3214	0.5600	0.8665	0.0800	0.1238
9/15/2008	0.4495	0.6955	0.8400	1.2998	0.1700	0.2630
9/16/2008	0.1777	0.2750	0.3500	0.5416	0.1300	0.2012

Summary

Flow meter data indicates a well exhibited dry weather diurnal curve with some questionable dry weather peaks during the early monitoring period. Data indicated a significant shape peak during the wet weather event indicating inflow. Also several drop outs in the flow meter data after the wet weather event which may indicate flow meter errors.

Flow Meter 3

Figure 3-3
Meter 3 Hydrograph

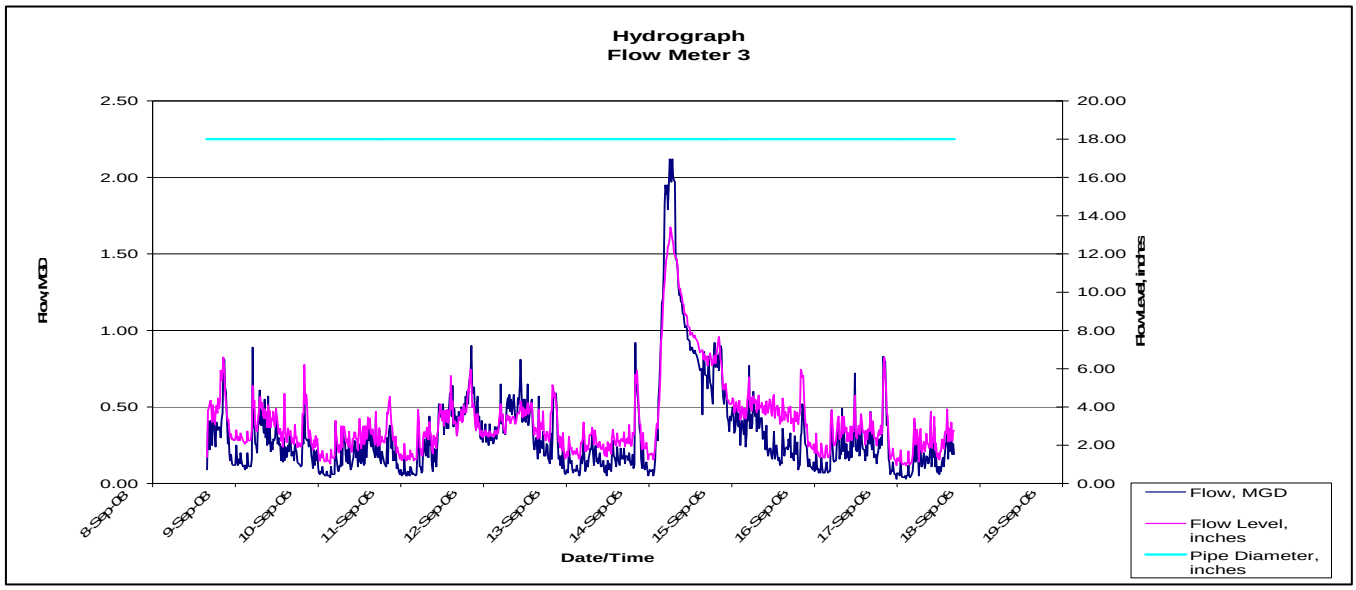


Table 3-3
Meter 3 Statistics

Date	Daily Avg. Flow		Daily Max. Flow		Daily Min. Flow	
	MGD	CFS	MGD	CFS	MGD	CFS
9/9/2008	0.2489	0.3851	0.8900	1.3771	0.0900	0.1393
9/10/2008	0.1767	0.2734	0.4400	0.6808	0.0400	0.0619
9/11/2008	0.3297	0.5101	0.9000	1.3926	0.0500	0.0774
9/12/2008	0.3659	0.5662	0.8100	1.2533	0.0600	0.0928
9/13/2008	0.1753	0.2713	0.9200	1.4235	0.0500	0.0774
9/15/2008	0.2583	0.3997	0.6000	0.9284	0.0900	0.1393
9/16/2008	0.2311	0.3577	0.8300	1.2843	0.0300	0.0464
9/17/2008	0.1518	0.2349	0.4700	0.7272	0.0300	0.0464

Summary

Flow meter data indicates a relatively consistent dry weather diurnal curve with a significant shape peak during the wet weather event indicating inflow.

Flow Meter 4

Figure 3-4
Meter 4 Hydrograph

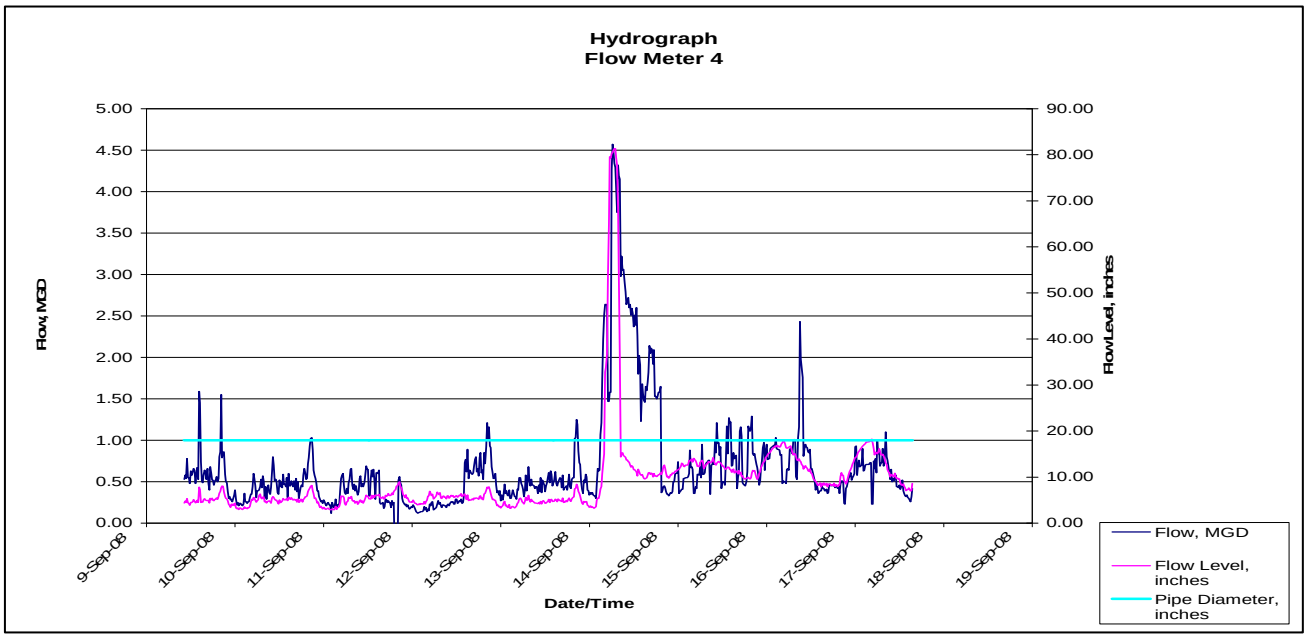


Table 3-4
Meter 4 Statistics

Date	Daily Avg. Flow		Daily Max. Flow		Daily Min. Flow	
	MGD	CFS	MGD	CFS	MGD	CFS
9/10/2008	0.4504	0.6969	1.0300	1.5938	0.2100	0.3249
9/11/2008	0.3687	0.5705	0.6900	1.0677	0.1200	0.1857
9/12/2008	0.4033	0.6241	1.2100	1.8723	0.1200	0.1857
9/13/2008	0.4901	0.7584	1.2500	1.9342	0.2700	0.4178
9/15/2008	0.7996	1.2373	1.2900	1.9961	0.4200	0.6499
9/16/2008	0.6746	1.0439	1.9800	3.0637	0.2300	0.3559
9/17/2008	0.6062	0.9380	1.1000	1.7021	0.2300	0.3559

Summary

Flow meter data indicates an atypical dry weather diurnal curve with significant variation in flow pattern early in the monitoring period. Data indicated a significant shape peak during the wet weather event indicating inflow. Also there was one drop out in the flow meter data on September 12 and after the wet weather event the dry weather diurnal curve was significant different than before the wet weather event.

Flow Meter 5

Figure 3-5
Meter 5 Hydrograph

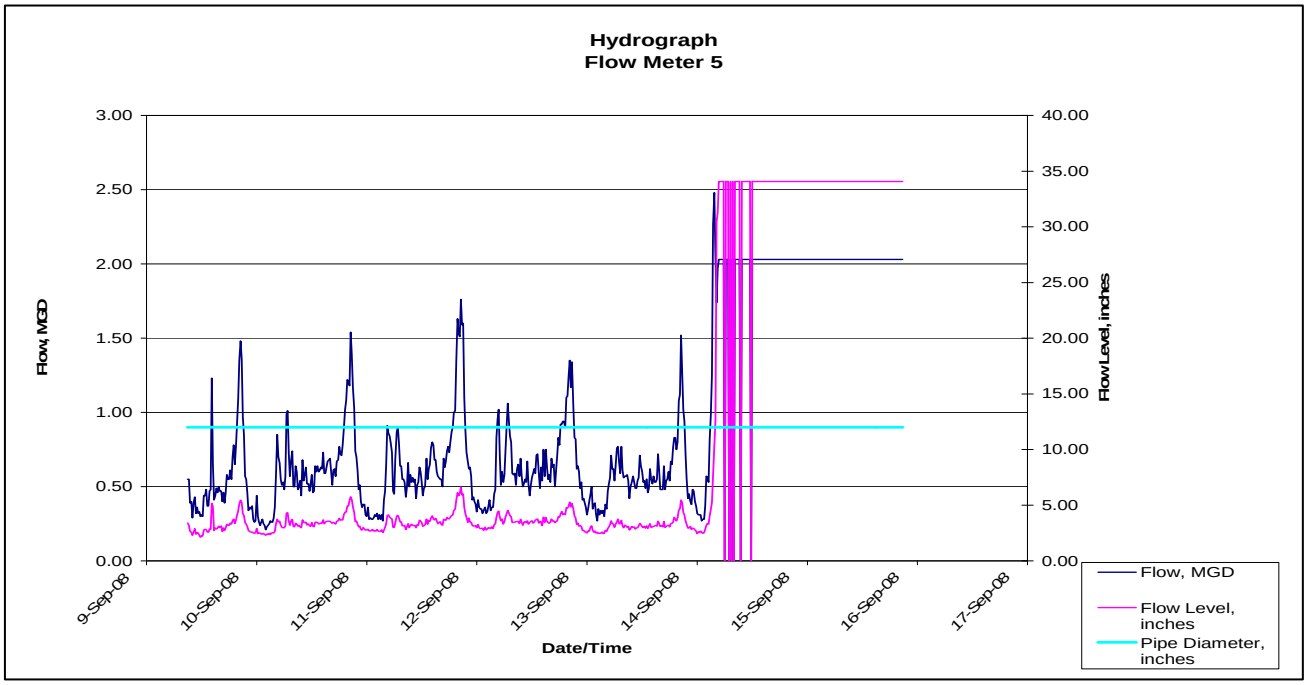


Table 3-5
Meter 5 Statistics

Date	Daily Avg. Flow		Daily Max. Flow		Daily Min. Flow	
	MGD	CFS	MGD	CFS	MGD	CFS
9/10/2008	0.6011	0.9302	1.5400	2.3829	0.2100	0.3249
9/11/2008	0.6544	1.0125	1.7600	2.7233	0.2700	0.4178
9/12/2008	0.6432	0.9953	1.3500	2.0889	0.3200	0.4951
9/13/2008	0.5684	0.8796	1.5200	2.3520	0.2700	0.4178

Summary

Flow meter data indicates a well exhibited dry weather diurnal curve before the wet weather event. During the wet weather event on September 14, 2008, this meter location surcharged causing the flow meter to malfunction. No flow meter data was recorded after the wet weather event.

Flow Meter 6

Figure 3-6
Meter 6 Hydrograph

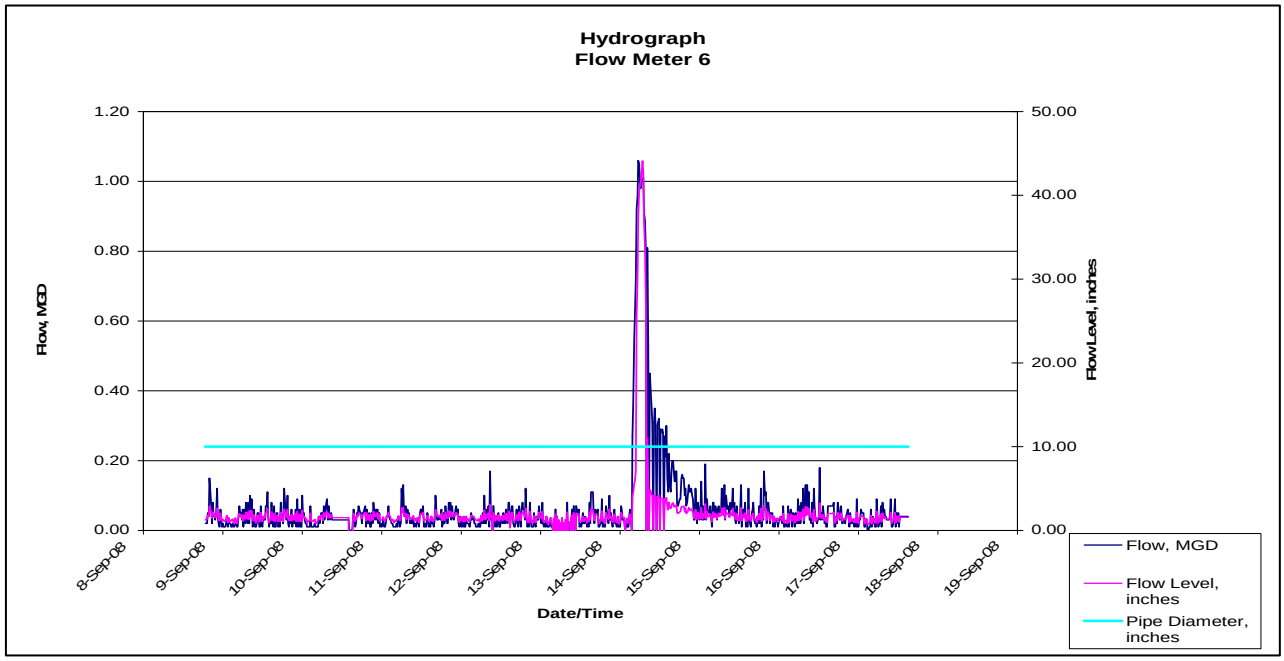


Table 3-6
Meter 6 Statistics

Date	Daily Avg. Flow		Daily Max. Flow		Daily Min. Flow	
	MGD	CFS	MGD	CFS	MGD	CFS
9/9/2008	0.0351	0.0543	0.1200	0.1857	0.0100	0.0155
9/10/2008	0.0351	0.0543	0.1000	0.1547	0.0100	0.0155
9/11/2008	0.0353	0.0546	0.1300	0.2012	0.0100	0.0155
9/12/2008	0.0345	0.0534	0.1700	0.2630	0.0100	0.0155
9/13/2008	0.0340	0.0527	0.1100	0.1702	0.0000	0.0000
9/15/2008	0.0525	0.0813	0.1700	0.2630	0.0100	0.0155
9/16/2008	0.0442	0.0683	0.1800	0.2785	0.0100	0.0155
9/17/2008	0.0343	0.0530	0.0900	0.1393	0.0000	0.0000

Summary

Flow meter data indicates a relatively consistent dry weather diurnal curve with a significant shape peak during the wet weather event indicating inflow. Also there were a few flow meter data inaccuracies that occurred during the monitoring period but these were very minor.

Flow Meter 7

Figure 3-7
Meter 7 Hydrograph

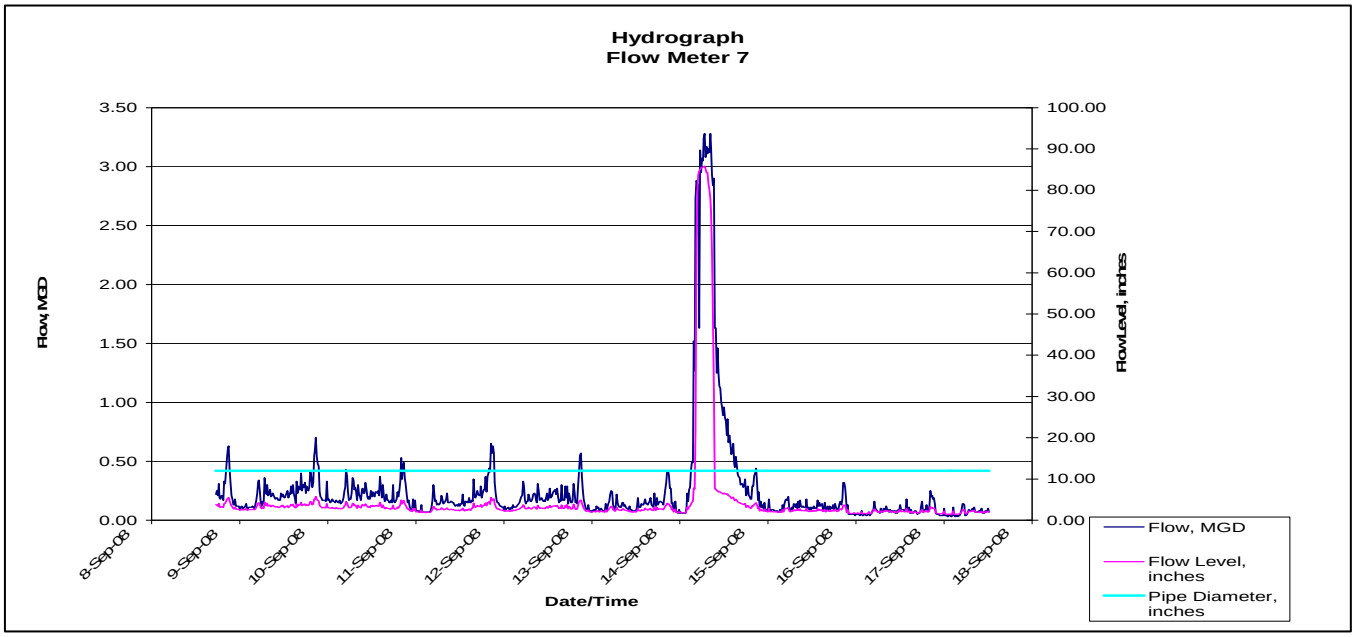


Table 3-7
Meter 7 Statistics

Date	Daily Avg. Flow		Daily Max. Flow		Daily Min. Flow	
	MGD	CFS	MGD	CFS	MGD	CFS
9/9/2008	0.2324	0.3596	0.7000	1.0831	0.0900	0.1393
9/10/2008	0.2201	0.3406	0.5300	0.8201	0.0900	0.1393
9/11/2008	0.1866	0.2887	0.6500	1.0058	0.0700	0.1083
9/12/2008	0.1886	0.2919	0.5700	0.8820	0.0800	0.1238
9/13/2008	0.1394	0.2157	0.4200	0.6499	0.0600	0.0928
9/15/2008	0.1182	0.1828	0.3200	0.4951	0.0400	0.0619
9/16/2008	0.0827	0.1280	0.2500	0.3868	0.0400	0.0619
9/17/2008	0.0682	0.1055	0.1400	0.2166	0.0300	0.0464

Summary

Flow meter data indicates a well exhibited dry weather diurnal curve with a significant shape peak during the wet weather event indicating inflow. Following the wet weather event the dry weather diurnal curve was less pronounced with lower peak flows which may indicate a meter inaccuracy.

Flow Meter 8

Figure 3-8
Meter 8 Hydrograph

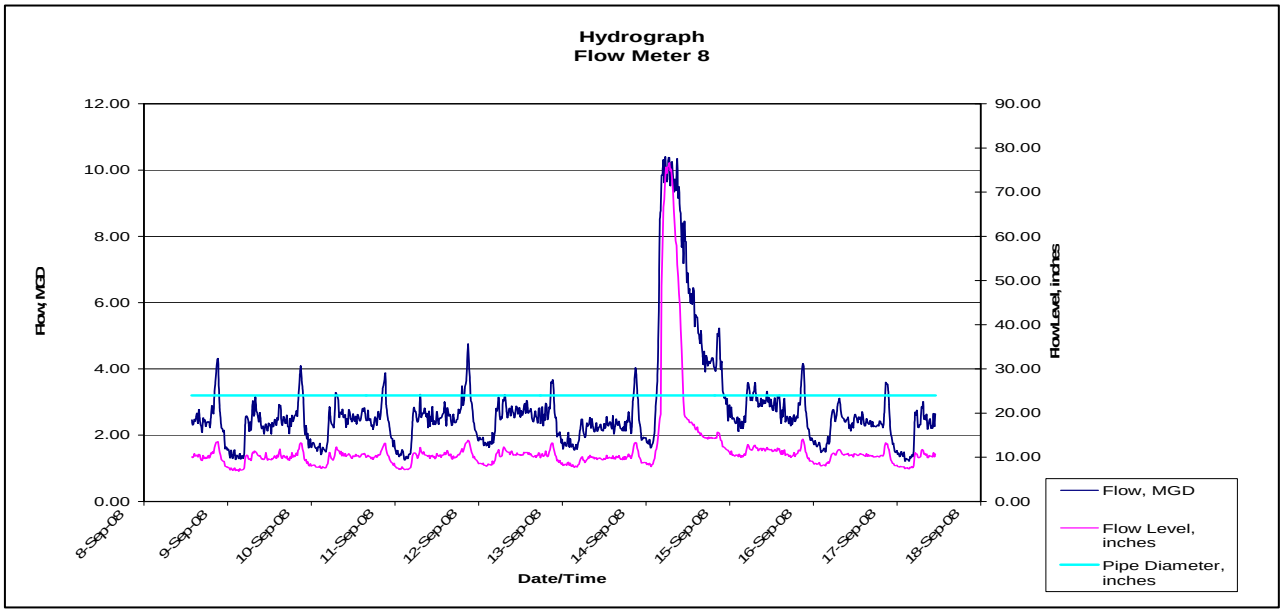


Table 3-8
Meter 8 Statistics

Date	Daily Avg. Flow		Daily Max. Flow		Daily Min. Flow	
	MGD	CFS	MGD	CFS	MGD	CFS
9/9/2008	2.2663	3.5067	4.0900	6.3286	1.2700	1.9651
9/10/2008	2.3816	3.6851	3.8600	5.9727	1.4200	2.1972
9/11/2008	2.4375	3.7716	4.7500	7.3498	1.2500	1.9342
9/12/2008	2.5181	3.8964	3.6700	5.6787	1.6300	2.5222
9/13/2008	2.2296	3.4499	4.0300	6.2358	1.5500	2.3984
9/15/2008	2.7613	4.2726	4.1600	6.4369	1.8400	2.8471
9/16/2008	2.2996	3.5582	3.5900	5.5549	1.4800	2.2901
9/17/2008	1.9860	3.0730	3.0000	4.6420	1.2200	1.8878

Summary

Flow meter data indicates a well exhibited dry weather diurnal curve with a significant shape peak during the wet weather event indicating inflow. The dry weather diurnal curve before and after the wet weather event seem to be consistent indicating good meter performance.

Section 4
BCT III Sewer Evaluation

4.1 Project Background

Trainee Barracks Complex III (BCT III), which includes a BCT with five barracks and a future dining facility, is connecting into an existing main collection system. A study conducted by HNTB in 2005 presented that the existing system is currently at or near capacity and would not be able to handle any additional flow. These results were to be confirmed during this study by updating the 2005 model result flows with the observed flow data.

4.2 Sewer Evaluation

The initial evaluation of the main sewer collection system included an attempt to reconcile the flow monitoring data with the "Height Fraction" and "Max Q Fraction" calculations from the previous study model outputs. As verification, the 90% capacity of an individual pipe segment was calculated using diameter, length, and invert elevation information from the provided GIS files. The previous study model maximum flows ("Max Flows") were then used to calculate a flow depth. The "Height Fraction" and the "Max Q Fraction" calculated did not correlate to the previous study calculations. Instead, the calculations performed as part of this study indicate the existing system to have adequate capacity when compared to the model flows, in contrast to the previous study results.

Because of this discrepancy, the previous study model results table was not updated to reflect the flow monitoring data obtained as part of this study. Instead, the existing system was analyzed from structure number 5-469 to structure number 2-325 using the flow monitoring data.

The following information was obtained for each structure and pipe segment using the provided GIS files: Rim Elevation, Upstream Invert Elevation, Downstream Invert Elevation, Pipe Material, Diameter, and Length. For those locations where no invert elevation data was available, a slope of 1.5% was assumed and the respective invert calculated. A Manning's "n" coefficient of 0.010 was used for poly-vinyl chloride pipe (PVC), and a Manning's "n" coefficient of 0.015 was used for reinforced concrete pipe (RCP). The 90% flow capacity of each pipe segment was calculated using Manning's equation.

Hydraulic grade line (HGL) elevations were calculated for three existing system scenarios:

- Scenario 1: 8 P.M. Peak Diurnal
- Scenario 2: 8 P.M. Peak Diurnal and New Facilities
- Scenario 3: September 14, 2008 Observed Storm Event

For each defined scenario, the flow observed at each respective flow monitoring location was input in Table 4-1 at the appropriate locations. The most downstream flow meter, Flow Meter 8, was installed on the main trunk line providing a cumulative flow comparison point for the system. Table 4-1 summarizes the flow and HGL elevation information for each scenario. Inadequate capacity for a pipe segment is defined as when the metered flow (Q_m) divided by the 90% flow capacity (Q) is greater than or equal to one (1).

The flow input for Scenario 1 indicates adequate existing system capacity during dry weather conditions for the entire evaluation length. Using these flows, a HGL elevation was calculated at each structure location.

For Scenario 2, the Scenario 1 flows were used with 1.50 cfs added to the existing system at 5-469 to represent the impact of the new facilities construction. Using these flows, a HGL elevation was calculated at each structure location. The data indicates adequate system capacity during dry weather conditions for the entire evaluation length.

One wet weather event occurred during flow monitoring on September 14, 2008. The peak flows for the event were recorded by the flow monitors in place for this study. No rain gauge data or additional observed wet weather events were available for detailed flow analysis. Using the peak flows observed at each meter location during this event, a HGL elevation was calculated at each structure location for Scenario 3. The flow and HGL elevation comparisons do indicate portions of the system with inadequate capacity. These line segments have been highlighted in Table 4-1.

Surcharge observed at Flow Meter 7 could be a result of the inadequate capacity immediately downstream of the meter location. Using the Flow Meter 8 location to compare the observed cumulative flow to the calculated flow from upstream meter locations, it appears that approximately 1.5 cfs is being detained at some point upstream. This could be a result of a blockage in the system, which would be revealed by completing additional flow monitoring and I/I investigations.

Table 4-1
Sewer Evaluation

												Scenario 1: 8 P.M. Peak Diurnal - Metered			Scenario 2: 8 P.M. Peak Diurnal - Metered + New Facilities**			Scenario 3: Flow Monitoring - September 14, 2008 Storm		
Flow Meter	Upstream Structure Number	Downstream Structure Number	Upstream Structure Rim Elevation	Upstream Invert Elevation	Downstream Invert Elevation	Height of Upstream Structure (ft)	Pipe Material	Diameter (inches)	Length (ft)	Slope (ft/ft)	90% Flow Capacity "Q" (cfs)	Upstream Structure HGL Elevation	Flow "Q_m" (cfs)	Q_m/Q	Upstream Structure HGL Elevation	Flow "Q_m" (cfs)	Q_m/Q	Upstream Structure HGL Elevation	Flow "Q_m" (cfs)	Q_m/Q
4, 5	*5-469	5-468	1074.02	1064.35	1062.33	9.67	PVC	18	109.21	0.018	16.71	1064.88	3.44	0.21	1064.99	4.94	0.30	1065.34	10.91	0.65
	5-468	5-467	1070.43	1062.33	1060.46	8.10	PVC	18	124.51	0.015	15.06	1062.89	3.44	0.23	1063.00	4.94	0.33	1063.38	10.91	0.72
	5-467	5-466A	1066.87	1060.46	1057.48	6.41	PVC	18	108.95	0.027	20.32	1060.95	3.54	0.17	1061.04	5.04	0.25	1061.33	10.91	0.54
	5-466A	5-466	1065.25	1057.48	1054.15	7.77	PVC	18	209.90	0.016	15.48	1058.04	3.54	0.23	1058.15	5.04	0.33	1058.52	10.91	0.70
	5-466	5-284	1061.36	1054.15	1053.01	7.21	RCP	18	80.99	0.014	9.72	1054.85	3.54	0.36	1055.00	5.04	0.52	1055.58	10.91	1.12
	5-284	5-283	1063.10	1053.01	1051.76	10.09	RCP	21	57.97	0.022	18.14	1053.62	3.64	0.20	1053.74	5.14	0.28	1054.10	10.91	0.60
	5-283	5-282	1060.93	1051.76	1050.12	9.17	RCP	21	120.13	0.014	14.44	1052.45	3.64	0.25	1052.57	5.14	0.36	1053.03	10.91	0.76
	5-282	5-281	1059.54	1050.12	1048.57	9.42	RCP	21	98.08	0.016	15.53	1050.79	3.74	0.24	1050.91	5.24	0.34	1051.33	10.91	0.70
	5-281	5-144	1058.01	1048.57	1046.44	9.44	RCP	21	100.76	0.021	17.96	1049.19	3.74	0.21	1049.31	5.24	0.29	1049.67	10.91	0.61
6	*5-144	5-143	1055.12	1046.44	1043.60	8.68	RCP	21	107.33	0.026	20.10	1047.04	3.80	0.19	1047.15	5.30	0.26	1047.56	12.54	0.62
	5-143	5-133	1050.90	1043.60	1042.11	7.30	RCP	21	117.77	0.013	13.90	1044.32	3.80	0.27	1044.44	5.30	0.38	1045.05	12.54	0.90
	5-133	5-132	1049.46	1042.11	1039.56	7.35	RCP	21	129.43	0.020	17.34	1042.76	3.90	0.22	1042.87	5.40	0.31	1043.34	12.54	0.72
	5-132	5-129A	1047.55	1039.56	1037.48	7.99	RCP	21	108.80	0.019	17.08	1040.21	3.90	0.23	1040.33	5.40	0.32	1040.80	12.54	0.73
	5-129A	5-129	1046.42	1037.48	1035.34	8.94	RCP	21	102.73	0.021	17.83	1038.12	3.90	0.22	1038.23	5.40	0.30	1038.69	12.54	0.70
	5-129	5-71	1043.99	1035.34	1034.40	8.65	RCP	21	49.87	0.019	16.96	1036.00	3.90	0.23	1036.11	5.40	0.32	1036.59	12.54	0.74
	5-71	5-68	1043.91	1034.40	1032.38	9.51	RCP	21	85.01	0.024	19.05	1035.02	3.90	0.20	1035.13	5.40	0.28	1035.56	12.54	0.66
	5-68	5-67	1042.36	1032.38	1030.27	9.98	RCP	21	87.60	0.024	19.18	1033.00	3.90	0.20	1033.11	5.40	0.28	1033.53	12.54	0.65
	5-67	5-65	1039.14	1030.27	1027.80	8.87	RCP	21	81.12	0.030	21.56	1030.85	3.90	0.18	1030.96	5.40	0.25	1031.34	12.54	0.58
7	*5-65	5-64	1037.71	1027.80	1024.62	9.91	RCP	21	90.62	0.035	23.15	1028.41	4.54	0.20	1028.50	6.04	0.26	1029.07	17.62	0.76
	5-64	2-199	1032.56	1024.62	1022.72	7.94	RCP	21	92.44	0.021	17.71	1025.31	4.54	0.26	1025.42	6.04	0.34	1026.20	17.62	0.99
	2-199	2-198	1031.44	1022.72	1021.74	8.72	RCP	21	78.94	0.012	13.77	1023.50	4.54	0.33	1023.62	6.04	0.44	1024.38	17.62	1.28
	2-198	2-197	1030.61	1021.74	1019.00	8.87	RCP	21	155.29	0.018	16.41	1022.46	4.54	0.28	1022.57	6.04	0.37	1023.40	17.62	1.07
	2-197	2-188	1024.94	1019.00	1012.77	5.94	RCP	21	161.89	0.038	24.24	1019.59	4.54	0.19	1019.68	6.04	0.25	1020.23	17.62	0.73
	2-188	2-178	1021.37	1012.77	1009.87	8.60	RCP	21	121.62	0.024	19.08	1013.44	4.64	0.24	1013.54	6.14	0.32	1014.25	17.62	0.92
	2-178	2-177	1017.78	1009.87	1005.94	7.91	RCP	21	122.80	0.032	22.10	1010.50	4.74	0.21	1010.60	6.24	0.28	1011.19	17.62	0.80
	2-177	2-176	1012.30	1005.94	1002.98	6.36	RCP	21	125.80	0.024	18.95	1006.62	4.74	0.25	1006.72	6.24	0.33	1007.43	17.62	0.93
	2-176	2-175	1011.28	1002.98	999.72	8.30	RCP	21	109.32	0.030	21.34	1003.63	4.84	0.23	1003.72	6.34	0.30	1004.33	17.62	0.83
	2-175	2-173A	1009.96	999.72	997.40	10.24	RCP	21	5.67	0.409	78.99	1000.04	4.94	0.06	1000.10	6.44	0.08	1000.37	17.62	0.22
	2-173A	2-173	1009.00	997.40	995.53	11.60	RCP	21	124.92	0.015	15.13	998.18	4.94	0.33	998.29	6.44	0.43	999.07	17.62	1.16
	2-173	2-312	1005.53	995.53	991.60	10.00	RCP	21	119.28	0.033	22.43	996.17	4.94	0.22	996.26	6.44	0.29	996.83	17.62	0.79
	2-312	2-313	1001.34	991.60	989.29	9.74	RCP	21	68.88	0.034	22.63	992.24	4.94	0.22	992.33	6.44	0.28	992.89	17.62	0.78
	2-313	2-314	999.04	989.29	987.85	9.75	RCP	21	49.28	0.029	21.12	989.95	4.94	0.23	990.04	6.44	0.30	990.65	17.62	0.83
	2-314	2-315	997.45	987.85	984.69	9.60	RCP	21	85.14	0.037	23.80	988.47	4.94	0.21	988.56	6.44	0.27	989.10	17.62	0.74
	2-315	2-316	993.05	984.69	983.88	8.36	RCP	21	40.60	0.020	17.45	985.42	4.94	0.28	985.52	6.44	0.37	986.35	17.62	1.01
	2-316	2-317	993.13	983.88	981.58	9.25	RCP	21	88.11	0.026	19.96	984.56	4.94	0.25	984.65	6.44	0.32	985.30	17.62	0.88
	2-317	2-318	987.21	981.58	980.55	5.63	RCP	21	36.25	0.028	20.83	982.25	4.94	0.24	982.34	6.44	0.31	982.95	17.62	0.85
	2-318	2-319	987.37	980.55	979.20	6.82	RCP	21	52.43	0.026	19.83	981.23	4.94	0.25	981.33	6.44	0.32	981.98	17.62	0.89
	2-319	2-320	987.33	979.20	977.87	8.13	RCP	21	35.90	0.037	23.78	979.82	4.94	0.21	979.91	6.44	0.27	980.45	17.62	0.74
	2-320	2-321	985.22	977.87	975.45	7.35	RCP	21	65.71	0.037	23.71	978.49	4.94	0.21	978.58	6.44	0.27	979.12	17.62	0.74
	2-321	2-322	983.19	975.45	968.51	7.74	RCP	21	85.26	0.081	35.25	975.97	4.94	0.14	976.04	6.44	0.18	976.42	17.62	0.50
8	*2-322	2-325	977.46	968.32	958.30	9.14	RCP	24	150.42	0.067	45.53	968.83	4.94	0.11	968.93	6.44	0.14	969.29	17.62	0.39

* Flow meter location directly upstream

** New facility flow estimate of 1.5 cfs added to system at structure 5-469.

*** For capacity calculations: Manning's "n" = 0.010 for PVC; Manning's "n" = 0.015 for RCP

Inadequate Capacity

Section 5
Conclusion and Recommendations

5.1 Conclusion

The flow monitoring results and sewer evaluation suggest that the existing sewer system has sufficient capacity during dry weather conditions to handle the additional flow from the new BCT and dining facilities. During dry weather flows, the flow metering data indicated that the main interceptor sewers were flowing approximately half full, leaving sufficient depth to accommodate flows from the new facilities.

However, the wet weather flow that was recorded in response to the September 14, 2008 rain event suggests significant inflow sources in several areas. Table 5-1 shows the instantaneous peak flows recorded by the flow meters during this storm event. These peak wet weather flows were compared to the average dry weather flows, and the resulting peak wet to average dry ratios were ranked from highest to lowest. Flow Meter Nos. 6 and 7 had the two highest ratios of 28.4 and 19.0, respectively. These ratios were significantly greater than for the remaining areas, and they suggest an excess of inflow is entering the system. Because the sewer system must be sized to handle the peak wet weather flows without allowing sanitary sewer overflows (SSOs), this inflow is taking capacity within the system that could be used to accommodate new facilities.

Table 5-1
Peak Wet Weather Metered Flow

	Flow Meter 1	Flow Meter 2	Flow Meter 3	Flow Meter 4	Flow Meter 5	Flow Meter 6	Flow Meter 7	Flow Meter 8
Instantaneous Peak Wet Weather Flow (cfs)	0.45	3.19	3.28	7.07	3.84	1.64	5.08	16.09
Average Dry Weather Flow (cfs)	0.13	0.54	0.39	0.85	0.93	0.06	0.26	3.69
Peak Wet/Average Dry Ratio	2.2	3.8	5.4	8.8	4.1	28.4	19.0	4.4
Ranking	8	7	4	3	6	1	2	5

5.2 Recommendations

It is recommended that further investigation be conducted within the areas tributary to Flow Meter Nos. 6 and 7 to identify inflow sources for removal. Because of time and budget constraints, the following phased approach is recommended:

1. **Conduct further flow monitoring of the areas tributary to Flow Meter Nos. 6 and 7.** The brief flow monitoring period coincided with one significant storm event. While the flow data response following this storm event is informative, the standard practice is to gather and evaluate data responses from multiple storm events. This flow monitoring data, in conjunction with rain gauge data, is used to characterize and quantify the sewer system storm response. We recommend that additional flow monitoring and concurrent rain gauge monitoring be conducted of sufficient length to capture system responses to at least three additional rain events.

2. **Conduct smoke testing of the sewers tributary to Flow Meter Nos. 6 and 7.** Smoke testing consists of blowing a non-toxic, non-staining smoke into the sewer lines and documenting locations where smoke appeared. Smoke testing can be an effective and economic method of locating major sources of inflow such as storm drainage connections, curb inlets, and area drains. Smoke testing can also aid in locating infiltration sources and structural defects such as collapsed, broken or cracked pipe, and offset, separated or deteriorated pipe joints.

3. **If necessary, conduct manhole inspections and/or dyed water testing to pinpoint and confirm inflow/infiltration sources identified during smoke testing.** During manhole inspections, field crews identify cracks, missing mortar and gaskets, and other inflow/infiltration sources. Dyed water testing can be used to confirm that select inflow sources, such as curb inlets, are contributing to the sewer flow.

4. **Prioritize sources for rehabilitation to remove wet weather flow from the system.** Estimate the quantity of inflow that is entering the system from each identified defect and estimate a cost to eliminate the source. These sources should be prioritized based on the ratio of cost to eliminate versus quantity of flow removed.

5. **Confirm interceptor capacity for select sections.** The interceptor sewer capacity evaluation indicated that several sections of the interceptor did not have sufficient capacity to convey the flows that were recorded following the September 14, 2008 storm event (see Table 4-1). It is recommended that an inventory of the existing system be conducted to evaluate and confirm the interceptor capacity for these select pipe sections. A survey of the pipe invert elevations, pipe diameters and manhole rim elevations for these pipe sections will provide the data to complete this capacity confirmation.

Appendix A

Flow Monitoring Field Notes and Data

FLOW MONITORING DATA

Project # 08-070

Flow Monitoring
Meter 1
Manhole 3868

Fort Leonard Wood, MO

08-Sep-08 to 17-Sep-08

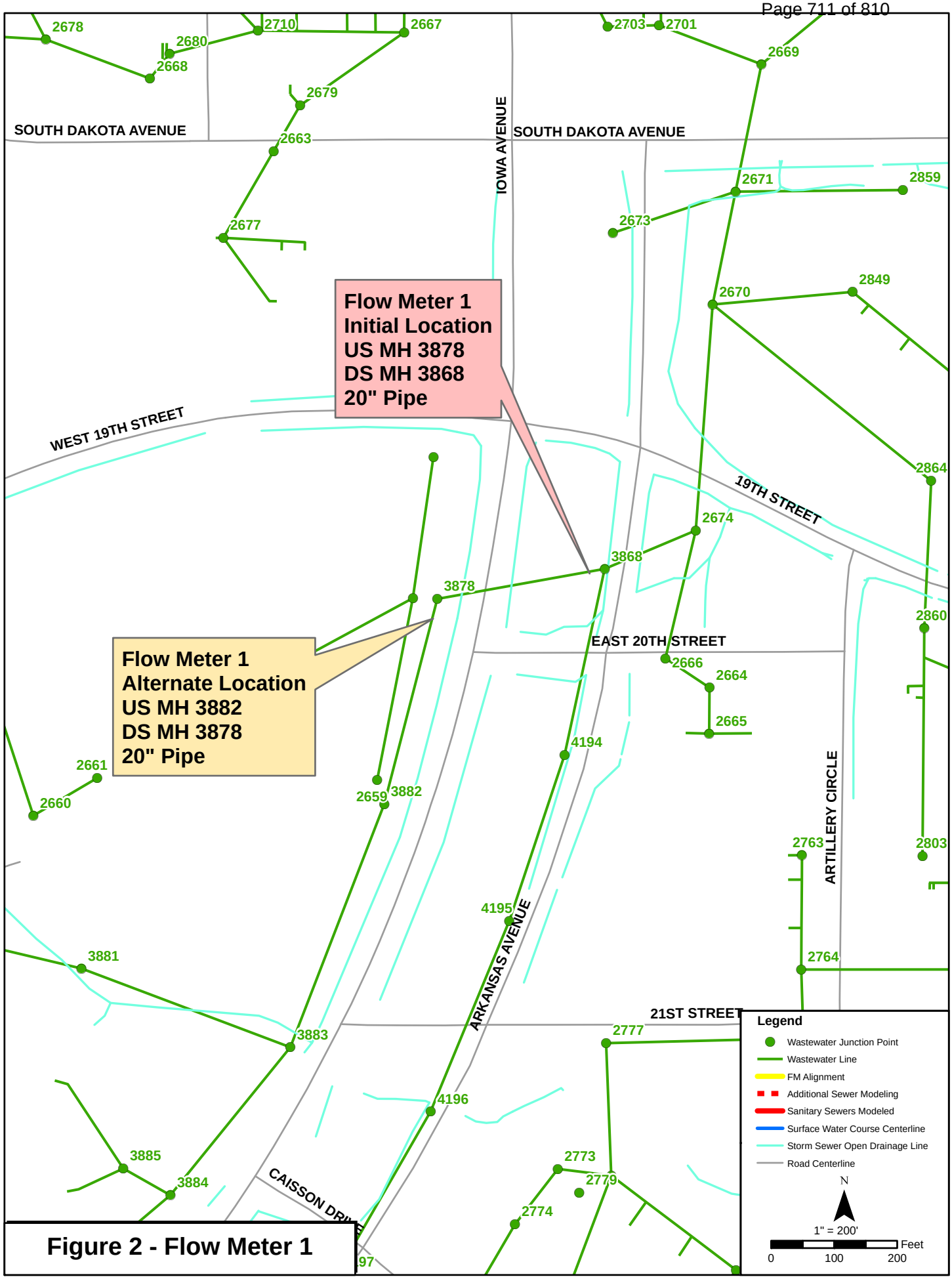


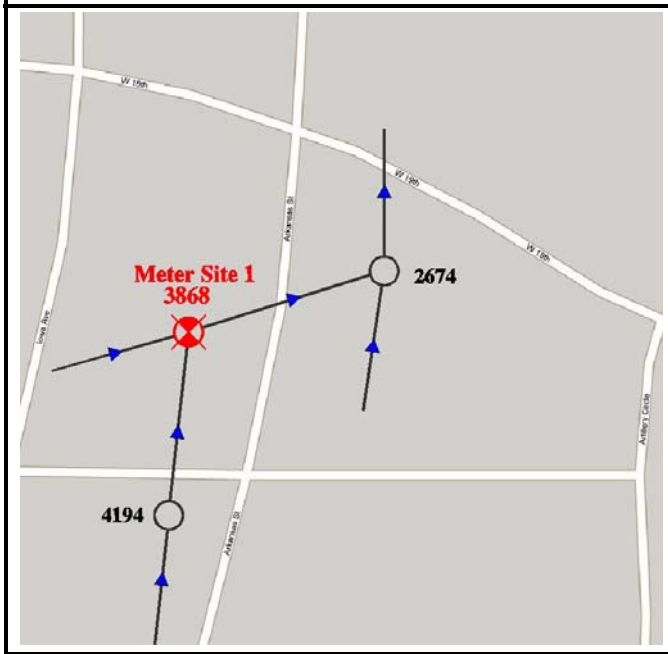
Figure 2 - Flow Meter 1

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
3868	Circular	PVC	18

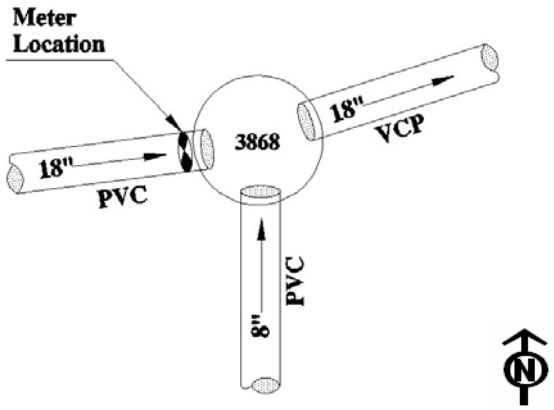
Site ID:	Address:	Meter #:	Site Quality:	Basin:
01	East 20th St. & Arkansas Ave	0408	Good	NA

Location Map



Photos:
M1_3868_A.JPG, M1_3868_T.JPG, M1_3868_I.JPG, M1_3868_P.JPG, M1_3868_L_09-09-08.JPG, M1_3868_L_09-12-08.JPG, M1_3868_L_09-17-08.JPG,

Planar Description



Describe MH Location
(Roadway, Easement, Field, Sidewalk)

Approximately 20' West of Arkansas Ave. – Between 19th Street and East 20th Street.

Site Hazards

Heavy Traffic? No
H_2S? Yes
LEL OK? No
Describe potential hazards:
Standard CSE Hazards
Used Blower
Must Call Fire Department at 573-596-0883 with Street Intersection and Manhole Number

Measurements

Manhole Depth (ft): 9.47
Measured Depth (in): 4.00
Manhole Dia. (in): 60.00
Velocity (fps): 2.00
Comments:

Site Conditions

Surcharge Evidence? Yes
Depth of Surcharge (ft): 9.47
Depth of Debris (in): 0.00
Comments:

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
3868	Circular	PVC	18

Site ID:	Address:	Meter #:	Site Quality:	Basin:
01	East 20th St. & Arkansas Ave	0408	Good	NA

Area Photo

Topside Photo

Install

Probe

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
3868	Circular	PVC	18

Site ID:	Address:	Meter #:	Site Quality:	Basin:
01	East 20th St. & Arkansas Ave	0408	Good	NA

Flow Depth 09/09/08

Flow Depth 09/12/08

Flow Depth 09/17/08

Flow Depth

FLOW METER INTERROGATION

Fort Leonard Wood

Project No. 08-070 Project Location Ft. Leonard Wood, Mo

Study Name _____ Site Description Arkansas Ave. & E. 20th St.

Serial No. 0408 Site ID 01

Physical Data: Pipe Size 18 Pipe Material PVC Manhole Depth (ft) 9.47

Manhole Diameter 60" Flow Characteristic (G) F P Depth of Debris Ø

Evidence of Surcharge (Y) N Depth of Surcharge (ft) 9.47 Step Condition G F P (None)

Comments: _____

Meter Setup: Install Crew DH, JS, _____ Install Date 09/08/08 Install Time 09 : 01

Depth Offset Ø Velocity Default/Site Coefficient _____ Cycle Time 15 min

New Battery Y (N) Voltage 10.8 Pipe Diameter 18" Pipe Shape: (Cir.) Rect. — x — in.

Site Interrogations:

Date	Time	Before Cleaning		After Cleaning		Measured Depth (in)	Measured Velocity (fps)	Depth of Debris (in)	Battery Voltage
		Metered Depth (in)	Metered Velocity (fps)	Metered Depth (in)	Metered Velocity (fps)				
09-08	09:42	2.34	1.06	—	—	2.25	1.03	Ø	10.9
Comments: Installed Meter									
09-09	10:20	1.90	0.74	—	—	1.68	0.77	Ø	10.3
Comments: V.S. = 92% / MG = 0.08 / Pic of flow 2-072 mi_3868_L_09-09-08									
9-12	11:30	1.95	1.21	1.98	1.13	1.8"	1.12	Ø	10.5
Comments: V.S = 83% MG = 0.35 Pic of flow = M = 01									
09-17	14:31	2.19	1.04	—	—	1.32	1.06	Ø	10.5
Comments: V.S. = 69% / MG = 0.8 / Pic of flow 0-003 Pulled Meter mi_3868_L_09-12-08 mi_3868_L_0917-08									
Comments:									
Comments:									

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/08/08 Time: 09 :49 Project No.: 08-070 Unit Serial # 0408

Line Segment US ( ) 3878 Line Segment DS ( ) 2674

Site No. 01 Crew: DH, JS

Site Location: Arkansas Ave. + E. 20th St.

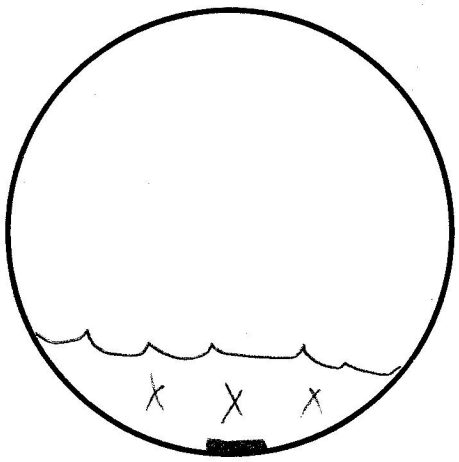
Inside Diameter	18 in.	Maximum Velocity	1.06 fps
Ruler Level	2.25 in.	Sensed Velocity	1.06 fps
Sensed Level	2.34 in.	*Check Sensed Velocity	1.03 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
0.99	1.06	1.03

1.16 - 1.04 - 1.03 · 1.02

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/09/08 Time: 10 :22 Project No.: 08-070 Unit Serial # 0408

Line Segment US ( ) 3878 Line Segment DS ( ) 2674

Site No. 01 Crew: DH, JS

Site Location: Arkansas Ave. + E. 20th St.

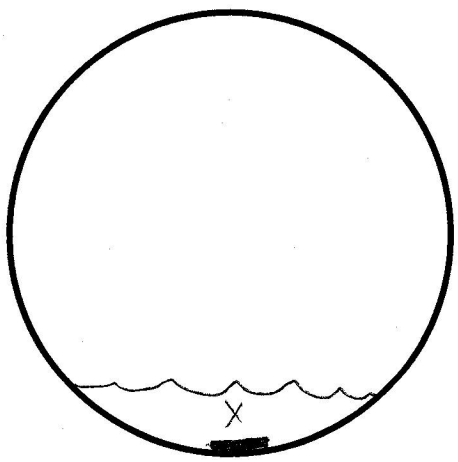
Inside Diameter	18 in.	Maximum Velocity	0.77 fps
Ruler Level	1.68 in.	Sensed Velocity	0.74 fps
Sensed Level	1.90 in.	*Check Sensed Velocity	0.77 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
	0.77	

0.72 - 0.79

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 9/12/08 Time: 11:45 Project No.: 08-070 Unit Serial # 0408

Line Segment US ( ) 3878 Line Segment DS ( ) 2674

Site No. 01 Crew: JS, RW

Site Location: Arkansas + E 20th St

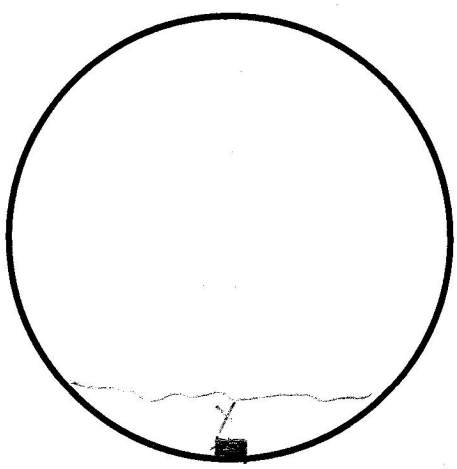
Inside Diameter	18 in.	Maximum Velocity	1.12 fps
Ruler Level	1.8 in.	Sensed Velocity	1.13 fps
Sensed Level	1.95 in.	*Check Sensed Velocity	1.12 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
	1.12	

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/17/08 Time: 14:36 Project No.: 08-070 Unit Serial # 0408

Line Segment US ( ) 3878 Line Segment DS ( ) 2674

Site No. 01 Crew: DH, JS

Site Location: Arkansas & E. 20th St.

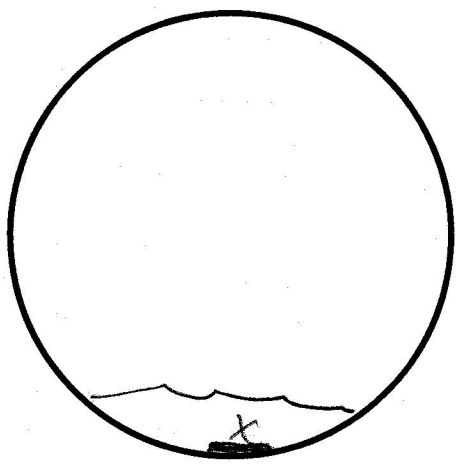
Inside Diameter	18 in.	Maximum Velocity	1.06 fps
Ruler Level	1.32 in.	Sensed Velocity	1.04 fps
Sensed Level	2.19 in.	*Check Sensed Velocity	1.06 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
	1.06	

1.05 - 1.04

CONFINED SPACE ENTRY PERMIT

COMPANY/LOCATION: Trekk/Field Ft Leon. Wd DEPARTMENT: Field DATE: 9/8/08

CONFINED SPACE TO BE ENTERED: MH 3868 PERMIT EXPIRATION DATE/TIME: 9/8/08 12:00pm

DESCRIPTION OF WORK TO BE PERFORMED: Install Meter

NATURE OF HAZARDS IN CONFINED SPACE: (check)

- ✓ Oxygen deficiency (Less than 19.5% at sea level)
- ✓ Flammable gases or vapors (greater than 10% of the lower flammable limit, or greater than 23.5% oxygen at sea level)
- ✓ Toxic gases or vapors (greater than the permissable exposure limit)
- ___ Mechanical hazards
- ___ Electrical shock
- ___ Materials harmful to the skin
- ✓ Engulfment
- ___ Configuration hazard
- ___ Other ___

EQUIPMENT REQUIRED FOR ENTRY AND WORK: (check)

- ___ Respirator
- ✓ Lifeline and safety harness
- ___ Protective clothing
- ___ Hearing protection
- ___ Lighting (Explosive Proof)
- ___ Fire Extinguishers
- ✓ Emergency Escape Retrieval Equipment
- ___ Resuscitators — Inhalator
- ___ Other ___

Electrical equipment/tools:

- ___ Low voltage
- ___ Ground-fault current interrupters
- ___ Approved for hazardous locations

Respiratory protection (specify) ___

Communication aid (specify) cell

Rescue equipment (specify) tripod w/winch

PREPARATION: (check)

- ___ Notify affected departments of service interruption
- ___ Isolate - blanked or double valve, with lock and tag.
- ___ Zero energy state (Lock Out all energy sources)
- ___ Cleaned, drained, washed and purged
- ✓ Ventilation to provide fresh air
- ✓ Emergency response team available
- ✓ Employees informed of specific confined space hazards
- ✓ Secure area (post, sign and flag)
- ✓ Procedures reviewed with each employee.
- ✓ Atmospheric test in compliance.
- ___ Attach hot work permit
- ___ Other ___

AUTHORIZED ENTRANTS:

Jeff Stacy

AUTHORIZED ATTENDANTS:

Dave Hamberlin

STAND BY SAFETY PERSONNEL:

TEST	Allowable Limits	Check (✓) if Required	In Result AM/PM	Out Result AM/PM	Result AM/PM	Result AM/PM	Result AM/PM	Result AM/PM
Time		✓	9:00 AM	10:00 AM	:	:	:	:
Oxygen-min.	19.5%	✓	20.8	20.3				
Oxygen-max.	23.5%	✓	20.8	20.8				
Flammability	10% LEL / LFL	✓	1	1				
H_2S	10 ppm	✓	0	14				
Toxic (specify)								
Cl_2	.5 ppm							
CO	35 ppm	✓	0	9				
SO_2	2 ppm							
Heat	°F/°C							
Other								
Other								

Name of employee conducting atmospheric monitoring: Jeff Stacy Instrument(s) used: MSA Solaris

Statement of acceptable entry conditions Good

AUTHORIZATION:

I certify that all required precautions have been taken and necessary equipment is provided for safe entry and work in this confined space

Time: 9:00 Date: 9/8/08

Name (Print) Jeff Stacy

Signature Jeff Stacy

TREKK DESIGN GROUP, LLC

Tabular Data Output

Site ID Fort Leonard Wood, MO - Meter 1

Start Date 9/8/2008
End Date 9/17/2008

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
0:00	0.00	0.03	0.05	0.03	0.09	0.06	0.04	0.05	0.05	0.02
0:15	0.00	0.04	0.04	0.06	0.07	0.05	0.07	0.04	0.04	0.05
0:30	0.00	0.03	0.04	0.03	0.04	0.11	0.05	0.04	0.02	0.04
0:45	0.00	0.05	0.05	0.05	0.05	0.15	0.07	0.06	0.05	0.06
1:00	0.00	0.03	0.04	0.03	0.05	0.08	0.05	0.05	0.04	0.04
1:15	0.00	0.04	0.04	0.03	0.05	0.08	0.10	0.04	0.04	0.04
1:30	0.00	0.05	0.04	0.03	0.05	0.05	0.06	0.05	0.04	0.04
1:45	0.00	0.03	0.03	0.04	0.05	0.04	0.08	0.04	0.02	0.04
2:00	0.00	0.03	0.04	0.03	0.05	0.05	0.08	0.05	0.04	0.05
2:15	0.00	0.03	0.04	0.03	0.04	0.06	0.06	0.04	0.03	0.03
2:30	0.00	0.02	0.04	0.02	0.04	0.04	0.06	0.04	0.02	0.03
2:45	0.00	0.04	0.04	0.03	0.05	0.03	0.20	0.05	0.04	0.04
3:00	0.00	0.03	0.05	0.06	0.05	0.06	0.06	0.05	0.04	0.04
3:15	0.00	0.02	0.03	0.06	0.05	0.04	0.06	0.05	0.03	0.03
3:30	0.00	0.03	0.03	0.03	0.03	0.02	0.04	0.05	0.03	0.03
3:45	0.00	0.04	0.04	0.04	0.06	0.04	0.04	0.04	0.04	0.05
4:00	0.00	0.03	0.04	0.05	0.07	0.06	0.04	0.06	0.04	0.04
4:15	0.00	0.04	0.04	0.03	0.06	0.08	0.04	0.08	0.05	0.05
4:30	0.00	0.05	0.04	0.04	0.07	0.07	0.03	0.09	0.08	0.12
4:45	0.00	0.20	0.16	0.14	0.20	0.18	0.03	0.23	0.23	0.28
5:00	0.00	0.14	0.14	0.14	0.14	0.17	0.02	0.15	0.10	0.13
5:15	0.00	0.04	0.05	0.05	0.09	0.04	0.04	0.06	0.04	0.05
5:30	0.00	0.04	0.04	0.04	0.06	0.03	0.03	0.07	0.02	-0.06
5:45	0.00	0.05	0.05	0.03	0.04	0.09	0.11	0.12	0.03	0.02
6:00	0.00	0.05	0.05	0.07	0.06	0.07	0.15	0.10	0.05	0.02
6:15	0.00	0.17	0.06	0.09	0.06	0.10	0.11	0.18	0.10	0.11
6:30	0.00	0.22	0.13	0.17	0.10	0.11	0.15	0.10	0.16	0.16
6:45	0.00	0.10	0.10	0.13	0.14	0.10	0.26	0.09	0.12	0.06
7:00	0.00	0.09	0.08	0.10	0.08	0.08	0.14	0.10	0.06	0.06
7:15	0.00	0.13	0.09	0.34	0.17	0.13	0.19	0.11	0.08	0.07
7:30	0.00	0.12	0.10	0.12	0.08	0.09	0.13	0.14	0.07	0.05
7:45	0.00	0.11	0.10	0.13	0.09	0.07	0.13	0.16	0.10	0.05
8:00	0.00	0.12	0.08	0.19	0.12	0.10	0.16	0.12	0.12	0.05
8:15	0.00	0.10	0.07	0.11	0.14	0.18	0.22	0.11	0.21	0.06
8:30	0.00	0.06	0.07	0.11	0.12	0.10	0.18	0.13	0.08	0.11
8:45	0.00	0.07	0.11	0.07	0.08	0.07	0.24	0.09	0.09	0.07
9:00	0.00	0.05	0.06	0.06	0.07	0.07	0.18	0.08	0.09	0.06
9:15	0.00	0.09	0.05	0.05	0.08	0.06	0.17	0.10	0.06	0.04
9:30	0.00	0.07	0.07	0.08	0.05	0.22	0.18	0.10	0.09	0.03
9:45	0.05	0.08	0.09	0.10	0.07	0.06	0.16	0.10	0.05	0.07
10:00	0.08	0.05	0.09	0.07	0.08	0.06	0.16	0.11	0.07	0.06
10:15	0.09	0.06	0.08	0.08	0.08	0.08	0.13	0.09	0.08	0.09
10:30	0.16	0.05	0.11	0.08	0.07	0.07	0.19	0.09	0.05	0.06
10:45	0.09	0.08	0.10	0.05	0.05	0.04	0.13	0.05	0.05	0.06
11:00	0.08	0.07	0.08	0.08	0.07	0.04	0.10	0.08	0.05	0.06
11:15	0.05	0.04	0.07	0.07	0.12	0.04	0.14	0.08	0.06	0.05
11:30	0.09	0.05	0.06	0.08	0.07	0.04	0.13	0.04	0.12	0.05
11:45	0.07	0.09	0.08	0.07	0.07	0.06	0.09	0.06	0.05	0.06
12:00	0.09	0.04	0.09	0.08	0.08	0.06	0.12	0.08	0.06	0.04
12:15	0.07	0.06	0.09	0.09	0.08	0.05	0.13	0.08	0.09	0.06
12:30	0.07	0.05	0.09	0.08	0.14	0.05	0.10	0.07	0.08	0.05

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
12:45	0.07	0.08	0.09	0.11	0.10	0.05	0.15	0.07	0.07	0.06
13:00	0.07	0.07	0.06	0.07	0.12	0.10	0.12	0.12	0.07	0.08
13:15	0.08	0.07	0.08	0.06	0.08	0.10	0.17	0.07	0.07	0.08
13:30	0.10	0.07	0.10	0.06	0.08	0.09	0.14	0.07	0.09	0.09
13:45	0.13	0.06	0.09	0.10	0.15	0.07	0.13	0.06	0.08	0.10
14:00	0.10	0.06	0.11	0.13	0.09	0.09	0.12	0.09	0.11	0.11
14:15	0.09	0.07	0.11	0.13	0.08	0.07	0.09	0.07	0.07	0.12
14:30	0.09	0.07	0.10	0.10	0.10	0.11	0.10	0.06	0.09	0.10
14:45	0.09	0.05	0.07	0.11	0.09	0.09	0.11	0.05	0.09	0.00
15:00	0.08	0.04	0.08	0.07	0.11	0.07	0.11	0.10	0.09	0.00
15:15	0.08	0.09	0.09	0.07	0.12	0.06	0.16	0.06	0.08	0.00
15:30	0.08	0.11	0.13	0.06	0.06	0.11	0.12	0.09	0.13	0.00
15:45	0.13	0.11	0.09	0.08	0.08	0.09	0.11	0.10	0.10	0.00
16:00	0.11	0.10	0.07	0.09	0.06	0.12	0.10	0.06	0.15	0.00
16:15	0.07	0.13	0.11	0.11	0.08	0.09	0.13	0.09	0.10	0.00
16:30	0.07	0.06	0.08	0.06	0.10	0.08	0.10	0.06	0.09	0.00
16:45	0.05	0.08	0.07	0.06	0.09	0.06	0.10	0.09	0.08	0.00
17:00	0.04	0.27	0.06	0.14	0.08	0.09	0.10	0.06	0.07	0.00
17:15	0.06	0.09	0.07	0.17	0.08	0.13	0.12	0.06	0.07	0.00
17:30	0.12	0.14	0.11	0.11	0.11	0.10	0.13	0.10	0.07	0.00
17:45	0.07	0.07	0.09	0.10	0.08	0.10	0.19	0.07	0.05	0.00
18:00	0.09	0.09	0.08	0.09	0.10	0.15	0.10	0.12	0.05	0.00
18:15	0.10	0.06	0.13	0.11	0.19	0.10	0.09	0.14	0.09	0.00
18:30	0.10	0.05	0.09	0.11	0.10	0.09	0.17	0.11	0.09	0.00
18:45	0.08	0.09	0.10	0.16	0.08	0.08	0.27	0.10	0.11	0.00
19:00	0.07	0.09	0.08	0.10	0.07	0.10	0.25	0.09	0.14	0.00
19:15	0.10	0.10	0.09	0.10	0.16	0.10	0.22	0.17	0.08	0.00
19:30	0.30	0.11	0.08	0.12	0.15	0.10	0.23	0.14	0.10	0.00
19:45	0.16	0.19	0.16	0.21	0.13	0.24	0.18	0.24	0.21	0.00
20:00	0.22	0.15	0.12	0.28	0.15	0.36	0.25	0.18	0.35	0.00
20:15	0.24	0.19	0.17	0.25	0.24	0.35	0.29	0.28	0.35	0.00
20:30	0.34	0.21	0.32	0.24	0.29	0.32	0.23	0.24	0.34	0.00
20:45	0.21	0.19	0.20	0.13	0.21	0.22	0.25	0.24	0.22	0.00
21:00	0.23	0.16	0.18	0.12	0.19	0.19	0.18	0.21	0.18	0.00
21:15	0.12	0.17	0.11	0.07	0.12	0.13	0.13	0.11	0.11	0.00
21:30	0.09	0.13	0.10	0.06	0.09	0.07	0.07	0.07	0.06	0.00
21:45	0.06	0.06	0.09	0.11	0.07	0.05	0.10	0.05	0.04	0.00
22:00	0.05	0.04	0.07	0.14	0.05	0.04	0.06	0.04	0.05	0.00
22:15	0.06	0.05	-0.05	0.11	0.06	0.02	0.06	0.05	0.06	0.00
22:30	0.05	0.04	0.07	0.09	0.06	0.02	0.04	0.03	0.03	0.00
22:45	0.04	0.04	0.07	0.08	0.05	0.02	0.06	0.03	0.05	0.00
23:00	0.05	0.14	0.04	0.05	0.04	0.04	0.05	0.04	0.04	0.00
23:15	0.03	0.12	0.03	0.06	0.04	0.04	0.04	0.03	0.03	0.00
23:30	0.04	0.09	0.04	0.03	0.06	0.03	0.03	0.02	0.02	0.00
23:45	0.04	0.08	0.03	0.05	0.07	0.04	0.06	0.03	0.05	0.00
Average	0.06	0.10	0.08	0.09	0.09	0.09	0.12	0.09	0.08	0.04
Max.	0.34	0.27	0.32	0.34	0.29	0.36	0.29	0.28	0.35	0.28
Min.	0.00	0.04	-0.05	0.02	0.03	0.02	0.02	0.02	0.02	-0.06

All Values in Million Gallons per Day (mgd)

FLOW MONITORING DATA

Project # 08-070

Flow Monitoring
Meter 2
Manhole 3910

Fort Leonard Wood, MO

08-Sep-08 to 17-Sep-08

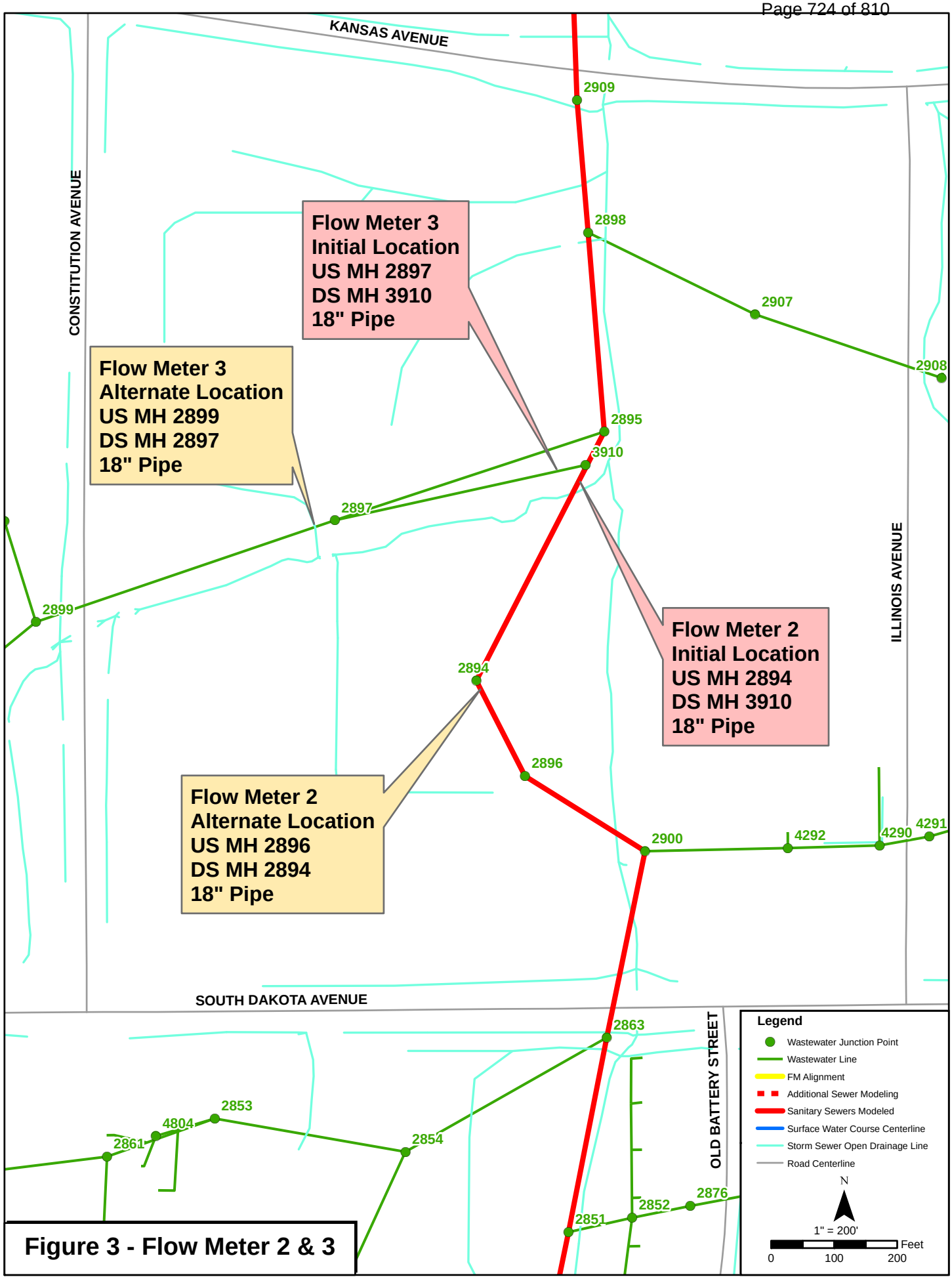


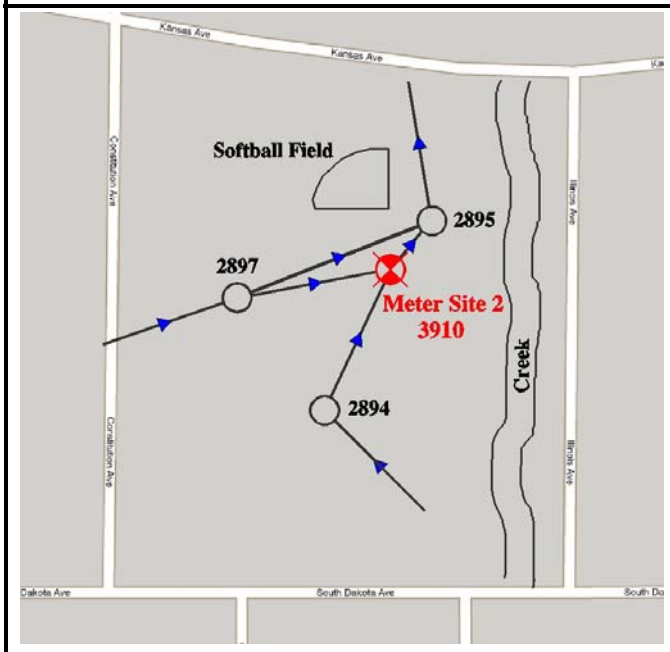
Figure 3 - Flow Meter 2 & 3

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
3910	Circular	PVC	18

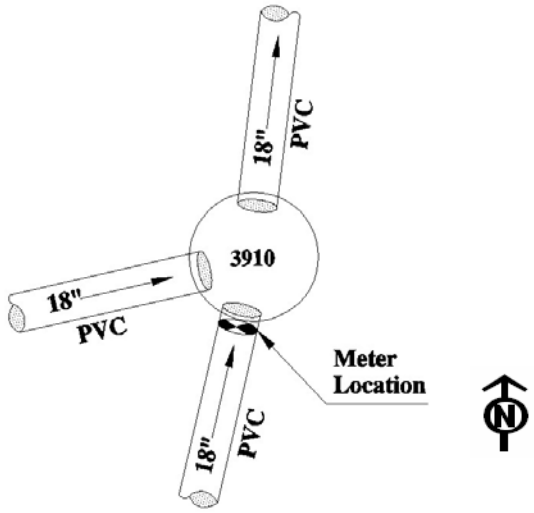
Site ID:	Address:	Meter #:	Site Quality:	Basin:
02	Kansas Ave & Illinois Ave	0785	Fair	NA

Location Map



Photos:
M2_3910_A.JPG, M2_3910_T.JPG, M2_3910_I.JPG, M2_3910_P.JPG, M2_3910_L_09-09-08.JPG, M2_3910_L_09-12-08.JPG

Planar Description



Describe MH Location
(Roadway, Easement, Field, Sidewalk)

Located Just South of Softball Field – Between Kansas Avenue and South Dakota Avenue.

Site Hazards

Heavy Traffic? No
H_2S? Yes
LEL OK? Yes
Describe potential hazards:
Standard CSE Hazards
Need Blower for H_2S
Must Call Fire Department at 573-596-0883 with Street Intersection and Manhole Number

Measurements

Manhole Depth (ft): 7.36
Measured Depth (in): 6.00
Manhole Dia. (in): 48.00
Velocity (fps): 2.00
Comments:

Site Conditions

Surcharge Evidence? Yes
Depth of Surcharge (ft): 4.00
Depth of Debris (in): 0.00
Comments:

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
3910	Circular	PVC	18

Site ID:	Address:	Meter #:	Site Quality:	Basin:
02	Kansas Ave & Illinois Ave	0785	Fair	NA

Area Photo

Topside Photo

Install

Probe

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
3910	Circular	PVC	18

Site ID:	Address:	Meter #:	Site Quality:	Basin:
02	Kansas Ave & Illinois Ave	0785	Fair	NA

Flow Depth 09/09/08	Flow Depth 09/12/08
	
Flow Depth	**Flow Depth**

FLOW METER INTERROGATION

Fort Leonard Wood

Project No. 08-070 Project Location Ft. Leonard Wood

Study Name _____ Site Description Kansas Ave. + Illinois Ave

Serial No. 0785 Site ID 02

Physical Data: Pipe Size 18 Pipe Material PVC Manhole Depth (ft) 7.36

Manhole Diameter 48" Flow Characteristic G (F) P Depth of Debris Ø

Evidence of Surcharge (Y) N Depth of Surcharge (ft) 4.00 Step Condition G (F) P None

Comments: _____

Meter Setup: Install Crew DH, JS, Install Date 09/08/08 Install Time 15 : 11

Depth Offset Ø Velocity Default/Site Coefficient _____ Cycle Time 15 min

New Battery Y (N) Voltage 7.5 Pipe Diameter 18 Pipe Shape: (Cir.) Rect. ___ x ___ in.

Site Interrogations:

Date	Time	Before Cleaning		After Cleaning		Measured Depth (in)	Measured Velocity (fps)	Depth of Debris (in)	Battery Voltage
		Metered Depth (in)	Metered Velocity (fps)	Metered Depth (in)	Metered Velocity (fps)				
09-08	15:33	2.91	1.62	—	—	3.00	1.47	Ø	7.5
Comments: Installed Meter									
09-09	12:05	3.20	1.78	—	—	3.00	1.82	Ø	12.2
Comments: V.S = 80% / MG = 0.2 / Pic of flow 2-077 / Changed batteries m2_3910_L_09-09-08									
9/12	1:15	6.60	1.32	6.34	1.48	4.56	1.20	Ø	12.2
Comments: V.S = 56% MG = 1.57 Pic of flow = M-03 Adjusted level to 4.5 m2_3910_L_09-12-08									
09-17	16:28	-0.11	0.00	3.76	0.00	4.00	1.83	Ø	11.8
Comments: V.S. = 20% / MG = 3.4 Pulled Meter									
Comments:									
Comments:									

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/05/08 Time: 15 :36 Project No.: 08-070 Unit Serial # 0785

Line Segment US ( ) 2894 Line Segment DS ( ) 3910

Site No. 02 Crew: DH, JS

Site Location: Kansas Ave. & Illinois Ave.

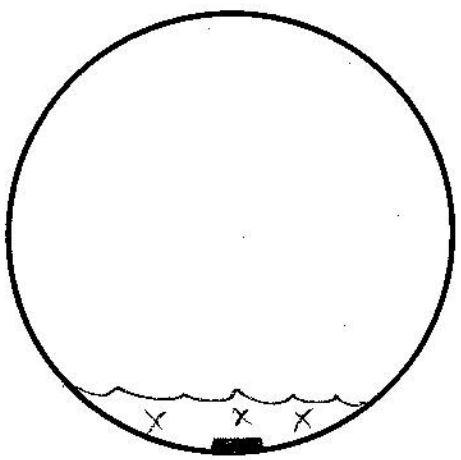
Inside Diameter	18 in.	Maximum Velocity	1.85 fps
Ruler Level	3.00 in.	Sensed Velocity	1.62 fps
Sensed Level	2.91 in.	*Check Sensed Velocity	1.47 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
1.30	1.85	1.25

1.91 - 1.18 - 1.59 - 1.82

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/09/08 Time: 12:11 Project No.: 08-070 Unit Serial # 0785

Line Segment US ( ) 2894 Line Segment DS ( ) 3910

Site No. 02 Crew: DH, JS

Site Location: Kansas Ave. & Illinois Ave.

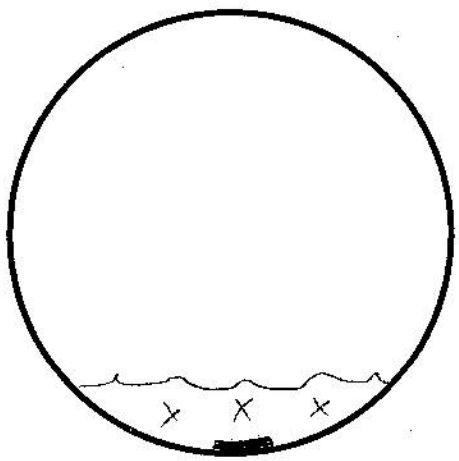
Inside Diameter	18 in.	Maximum Velocity	1.97 fps
Ruler Level	3.00 in.	Sensed Velocity	1.78 fps
Sensed Level	3.20 in.	*Check Sensed Velocity	1.82 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
1.66	1.97	1.84

1.98 - 1.82 - 1.68 - 1.65

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 9/12/08 Time: 1:15 Project No.: 08-070 Unit Serial # 0785

Line Segment US ( ) 2894 Line Segment DS ( ) 3910

Site No. 02 Crew: JS, RW

Site Location: Kansas Ave + Illinois Ave

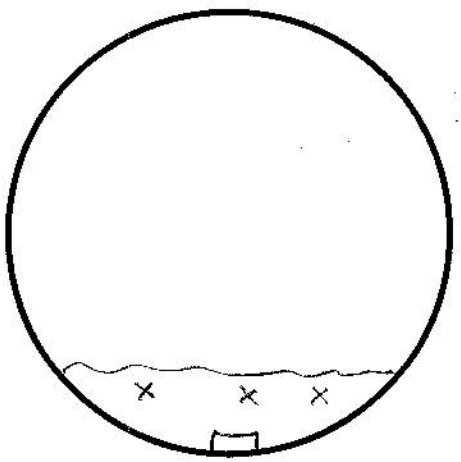
Inside Diameter	18 in.	Maximum Velocity	1.31 fps
Ruler Level	4.50 in.	Sensed Velocity	1.10 fps
Sensed Level	6.34 in.	*Check Sensed Velocity	1.20 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
1.20	1.31	1.09
1.10	1.10	1.10

TREKK DESIGN GROUP, LLC

Tabular Data Output

Site ID Fort Leonard Wood, MO - Meter 2

Start Date 9/8/2008
End Date 9/17/2008

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
0:00	0.00	0.12	0.31	0.24	0.23	0.10	0.21	0.56	0.15	0.00
0:15	0.00	0.12	0.31	0.25	0.24	0.11	0.15	0.59	0.17	0.00
0:30	0.00	0.11	0.28	0.28	0.25	0.10	0.15	0.59	0.22	0.00
0:45	0.00	0.09	0.23	0.31	0.22	0.12	0.13	0.47	0.14	0.00
1:00	0.00	0.10	0.30	0.29	0.22	0.16	0.11	0.47	0.15	0.00
1:15	0.00	0.12	0.32	0.20	0.18	0.15	0.10	0.48	0.13	0.00
1:30	0.00	0.15	0.33	0.25	0.18	0.11	0.11	0.52	0.14	0.00
1:45	0.00	0.11	0.25	0.22	0.19	0.10	0.11	0.52	0.13	0.00
2:00	0.00	0.12	0.28	0.23	0.10	0.10	0.26	0.58	0.16	0.00
2:15	0.00	0.08	0.33	0.21	0.19	0.09	0.22	0.55	0.16	0.00
2:30	0.00	0.09	0.34	0.22	0.26	0.09	0.20	0.46	0.13	0.00
2:45	0.00	0.14	0.37	0.22	0.26	0.20	0.27	0.51	0.16	0.00
3:00	0.00	0.12	0.37	0.29	0.27	0.18	0.40	0.52	0.14	0.00
3:15	0.00	0.09	0.34	0.22	0.19	0.13	0.45	0.48	0.18	0.00
3:30	0.00	0.08	0.40	0.28	0.17	0.13	1.27	0.44	0.19	0.00
3:45	0.00	0.09	0.37	0.21	0.18	0.14	0.72	0.51	0.17	0.00
4:00	0.00	0.11	0.33	0.23	0.20	0.12	0.97	0.46	0.16	0.00
4:15	0.00	0.19	0.47	0.22	0.20	0.13	1.24	0.50	0.16	0.00
4:30	0.00	0.16	0.43	0.42	0.46	0.21	1.26	0.55	0.18	0.00
4:45	0.00	0.35	0.49	0.72	0.56	0.20	1.38	0.70	0.29	0.00
5:00	0.00	0.50	0.43	0.75	0.43	0.19	1.52	0.63	0.35	0.00
5:15	0.00	0.33	0.54	0.61	0.47	0.26	1.80	0.56	0.25	0.00
5:30	0.00	0.48	0.53	0.59	0.56	0.23	1.71	0.61	-0.10	0.00
5:45	0.00	0.17	0.59	0.38	0.37	0.12	1.90	0.41	-0.08	0.00
6:00	0.00	0.13	0.63	0.39	0.35	0.12	1.98	0.56	-0.07	-0.07
6:15	0.00	0.17	0.46	0.44	0.27	0.13	2.02	0.33	-0.15	-0.05
6:30	0.00	0.16	0.45	0.38	0.32	0.08	2.06	0.50	0.32	-0.07
6:45	0.00	0.22	0.46	0.39	0.37	0.27	1.94	0.55	0.41	0.31
7:00	0.00	0.27	0.41	0.45	0.33	0.19	1.91	0.46	0.48	0.19
7:15	0.00	0.39	0.41	0.49	0.30	0.21	1.73	0.42	0.24	0.11
7:30	0.00	0.33	0.58	0.41	0.32	0.21	1.59	0.37	0.25	0.11
7:45	0.00	0.28	0.38	0.52	0.28	0.29	1.69	0.47	0.24	0.22
8:00	0.00	0.22	0.49	0.42	0.30	0.19	1.42	0.48	0.38	0.18
8:15	0.00	0.22	0.52	0.36	0.32	0.21	1.65	0.46	0.26	0.20
8:30	0.00	0.20	0.39	0.47	0.30	0.16	1.47	0.44	0.38	0.25
8:45	0.00	0.22	0.38	0.29	0.28	0.15	1.29	0.45	0.30	0.20
9:00	0.00	0.28	0.40	0.38	0.24	0.19	1.53	0.31	0.00	0.21
9:15	0.00	0.19	0.42	0.37	0.34	0.17	1.35	0.38	0.00	0.17
9:30	0.00	0.21	0.41	0.44	0.36	0.14	1.24	0.44	0.00	0.19
9:45	0.00	0.17	0.51	0.43	0.38	0.12	1.17	0.50	0.00	0.37
10:00	0.00	0.31	0.51	0.39	0.33	0.14	1.13	0.48	0.00	0.17
10:15	0.00	0.26	0.51	0.43	0.40	0.12	1.02	0.51	0.00	0.21
10:30	0.00	0.28	0.51	0.49	0.36	0.17	0.00	0.54	0.00	0.19
10:45	0.00	0.37	0.43	0.35	0.37	0.16	1.12	0.61	0.00	0.32
11:00	0.00	0.32	0.53	0.90	0.45	0.17	1.04	0.68	0.00	0.00
11:15	0.00	0.20	0.45	0.52	0.52	0.17	1.00	0.74	0.00	0.00
11:30	0.00	0.17	0.34	0.68	0.49	0.17	0.00	0.53	0.00	0.00
11:45	0.00	0.30	0.60	0.56	0.57	0.17	0.93	0.47	0.00	0.00
12:00	0.00	0.28	0.64	0.44	0.57	0.22	0.87	0.68	0.00	0.00
12:15	0.00	0.00	0.55	0.48	0.57	0.17	0.96	0.69	0.00	0.00
12:30	0.00	0.61	0.46	0.39	0.48	0.28	0.95	0.45	0.00	0.00

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
12:45	0.00	0.44	0.56	0.41	0.44	0.38	0.84	0.54	0.00	0.00
13:00	0.00	0.57	0.50	0.40	0.60	0.17	0.94	0.66	0.00	0.00
13:15	0.00	0.63	0.60	0.45	0.54	0.19	0.87	0.53	0.00	0.00
13:30	0.00	0.57	0.58	0.55	0.51	0.20	0.91	0.57	0.00	0.00
13:45	0.00	0.54	0.55	0.48	0.33	0.32	0.82	0.51	0.00	-0.08
14:00	0.00	0.61	0.63	0.40	0.39	0.20	1.05	0.36	0.00	-0.08
14:15	0.00	1.64	0.47	0.34	0.37	0.16	0.95	0.45	0.00	-0.08
14:30	0.00	0.46	0.55	0.47	0.38	0.18	1.01	0.47	0.21	-0.13
14:45	0.00	0.47	0.50	0.55	0.30	0.20	0.93	0.59	0.18	-0.07
15:00	0.00	0.38	0.65	0.38	0.28	0.19	0.98	0.50	0.25	-0.09
15:15	0.00	0.63	0.49	0.42	0.26	0.21	0.93	0.40	0.20	-0.07
15:30	0.00	0.52	0.52	0.23	0.29	0.20	0.86	0.49	0.24	-0.08
15:45	0.00	0.46	0.46	0.24	0.30	0.15	0.00	0.51	0.30	-0.10
16:00	0.23	0.56	0.54	0.14	0.31	0.23	0.00	0.42	0.21	-0.07
16:15	0.29	0.51	0.52	0.27	0.23	0.20	0.00	0.44	0.28	-0.09
16:30	0.49	0.41	0.39	0.30	0.34	0.18	0.00	0.48	0.20	0.00
16:45	0.45	0.47	0.95	0.38	0.27	0.23	0.91	0.53	0.26	0.00
17:00	0.31	0.44	0.50	0.38	0.34	0.17	0.81	0.50	0.32	0.00
17:15	0.28	0.66	0.58	0.31	0.51	0.23	0.89	0.37	0.24	0.00
17:30	0.30	0.51	0.59	0.34	0.23	0.15	0.95	0.42	0.24	0.00
17:45	0.21	0.58	0.41	0.31	0.30	0.24	0.96	0.36	0.25	0.00
18:00	0.28	0.41	0.36	0.38	0.21	0.21	0.92	0.30	0.23	0.00
18:15	0.38	0.63	0.61	0.42	0.25	0.35	0.93	0.40	0.23	0.00
18:30	0.33	0.37	0.63	0.39	0.27	0.30	0.84	0.42	0.26	0.00
18:45	0.36	0.75	0.43	0.30	0.28	0.25	0.90	0.40	0.28	0.00
19:00	0.39	0.61	0.58	0.37	0.27	0.21	0.85	0.49	0.26	0.00
19:15	0.38	0.67	0.75	0.43	0.30	0.31	0.77	0.35	0.32	0.00
19:30	0.46	0.93	0.84	0.60	0.48	0.38	0.88	0.44	-0.17	0.00
19:45	0.63	0.94	0.96	0.58	0.68	0.38	1.12	0.47	-0.15	0.00
20:00	0.72	1.78	0.86	0.57	0.63	0.43	0.99	0.84	-0.32	0.00
20:15	0.69	0.84	1.19	0.70	0.59	0.37	1.03	0.82	-0.28	0.00
20:30	0.75	1.13	1.01	0.56	0.46	0.56	1.10	0.54	-0.34	0.00
20:45	0.55	0.92	0.89	0.39	0.28	0.35	0.89	0.55	-0.28	0.00
21:00	0.49	0.60	0.71	0.41	0.40	0.47	0.89	0.41	-0.21	0.00
21:15	0.26	0.47	0.76	0.32	0.31	0.26	0.72	0.31	-0.13	0.00
21:30	0.21	0.61	0.53	0.36	0.23	0.27	0.68	0.25	-0.09	0.00
21:45	0.24	0.53	0.56	0.29	0.20	0.26	0.74	0.27	-0.07	0.00
22:00	0.18	0.36	0.38	0.35	0.27	0.16	0.72	0.20	0.00	0.00
22:15	0.14	0.26	0.40	0.32	0.19	0.29	0.72	0.17	0.00	0.00
22:30	0.17	0.31	0.36	0.28	0.19	0.21	0.64	0.17	0.00	0.00
22:45	0.12	0.22	0.23	0.28	0.12	0.37	0.39	0.19	0.00	0.00
23:00	0.12	0.44	0.34	0.20	0.15	0.38	0.71	0.20	0.00	0.00
23:15	0.15	0.43	0.25	0.20	0.12	0.18	0.68	0.17	0.00	0.00
23:30	0.13	0.38	0.25	0.18	0.10	0.20	0.67	0.17	0.00	0.00
23:45	0.11	0.35	0.28	0.24	0.16	0.17	0.67	0.19	0.00	0.00
Average	0.11	0.56	0.49	0.39	0.33	0.21	0.90	0.47	0.10	0.03
Max.	0.75	1.78	1.19	0.90	0.68	0.56	2.06	0.84	0.48	0.37
Min.	0.00	0.00	0.23	0.14	0.10	0.08	0.00	0.17	-0.34	-0.13

All Values in Million Gallons per Day (mgd)

FLOW MONITORING DATA

Project # 08-070

Flow Monitoring
Meter 3
Manhole 3910

Fort Leonard Wood, MO

08-Sep-08 to 17-Sep-08

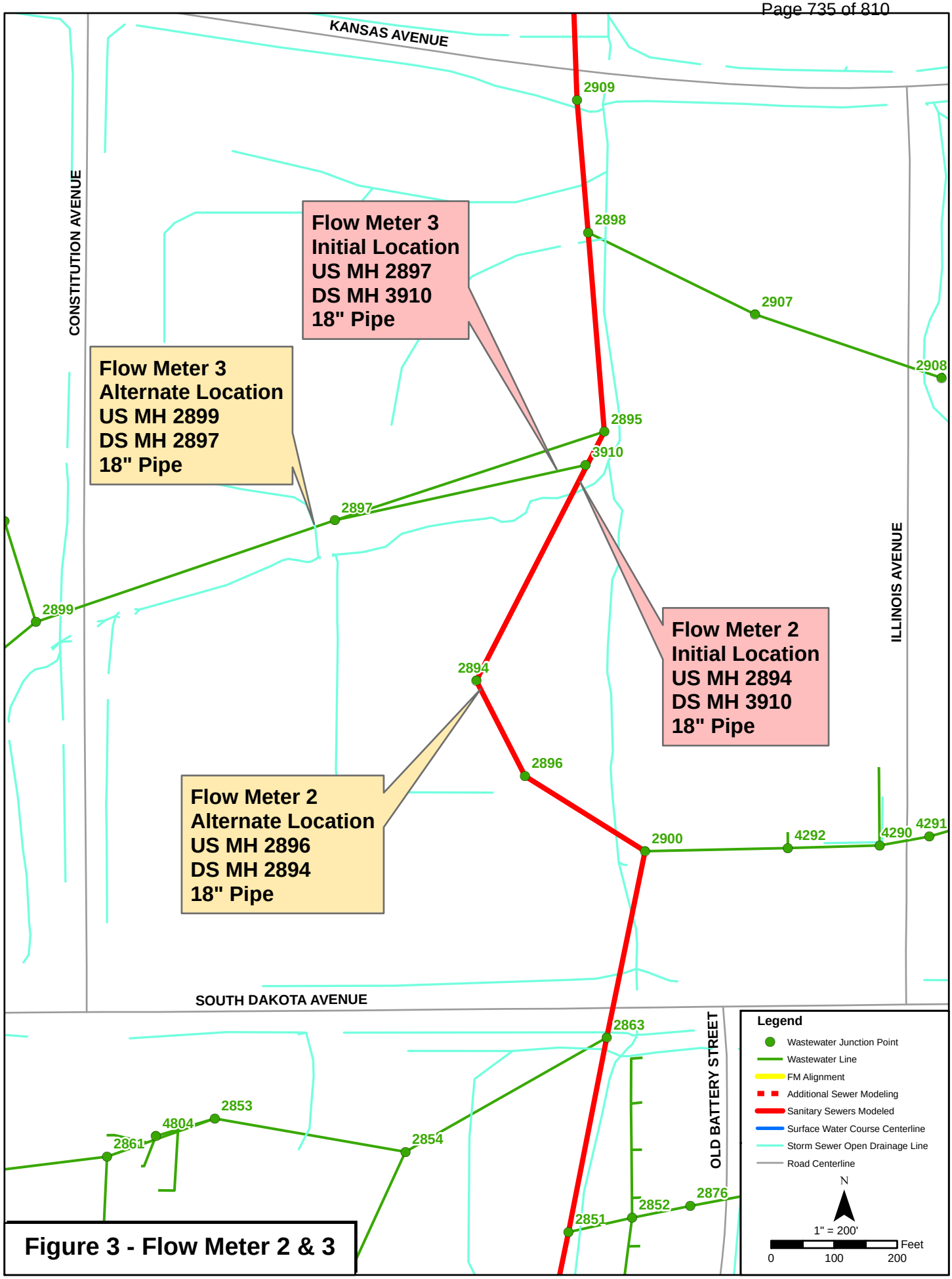


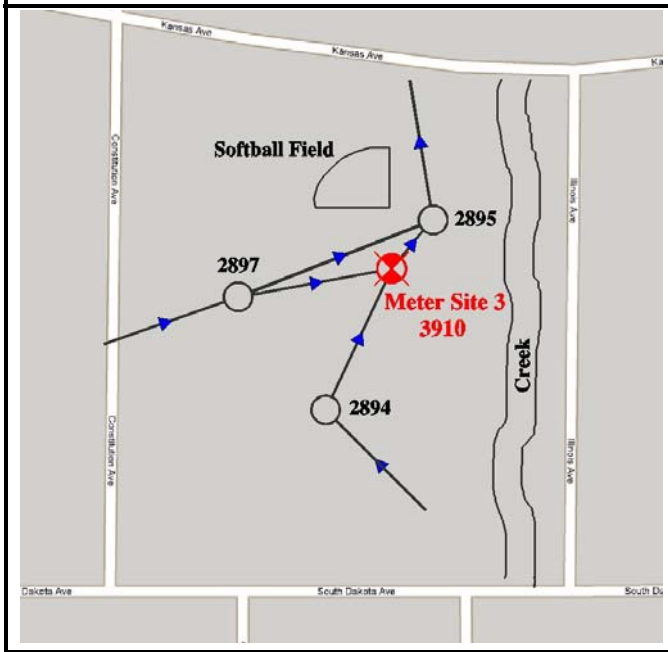
Figure 3 - Flow Meter 2 & 3

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
3910	Circular	PVC	18

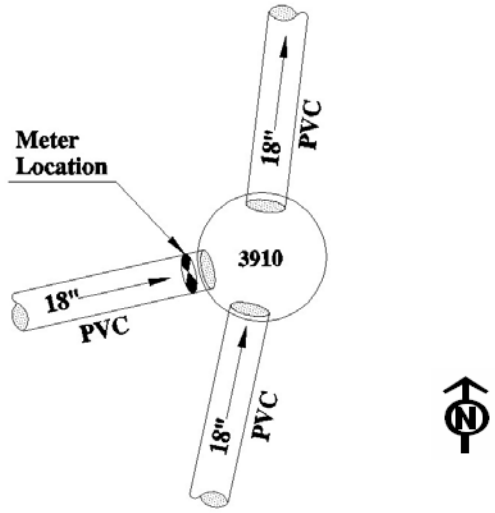
Site ID:	Address:	Meter #:	Site Quality:	Basin:
03	Kansas Ave & Illinois Ave	1543	Fair	NA

Location Map



Photos:
M3_3910_A.JPG, M3_3910_T.JPG, M3_3910_I.JPG, M3_3910_P.JPG, M3_3910_L_09-09-08.JPG, M3_3910_L_09-12-08.JPG, M3_3910_L_09-17-08.JPG

Planar Description



Describe MH Location
(Roadway, Easement, Field, Sidewalk)

Located Just South of Softball Field – Between Kansas Avenue and South Dakota Avenue.

Site Hazards

Heavy Traffic? No
H_2S? Yes
LEL OK? Yes
Describe potential hazards:
Standard CSE Hazards
Need Blower for H_2S
Must Call Fire Department at 573-596-0883 with Street Intersection and Manhole Number

Measurements

Manhole Depth (ft): 7.36
Measured Depth (in): 6.00
Manhole Dia. (in): 48.00
Velocity (fps): 2.00
Comments:

Site Conditions

Surcharge Evidence? Yes
Depth of Surcharge (ft): 4.00
Depth of Debris (in): 0.00
Comments:

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
3910	Circular	PVC	18

Site ID:	Address:	Meter #:	Site Quality:	Basin:
03	Kansas Ave & Illinois Ave	1543	Fair	NA

Area Photo

Topside Photo

Install

Probe

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
3910	Circular	PVC	18

Site ID:	Address:	Meter #:	Site Quality:	Basin:
03	Kansas Ave & Illinois Ave	1543	Fair	NA

Flow Depth 09/09/08

Flow Depth 09/12/08

Flow Depth 19/17/08

Flow Depth

TREKK

FLOW METER INTERROGATION

Fort Leonard Wood

Project No. 08-070 Project Location Ft. Leonard Wood

Study Name _____ Site Description Kansas Ave & Illinois Ave

Serial No. 1543 Site ID 03

Physical Data: Pipe Size 18 Pipe Material PVC Manhole Depth (ft) 7.36

Manhole Diameter 48 Flow Characteristic G (F) P Depth of Debris Ø

Evidence of Surcharge (Y) N Depth of Surcharge (ft) 4.0 Step Condition G (F) P None

Comments: _____

Meter Setup: Install Crew DH, JS, _____ Install Date 09/08/08 Install Time 15 : 11

Depth Offset Ø Velocity Default/Site Coefficient _____ Cycle Time 15 min

New Battery Y (N) Voltage 11.1 Pipe Diameter 18 Pipe Shape: (Cir.) Rect. ___ x ___ in.

Site Interrogations:

Date	Time	Before Cleaning		After Cleaning		Measured Depth (in)	Measured Velocity (fps)	Depth of Debris (in)	Battery Voltage
		Metered Depth (in)	Metered Velocity (fps)	Metered Depth (in)	Metered Velocity (fps)				
09-08	15:47	3.60	2.41	—	—	3.50	1.72	Ø	11.1
Comments: Installed Meter									
09-09	12:15	2.68	2.57	—	—	2.40	2.00	Ø	11.2
Comments: V.S. = 92% /MG = 0.2 /Pic of flow 2-078 m3_3910_L_09-09-08									
9-12	1:40	4.22	2.47	4.07	2.57	4.20	2.09	Ø	11.1
Comments: V.S = 89% MG = 1.12 Pic of flow = M-04 m3_3910_L_09-12-08									
09-17	16:37	2.44	2,23	—	—	3.00	1.64	Ø	11.0
Comments: V.S. = 80% /MG = 2.95 /Pic of flow 0-005 Failed Meter m3_3910_L_09-17-08									
Comments: _____									
Comments: _____									

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 9/08/08 Time: 15:48 Project No.: 08-070 Unit Serial # 1543

Line Segment US ( ) 2897 Line Segment DS ( ) 3910

Site No. 03 Crew: DH, JS

Site Location: Kansas Ave + Illinois Ave

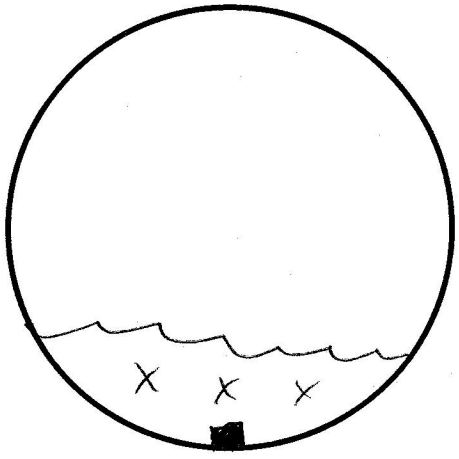
Inside Diameter	18 in.	Maximum Velocity	2.07 fps
Ruler Level	3.50 in.	Sensed Velocity	2.41 fps
Sensed Level	3.60 in.	*Check Sensed Velocity	1.72 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
1.26	1.84	2.07

2.41 · 2.42 - 2.37 · 2.45

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/09/08 Time: 12:22 Project No.: 08-070 Unit Serial # 1543

Line Segment US ( ) 2897 Line Segment DS ( ) 3910

Site No. 03 Crew: DH, JS

Site Location: Kansas Ave. & Illinois Ave.

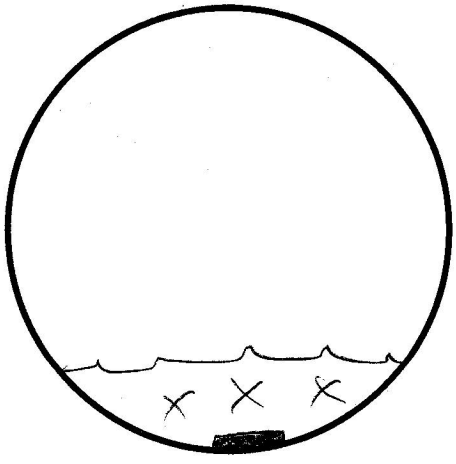
Inside Diameter	18 in.	Maximum Velocity	2.38 fps
Ruler Level	2.40 in.	Sensed Velocity	2.57 fps
Sensed Level	2.68 in.	*Check Sensed Velocity	2.00 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
2.38	1.72	1.91

2.84-2.45-2.44-2.54

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 9/12/08 Time: 1:34 Project No.: 08-070 Unit Serial # 1543

Line Segment US ( ) 2897 Line Segment DS ( ) 3910

Site No. 03 Crew: JS, RW

Site Location: Kansas Ave + Illinois Ave

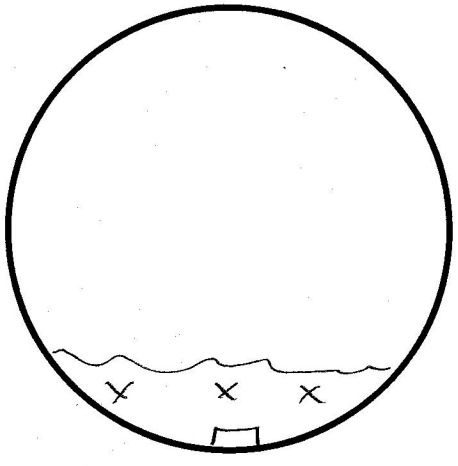
Inside Diameter	18 in.	Maximum Velocity	2.39 fps
Ruler Level	4.20 in.	Sensed Velocity	2.63 fps
Sensed Level	4.22 in.	*Check Sensed Velocity	2.09 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
2.39	1.89	1.99
2.58	2.63	2.69

TREKK DESIGN GROUP, LLC

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/17/08 Time: 16:41 Project No.: 08-070 Unit Serial # 1543

Line Segment US ( ) 2897 Line Segment DS ( ) 3910

Site No. 03 Crew: DH, JS

Site Location: Kansas Ave. & Illinois Ave.

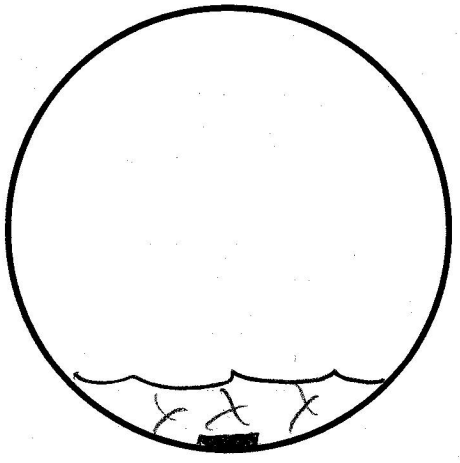
Inside Diameter	18 in.	Maximum Velocity	1.80 fps
Ruler Level	3.00 in.	Sensed Velocity	2.23 fps
Sensed Level	2.44 in.	*Check Sensed Velocity	1.64 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
1.54	1.57	1.80

2.07- 2.21- 2.31- 2.34

CONFINED SPACE ENTRY PERMIT

COMPANY/LOCATION: Trekk / Ft Leon. Wd DEPARTMENT: Field DATE: 9/8/08
CONFINED SPACE TO BE ENTERED: MH 3910 PERMIT EXPIRATION DATE/TIME: 9/8/08 4:00
DESCRIPTION OF WORK TO BE PERFORMED: Install Meters # 02 & #03

NATURE OF HAZARDS IN CONFINED SPACE: (check)

- ✓ Oxygen deficiency (Less than 19.5% at sea level)
- ✓ Flammable gases or vapors (greater than 10% of the lower flammable limit, or greater than 23.5% oxygen at sea level)
- ✓ Toxic gases or vapors (greater than the permissable exposure limit)
- ____ Mechanical hazards
- ____ Electrical shock
- ✓ Materials harmful to the skin
- ✓ Engulfment
- ____ Configuration hazard
- ____ Other

EQUIPMENT REQUIRED FOR ENTRY AND WORK: (check)

- ____ Respirator
- ✓ Lifeline and safety harness
- ____ Protective clothing
- ____ Hearing protection
- ____ Other
- ____ Lighting (Explosive Proof)
- ____ Fire Extinguishers
- ✓ Emergency Escape Retrieval Equipment
- ____ Resuscitators — Inhalator

Electrical equipment/tools:
- ____ Low voltage
- ____ Ground-fault current interrupters
- ____ Approved for hazardous locations

Respiratory protection (specify)
Communication aid (specify) cell
Rescue equipment (specify) tripod w/winch

PREPARATION: (check)

- ____ Notify affected departments of service interruption
- ____ Isolate - blanked or double valve, with lock and tag.
- ____ Zero energy state (Lock Out all energy sources)
- ____ Cleaned, drained, washed and purged
- ✓ Ventilation to provide fresh air
- ✓ Emergency response team available
- ✓ Employees informed of specific confined space hazards
- ✓ Secure area (post, sign and flag)
- ✓ Procedures reviewed with each employee.
- ✓ Atmospheric test in compliance.
- ____ Attach hot work permit
- ____ Other

AUTHORIZED ENTRANTS:

Jeff Stacy

AUTHORIZED ATTENDANTS:

Dave Hamberlin

STAND BY SAFETY PERSONNEL:

TEST	Allowable Limits	Check (✓) if Required	In Result AM/PM	Out Result AM/PM	Result AM/PM	Result AM/PM	Result AM/PM	Result AM/PM
Time			2:45 PM	15:59 PM				
Oxygen-min.	19.5%	✓	20.8	20.1				
Oxygen-max.	23.5%	✓	20.8	20.8				
Flammability	10% LEL / LFL	✓	1	1				
H_2S	10 ppm	✓	7	7				
Toxic (specify)								
Cl_2	.5 ppm							
CO	35 ppm	✓	9	9				
SO_2	2 ppm							
Heat	°F/°C							
Other								
Other								

Name of employee conducting atmospheric monitoring: Jeff Stacy Instrument(s) used: MSA Solaris

Statement of acceptable entry conditions Good

AUTHORIZATION:
I certify that all required precautions have been taken and necessary equipment is provided for safe entry and work in this confined space

Time: 2:45 Date: 9/8/08 Name (Print) Jeff Stacy Signature

TREKK DESIGN GROUP, LLC

Tabular Data Output

Site ID Fort Leonard Wood, MO - Meter 3

Start Date 9/8/2008
End Date 9/17/2008

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
0:00	0.00	0.12	0.10	0.09	0.33	0.08	0.07	0.46	0.08	0.07
0:15	0.00	0.25	0.07	0.05	0.33	0.09	0.09	0.50	0.10	0.06
0:30	0.00	0.14	0.06	0.07	0.39	0.07	0.08	0.45	0.22	0.07
0:45	0.00	0.12	0.08	0.06	0.27	0.26	0.08	0.33	0.09	0.05
1:00	0.00	0.16	0.07	0.16	0.31	0.17	0.09	0.35	0.10	0.14
1:15	0.00	0.13	0.11	0.08	0.29	0.13	0.05	0.49	0.07	0.05
1:30	0.00	0.20	0.06	0.05	0.25	0.15	0.08	0.48	0.09	0.04
1:45	0.00	0.15	0.06	0.05	0.39	0.09	0.16	0.38	0.07	0.04
2:00	0.00	0.12	0.05	0.08	0.30	0.07	0.30	0.37	0.17	0.04
2:15	0.00	0.11	0.05	0.07	0.28	0.09	0.34	0.46	0.10	0.05
2:30	0.00	0.12	0.08	0.05	0.30	0.09	0.28	0.25	0.07	0.03
2:45	0.00	0.09	0.05	0.11	0.26	0.08	0.55	0.38	0.07	0.05
3:00	0.00	0.12	0.05	0.10	0.27	0.12	0.65	0.41	0.07	0.05
3:15	0.00	0.10	0.05	0.06	0.37	0.09	0.83	0.37	0.10	0.12
3:30	0.00	0.20	0.04	0.07	0.32	0.08	0.95	0.32	0.14	0.05
3:45	0.00	0.12	0.11	0.06	0.29	0.05	1.18	0.44	0.08	0.04
4:00	0.00	0.11	0.06	0.06	0.37	0.07	1.21	0.24	0.07	0.05
4:15	0.00	0.11	0.06	0.05	0.34	0.18	1.38	0.32	0.08	0.06
4:30	0.00	0.11	0.06	0.06	0.38	0.13	1.83	0.47	0.08	0.08
4:45	0.00	0.16	0.06	0.15	0.42	0.17	1.95	0.41	0.28	0.16
5:00	0.00	0.89	0.40	0.40	0.65	0.36	1.89	0.77	0.48	0.40
5:15	0.00	0.38	0.18	0.28	0.39	0.17	1.95	0.36	0.23	0.14
5:30	0.00	0.36	0.13	0.11	0.45	0.08	1.79	0.45	0.15	0.16
5:45	0.00	0.26	0.08	0.11	0.33	0.11	1.95	0.36	0.14	0.27
6:00	0.00	0.25	0.08	0.07	0.34	0.15	2.12	0.39	0.15	0.20
6:15	0.00	0.20	0.12	0.08	0.32	0.11	2.05	0.60	0.15	0.05
6:30	0.00	0.35	0.11	0.24	0.40	0.17	1.97	0.50	0.28	0.23
6:45	0.00	0.41	0.34	0.29	0.52	0.19	2.12	0.44	0.31	0.28
7:00	0.00	0.61	0.12	0.21	0.56	0.23	2.00	0.48	0.39	0.11
7:15	0.00	0.39	0.34	0.18	0.49	0.22	1.98	0.34	0.16	0.11
7:30	0.00	0.38	0.27	0.35	0.58	0.34	1.97	0.39	0.22	0.16
7:45	0.00	0.48	0.27	0.20	0.47	0.20	1.47	0.53	0.19	0.20
8:00	0.00	0.39	0.18	0.17	0.55	0.12	1.46	0.36	0.49	0.10
8:15	0.00	0.33	0.14	0.44	0.45	0.22	1.40	0.41	0.21	0.14
8:30	0.00	0.55	0.22	0.25	0.52	0.25	1.30	0.43	0.36	0.18
8:45	0.00	0.30	0.13	0.28	0.58	0.14	1.23	0.43	0.25	0.17
9:00	0.00	0.40	0.29	0.12	0.48	0.16	1.24	0.29	0.16	0.13
9:15	0.00	0.25	0.12	0.08	0.40	0.13	1.19	0.34	0.26	0.14
9:30	0.00	0.57	0.09	0.23	0.44	0.18	1.18	0.34	0.17	0.20
9:45	0.00	0.26	0.11	0.14	0.46	0.20	1.11	0.22	0.21	0.47
10:00	0.00	0.38	0.15	0.22	0.56	0.11	1.11	0.38	0.15	0.11
10:15	0.00	0.21	0.17	0.11	0.52	0.11	1.05	0.24	0.18	0.22
10:30	0.00	0.27	0.28	0.21	0.64	0.12	1.02	0.18	0.32	0.17
10:45	0.00	0.22	0.27	0.33	0.81	0.15	1.03	0.20	0.17	0.37
11:00	0.00	0.29	0.17	0.52	0.61	0.08	1.01	0.23	0.29	0.11
11:15	0.00	0.28	0.22	0.52	0.40	0.07	0.94	0.23	0.24	0.19
11:30	0.00	0.30	0.11	0.45	0.55	0.12	0.94	0.18	0.39	0.08
11:45	0.00	0.41	0.23	0.43	0.41	0.05	0.93	0.16	0.72	0.07
12:00	0.00	0.35	0.14	0.42	0.55	0.15	0.87	0.22	0.22	0.11
12:15	0.00	0.26	0.26	0.52	0.40	0.09	0.89	0.34	0.21	0.06
12:30	0.00	0.30	0.13	0.32	0.46	0.13	0.89	0.16	0.22	0.11

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
12:45	0.00	0.25	0.15	0.47	0.65	0.11	0.86	0.24	0.33	0.08
13:00	0.00	0.26	0.31	0.47	0.38	0.08	0.85	0.25	0.18	0.14
13:15	0.00	0.15	0.12	0.36	0.43	0.18	0.87	0.18	0.19	0.17
13:30	0.00	0.24	0.13	0.47	0.49	0.28	0.85	0.15	0.42	0.11
13:45	0.00	0.14	0.30	0.36	0.53	0.18	0.84	0.17	0.27	0.18
14:00	0.00	0.30	0.17	0.49	0.55	0.17	0.82	0.12	0.23	0.24
14:15	0.00	0.15	0.27	0.59	0.39	0.14	0.80	0.15	0.22	0.27
14:30	0.00	0.24	0.42	0.57	0.26	0.11	0.77	0.13	0.22	0.40
14:45	0.00	0.17	0.28	0.44	0.22	0.24	0.74	0.36	0.15	0.16
15:00	0.00	0.18	0.41	0.64	0.26	0.16	0.75	0.28	0.25	0.28
15:15	0.00	0.25	0.26	0.37	0.30	0.14	0.75	0.18	0.18	0.21
15:30	0.00	0.21	0.24	0.49	0.22	0.12	0.45	0.23	0.29	0.23
15:45	0.09	0.31	0.34	0.41	0.16	0.23	0.82	0.23	0.33	0.32
16:00	0.41	0.29	0.22	0.44	0.57	0.16	0.86	0.24	0.26	0.19
16:15	0.40	0.18	0.20	0.32	0.20	0.18	0.71	0.22	0.47	0.26
16:30	0.22	0.19	0.17	0.39	0.28	0.16	0.71	0.29	0.25	0.19
16:45	0.41	0.21	0.44	0.47	0.26	0.23	0.70	0.24	0.22	0.00
17:00	0.29	0.15	0.19	0.44	0.23	0.13	0.62	0.33	0.38	0.00
17:15	0.25	0.26	0.17	0.44	0.34	0.18	0.83	0.17	0.17	0.00
17:30	0.49	0.22	0.20	0.50	0.18	0.18	0.71	0.20	0.19	0.00
17:45	0.40	0.21	0.35	0.43	0.18	0.18	0.66	0.17	0.19	0.00
18:00	0.31	0.14	0.16	0.41	0.18	0.15	0.64	0.15	0.13	0.00
18:15	0.24	0.13	0.13	0.52	0.26	0.20	0.57	0.31	0.18	0.00
18:30	0.40	0.13	0.21	0.45	0.25	0.14	0.52	0.23	0.21	0.00
18:45	0.35	0.12	0.18	0.57	0.16	0.12	0.82	0.19	0.29	0.00
19:00	0.35	0.11	0.15	0.50	0.15	0.13	0.92	0.27	0.23	0.00
19:15	0.37	0.12	0.13	0.60	0.13	0.19	0.76	0.09	0.30	0.00
19:30	0.35	0.30	0.12	0.52	0.33	0.10	0.80	0.11	0.25	0.00
19:45	0.30	0.26	0.11	0.64	0.16	0.12	0.76	0.12	0.41	0.00
20:00	0.42	0.61	0.30	0.69	0.30	0.92	0.84	0.31	0.83	0.00
20:15	0.46	0.30	0.13	0.75	0.60	0.61	0.74	0.33	0.71	0.00
20:30	0.76	0.29	0.33	0.90	0.57	0.61	0.85	0.52	0.80	0.00
20:45	0.81	0.28	0.38	0.59	0.59	0.55	0.90	0.48	0.58	0.00
21:00	0.63	0.29	0.38	0.59	0.59	0.49	0.88	0.37	0.38	0.00
21:15	0.60	0.24	0.23	0.63	0.46	0.36	0.68	0.26	0.41	0.00
21:30	0.43	0.34	0.28	0.43	0.29	0.32	0.57	0.25	0.16	0.00
21:45	0.26	0.29	0.15	0.35	0.16	0.16	0.52	0.24	0.14	0.00
22:00	0.35	0.18	0.21	0.49	0.18	0.10	0.62	0.14	0.06	0.00
22:15	0.19	0.16	0.15	0.57	0.12	0.25	0.63	0.11	0.08	0.00
22:30	0.15	0.10	0.25	0.37	0.18	0.11	0.54	0.16	0.08	0.00
22:45	0.19	0.22	0.10	0.44	0.10	0.09	0.43	0.11	0.14	0.00
23:00	0.13	0.12	0.13	0.30	0.28	0.12	0.41	0.11	0.08	0.00
23:15	0.12	0.21	0.10	0.29	0.13	0.14	0.34	0.10	0.06	0.00
23:30	0.12	0.15	0.07	0.41	0.07	0.09	0.44	0.09	0.06	0.00
23:45	0.12	0.22	0.06	0.27	0.06	0.05	0.41	0.14	0.03	0.00
Average	0.12	0.23	0.18	0.33	0.37	0.18	0.91	0.30	0.23	0.11
Max.	0.81	0.61	0.44	0.90	0.81	0.92	2.12	0.77	0.83	0.47
Min.	0.00	0.10	0.04	0.05	0.06	0.05	0.05	0.09	0.03	0.00

All Values in Million Gallons per Day (mgd)

FLOW MONITORING DATA

Project # 08-070

Flow Monitoring
Meter 4
Manhole 2913

Fort Leonard Wood, MO

08-Sep-08 to 17-Sep-08

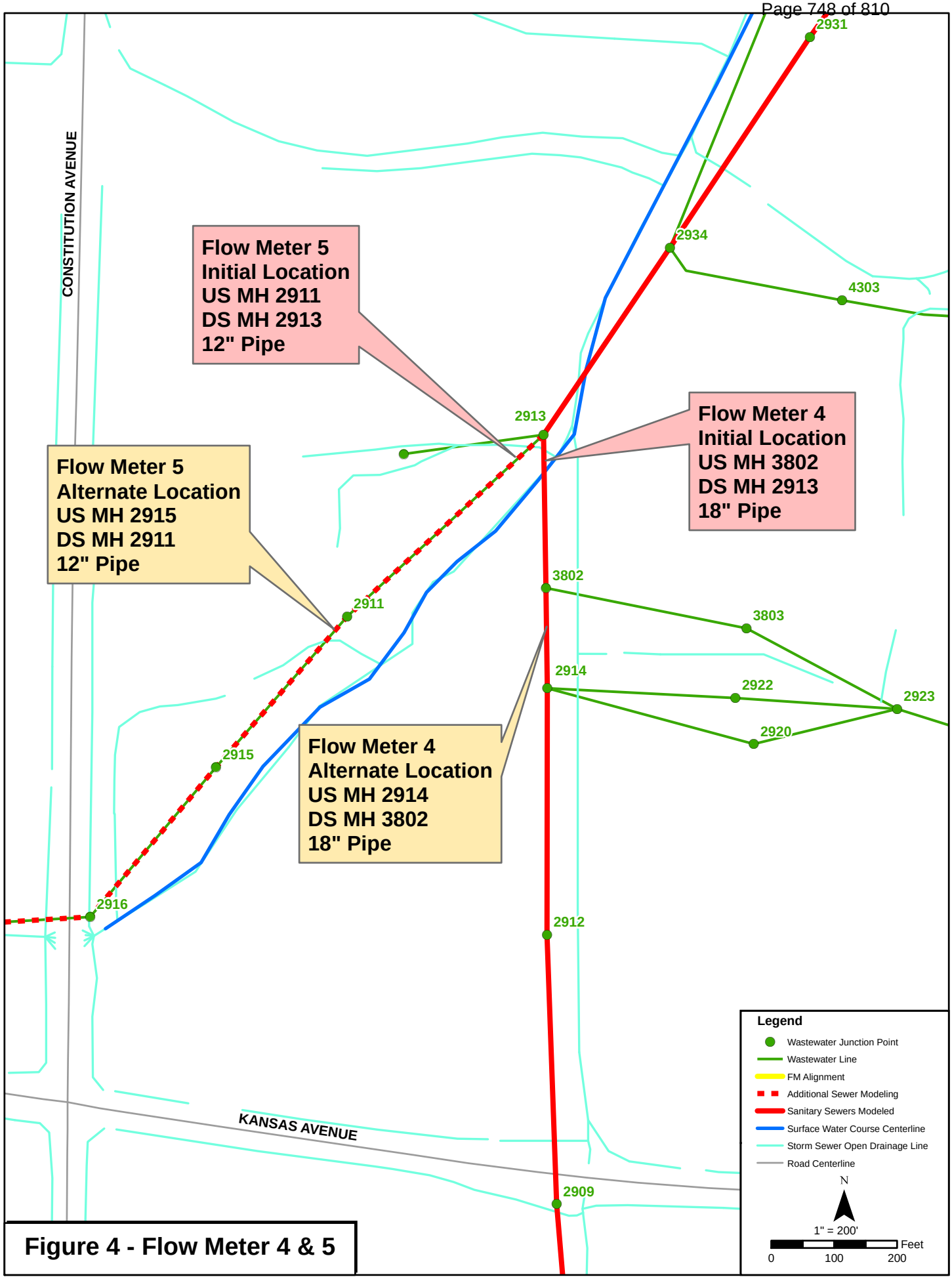


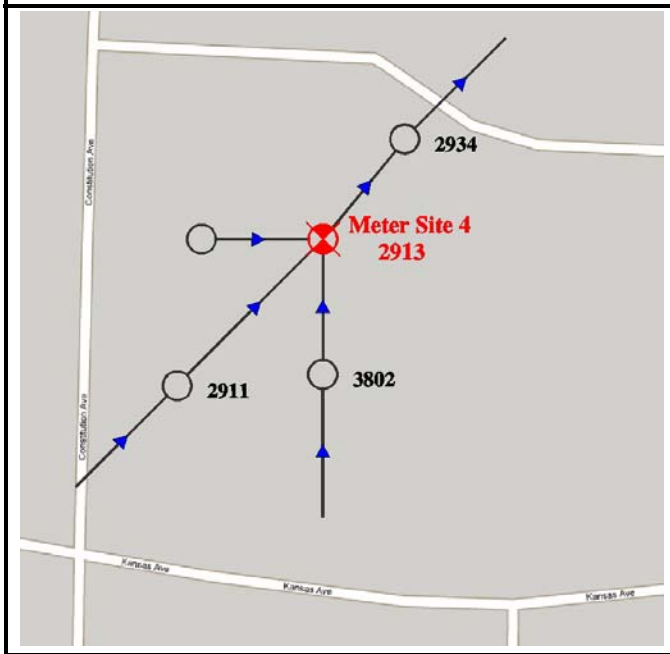
Figure 4 - Flow Meter 4 & 5

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
2913	Circular	PVC	18

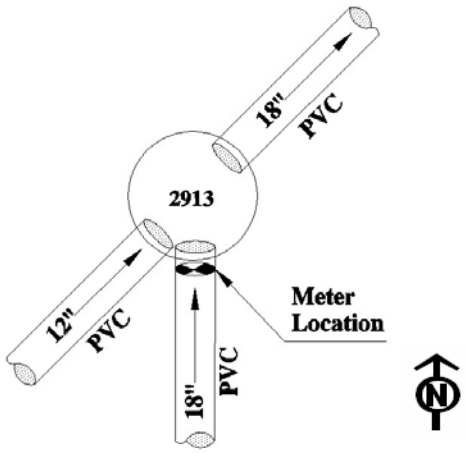
Site ID:	Address:	Meter #:	Site Quality:	Basin:
04	Constitution Ave & Kansas Ave	0777	Fair	NA

Location Map



Photos:
M4_2913_A.JPG, M4_2913_T.JPG, M4_2913_I.JPG, M4_2913_P.JPG

Planar Description



Describe MH Location
(Roadway, Easement, Field, Sidewalk)

Approximately 500' East of Constitution Avenue Next to Creek.

Site Hazards

Heavy Traffic? No
H_2S? No
LEL OK? Yes
Describe potential hazards:
Standard CSE Hazards
Must Call Fire Department at 573-596-0883 with Street Intersection and Manhole Number

Measurements

Manhole Depth (ft): 7.00
Measured Depth (in): 6.00
Manhole Dia. (in): 48.00
Velocity (fps): 3.00
Comments:

Site Conditions

Surcharge Evidence? Yes
Depth of Surcharge (ft): 4.00
Depth of Debris (in): 0.00
Comments:

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
2913	Circular	PVC	18

Site ID:	Address:	Meter #:	Site Quality:	Basin:
04	Constitution Ave & Kansas Ave	0777	Fair	NA

Area Photo

Topside Photo

Install

Probe

FLOW METER INTERROGATION

Fort Leonard Wood

Project No. 08-070 Project Location Ft. Leonard Wood, Mo

Study Name _____ Site Description Constitution Ave. & Kansas Ave.

Serial No. 0777 Site ID 04

Physical Data: Pipe Size 18 Pipe Material PVC Manhole Depth (ft) 7.00

Manhole Diameter 48" Flow Characteristic G (E) P Depth of Debris Ø

Evidence of Surcharge (Y) N Depth of Surcharge (ft) 4.00 Step Condition G (F) P None

Comments: _____

Meter Setup: Install Crew DH, JS, _____ Install Date 09/08/08 Install Time 19 : 58

Depth Offset Ø Velocity Default/Site Coefficient _____ Cycle Time 15 min

New Battery Y (N) Voltage _____ Pipe Diameter 18 Pipe Shape: (Cir.) Rect. ___ x ___ in.

Site Interrogations:

Date	Time	Before Cleaning		After Cleaning		Measured Depth (in)	Measured Velocity (fps)	Depth of Debris (in)	Battery Voltage
		Metered Depth (in)	Metered Velocity (fps)	Metered Depth (in)	Metered Velocity (fps)				
09-09	09:52	4.06	2.55	—	—	4.00	1.98	Ø	12.4
Comments: Installed Meter / offset meter 1.00" to Right									
09-09	12:39	5.04	2.27	—	—	5.00	2.01	Ø	12.4
Comments: V.S.= 49% / MG= 0.06									
9/12	1:54	6.17	0.76	6.32	2.77	6.25	2.44	0.5	12.1
Comments: V.S. = 26% MG= 1.26 Velocity probe had some gravel on it									
09-17	15:35	4.71	0.61	2.85	1.20	5.00	2.34	Ø	11.8
Comments: V.S.= 32% / MG= 5.6 / MH has surcharged & over flowed Pulled Meter									
Comments:									
Comments:									

TREKK DESIGN GROUP

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/08/08 Time: 09:52 Project No.: 08-070 Unit Serial # 0777

Line Segment US ( ) 3802 Line Segment DS ( ) 2934

Site No. 04 Crew: DH, JS

Site Location: Constitution Ave. & Kansas Ave.

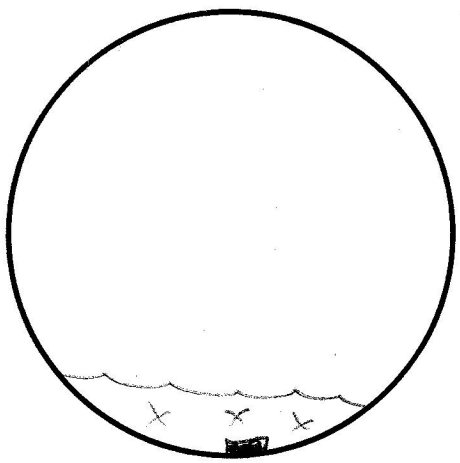
Inside Diameter	18 in.	Maximum Velocity	2.51 fps
Ruler Level	4.00 in.	Sensed Velocity	2.55 fps
Sensed Level	4.06 in.	*Check Sensed Velocity	1.98 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
2.51	1.77	1.67

2.52 · 2.51 · 2.69 · 2.49

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/09/08 Time: 12 : 42 Project No.: 08-070 Unit Serial # 0777

Line Segment US ( ) 3802 Line Segment DS ( ) 2934

Site No. 04 Crew: DH, JS

Site Location: Constitution Ave. & Kansas Ave.

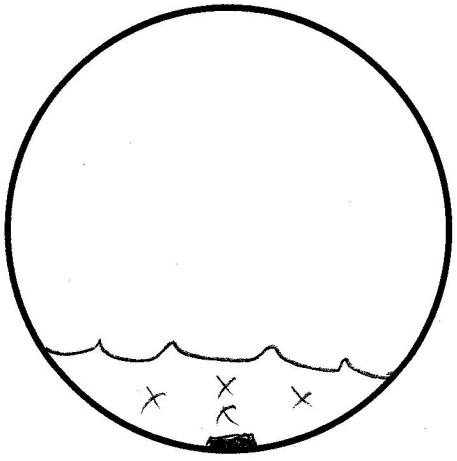
Inside Diameter	18 in.	Maximum Velocity	2.33 fps
Ruler Level	5.00 in.	Sensed Velocity	2.27 fps
Sensed Level	5.04 in.	*Check Sensed Velocity	2.01 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
2.33	2.02	1.79
	1.90	

2.28-2.28-2.28-2.24

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 9/12/08 Time: 2:05 Project No.: 08-070 Unit Serial # _____

Line Segment US ( ) 3802 Line Segment DS ( ) 2934

Site No. 4 Crew: JS, RW

Site Location: Constitution Ave + Kansas Ave

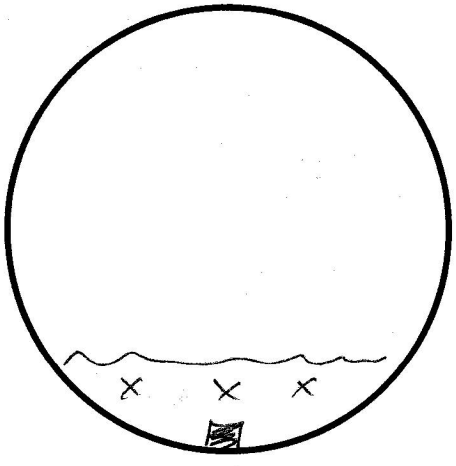
Inside Diameter	18 in.	Maximum Velocity	2.75 fps
Ruler Level	6.25 in.	Sensed Velocity	2.71 fps
Sensed Level	6.32 in.	*Check Sensed Velocity	2.44 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
2.75	2.00	2.56
2.82	2.64	2.67

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/17/08 Time: 15:42 Project No.: 08-070 Unit Serial # 0777

Line Segment US ( ) 3802 Line Segment DS ( ) 2934

Site No. 04 Crew: DH, JS

Site Location: Constitution Ave. + Kansas Ave

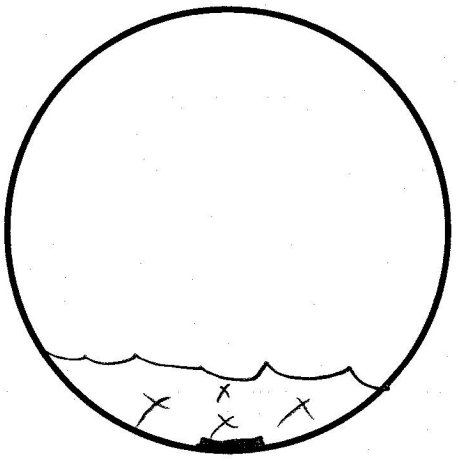
Inside Diameter	18 in.	Maximum Velocity	2.62 fps
Ruler Level	5.00 in.	Sensed Velocity	1.20 fps
Sensed Level	2.85 in.	*Check Sensed Velocity	2.34 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
2.62	2.53	2.28
	1.95	

1.37 - 1.24 - 1.15 - 1.03

CONFINED SPACE ENTRY PERMIT

COMPANY/LOCATION: TREKK / Ft. Leonard Wood
DEPARTMENT: Field Tech
DATE: 09-09-08
CONFINED SPACE TO BE ENTERED: 2913
PERMIT EXPIRATION DATE/TIME: 09-09-08 / 10:30
DESCRIPTION OF WORK TO BE PERFORMED: Replace Probe on meter #04

NATURE OF HAZARDS IN CONFINED SPACE: (check)

- ✓ Oxygen deficiency (Less than 19.5% at sea level)
- ✓ Flammable gases or vapors (greater than 10% of the lower flammable limit, or greater than 23.5% oxygen at sea level)
- ✓ Toxic gases or vapors (greater than the permissable exposure limit)
- _____ Mechanical hazards
- _____ Electrical shock
- ✓ Materials harmful to the skin
- ✓ Engulfment
- ✓ Configuration hazard
- _____ Other _____

EQUIPMENT REQUIRED FOR ENTRY AND WORK: (check)

- _____ Respirator
- ✓ Lifeline and safety harness
- ✓ Protective clothing
- _____ Hearing protection
- _____ Other _____
- _____ Lighting (Explosive Proof)
- _____ Fire Extinguishers
- ✓ Emergency Escape Retrieval Equipment
- _____ Resuscitators — Inhalator

Electrical equipment/tools:

- _____ Low voltage
- _____ Ground-fault current interrupters
- _____ Approved for hazardous locations

Respiratory protection (specify) _____
Communication aid (specify) cell phone
Rescue equipment (specify) harness, tripod, winch

PREPARATION: (check)

- _____ Notify affected departments of service interruption
- _____ Isolate - blanked or double valve, with lock and tag.
- _____ Zero energy state (Lock Out all energy sources)
- _____ Cleaned. drained, washed and purged
- ✓ Ventilation to provide fresh air
- 911 Emergency response team available
- ✓ Employees informed of specific confined space hazards
- ✓ Secure area (post, sign and flag)
- ✓ Procedures reviewed with each employee.
- ✓ Atmospheric test in compliance.
- _____ Attach hot work permit
- _____ Other _____

AUTHORIZED ENTRANTS: Jeff Stacy

AUTHORIZED ATTENDANTS: David Hamberlin

STAND BY SAFETY PERSONNEL:

TEST	Allowable Limits	Check (✓) if Required	Result 09:45 AM/PM	Result 10:00 AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM
Time								
Oxygen-min.	19.5%	✓	20.8	20.7				
Oxygen-max.	23.5%	✓	20.8	20.8				
Flammability	10% LEL / LFL	✓	0	1				
H_2S	10 ppm	✓	0	0				
Toxic (specify)								
Cl_2	.5 ppm							
CO	35 ppm	✓	0	0				
SO_2	2 ppm							
Heat	°F/°C							
Other								
Other								

Name of employee conducting atmospheric monitoring: Jeff Stacy
Instrument(s) used: Solaris

Statement of acceptable entry conditions: Good

AUTHORIZATION:
I certify that all required precautions have been taken and necessary equipment is provided for safe entry and work in this confined space

Time: 09:35 Date: 09-09-08
Name (Print) David Hamberlin
Signature [signature]

TREKK DESIGN GROUP, LLC

Tabular Data Output

Site ID Fort Leonard Wood, MO - Meter 4

Start Date 9/8/2008
End Date 9/17/2008

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
0:00	0.00	0.00	0.40	0.28	0.19	0.27	0.34	0.74	0.95	0.92
0:15	0.00	0.00	0.29	0.26	0.22	0.34	0.37	0.36	0.77	0.93
0:30	0.00	0.00	0.22	0.23	0.20	0.28	0.35	0.38	0.78	0.58
0:45	0.00	0.00	0.25	0.21	0.18	0.35	0.37	0.39	0.78	0.68
1:00	0.00	0.00	0.21	0.24	0.14	0.47	0.34	0.41	0.90	0.76
1:15	0.00	0.00	0.24	0.25	0.13	0.36	0.33	0.41	0.91	0.68
1:30	0.00	0.00	0.24	0.22	0.12	0.39	0.33	0.54	0.92	0.69
1:45	0.00	0.00	0.22	0.22	0.13	0.34	0.30	0.54	0.93	0.70
2:00	0.00	0.00	0.21	0.12	0.13	0.33	0.47	0.55	0.94	0.90
2:15	0.00	0.00	0.23	0.25	0.14	0.40	0.66	0.55	0.92	0.63
2:30	0.00	0.00	0.36	0.22	0.14	0.30	0.63	0.55	1.03	0.64
2:45	0.00	0.00	0.26	0.19	0.14	0.30	0.64	0.56	0.90	0.70
3:00	0.00	0.00	0.26	0.22	0.15	0.35	1.07	0.60	0.89	0.71
3:15	0.00	0.00	0.24	0.29	0.20	0.40	1.21	0.88	0.89	0.71
3:30	0.00	0.00	0.26	0.18	0.16	0.36	1.74	0.67	0.88	0.71
3:45	0.00	0.00	0.26	0.22	0.19	0.32	2.22	0.68	0.82	0.71
4:00	0.00	0.00	0.31	0.22	0.14	0.32	2.51	0.65	0.83	0.73
4:15	0.00	0.00	0.35	0.24	0.17	0.29	2.64	0.36	0.48	0.73
4:30	0.00	0.00	0.35	0.42	0.15	0.41	2.64	0.36	0.51	0.23
4:45	0.00	0.00	0.44	0.54	0.23	0.40	2.64	0.44	0.50	0.23
5:00	0.00	0.00	0.60	0.58	0.21	0.55	1.47	0.42	0.50	0.75
5:15	0.00	0.00	0.54	0.60	0.25	0.55	1.47	0.59	0.48	0.66
5:30	0.00	0.00	0.45	0.45	0.26	0.48	1.58	0.59	0.65	0.78
5:45	0.00	0.00	0.31	0.37	0.16	0.45	1.58	0.58	0.66	0.61
6:00	0.00	0.00	0.39	0.35	0.17	0.41	4.26	0.68	0.64	1.00
6:15	0.00	0.00	0.39	0.42	0.18	0.32	4.57	0.55	0.89	0.84
6:30	0.00	0.00	0.40	0.36	0.19	0.40	4.49	0.95	0.90	0.87
6:45	0.00	0.00	0.44	0.49	0.23	0.58	4.34	0.59	0.87	0.69
7:00	0.00	0.00	0.53	0.53	0.27	0.39	4.29	0.59	0.84	0.73
7:15	0.00	0.00	0.43	0.65	0.23	0.50	4.05	0.61	0.99	0.73
7:30	0.00	0.00	0.57	0.66	0.25	0.68	3.75	0.71	1.01	0.90
7:45	0.00	0.00	0.50	0.46	0.21	0.52	4.32	0.73	1.00	0.69
8:00	0.00	0.00	0.31	0.41	0.19	0.45	4.19	0.74	0.56	0.78
8:15	0.00	0.00	0.44	0.47	0.22	0.53	4.15	0.76	0.53	1.10
8:30	0.00	0.00	0.29	0.39	0.22	0.46	2.98	0.76	1.03	0.80
8:45	0.00	0.00	0.41	0.45	0.21	0.46	3.22	0.35	1.16	0.76
9:00	0.00	0.00	0.46	0.38	0.21	0.45	3.05	0.70	2.43	0.68
9:15	0.00	0.00	0.37	0.34	0.19	0.42	3.06	0.71	1.98	0.61
9:30	0.00	0.00	0.35	0.38	0.22	0.44	2.91	0.75	1.87	0.53
9:45	0.00	0.00	0.43	0.54	0.23	0.44	2.79	0.71	1.76	0.65
10:00	0.00	0.00	0.61	0.57	0.21	0.36	2.64	1.00	0.81	0.50
10:15	0.00	0.53	0.80	0.44	0.24	0.46	2.69	0.85	0.90	0.54
10:30	0.00	0.58	0.70	0.48	0.26	0.38	2.72	1.21	0.95	0.51
10:45	0.00	0.54	0.51	0.44	0.25	0.55	2.60	0.96	0.92	0.56
11:00	0.00	0.78	0.53	0.49	0.26	0.37	2.64	0.97	0.91	0.58
11:15	0.00	0.55	0.51	0.58	0.23	0.52	2.51	0.82	0.86	0.44
11:30	0.00	0.55	0.37	0.69	0.23	0.49	2.59	0.92	0.85	0.44
11:45	0.00	0.48	0.35	0.65	0.29	0.46	2.53	0.42	0.89	0.43
12:00	0.00	0.63	0.52	0.65	0.29	0.38	2.37	0.50	0.66	0.46
12:15	0.00	0.58	0.44	0.33	0.24	0.45	2.51	0.50	0.66	0.41
12:30	0.00	0.62	0.49	0.33	0.25	0.49	2.39	0.49	0.62	0.44

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
12:45	0.00	0.66	0.43	0.53	0.27	0.55	2.60	0.46	0.57	0.52
13:00	0.00	0.64	0.59	0.64	0.26	0.61	2.26	0.77	0.52	0.39
13:15	0.00	0.48	0.47	0.56	0.29	0.49	1.80	1.17	0.40	0.36
13:30	0.00	0.59	0.47	0.65	0.24	0.63	2.02	0.84	0.47	0.33
13:45	0.00	0.67	0.44	0.53	0.25	0.59	1.91	1.27	0.43	0.32
14:00	0.00	0.53	0.55	0.29	0.32	0.45	1.23	1.21	0.36	0.34
14:15	0.00	1.59	0.31	0.61	0.73	0.49	1.68	1.22	0.38	0.31
14:30	0.00	1.45	0.60	0.61	0.77	0.52	1.56	0.69	0.39	0.30
14:45	0.00	0.74	0.45	0.60	0.62	0.62	1.48	0.70	0.39	0.28
15:00	0.00	0.51	0.45	0.64	0.89	0.48	1.46	0.85	0.44	0.26
15:15	0.00	0.49	0.51	0.25	0.54	0.45	1.65	0.78	0.42	0.32
15:30	0.00	0.59	0.47	0.23	0.64	0.49	1.60	0.79	0.42	0.42
15:45	0.00	0.64	0.44	0.24	0.62	0.52	1.70	0.82	0.39	0.00
16:00	0.00	0.61	0.51	0.25	0.60	0.55	1.82	0.42	0.39	0.00
16:15	0.00	0.53	0.40	0.18	0.59	0.54	2.14	0.56	0.41	0.00
16:30	0.00	0.66	0.54	0.20	0.61	0.43	2.05	0.60	0.36	0.00
16:45	0.00	0.48	0.38	0.29	0.69	0.58	2.11	1.11	0.37	0.00
17:00	0.00	0.40	0.50	0.28	0.77	0.40	2.09	1.16	0.47	0.00
17:15	0.00	0.68	0.30	0.25	0.80	0.43	1.92	1.05	0.47	0.00
17:30	0.00	0.61	0.36	0.27	0.62	0.43	2.09	0.49	0.45	0.00
17:45	0.00	0.52	0.43	0.25	0.66	0.45	1.53	0.47	0.46	0.00
18:00	0.00	0.52	0.46	0.25	0.57	0.40	1.53	0.46	0.45	0.00
18:15	0.00	0.46	0.44	0.19	0.79	0.48	1.50	0.45	0.48	0.00
18:30	0.00	0.51	0.58	0.27	0.85	0.59	1.53	0.50	0.43	0.00
18:45	0.00	0.52	0.66	0.22	0.61	0.44	1.58	0.62	0.45	0.00
19:00	0.00	0.56	0.61	0.25	0.64	0.42	1.58	1.17	0.44	0.00
19:15	0.00	0.50	0.53	-0.34	0.53	0.53	1.65	1.13	0.42	0.00
19:30	0.00	0.54	0.54	-0.35	0.85	0.55	0.37	1.11	0.45	0.00
19:45	0.00	0.80	0.72	-0.40	0.72	0.55	0.39	1.16	0.36	0.00
20:00	0.00	0.86	0.79	-0.41	0.92	1.02	0.44	1.29	0.47	0.00
20:15	0.00	1.55	0.93	0.52	1.21	1.03	0.45	0.84	0.51	0.00
20:30	0.00	0.79	1.02	0.56	1.02	1.25	0.43	0.82	0.50	0.00
20:45	0.00	0.86	1.03	0.49	1.16	1.19	0.38	0.84	0.51	0.00
21:00	0.00	0.86	0.88	0.46	0.93	0.87	0.35	0.77	0.24	0.00
21:15	0.00	0.59	0.64	0.30	0.91	0.73	0.35	0.71	0.23	0.00
21:30	0.00	0.50	0.58	0.26	0.68	0.71	0.33	0.67	0.42	0.00
21:45	0.00	0.49	0.54	0.24	0.61	0.50	0.35	0.59	0.44	0.00
22:00	0.00	0.38	0.49	0.22	0.54	0.41	0.37	0.46	0.49	0.00
22:15	0.00	0.30	0.39	0.23	0.55	0.36	0.36	0.51	0.54	0.00
22:30	0.00	0.32	0.39	0.20	0.60	0.52	0.38	0.66	0.57	0.00
22:45	0.00	0.28	0.32	0.22	0.46	0.49	0.50	0.75	0.61	0.00
23:00	0.00	0.29	0.29	0.19	0.37	0.59	0.50	0.91	0.52	0.00
23:15	0.00	0.26	0.26	0.17	0.39	0.56	0.60	0.97	0.55	0.00
23:30	0.00	0.30	0.27	0.18	0.34	0.40	0.60	0.64	0.57	0.00
23:45	0.00	0.34	0.24	0.20	0.39	0.39	0.61	0.88	0.60	0.00
Average	0.00	0.61	0.45	0.34	0.40	0.49	1.80	0.72	0.69	0.40
Max.	0.00	1.59	1.03	0.69	1.21	1.25	4.57	1.29	2.43	1.10
Min.	0.00	0.26	0.21	-0.41	0.12	0.27	0.30	0.35	0.23	0.00

All Values in Million Gallons per Day (mgd)

FLOW MONITORING DATA

Project # 08-070

Flow Monitoring
Meter 5
Manhole 2913

Fort Leonard Wood, MO

08-Sep-08 to 17-Sep-08

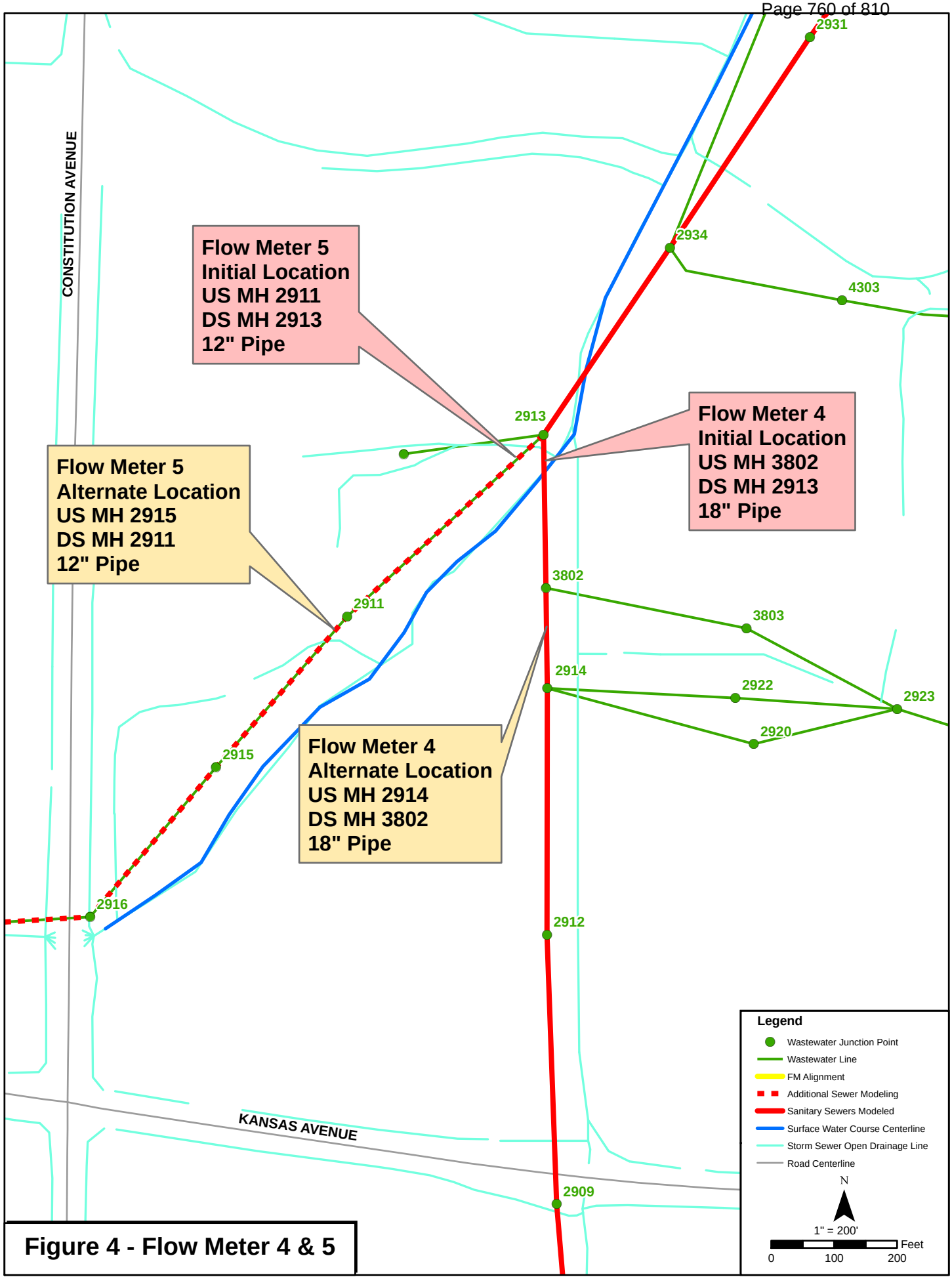


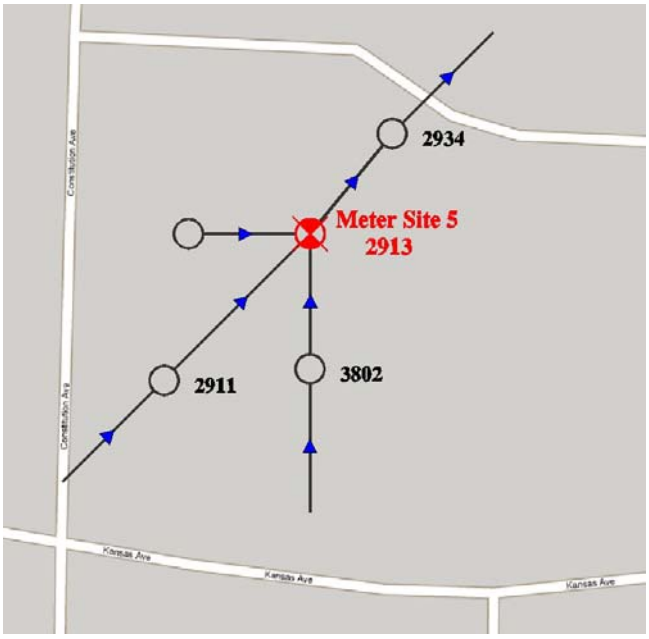
Figure 4 - Flow Meter 4 & 5

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
2913	Circular	PVC	12

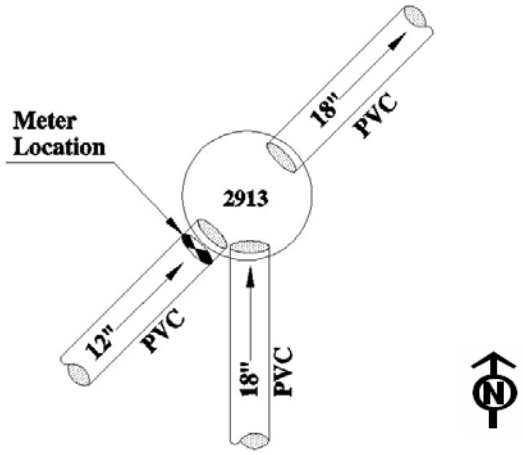
Site ID:	Address:	Meter #:	Site Quality:	Basin:
05	Constitution & Kansas Ave	0776	Fair	NA

Location Map



Photos:
M5_2913_A.JPG, M5_2913_T.JPG, M5_2913_I.JPG, M5_2913_P.JPG, M5_2913_L_09-09-08.JPG

Planar Description



Describe MH Location
(Roadway, Easement, Field, Sidewalk)

Approximately 500' East of Constitution Avenue Next to Creek.

Site Hazards

Heavy Traffic? No
H_2S? No
LEL OK? Yes
Describe potential hazards:
Standard CSE Hazards
Must Call Fire Department at 573-596-0883 with Street Intersection and Manhole Number

Measurements

Manhole Depth (ft): 7.00
Measured Depth (in): 6.00
Manhole Dia. (in): 48.00
Velocity (fps): 4.00
Comments:

Site Conditions

Surcharge Evidence? Yes
Depth of Surcharge (ft): 4.00
Depth of Debris (in): 0.00
Comments:

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
2913	Circular	PVC	12

Site ID:	Address:	Meter #:	Site Quality:	Basin:
05	Constitution & Kansas Ave	0776	Fair	NA

Area Photo

Topside Photo

Install

Probe

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
2913	Circular	PVC	12

Site ID:	Address:	Meter #:	Site Quality:	Basin:
05	Constitution & Kansas Ave	07776	Fair	NA

Flow Depth 09/09/08	Flow Depth
	
Flow Depth	**Flow Depth**

FLOW METER INTERROGATION

Fort Leonard Wood

Project No. 08-070 Project Location Ft. Leonard Wood, MO

Study Name _____ Site Description Constitution Ave & Kansas Ave

Serial No. 0776 Site ID 05

Physical Data: Pipe Size 12" Pipe Material PVC Manhole Depth (ft) 7.0

Manhole Diameter 48" Flow Characteristic G (F) P Depth of Debris Ø

Evidence of Surcharge (Y) N Depth of Surcharge (ft) 4.0 Step Condition G (F) P None

Comments: _____

Meter Setup: Install Crew JS, DH, ____ Install Date 9/8/08 Install Time 19:58

Depth Offset Ø Velocity Default/Site Coefficient _____ Cycle Time 15 min

New Battery Y (N) Voltage 11.1 Pipe Diameter 12 Pipe Shape: (Cir.) Rect. ___ x ___ in.

Site Interrogations:

Date	Time	Before Cleaning		After Cleaning		Measured Depth (in)	Measured Velocity (fps)	Depth of Debris (in)	Battery Voltage
		Metered Depth (in)	Metered Velocity (fps)	Metered Depth (in)	Metered Velocity (fps)				
9-09	09:00	3.66	4.95	—	—	3.62	4.74	Ø	12.2
Comments: Installed Meters / Dir. of flow 2-07 MS_2913_L_09-09-08									
09-09	12:47	3.07	5.44	—	—	3.00	4.73	Ø	12.3
Comments: V.S. = 99% / MG: 0.05									
9/12	2:15	3.10	4.97	3.09	4.79	3.50	4.62	Ø	12.4
Comments: V.S = 94% MG = 1.93									
09-17	15:37	0.00	0.00	0.00	0.00	4.50	4.77	Ø	11.8
Comments: V.S.: N/A / MG: 3.00 / MH surcharged + overflowed Pulled meter									
Comments: _____									

Comments: _____

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 9/8/08 Time: 19:58 Project No.: 08-070 Unit Serial # 0776

Line Segment US ( ) 2911 Line Segment DS (2913

Site No. 05 Crew: JS, DH

Site Location: Constitution Ave & Kansas Ave

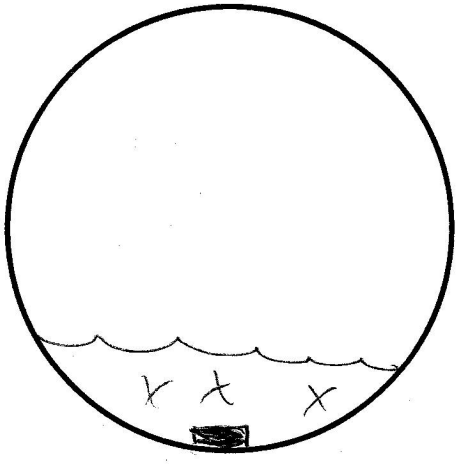
Inside Diameter	12 in.	Maximum Velocity	4.81 fps
Ruler Level	3.62 in.	Sensed Velocity	4.95 fps
Sensed Level	3.66 in.	*Check Sensed Velocity	4.74 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
4.61	4.80	4.81

4.75-5.07-4.93-5.05

TREKK DESIGN GROUP, LLC

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/09/08 Time: 12 : 48 Project No.: 08-070 Unit Serial # 0776

Line Segment US ( ) 2911 Line Segment DS ( ) 2913

Site No. 05 Crew: JS, DH

Site Location: Constitution Ave. & Kansas Ave.

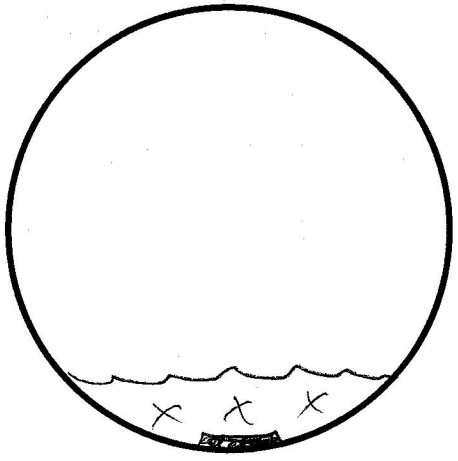
Inside Diameter	12 in.	Maximum Velocity	4.98 fps
Ruler Level	3.00 in.	Sensed Velocity	5.44 fps
Sensed Level	3.07 in.	*Check Sensed Velocity	4.73 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
4.68	4.98	4.52

5.45 - 5.36 - 5.43 - 5.51

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 9/12/08 Time: 2:15 Project No.: 08-070 Unit Serial # 0776

Line Segment US ( ) 2911 Line Segment DS ( ) 2913

Site No. 05 Crew: JS, RW

Site Location: Constitution + Kansas Ave

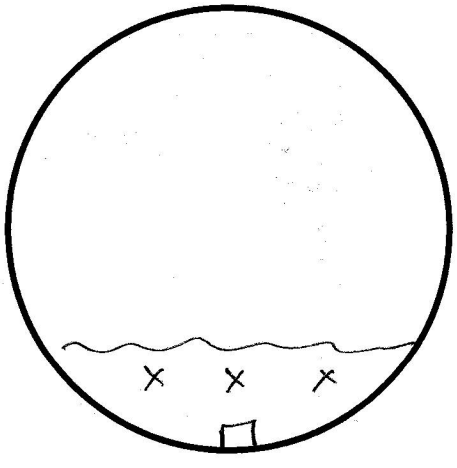
Inside Diameter	12 in.	Maximum Velocity	4.75 fps
Ruler Level	3.5 in.	Sensed Velocity	4.99 fps
Sensed Level	3.09 in.	*Check Sensed Velocity	4.62 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
4.62	4.50	4.75
5.19	4.95	4.84

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/17/08 Time: 16:03 Project No.: 08-070 Unit Serial # 0776

Line Segment US ( ) 2911 Line Segment DS ( ) 2913

Site No. 05 Crew: DH, JS

Site Location: Constitution Ave. & Kansas Ave.

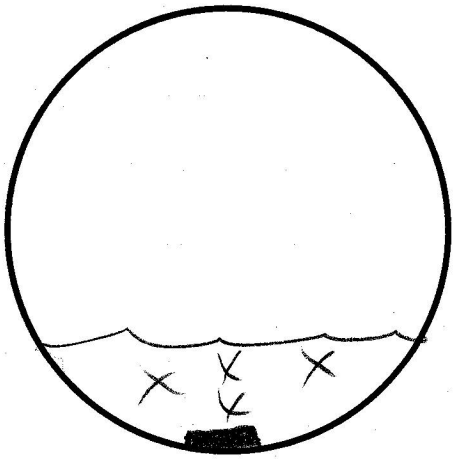
Inside Diameter	12 in.	Maximum Velocity	5.20 fps
Ruler Level	4.50 in.	Sensed Velocity	0.00 fps
Sensed Level	0.00 in.	*Check Sensed Velocity	4.77 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
4.50	5.20	4.94
	4.47	

CONFINED SPACE ENTRY PERMIT

COMPANY/LOCATION: Trekk / Ft Leon. WI. DEPARTMENT: Field DATE: 9/8/08

CONFINED SPACE TO BE ENTERED: MH 2913 PERMIT EXPIRATION DATE/TIME: 9/8/08 10:00

DESCRIPTION OF WORK TO BE PERFORMED: Install Meters

NATURE OF HAZARDS IN CONFINED SPACE: (check)

- ✓ Oxygen deficiency (Less than 19.5% at sea level)
- ✓ Flammable gases or vapors (greater than 10% of the lower flammable limit, or greater than 23.5% oxygen at sea level)
- ✓ Toxic gases or vapors (greater than the permissable exposure limit)
- _____ Mechanical hazards
- _____ Electrical shock
- _____ Materials harmful to the skin
- ✓ Engulfment
- _____ Configuration hazard
- _____ Other _____

EQUIPMENT REQUIRED FOR ENTRY AND WORK: (check)

- _____ Respirator
- ✓ Lifeline and safety harness
- _____ Protective clothing
- _____ Hearing protection
- _____ Other _____
- _____ Lighting (Explosive Proof)
- _____ Fire Extinguishers
- ✓ Emergency Escape Retrieval Equipment
- _____ Resuscitators — Inhalator

Electrical equipment/tools:

- _____ Low voltage
- _____ Ground-fault current interrupters
- _____ Approved for hazardous locations

Respiratory protection (specify) _____

Communication aid (specify) ✓ _____

Rescue equipment (specify) ✓ _____

PREPARATION: (check)

- _____ Notify affected departments of service interruption
- _____ Isolate - blanked or double valve, with lock and tag.
- _____ Zero energy state (Lock Out all energy sources)
- _____ Cleaned. drained, washed and purged
- ✓ Ventilation to provide fresh air
- ✓ Emergency response team available
- ✓ Employees informed of specific confined space hazards
- ✓ Secure area (post, sign and flag)
- ✓ Procedures reviewed with each employee.
- ✓ Atmospheric test in compliance.
- _____ Attach hot work permit
- _____ Other _____

AUTHORIZED ENTRANTS:

Jeff Stacy

AUTHORIZED ATTENDANTS:

Dave Hamberlin

STAND BY SAFETY PERSONNEL:

TEST	Allowable Limits	Check (✓) if Required	Result In AM/PM	Result Out AM/PM	Result AM/PM	Result AM/PM	Result AM/PM	Result AM/PM
Time			7:55 AM	9:00 AM	: AM/PM	: AM/PM	: AM/PM	: AM/PM
Oxygen-min.	19.5%	✓	20.8	20.8				
Oxygen-max.	23.5%	✓	20.8	20.8				
Flammability	10% LEL / LFL	✓	0	0				
H_2S	10 ppm	✓	0	0				
Toxic (specify)								
Cl_2	.5 ppm							
CO	35 ppm	✓	0	0				
SO_2	2 ppm							
Heat	°F/°C							
Other								
Other								

Name of employee conducting atmospheric monitoring: Jeff Stacy Instrument(s) used: MSA Solaris

Statement of acceptable entry conditions Good

AUTHORIZATION:
I certify that all required precautions have been taken and necessary equipment is provided for safe entry and work in this confined space

Time: 7:55 Date: 9/8/08

Name (Print) Jeff Stacy

Signature _____

TREKK DESIGN GROUP, LLC

Tabular Data Output

Site ID Fort Leonard Wood, MO - Meter 5

Start Date 9/8/2008
End Date 1/0/1900

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Sat 1/0/1900	Sat 1/0/1900
0:00	0.00	0.00	0.44	0.30	0.33	0.31	0.32	2.03	0.00	0.00
0:15	0.00	0.00	0.30	0.36	0.41	0.35	0.31	2.03	0.00	0.00
0:30	0.00	0.00	0.26	0.28	0.36	0.40	0.31	2.03	0.00	0.00
0:45	0.00	0.00	0.24	0.29	0.35	0.45	0.31	2.03	0.00	0.00
1:00	0.00	0.00	0.26	0.28	0.35	0.50	0.27	2.03	0.00	0.00
1:15	0.00	0.00	0.28	0.28	0.32	0.35	0.28	2.03	0.00	0.00
1:30	0.00	0.00	0.25	0.29	0.34	0.38	0.28	2.03	0.00	0.00
1:45	0.00	0.00	0.24	0.31	0.36	0.39	0.37	2.03	0.00	0.00
2:00	0.00	0.00	0.21	0.30	0.32	0.31	0.57	2.03	0.00	0.00
2:15	0.00	0.00	0.23	0.32	0.33	0.27	0.56	2.03	0.00	0.00
2:30	0.00	0.00	0.24	0.28	0.37	0.35	0.53	2.03	0.00	0.00
2:45	0.00	0.00	0.25	0.31	0.41	0.31	0.82	2.03	0.00	0.00
3:00	0.00	0.00	0.27	0.28	0.34	0.34	0.98	2.03	0.00	0.00
3:15	0.00	0.00	0.26	0.31	0.36	0.32	1.25	2.03	0.00	0.00
3:30	0.00	0.00	0.26	0.27	0.36	0.34	2.26	2.03	0.00	0.00
3:45	0.00	0.00	0.29	0.41	0.45	0.30	2.48	2.03	0.00	0.00
4:00	0.00	0.00	0.36	0.47	0.48	0.38	2.05	2.03	0.00	0.00
4:15	0.00	0.00	0.57	0.65	0.83	0.35	1.74	2.03	0.00	0.00
4:30	0.00	0.00	0.85	0.91	0.95	0.47	1.97	2.03	0.00	0.00
4:45	0.00	0.00	0.70	0.86	1.02	0.52	2.03	2.03	0.00	0.00
5:00	0.00	0.00	0.66	0.84	0.71	0.56	2.03	2.03	0.00	0.00
5:15	0.00	0.00	0.55	0.79	0.51	0.71	2.03	2.03	0.00	0.00
5:30	0.00	0.00	0.51	0.73	0.60	0.62	2.03	2.03	0.00	0.00
5:45	0.00	0.00	0.53	0.47	0.53	0.62	2.03	2.03	0.00	0.00
6:00	0.00	0.00	0.48	0.45	0.58	0.54	0.00	2.03	0.00	0.00
6:15	0.00	0.00	0.57	0.69	0.75	0.64	2.03	2.03	0.00	0.00
6:30	0.00	0.00	0.99	0.87	0.91	0.76	2.03	2.03	0.00	0.00
6:45	0.00	0.00	1.01	0.90	1.06	0.77	2.03	2.03	0.00	0.00
7:00	0.00	0.00	0.73	0.79	0.94	0.66	0.00	2.03	0.00	0.00
7:15	0.00	0.00	0.57	0.64	0.84	0.59	2.03	2.03	0.00	0.00
7:30	0.00	0.00	0.67	0.64	0.80	0.77	0.00	2.03	0.00	0.00
7:45	0.00	0.00	0.74	0.55	0.59	0.61	2.03	2.03	0.00	0.00
8:00	0.00	0.00	0.50	0.55	0.58	0.56	0.00	2.03	0.00	0.00
8:15	0.00	0.00	0.50	0.53	0.59	0.57	2.03	2.03	0.00	0.00
8:30	0.00	0.00	0.64	0.43	0.51	0.57	2.03	2.03	0.00	0.00
8:45	0.00	0.00	0.60	0.50	0.62	0.58	2.03	2.03	0.00	0.00
9:00	0.00	0.55	0.48	0.66	0.65	0.54	2.03	2.03	0.00	0.00
9:15	0.00	0.55	0.50	0.50	0.57	0.42	2.03	2.03	0.00	0.00
9:30	0.00	0.39	0.54	0.58	0.69	0.50	0.00	2.03	0.00	0.00
9:45	0.00	0.40	0.44	0.53	0.57	0.53	2.03	2.03	0.00	0.00
10:00	0.00	0.29	0.68	0.56	0.50	0.57	2.03	2.03	0.00	0.00
10:15	0.00	0.39	0.54	0.53	0.52	0.53	2.03	2.03	0.00	0.00
10:30	0.00	0.43	0.58	0.55	0.55	0.49	2.03	2.03	0.00	0.00
10:45	0.00	0.32	0.63	0.42	0.53	0.49	2.03	2.03	0.00	0.00
11:00	0.00	0.36	0.52	0.51	0.67	0.54	2.03	2.03	0.00	0.00
11:15	0.00	0.32	0.52	0.53	0.52	0.56	2.03	2.03	0.00	0.00
11:30	0.00	0.33	0.47	0.63	0.44	0.71	2.03	2.03	0.00	0.00
11:45	0.00	0.30	0.52	0.60	0.51	0.64	0.00	2.03	0.00	0.00
12:00	0.00	0.31	0.58	0.53	0.56	0.60	2.03	2.03	0.00	0.00
12:15	0.00	0.30	0.46	0.44	0.59	0.53	2.03	2.03	0.00	0.00
12:30	0.00	0.44	0.47	0.49	0.62	0.54	2.03	2.03	0.00	0.00

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Sat 1/0/1900	Sat 1/0/1900
12:45	0.00	0.44	0.64	0.50	0.59	0.49	2.03	2.03	0.00	0.00
13:00	0.00	0.48	0.60	0.69	0.71	0.55	2.03	2.03	0.00	0.00
13:15	0.00	0.37	0.64	0.55	0.72	0.46	2.03	2.03	0.00	0.00
13:30	0.00	0.37	0.60	0.62	0.59	0.49	2.03	2.03	0.00	0.00
13:45	0.00	0.47	0.61	0.65	0.49	0.62	2.03	2.03	0.00	0.00
14:00	0.00	0.48	0.63	0.76	0.63	0.55	2.03	2.03	0.00	0.00
14:15	0.00	1.23	0.62	0.80	0.54	0.52	2.03	2.03	0.00	0.00
14:30	0.00	0.65	0.73	0.78	0.75	0.57	2.03	2.03	0.00	0.00
14:45	0.00	0.41	0.59	0.68	0.57	0.53	2.03	2.03	0.00	0.00
15:00	0.00	0.44	0.59	0.68	0.75	0.53	2.03	2.03	0.00	0.00
15:15	0.00	0.49	0.63	0.60	0.63	0.55	2.03	2.03	0.00	0.00
15:30	0.00	0.46	0.67	0.57	0.55	0.72	2.03	2.03	0.00	0.00
15:45	0.00	0.50	0.68	0.56	0.58	0.61	2.03	2.03	0.00	0.00
16:00	0.00	0.47	0.69	0.55	0.53	0.48	2.03	2.03	0.00	0.00
16:15	0.00	0.47	0.60	0.55	0.69	0.48	2.03	2.03	0.00	0.00
16:30	0.00	0.40	0.51	0.50	0.63	0.48	2.03	2.03	0.00	0.00
16:45	0.00	0.46	0.61	0.69	0.65	0.64	2.03	2.03	0.00	0.00
17:00	0.00	0.39	0.62	0.63	0.50	0.48	2.03	2.03	0.00	0.00
17:15	0.00	0.46	0.57	0.67	0.61	0.54	2.03	2.03	0.00	0.00
17:30	0.00	0.58	0.67	0.74	0.71	0.55	2.03	2.03	0.00	0.00
17:45	0.00	0.55	0.68	0.77	0.83	0.60	2.03	2.03	0.00	0.00
18:00	0.00	0.55	0.77	0.73	0.78	0.54	2.03	2.03	0.00	0.00
18:15	0.00	0.61	0.72	0.80	0.92	0.67	2.03	2.03	0.00	0.00
18:30	0.00	0.55	0.71	0.87	0.92	0.65	2.03	2.03	0.00	0.00
18:45	0.00	0.70	0.78	0.90	0.94	0.76	2.03	2.03	0.00	0.00
19:00	0.00	0.78	0.90	1.00	0.94	0.83	2.03	2.03	0.00	0.00
19:15	0.00	0.65	1.02	1.01	0.90	0.83	2.03	2.03	0.00	0.00
19:30	0.00	0.77	1.08	1.34	1.10	0.75	2.03	2.03	0.00	0.00
19:45	0.00	0.93	1.22	1.63	1.11	0.80	2.03	2.03	0.00	0.00
20:00	0.00	1.09	1.21	1.53	1.24	1.08	2.03	2.03	0.00	0.00
20:15	0.00	1.35	1.18	1.51	1.35	1.12	2.03	2.03	0.00	0.00
20:30	0.00	1.48	1.54	1.76	1.17	1.52	2.03	2.03	0.00	0.00
20:45	0.00	1.36	1.39	1.59	1.34	1.27	2.03	2.03	0.00	0.00
21:00	0.00	0.97	1.17	1.60	1.03	1.02	2.03	0.00	0.00	0.00
21:15	0.00	0.85	1.03	1.10	0.83	0.94	2.03	0.00	0.00	0.00
21:30	0.00	0.57	0.74	0.88	0.82	0.72	2.03	0.00	0.00	0.00
21:45	0.00	0.55	0.70	0.73	0.62	0.55	2.03	0.00	0.00	0.00
22:00	0.00	0.46	0.61	0.67	0.64	0.42	2.03	0.00	0.00	0.00
22:15	0.00	0.34	0.48	0.62	0.60	0.45	2.03	0.00	0.00	0.00
22:30	0.00	0.36	0.51	0.63	0.49	0.40	2.03	0.00	0.00	0.00
22:45	0.00	0.35	0.40	0.57	0.53	0.38	2.03	0.00	0.00	0.00
23:00	0.00	0.37	0.36	0.41	0.41	0.48	2.03	0.00	0.00	0.00
23:15	0.00	0.28	0.38	0.43	0.42	0.47	2.03	0.00	0.00	0.00
23:30	0.00	0.26	0.38	0.40	0.39	0.40	2.03	0.00	0.00	0.00
23:45	0.00	0.27	0.31	0.38	0.36	0.37	2.03	0.00	0.00	0.00
Average	0.00	0.57	0.60	0.65	0.64	0.57	1.69	1.78	0.00	0.00
Max.	0.00	1.48	1.54	1.76	1.35	1.52	2.48	2.03	0.00	0.00
Min.	0.00	0.26	0.21	0.27	0.32	0.27	0.00	0.00	0.00	0.00

All Values in Million Gallons per Day (mgd)

FLOW MONITORING DATA

Project # 08-070

Flow Monitoring
Meter 6
Manhole 4109

Fort Leonard Wood, MO

08-Sep-08 to 17-Sep-08

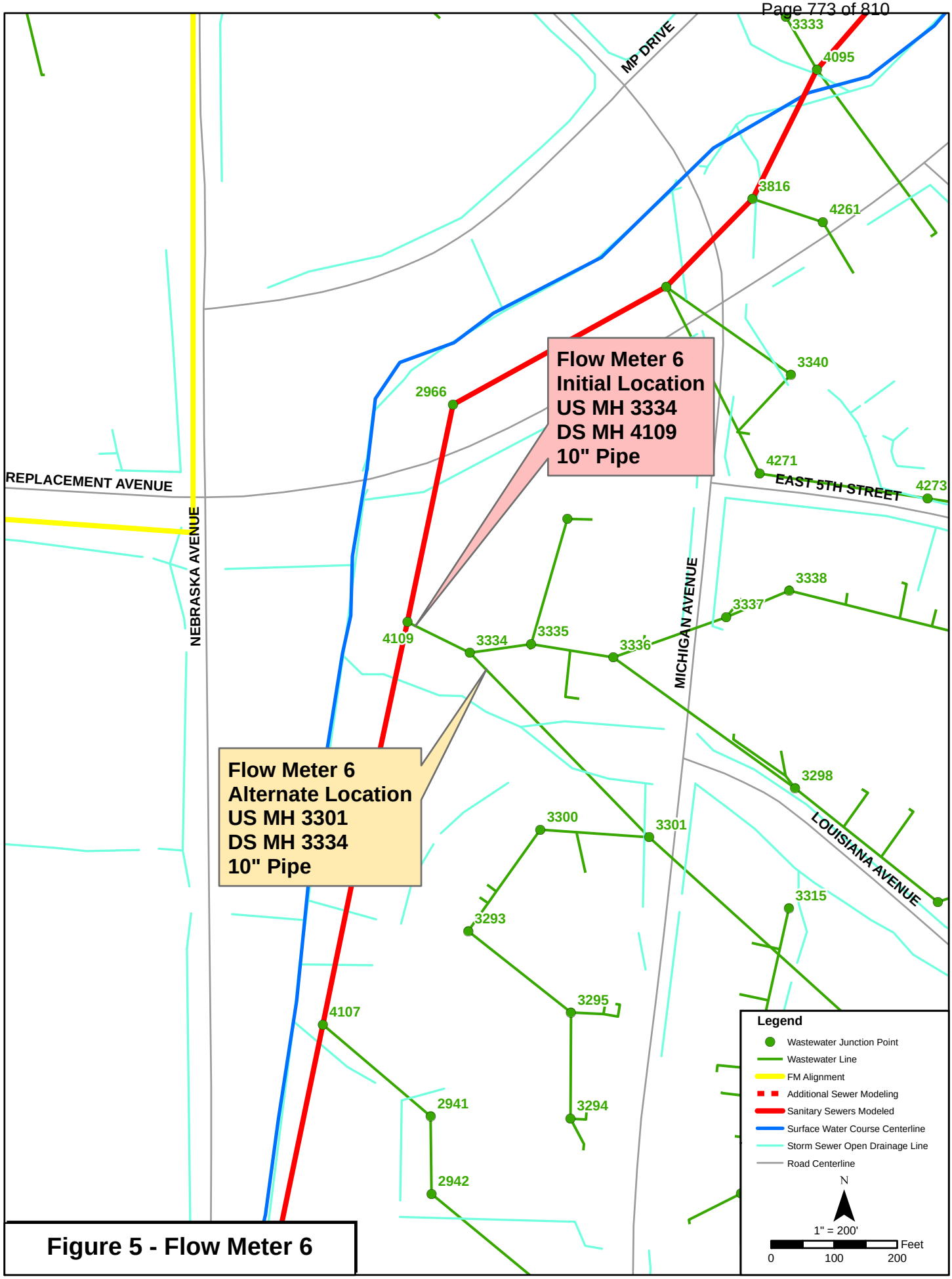


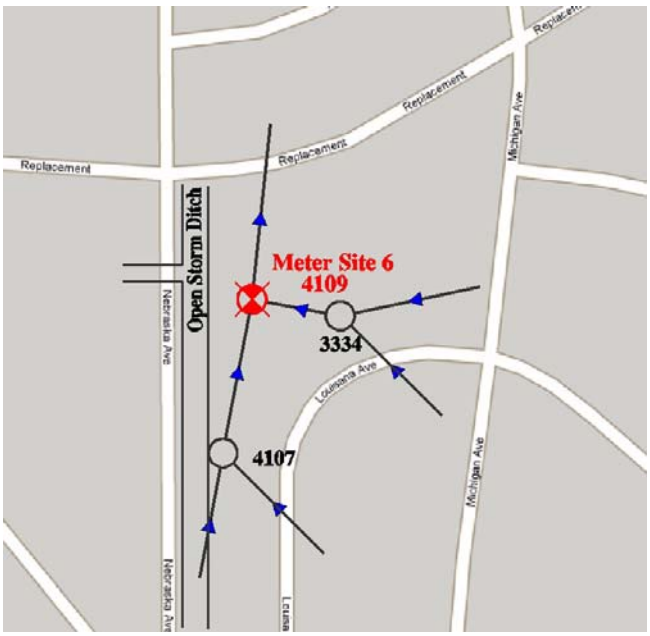
Figure 5 - Flow Meter 6

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
4109	Circular	PVC	10

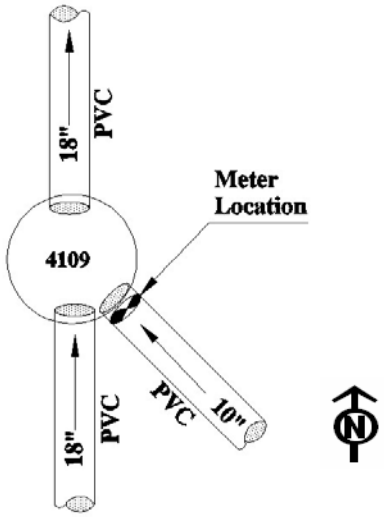
Site ID:	Address:	Meter #:	Site Quality:	Basin:
06	Nebraska Ave & Replacement Ave	1540	Fair	NA

Location Map



Photos:
M6_4109_A.JPG, M6_4109_T.JPG, M6_4109_I.JPG, M6_4109_P.JPG, M6_4109_L_09-09-08.JPG, M6_4109_L_09-12-08.JPG, M6_4109_L_09-17-08.JPG

Planar Description



Describe MH Location
(Roadway, Easement, Field, Sidewalk)

South East of Intersection of Nebraska Avenue and Replacement Avenue – Across Open Storm Ditch in Grass Field.

Site Hazards

Heavy Traffic? No
H_2S? Yes
LEL OK? No
Describe potential hazards:
Standard CSE Hazards
Must Call Fire Department at 573-596-0883 with Street Intersection and Manhole Number

Measurements

Manhole Depth (ft): 9.60
Measured Depth (in): 1.50
Manhole Dia. (in): 48.00
Velocity (fps): 1.00
Comments:

Site Conditions

Surcharge Evidence? No
Depth of Surcharge (ft): 0.00
Depth of Debris (in): 0.00
Comments:

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
4109	Circular	PVC	10

Site ID:	Address:	Meter #:	Site Quality:	Basin:
06	Nebraska Ave & Replacement Ave	1540	Fair	NA

Area Photo

Topside Photo

Install

Probe

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
4109	Circular	PVC	10

Site ID:	Address:	Meter #:	Site Quality:	Basin:
06	Nebraska Ave & Replacement Ave	1540	Fair	NA

Flow Depth 09/09/08

Flow Depth 09/12/08

Flow Depth 09/17/08

Flow Depth

FLOW METER INTERROGATION
Fort Leonard Wood

Project No. 08-070 Project Location Ft. Leonard Wood, Mo
Study Name _____ Site Description Nebraska Ave. + Replacement Ave.
Serial No. 1540 Site ID 06

Physical Data: Pipe Size 10 Pipe Material PVC Manhole Depth (ft) 9.60
Manhole Diameter 48" Flow Characteristic G (F) P Depth of Debris Ø
Evidence of Surcharge Y (N) Depth of Surcharge (ft) Ø Step Condition G (F) P None
Comments: _____

Meter Setup: Install Crew DH, JS, _____ Install Date 09/08/08 Install Time 18 : 23
Depth Offset Ø Velocity Default/Site Coefficient _____ Cycle Time 15 min
New Battery Y (N) Voltage 11.4 Pipe Diameter 10 Pipe Shape: (Cir) Rect. ___ x ___ in.

Site Interrogations:

Date	Time	Before Cleaning		After Cleaning		Measured Depth (in)	Measured Velocity (fps)	Depth of Debris (in)	Battery Voltage
		Metered Depth (in)	Metered Velocity (fps)	Metered Depth (in)	Metered Velocity (fps)				
09-08	18:34	1.01	0.48	—	—	1.00	0.63	Ø	11.4
Comments: Installed Meter									
09-09	11:49	1.22	0.60	—	—	1.20	0.80	Ø	11.6
Comments: V.S.= 78%/MG=0.02/Pic of flow 2-076									
9/12	2:23	1.69	0.97	1.69	0.88	1.68	1.14	Ø	11.4
Comments: V.S.= 92% MG=0.13 Pic of flow = M-05 M6-4109-L-09-12-08									
09-17	15:06	0.00	0.00	0.00	0.00	1.80	0.98	Ø	11.3
Comments: V.S.= N/A /MG:0.5 /Pic of flow 0-004 Pulled Meter M6-4109-L-09-17-08									
Comments: _____									
Comments: _____									

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/08/08 Time: 18 : 35 Project No.: 08-070 Unit Serial # 1546

Line Segment US ( ) 3334 Line Segment DS ( ) 4109

Site No. 06 Crew: DH, JS

Site Location: Nebraska Ave. & Replacement Ave.

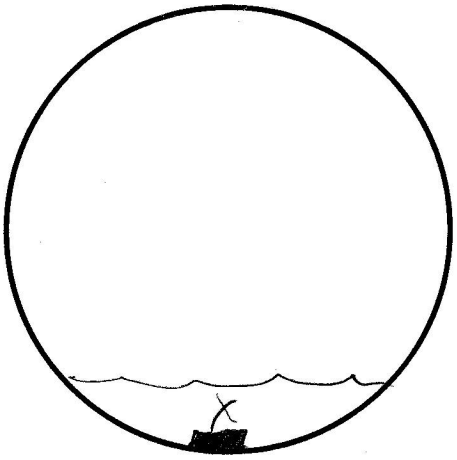
Inside Diameter	10 in.	Maximum Velocity	0.63 fps
Ruler Level	1.00 in.	Sensed Velocity	0.48 fps
Sensed Level	1.01 in.	*Check Sensed Velocity	0.63 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
	0.63	

0.54 - 0.42

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/09/08 Time: 11 : 52 Project No.: 08-070 Unit Serial # 1540

Line Segment US ( ) 3334 Line Segment DS ( ) 4109

Site No. 06 Crew: DH, JS

Site Location: Nebraska Ave. & Replacement Ave.

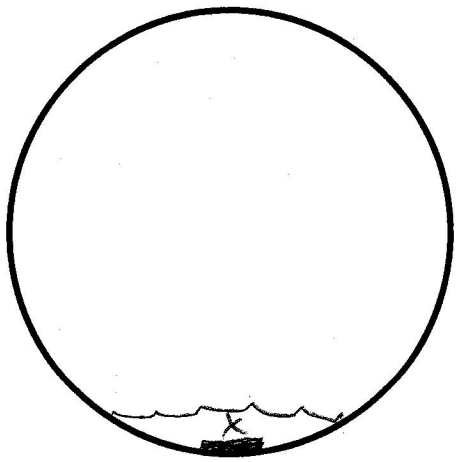
Inside Diameter	10 in.	Maximum Velocity	0.80 fps
Ruler Level	1.20 in.	Sensed Velocity	0.60 fps
Sensed Level	1.22 in.	*Check Sensed Velocity	0.80 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
	0.80	

0.52 - 0.69

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 9/12/08 Time: 2:24 Project No.: 08-070 Unit Serial # 1540

Line Segment US ( ) 3334 Line Segment DS ( ) 4109

Site No. 06 Crew: JS, RW

Site Location: Nebraska Ave + Replacement Ave

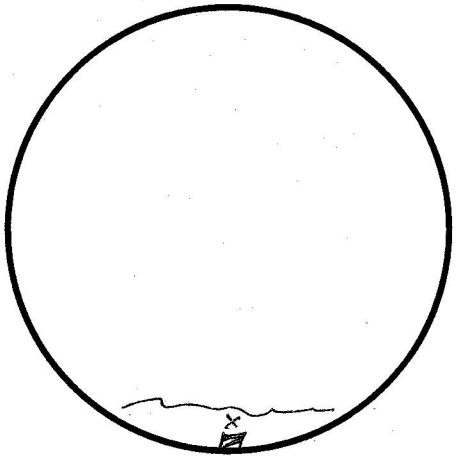
Inside Diameter	10 in.	Maximum Velocity	1.49 fps
Ruler Level	1.68 in.	Sensed Velocity	1.14 fps
Sensed Level	1.69 in.	*Check Sensed Velocity	1.49 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
	1.49	

1.14

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/17/08 Time: 15:16 Project No.: 08-070 Unit Serial # 1540

Line Segment US ( ) 3334 Line Segment DS ( ) 4109

Site No. 06 Crew: DH, JS

Site Location: Nebraska Ave & Replacement Ave.

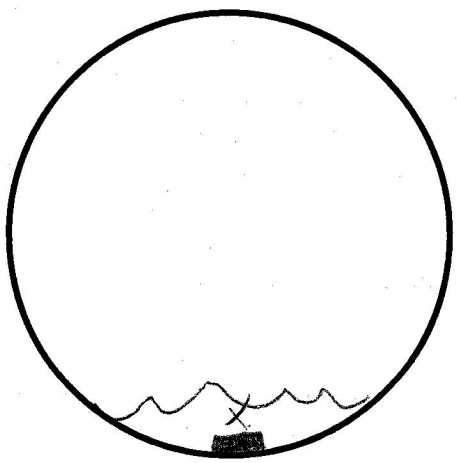
Inside Diameter	10 in.	Maximum Velocity	0.98 fps
Ruler Level	1.80 in.	Sensed Velocity	0.98 fps
Sensed Level	0.00 in.	*Check Sensed Velocity	0.00 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
	0.98	

CONFINED SPACE ENTRY PERMIT

COMPANY/LOCATION: Trekk / Ft Leonwd

DEPARTMENT: Field

DATE: 9/8/08

CONFINED SPACE TO BE ENTERED: MH 4109

PERMIT EXPIRATION DATE/TIME: 9/8/08 7:00

DESCRIPTION OF WORK TO BE PERFORMED: Install Meter

NATURE OF HAZARDS IN CONFINED SPACE: (check)

- ✓ Oxygen deficiency (Less than 19.5% at sea level)
- ✓ Flammable gases or vapors (greater than 10% of the lower flammable limit, or greater than 23.5% oxygen at sea level)
- ✓ Toxic gases or vapors (greater than the permissable exposure limit)
- ___ Mechanical hazards
- ___ Electrical shock
- ✓ Materials harmful to the skin
- ✓ Engulfment
- ___ Configuration hazard
- ___ Other

EQUIPMENT REQUIRED FOR ENTRY AND WORK: (check)

- ___ Respirator
- ✓ Lifeline and safety harness
- ___ Protective clothing
- ___ Hearing protection
- ___ Other
- ___ Lighting (Explosive Proof)
- ___ Fire Extinguishers
- ✓ Emergency Escape Retrieval Equipment
- ___ Resuscitators — Inhalator

Electrical equipment/tools:

- ___ Low voltage
- ___ Ground-fault current interrupters
- ___ Approved for hazardous locations

Respiratory protection (specify)

Communication aid (specify) cell

Rescue equipment (specify) tripod w/winch

PREPARATION: (check)

- ___ Notify affected departments of service interruption
- ___ Isolate - blanked or double valve, with lock and tag.
- ___ Zero energy state (Lock Out all energy sources)
- ___ Cleaned, drained, washed and purged
- ✓ Ventilation to provide fresh air
- ✓ Emergency response team available
- ✓ Employees informed of specific confined space hazards
- ✓ Secure area (post, sign and flag)
- ✓ Procedures reviewed with each employee.
- ✓ Atmospheric test in compliance.
- ___ Attach hot work permit
- ___ Other

AUTHORIZED ENTRANTS:

Jeff Stacy

AUTHORIZED ATTENDANTS:

Dave Hamberlin

STAND BY SAFETY PERSONNEL:

TEST	Allowable Limits	Check (✓) if Required	In Result AM/PM	Out Result AM/PM	Result AM/PM	Result AM/PM	Result AM/PM	Result AM/PM
Time			5:50 AM	6:45 AM				
Oxygen-min.	19.5%	✓	20.1	19.6				
Oxygen-max.	23.5%	✓	20.8	20.8				
Flammability	10% LEL / LFL	✓	1	1				
H_2S	10 ppm	✓	9	15				
Toxic (specify)								
Cl_2	5 ppm							
CO	35 ppm	✓	7	7				
SO_2	2 ppm							
Heat	°F/°C							
Other								
Other								

Name of employee conducting atmospheric monitoring: Jeff Stacy

Instrument(s) used: MSA Solaris

Statement of acceptable entry conditions Good

AUTHORIZATION:

I certify that all required precautions have been taken and necessary equipment is provided for safe entry and work in this confined space

Time: 6:00 Date: 9/8/08

Name (Print) Jeff Stacy

Signature

TREKK DESIGN GROUP, LLC

Tabular Data Output

Site ID Fort Leonard Wood, MO - Meter 6

Start Date 9/8/2008
End Date 9/17/2008

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
0:00	0.00	0.02	0.10	0.01	0.01	0.03	0.01	0.03	0.03	0.01
0:15	0.00	0.01	0.04	0.02	0.03	0.02	0.07	0.04	0.03	0.03
0:30	0.00	0.01	0.05	0.03	0.01	0.08	0.06	0.14	0.04	0.03
0:45	0.00	0.01	0.03	0.01	0.04	0.02	0.03	0.03	0.03	0.06
1:00	0.00	0.02	0.02	0.01	0.01	0.01	0.03	0.07	0.02	0.05
1:15	0.00	0.04	0.02	0.02	0.01	0.02	0.03	0.03	0.07	0.05
1:30	0.00	0.01	0.01	0.04	0.03	0.01	0.00	0.04	0.01	0.05
1:45	0.00	0.03	0.01	0.04	0.02	0.04	0.01	0.19	0.01	0.01
2:00	0.00	0.02	0.01	0.07	0.02	0.01	0.03	0.03	0.02	0.01
2:15	0.00	0.02	0.01	0.04	0.02	0.01	0.01	0.09	0.02	0.03
2:30	0.00	0.01	0.07	0.03	0.01	0.01	0.01	0.06	0.01	0.03
2:45	0.00	0.01	0.01	0.03	0.02	0.02	0.04	0.05	0.07	0.00
3:00	0.00	0.02	0.01	0.02	0.05	0.03	0.06	0.05	0.01	0.00
3:15	0.00	0.01	0.01	0.02	0.03	0.01	0.03	0.07	0.04	0.01
3:30	0.00	0.01	0.01	0.01	0.04	0.01	0.00	0.04	0.06	0.01
3:45	0.00	0.02	0.02	0.01	0.04	0.00	0.27	0.01	0.05	0.06
4:00	0.00	0.02	0.01	0.01	0.02	0.03	0.37	0.08	0.01	0.01
4:15	0.00	0.01	0.01	0.01	0.02	0.00	0.55	0.08	0.05	0.04
4:30	0.00	0.01	0.01	0.02	0.01	0.06	0.61	0.04	0.04	0.02
4:45	0.00	0.04	0.01	0.01	0.01	0.00	0.72	0.07	0.01	0.03
5:00	0.00	0.07	0.04	0.04	0.01	0.04	0.92	0.06	0.05	0.01
5:15	0.00	0.05	0.02	0.03	0.02	0.00	0.96	0.03	0.02	0.01
5:30	0.00	0.05	0.04	0.01	0.01	0.02	1.06	0.06	0.02	0.09
5:45	0.00	0.03	0.05	0.02	0.01	0.00	1.05	0.07	0.09	0.04
6:00	0.00	0.06	0.05	0.12	0.04	0.01	1.00	0.05	0.02	0.01
6:15	0.00	0.01	0.02	0.06	0.02	0.00	0.98	0.06	0.07	0.02
6:30	0.00	0.06	0.07	0.13	0.05	0.03	1.00	0.05	0.02	0.02
6:45	0.00	0.02	0.03	0.04	0.02	0.00	1.01	0.12	0.08	0.07
7:00	0.00	0.08	0.06	0.04	0.10	0.01	1.01	0.08	0.04	0.01
7:15	0.00	0.03	0.08	0.07	0.02	0.00	0.91	0.05	0.12	0.08
7:30	0.00	0.02	0.09	0.02	0.02	0.02	0.89	0.13	0.02	0.05
7:45	0.00	0.08	0.03	0.06	0.06	0.00	0.80	0.03	0.06	0.06
8:00	0.00	0.02	0.07	0.04	0.03	0.08	0.00	0.10	0.13	0.04
8:15	0.00	0.10	0.03	0.05	0.07	0.00	0.81	0.07	0.05	0.04
8:30	0.00	0.04	0.04	0.02	0.01	0.01	0.52	0.06	0.13	0.03
8:45	0.00	0.09	0.05	0.02	0.17	0.01	0.00	0.07	0.06	0.03
9:00	0.00	0.01	0.03	0.03	0.03	0.00	0.45	0.04	0.11	0.03
9:15	0.00	0.02	0.03	0.02	0.05	0.03	0.40	0.08	0.03	0.03
9:30	0.00	0.06	0.03	0.04	0.00	0.06	0.35	0.06	0.03	0.04
9:45	0.00	0.01	0.03	0.01	0.07	0.00	0.31	0.06	0.02	0.09
10:00	0.00	0.01	0.03	0.02	0.02	0.07	0.00	0.12	0.08	0.01
10:15	0.00	0.02	0.03	0.02	0.01	0.03	0.31	0.05	0.01	0.01
10:30	0.00	0.05	0.03	0.01	0.04	0.00	0.35	0.08	0.12	0.02
10:45	0.00	0.05	0.03	0.03	0.01	0.07	0.30	0.03	0.07	0.04
11:00	0.00	0.01	0.03	0.03	0.03	0.06	0.00	0.02	0.03	0.09
11:15	0.00	0.01	0.03	0.01	0.05	0.05	0.30	0.07	0.03	0.01
11:30	0.00	0.07	0.03	0.04	0.01	0.06	0.31	0.03	0.02	0.05
11:45	0.00	0.02	0.03	0.06	0.01	0.01	0.32	0.03	0.03	0.02
12:00	0.00	0.01	0.03	0.06	0.03	0.02	0.00	0.02	0.04	0.05
12:15	0.00	0.04	0.03	0.05	0.04	0.01	0.29	0.05	0.18	0.01
12:30	0.00	0.03	0.03	0.07	0.02	0.02	0.28	0.13	0.03	0.04

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
12:45	0.00	0.03	0.03	0.01	0.05	0.05	0.29	0.01	0.05	0.04
13:00	0.00	0.07	0.03	0.01	0.02	0.02	0.28	0.05	0.03	0.04
13:15	0.00	0.07	0.03	0.02	0.02	0.02	0.00	0.06	0.07	0.04
13:30	0.00	0.11	0.03	0.01	0.06	0.04	0.27	0.04	0.05	0.04
13:45	0.00	0.04	0.03	0.05	0.03	0.03	0.21	0.08	0.02	0.04
14:00	0.00	0.01	0.03	0.04	0.02	0.01	0.30	0.01	0.03	0.04
14:15	0.00	0.03	0.00	0.01	0.08	0.03	0.15	0.04	0.01	0.04
14:30	0.00	0.02	0.00	0.02	0.08	0.01	0.11	0.01	0.01	0.04
14:45	0.00	0.08	0.00	0.01	0.01	0.08	0.22	0.12	0.07	0.04
15:00	0.00	0.02	0.00	0.04	0.04	0.02	0.13	0.03	0.07	0.04
15:15	0.00	0.01	0.01	0.02	0.07	0.11	0.11	0.02	0.07	0.00
15:30	0.00	0.07	0.06	0.02	0.07	0.11	0.16	0.01	0.07	0.00
15:45	0.00	0.01	0.03	0.01	0.02	0.11	0.20	0.05	0.07	0.00
16:00	0.00	0.01	0.01	0.03	0.01	0.05	0.20	0.06	0.07	0.00
16:15	0.00	0.05	0.02	0.10	0.01	0.02	0.16	0.08	0.07	0.00
16:30	0.00	0.05	0.05	0.06	0.03	0.06	0.14	0.03	0.08	0.00
16:45	0.00	0.01	0.04	0.03	0.06	0.05	0.17	0.02	0.01	0.00
17:00	0.00	0.02	0.07	0.03	0.02	0.05	0.17	0.03	0.01	0.00
17:15	0.00	0.01	0.06	0.04	0.01	0.06	0.07	0.01	0.04	0.00
17:30	0.00	0.08	0.05	0.04	0.07	0.01	0.07	0.04	0.02	0.00
17:45	0.00	0.03	0.05	0.03	0.03	0.01	0.08	0.02	0.08	0.00
18:00	0.00	0.04	0.02	0.06	0.01	0.02	0.09	0.07	0.06	0.00
18:15	0.00	0.02	0.05	0.01	0.06	0.02	0.09	0.02	0.03	0.00
18:30	0.00	0.12	0.05	0.02	0.08	0.09	0.15	0.12	0.03	0.00
18:45	0.02	0.09	0.06	0.05	0.06	0.01	0.16	0.01	0.07	0.00
19:00	0.02	0.06	0.07	0.02	0.06	0.02	0.15	0.04	0.02	0.00
19:15	0.02	0.03	0.01	0.07	0.03	0.01	0.15	0.03	0.02	0.00
19:30	0.05	0.10	0.06	0.04	0.12	0.01	0.10	0.17	0.03	0.00
19:45	0.04	0.02	0.02	0.02	0.04	0.07	0.12	0.10	0.03	0.00
20:00	0.15	0.01	0.02	0.02	0.01	0.05	0.07	0.11	0.02	0.00
20:15	0.11	0.04	0.05	0.08	0.02	0.04	0.08	0.02	0.04	0.00
20:30	0.07	0.02	0.01	0.04	0.01	0.02	0.11	0.08	0.05	0.00
20:45	0.02	0.06	0.01	0.08	0.08	0.10	0.13	0.08	0.06	0.00
21:00	0.08	0.01	0.05	0.03	0.03	0.03	0.11	0.05	0.04	0.00
21:15	0.04	0.04	0.02	0.07	0.01	0.05	0.11	0.02	0.01	0.00
21:30	0.04	0.02	0.08	0.04	0.01	0.02	0.12	0.05	0.05	0.00
21:45	0.03	0.02	0.05	0.03	0.01	0.01	0.10	0.04	0.02	0.00
22:00	0.05	0.06	0.03	0.04	0.05	0.03	0.09	0.05	0.02	0.00
22:15	0.12	0.01	0.06	0.06	0.02	0.06	0.03	0.01	0.02	0.00
22:30	0.04	0.09	0.03	0.07	0.01	0.02	0.03	0.04	0.03	0.00
22:45	0.02	0.01	0.06	0.05	0.04	0.02	0.12	0.01	0.01	0.00
23:00	0.01	0.01	0.02	0.06	0.03	0.01	0.07	0.03	0.03	0.00
23:15	0.06	0.06	0.05	0.02	0.03	0.04	0.02	0.03	0.01	0.00
23:30	0.04	0.01	0.01	0.01	0.07	0.01	0.08	0.03	0.09	0.00
23:45	0.01	0.01	0.02	0.04	0.05	0.01	0.06	0.01	0.01	0.00
Average	0.01	0.04	0.03	0.04	0.03	0.03	0.27	0.05	0.04	0.02
Max.	0.15	0.12	0.10	0.13	0.17	0.11	1.06	0.19	0.18	0.09
Min.	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00

All Values in Million Gallons per Day (mgd)

FLOW MONITORING DATA

Project # 08-070

Flow Monitoring
Meter 7
Manhole 4072

Fort Leonard Wood, MO

08-Sep-08 to 17-Sep-08

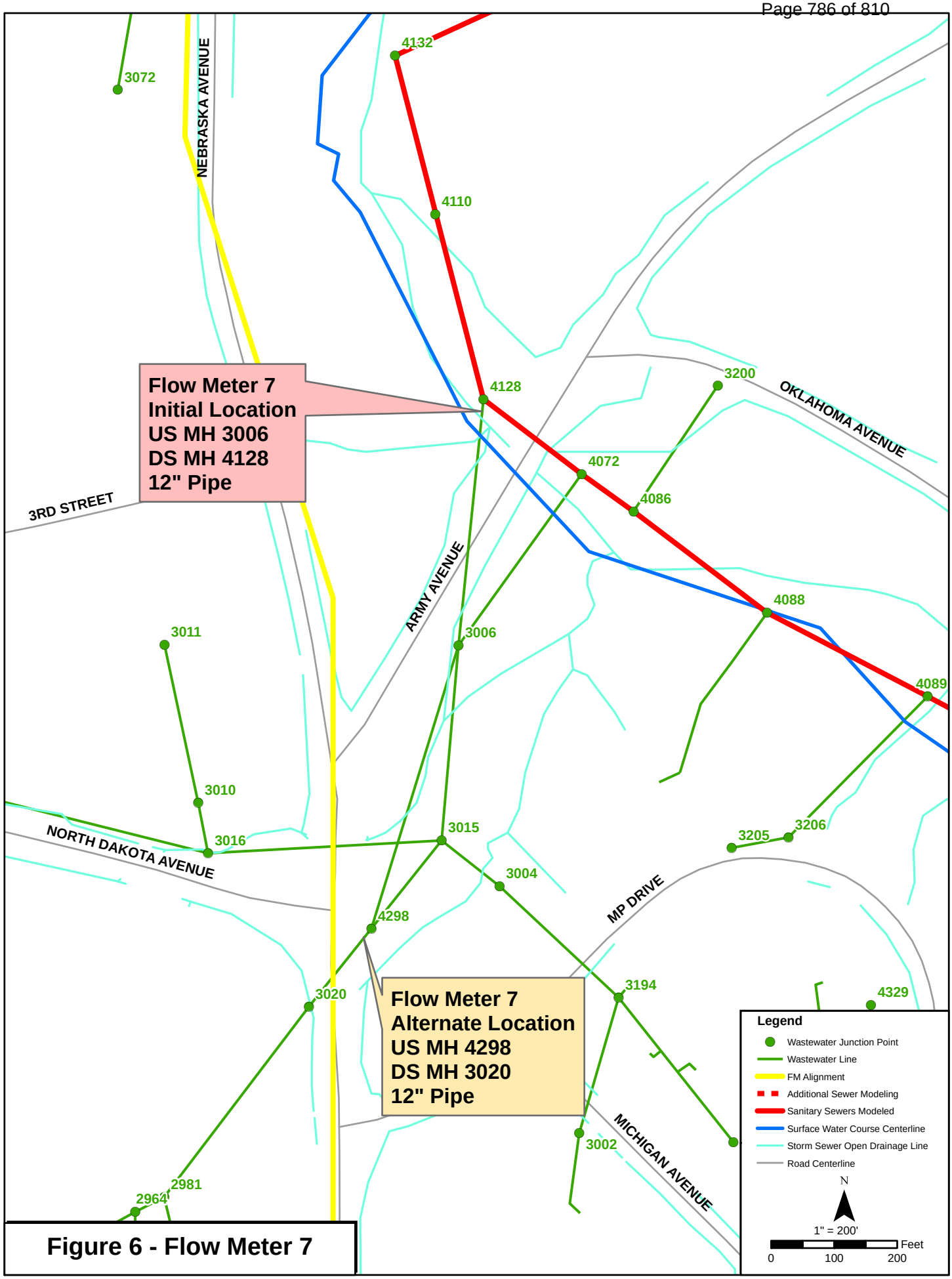


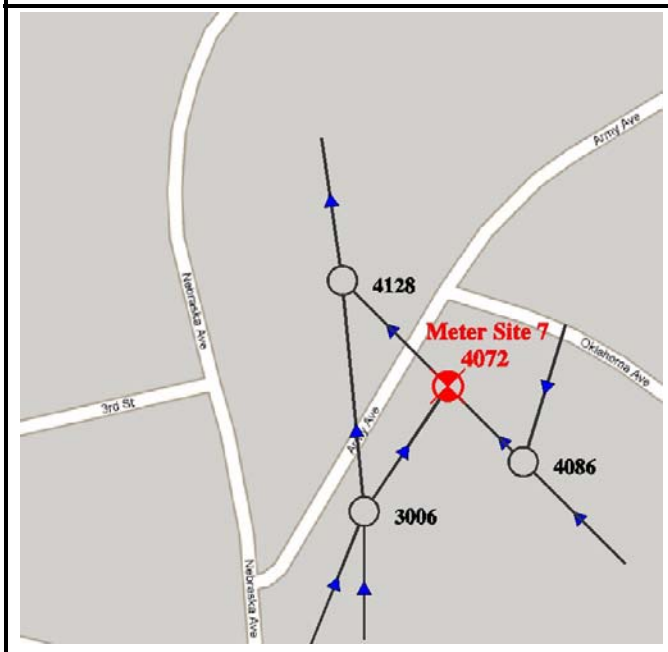
Figure 6 - Flow Meter 7

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
4072	Circular	PVC	12

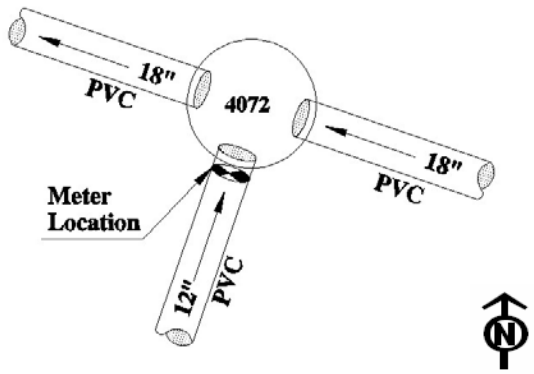
Site ID:	Address:	Meter #:	Site Quality:	Basin:
07	Army Ave & Oklahoma Ave	1921	Fair	NA

Location Map



Photos:
M7_4072_A.JPG, M7_4072_T.JPG, M7_4072_I.JPG, M7_4072_P.JPG, M7_4072_L_09-09-08.JPG, M7_4072_L_09-12-08.JPG, M7_4072_L_09-17-08.JPG

Planar Description



Describe MH Location
(Roadway, Easement, Field, Sidewalk)

South East of Intersection of Army Avenue and Oklahoma Avenue – In Grassy Field.

Site Hazards

Heavy Traffic? No
H_2S? No
LEL OK? No
Describe potential hazards:
Standard CSE Hazards
Must Call Fire Department at 573-596-0883 with Street Intersection and Manhole Number

Measurements

Manhole Depth (ft): 10.10
Measured Depth (in): 3.00
Manhole Dia. (in): 48.00
Velocity (fps): 2.50
Comments:

Site Conditions

Surcharge Evidence? No
Depth of Surcharge (ft): 0.00
Depth of Debris (in): 0.00
Comments:

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
4072	Circular	PVC	12

Site ID:	Address:	Meter #:	Site Quality:	Basin:
07	Army Ave & Oklahoma Ave	1921	Fair	NA

Area Photo

Topside Photo

Install

Probe

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
4072	Circular	PVC	12

Site ID:	Address:	Meter #:	Site Quality:	Basin:
07	Army Ave & Okalahoma Ave	1921	Fair	NA

Flow Depth 09/09/08

Flow Depth 09/12/08

Flow Depth 09/17/08

Flow Depth

FLOW METER INTERROGATION

Fort Leonard Wood

Project No. 08-070 Project Location Ft. Leonard Wood, Mo

Study Name _____ Site Description Army Ave.

Serial No. 1921 Site ID 07

Physical Data: Pipe Size 12 Pipe Material PVC Manhole Depth (ft) 10.10

Manhole Diameter 48" Flow Characteristic G (F) P Depth of Debris Ø

Evidence of Surcharge Y (N) Depth of Surcharge (ft) Ø Step Condition G (F) P None

Comments: _____

Meter Setup: Install Crew DH, JS, _____ Install Date 09/08/08 Install Time 17:04

Depth Offset Ø Velocity Default/Site Coefficient _____ Cycle Time 15 min

New Battery Y (N) Voltage 11.2 Pipe Diameter 12 Pipe Shape: (Cir.) Rect. ___x___ in.

Site Interrogations:

Date	Time	Before Cleaning		After Cleaning		Measured Depth (in)	Measured Velocity (fps)	Depth of Debris (in)	Battery Voltage
		Metered Depth (in)	Metered Velocity (fps)	Metered Depth (in)	Metered Velocity (fps)				
09-08-08	17:20	3.71	1.73	—	—	3.75	1.46	Ø	11.2
Comments: Installed Meter									
09-09	11:31	3.50	1.70	—	—	3.75	1.60	Ø	11.5
Comments: V.S. = 98% / MG = 0.1 / Pic of flow 2 - 0.75									
							m2_4072_L_09-09-08		
9/12	3:00	2.71	1.71	3.12	1.62	3.0	1.62	Ø	11.4
Comments: V.S. = 96% MG = 0.82 Pic of flow = M-7									
							m2_4072_L_09-[illegible]-08		
09-17	12:21	2.41	1.49	—	—	3.12	2.26	Ø	11.4
Comments: V.S. = 99% / MG = 2.2 / Pic of flow 0-002 Pulled Meter									
							m2_4072_L_09-17-08		
Comments:									
Comments:									

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/08/08 Time: 17:21 Project No.: 08-070 Unit Serial # 1921

Line Segment US ( ) 3006 Line Segment DS ( ) 4128

Site No. 07 Crew: DH, JS

Site Location: Army Ave. + Oklahoma Ave.

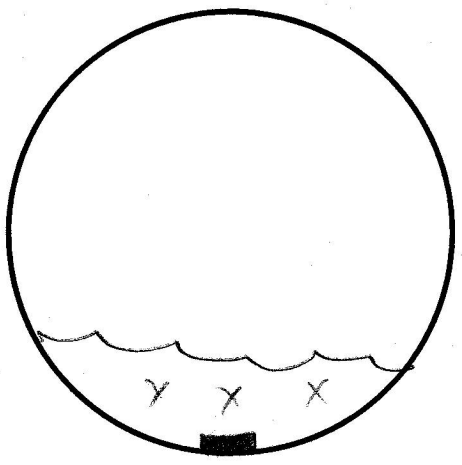
Inside Diameter	12 in.	Maximum Velocity	1.79 fps
Ruler Level	3.75 in.	Sensed Velocity	1.73 fps
Sensed Level	3.71 in.	*Check Sensed Velocity	1.46 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
1.09	1.79	1.49

1.67 - 1.73 - 1.81 - 1.93

TREKK DESIGN GROUP LLC

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/09/08 Time: 11 : 34 Project No.: 08-070 Unit Serial # 1921

Line Segment US ( ) 3006 Line Segment DS ( ) 4128

Site No. 07 Crew: DH, JS

Site Location: Army Ave. & Oklahoma Ave.

Inside Diameter 12 in. Maximum Velocity 1.83 fps

Ruler Level 3.75 in. Sensed Velocity 1.70 fps

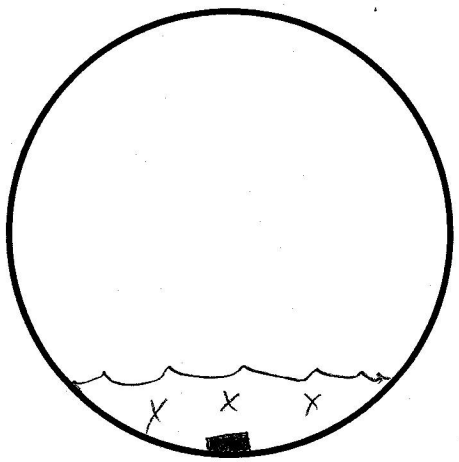
Sensed Level 3.50 in. *Check Sensed Velocity 1.60 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
1.43	1.83	1.54

1.72 - 1.68 - 1.68 - 1.71

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 9/12/08 Time: 2:55 Project No.: 08-070 Unit Serial # 1921

Line Segment US ( ) 3006 Line Segment DS ( ) 4128

Site No. 07 Crew: JS, RW

Site Location: Army Ave & Oklahoma

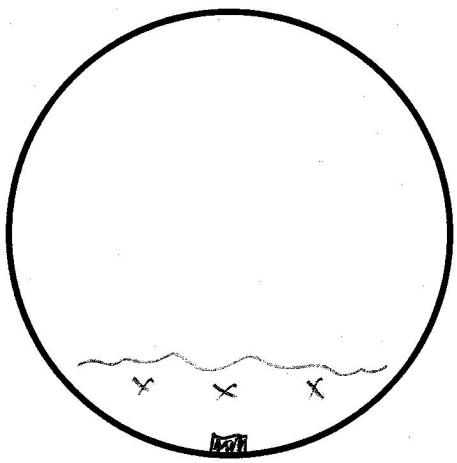
Inside Diameter	12 in.	Maximum Velocity	1.80 fps
Ruler Level	3.0 in.	Sensed Velocity	1.57 fps
Sensed Level	3.14 in.	*Check Sensed Velocity	1.62 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
1.80	1.56	1.50
1.54	1.63	1.54

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/17/08 Time: 12:26 Project No.: 08-070 Unit Serial # 1921

Line Segment US ( ) 3006 Line Segment DS ( ) 4128

Site No. 07 Crew: DH, JS

Site Location: Army Auc. + Oklahoma

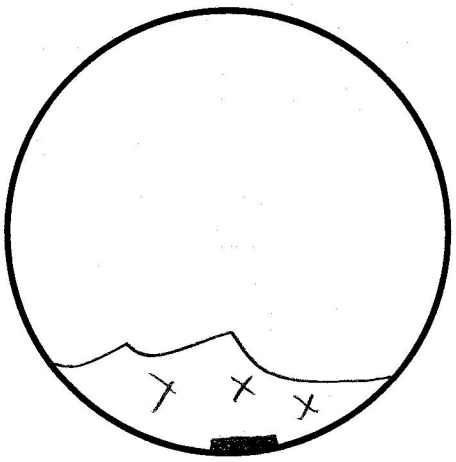
Inside Diameter	12 in.	Maximum Velocity	2.39 fps
Ruler Level	3.12 in.	Sensed Velocity	1.49 fps
Sensed Level	2.41 in.	*Check Sensed Velocity	2.26 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
2.39	2.25	2.14

1.49 - 1.56 - 1.43 - 1.49

CONFINED SPACE ENTRY PERMIT

COMPANY/LOCATION: Trekk / Ft Leon. Wd

DEPARTMENT: Field

DATE: 9/8/08

CONFINED SPACE TO BE ENTERED: MH 4072

PERMIT EXPIRATION DATE/TIME: 9/8/08

DESCRIPTION OF WORK TO BE PERFORMED: Install Meter # 07

NATURE OF HAZARDS IN CONFINED SPACE: (check)

- ✓ Oxygen deficiency (Less than 19.5% at sea level)
- ✓ Flammable gases or vapors (greater than 10% of the lower flammable limit, or greater than 23.5% oxygen at sea level)
- ✓ Toxic gases or vapors (greater than the permissable exposure limit)
- ___ Mechanical hazards
- ___ Electrical shock
- ___ Materials harmful to the skin
- ✓ Engulfment
- ___ Configuration hazard
- ___ Other

EQUIPMENT REQUIRED FOR ENTRY AND WORK: (check)

- ___ Respirator
- ✓ Lifeline and safety harness
- ___ Protective clothing
- ___ Hearing protection
- ___ Other
- ___ Lighting (Explosive Proof)
- ___ Fire Extinguishers
- ✓ Emergency Escape Retrieval Equipment
- ___ Resuscitators — Inhalator

Electrical equipment/tools:

- ___ Low voltage
- ___ Ground-fault current interrupters
- ___ Approved for hazardous locations

Respiratory protection (specify)

Communication aid (specify) cell

Rescue equipment (specify) tripod w/winch

PREPARATION: (check)

- ___ Notify affected departments of service interruption
- ___ Isolate - blanked or double valve, with lock and tag.
- ___ Zero energy state (Lock Out all energy sources)
- ___ Cleaned, drained, washed and purged
- ✓ Ventilation to provide fresh air
- ✓ Emergency response team available
- ✓ Employees informed of specific confined space hazards
- ✓ Secure area (post, sign and flag)
- ✓ Procedures reviewed with each employee.
- ✓ Atmospheric test in compliance.
- ___ Attach hot work permit
- ___ Other

AUTHORIZED ENTRANTS:

Jeff Stacy

AUTHORIZED ATTENDANTS:

Dave Hamberlin

STAND BY SAFETY PERSONNEL:

TEST	Allowable Limits	Check (✓) if Required	In Result AM/PM	Out Result AM/PM	Result AM/PM	Result AM/PM	Result AM/PM	Result AM/PM
Time			4:50 AM PM	5:35 AM PM	: AM PM	: AM PM	: AM PM	: AM PM
Oxygen-min.	19.5%	✓	20.8	19.5				
Oxygen-max.	23.5%	✓	20.8	20.8				
Flammability	10% LEL / LFL	✓	0	0				
H_2S	10 ppm	✓	9.0	14				
Toxic (specify)								
Cl_2	.5 ppm							
CO	35 ppm	✓	0	0				
SO_2	2 ppm							
Heat	°F/°C							
Other								
Other								

Name of employee conducting atmospheric monitoring: Jeff Stacy

Instrument(s) used: MSA Solaris

Statement of acceptable entry conditions: Good - used blower to lower H_2S

AUTHORIZATION:
I certify that all required precautions have been taken and necessary equipment is provided for safe entry and work in this confined space

Time: 4:50 Date: 9/8/08

Name (Print) Jeff Stacy

Signature

TREKK DESIGN GROUP, LLC

Tabular Data Output

Site ID Fort Leonard Wood, MO - Meter 7

Start Date 9/8/2008
End Date 9/17/2008

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
0:00	0.00	0.09	0.17	0.08	0.09	0.07	0.06	0.08	0.05	0.10
0:15	0.00	0.11	0.18	0.08	0.12	0.08	0.07	0.18	0.05	0.04
0:30	0.00	0.12	0.16	0.08	0.09	0.09	0.06	0.08	0.06	0.04
0:45	0.00	0.10	0.15	0.08	0.10	0.09	0.06	0.08	0.05	0.04
1:00	0.00	0.10	0.16	0.07	0.10	0.08	0.06	0.09	0.04	0.03
1:15	0.00	0.11	0.18	0.07	0.11	0.12	0.06	0.09	0.05	0.04
1:30	0.00	0.12	0.16	0.13	0.09	0.10	0.06	0.09	0.08	0.04
1:45	0.00	0.14	0.16	0.07	0.09	0.11	0.11	0.08	0.04	0.04
2:00	0.00	0.09	0.15	0.07	0.11	0.08	0.23	0.08	0.04	0.03
2:15	0.00	0.10	0.17	0.07	0.10	0.09	0.16	0.08	0.05	0.04
2:30	0.00	0.11	0.16	0.07	0.13	0.10	0.26	0.08	0.05	0.11
2:45	0.00	0.11	0.15	0.07	0.11	0.09	0.28	0.07	0.04	0.04
3:00	0.00	0.11	0.15	0.07	0.11	0.08	0.43	0.07	0.04	0.03
3:15	0.00	0.11	0.17	0.07	0.11	0.08	0.50	0.09	0.05	0.04
3:30	0.00	0.12	0.14	0.07	0.12	0.08	0.49	0.07	0.07	0.04
3:45	0.00	0.11	0.15	0.07	0.13	0.14	1.52	0.08	0.04	0.03
4:00	0.00	0.10	0.16	0.08	0.14	0.08	1.27	0.13	0.05	0.04
4:15	0.00	0.13	0.19	0.11	0.15	0.12	2.73	0.09	0.06	0.04
4:30	0.00	0.17	0.25	0.17	0.18	0.14	2.88	0.14	0.08	0.06
4:45	0.00	0.23	0.28	0.30	0.20	0.16	2.85	0.17	0.09	0.09
5:00	0.00	0.33	0.43	0.25	0.21	0.22	2.85	0.18	0.16	0.14
5:15	0.00	0.34	0.38	0.16	0.33	0.25	1.63	0.17	0.10	0.14
5:30	0.00	0.25	0.24	0.17	0.29	0.24	3.14	0.20	0.09	0.13
5:45	0.00	0.15	0.17	0.13	0.17	0.13	2.95	0.10	0.08	0.04
6:00	0.00	0.12	0.18	0.14	0.14	0.11	3.07	0.08	0.07	0.04
6:15	0.00	0.16	0.18	0.13	0.16	0.09	3.05	0.09	0.07	0.05
6:30	0.00	0.14	0.23	0.14	0.16	0.11	3.24	0.11	0.06	0.07
6:45	0.00	0.36	0.36	0.16	0.22	0.22	3.28	0.09	0.10	0.09
7:00	0.00	0.27	0.34	0.21	0.19	0.15	3.08	0.14	0.07	0.08
7:15	0.00	0.22	0.26	0.18	0.16	0.12	3.17	0.13	0.07	0.08
7:30	0.00	0.30	0.28	0.14	0.16	0.11	3.11	0.11	0.10	0.09
7:45	0.00	0.21	0.24	0.15	0.18	0.12	3.15	0.14	0.08	0.10
8:00	0.00	0.22	0.17	0.16	0.22	0.11	3.12	0.10	0.09	0.09
8:15	0.00	0.26	0.30	0.18	0.23	0.15	3.28	0.16	0.12	0.11
8:30	0.00	0.20	0.22	0.23	0.22	0.15	3.17	0.11	0.09	0.07
8:45	0.00	0.21	0.20	0.15	0.17	0.12	2.93	0.17	0.09	0.07
9:00	0.00	0.23	0.17	0.15	0.15	0.13	2.84	0.12	0.07	0.07
9:15	0.00	0.21	0.25	0.15	0.31	0.11	2.90	0.11	0.09	0.07
9:30	0.00	0.19	0.27	0.16	0.25	0.10	1.63	0.12	0.07	0.08
9:45	0.00	0.18	0.23	0.16	0.17	0.10	1.63	0.11	0.08	0.07
10:00	0.00	0.19	0.23	0.15	0.18	0.09	1.25	0.11	0.08	0.08
10:15	0.00	0.19	0.32	0.15	0.19	0.12	1.46	0.11	0.07	0.10
10:30	0.00	0.17	0.27	0.13	0.17	0.08	1.24	0.18	0.08	0.06
10:45	0.00	0.17	0.20	0.12	0.16	0.09	1.14	0.10	0.06	0.07
11:00	0.00	0.17	0.18	0.13	0.17	0.08	1.12	0.11	0.08	0.06
11:15	0.00	0.23	0.20	0.13	0.16	0.08	1.00	0.09	0.06	0.08
11:30	0.00	0.20	0.18	0.12	0.19	0.08	0.96	0.11	0.09	0.07
11:45	0.00	0.22	0.25	0.14	0.23	0.08	0.89	0.09	0.08	0.08
12:00	0.00	0.20	0.20	0.12	0.17	0.08	0.96	0.11	0.13	0.10
12:15	0.00	0.19	0.24	0.14	0.19	0.11	0.87	0.10	0.09	0.07
12:30	0.00	0.21	0.22	0.14	0.27	0.19	0.84	0.12	0.09	0.00

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
12:45	0.00	0.23	0.20	0.22	0.19	0.11	0.72	0.10	0.09	0.00
13:00	0.00	0.25	0.24	0.13	0.20	0.11	0.86	0.10	0.09	0.00
13:15	0.00	0.19	0.24	0.12	0.22	0.11	0.66	0.10	0.08	0.00
13:30	0.00	0.23	0.23	0.16	0.24	0.14	0.72	0.17	0.08	0.00
13:45	0.00	0.22	0.25	0.16	0.25	0.13	0.65	0.12	0.18	0.00
14:00	0.00	0.29	0.21	0.15	0.26	0.13	0.56	0.15	0.08	0.00
14:15	0.00	0.23	0.37	0.15	0.22	0.15	0.59	0.12	0.08	0.00
14:30	0.00	0.30	0.28	0.19	0.27	0.18	0.65	0.13	0.11	0.00
14:45	0.00	0.22	0.19	0.15	0.20	0.14	0.48	0.14	0.06	0.00
15:00	0.00	0.19	0.30	0.15	0.15	0.14	0.45	0.09	0.09	0.00
15:15	0.00	0.14	0.21	0.17	0.17	0.13	0.54	0.09	0.06	0.00
15:30	0.00	0.33	0.16	0.16	0.16	0.15	0.47	0.15	0.06	0.00
15:45	0.00	0.23	0.18	0.35	0.30	0.16	0.39	0.08	0.07	0.00
16:00	0.00	0.29	0.22	0.22	0.17	0.19	0.37	0.10	0.08	0.00
16:15	0.00	0.26	0.17	0.19	0.17	0.13	0.36	0.12	0.08	0.00
16:30	0.00	0.26	0.17	0.21	0.17	0.12	0.30	0.09	0.07	0.00
16:45	0.00	0.40	0.15	0.25	0.29	0.11	0.31	0.12	0.05	0.00
17:00	0.00	0.25	0.15	0.22	0.19	0.23	0.31	0.09	0.06	0.00
17:15	0.00	0.30	0.17	0.21	0.29	0.14	0.28	0.11	0.06	0.00
17:30	0.22	0.28	0.15	0.21	0.14	0.12	0.29	0.10	0.07	0.00
17:45	0.25	0.32	0.30	0.29	0.23	0.19	0.35	0.13	0.12	0.00
18:00	0.21	0.23	0.17	0.19	0.19	0.13	0.21	0.09	0.16	0.00
18:15	0.31	0.29	0.15	0.23	0.15	0.15	0.23	0.14	0.07	0.00
18:30	0.19	0.26	0.16	0.26	0.15	0.16	0.29	0.11	0.08	0.00
18:45	0.18	0.25	0.18	0.26	0.17	0.16	0.21	0.09	0.09	0.00
19:00	0.21	0.29	0.24	0.37	0.31	0.15	0.20	0.09	0.09	0.00
19:15	0.21	0.42	0.20	0.24	0.24	0.15	0.18	0.10	0.13	0.00
19:30	0.17	0.37	0.25	0.37	0.15	0.13	0.18	0.14	0.08	0.00
19:45	0.33	0.28	0.33	0.40	0.16	0.19	0.29	0.16	0.08	0.00
20:00	0.31	0.32	0.53	0.44	0.14	0.26	0.29	0.13	0.12	0.00
20:15	0.42	0.55	0.35	0.41	0.29	0.32	0.38	0.18	0.25	0.00
20:30	0.53	0.59	0.45	0.65	0.41	0.42	0.40	0.32	0.20	0.00
20:45	0.60	0.70	0.49	0.57	0.55	0.42	0.44	0.32	0.21	0.00
21:00	0.63	0.54	0.36	0.63	0.57	0.38	0.31	0.28	0.18	0.00
21:15	0.44	0.48	0.30	0.57	0.37	0.27	0.17	0.20	0.19	0.00
21:30	0.32	0.46	0.22	0.32	0.25	0.27	0.24	0.07	0.14	0.00
21:45	0.21	0.24	0.15	0.23	0.17	0.14	0.11	0.13	0.06	0.00
22:00	0.18	0.20	0.17	0.17	0.15	0.15	0.16	0.05	0.05	0.00
22:15	0.13	0.19	0.12	0.15	0.11	0.08	0.11	0.05	0.05	0.00
22:30	0.13	0.17	0.10	0.15	0.09	0.09	0.13	0.05	0.05	0.00
22:45	0.18	0.17	0.09	0.13	0.09	0.16	0.10	0.05	0.04	0.00
23:00	0.12	0.17	0.09	0.12	0.13	0.07	0.15	0.05	0.04	0.00
23:15	0.12	0.17	0.18	0.12	0.08	0.07	0.09	0.05	0.04	0.00
23:30	0.12	0.16	0.11	0.11	0.08	0.06	0.09	0.06	0.04	0.00
23:45	0.12	0.33	0.17	0.11	0.08	0.09	0.09	0.04	0.04	0.00
Average	0.07	0.28	0.22	0.19	0.19	0.14	1.03	0.12	0.08	0.04
Max.	0.63	0.70	0.53	0.65	0.57	0.42	3.28	0.32	0.25	0.14
Min.	0.00	0.14	0.09	0.07	0.08	0.06	0.06	0.04	0.04	0.00

All Values in Million Gallons per Day (mgd)

FLOW MONITORING DATA

Project # 08-070

Flow Monitoring
Meter 8
Manhole 3174

Fort Leonard Wood, MO

08-Sep-08 to 17-Sep-08

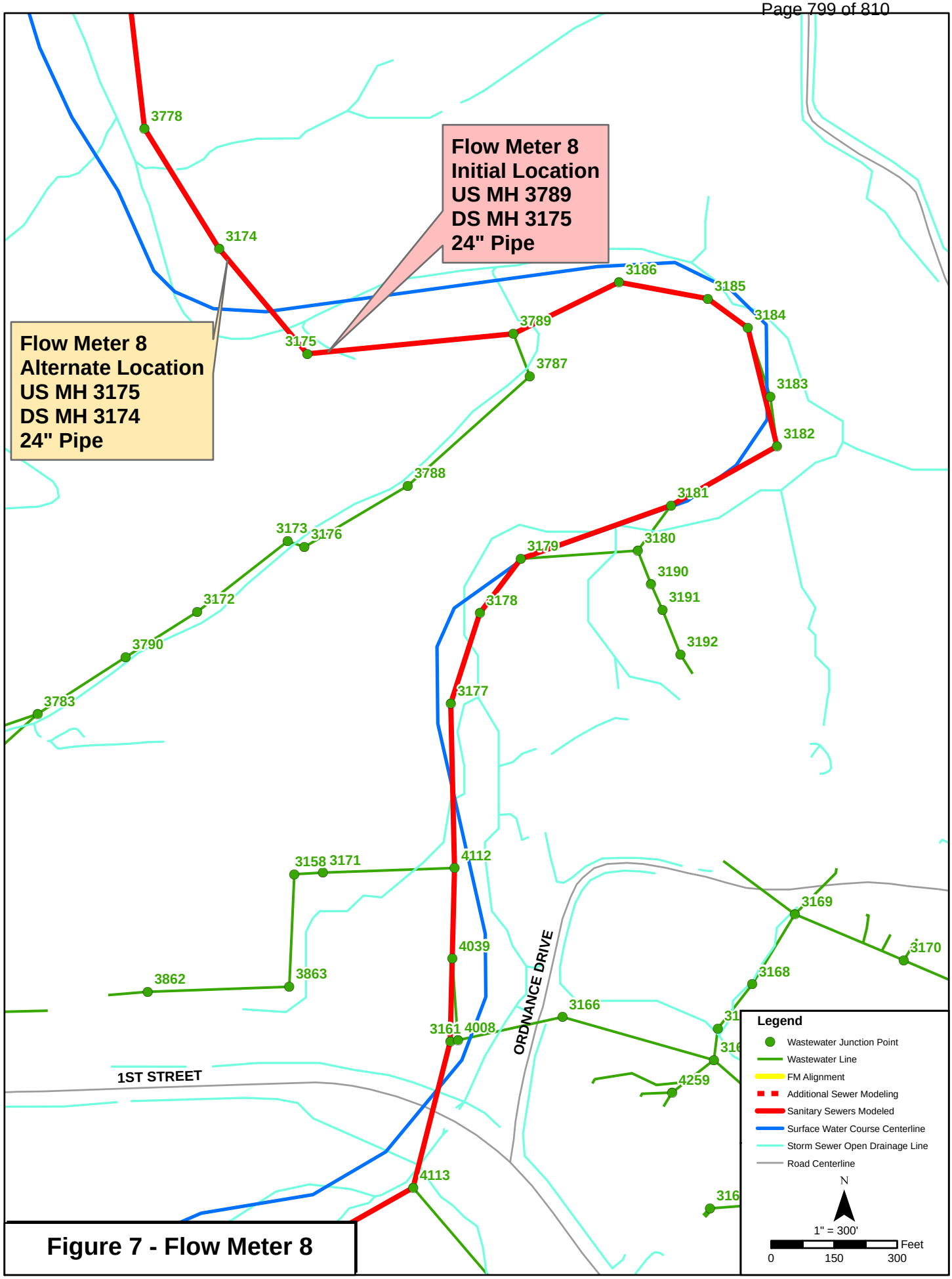


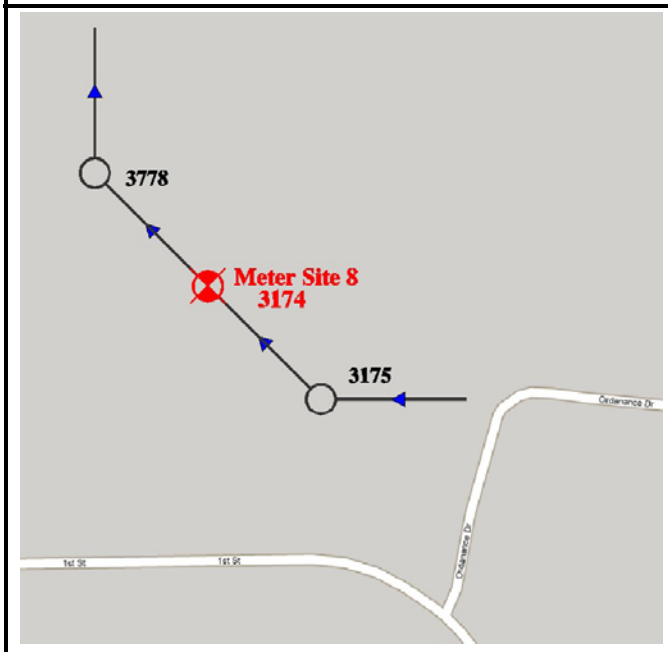
Figure 7 - Flow Meter 8

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
3174	Circular	RCP	24

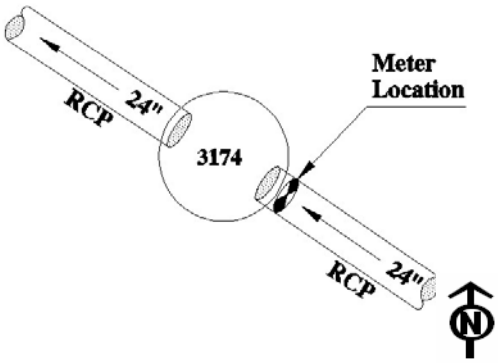
Site ID:	Address:	Meter #:	Site Quality:	Basin:
08	1st St. & Ordnance Dr.	0770	Good	NA

Location Map



Photos:
M8_3174_A.JPG, M8_3174_T.JPG, M8_3174_I.JPG, M8_3174_P.JPG, M8_3174_L_09-09-08.JPG, M8_3174_L_09-12-08.JPG, M8_3174_L_09-17-08.JPG

Planar Description



Describe MH Location
(Roadway, Easement, Field, Sidewalk)

Approximately 1500' North of 1st Street – in Woods Besides Walking Trail.

Site Hazards

Heavy Traffic? No
H_2S? No
LEL OK? Yes
Describe potential hazards:
Standard CSE Hazards
Must Call Fire Department at 573-596-0883 with Street Intersection and Manhole Number

Measurements

Manhole Depth (ft): 12.50
Measured Depth (in): 5.00
Manhole Dia. (in): 48.00
Velocity (fps): 3.00
Comments:

Site Conditions

Surcharge Evidence? Yes
Depth of Surcharge (ft): 3.00
Depth of Debris (in): 0.00
Comments:

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
3174	Circular	RCP	24

Site ID:	Address:	Meter #:	Site Quality:	Basin:
08	1st St. & Ordnance Dr.	0770	Good	NA

Area Photo

Topside Photo

Install

Probe

Flow Meter Site Investigation

Project #:	Location:	Date:	Crew:
08-070	Fort Leonard Wood	09-08-08	DH, JS
MH#:	**Pipe Shape:**	**Pipe Material:**	**Pipe Size (in):**
3174	Circular	RCP	24

Site ID:	Address:	Meter #:	Site Quality:	Basin:
08	1st St. & Ordnance Dr.	0770	Good	NA

Flow Depth 09/09/08	Flow Depth 09/12/08
	
Flow Depth 09/17/08	**Flow Depth**
	

FLOW METER INTERROGATION
Fort Leonard Wood

Project No. 08-070 Project Location Ft. Leonard Wood, Mo
Study Name _____ Site Description 1st St. + Ordnance Dr.
Serial No. 0770 Site ID 09

Physical Data: Pipe Size 24" Pipe Material RCP Manhole Depth (ft) 12.50
Manhole Diameter 4.00' Flow Characteristic (G) F P Depth of Debris Ø
Evidence of Surcharge (Y) N Depth of Surcharge (ft) 3.00 Step Condition G (F) P None
Comments: _____

Meter Setup: Install Crew DH, JS, _____ Install Date 09/08/08 Install Time 11 : 44
Depth Offset Ø Velocity Default/Site Coefficient _____ Cycle Time 15 min
New Battery Y (N) Voltage _____ Pipe Diameter 24" Pipe Shape: (Cir.) Rect. ___ x ___ in.

Site Interrogations:

Date	Time	Before Cleaning		After Cleaning		Measured Depth (in)	Measured Velocity (fps)	Depth of Debris (in)	Battery Voltage
		Metered Depth (in)	Metered Velocity (fps)	Metered Depth (in)	Metered Velocity (fps)				
09-08	12:17	9.98	3.06	—	—	10.00	3.68	Ø	11.1
Comments: Installed Meter									
09-09	11:02	9.30	2.87	—	—	9.00	3.55	Ø	11.3
Comments: V.S. = 80% / MG = 2.0 / Pic of flow 2-074 / Pic 2-073 is trash									
								m8_3174_L_09-09-08	
9/12	12:36	10.39	3.02	10.42	3.15	10.00"	3.47	Ø	11.0
Comments: V.S = 100% MG = 9.43 Pic of flow = M-02									
								m8_3174_L_09-12-08	
09-17	11:10	10.24	2.85	—	—	10.00	3.84	Ø	11.3
Comments: V.S = 99% / MG = 24.73 / Pick of flow 0-001 Pulled Meter									
								m8_3174_L_09-17-08	
Comments:									
Comments:									

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/08/08 Time: 12 : 20 Project No.: 08-070 Unit Serial # 0770

Line Segment US ( ) 3778 Line Segment DS ( ) 3175

Site No. 08 Crew: DH, JS

Site Location: 1st St. + Ordnance Dr

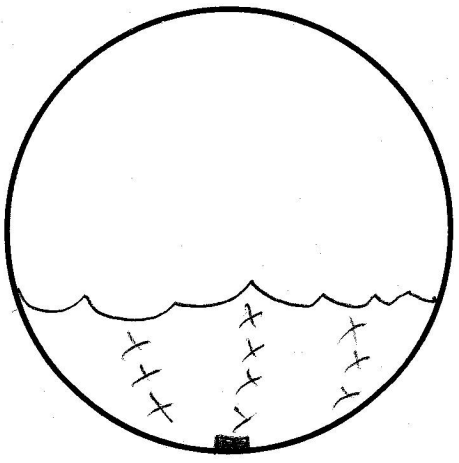
Inside Diameter	24. in.	Maximum Velocity	3.98 fps
Ruler Level	10.00 in.	Sensed Velocity	3.06 fps
Sensed Level	9.98 in.	*Check Sensed Velocity	3.68 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
3.89	3.73	3.58
3.72	3,98	3.72
3.40	3,83	3.23
	3.70	

2.92 - 3.15 - 3.06 - 3.12

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09/09/08 Time: 11 : 04 Project No.: 08-070 Unit Serial # 0770

Line Segment US ( ) 3778 Line Segment DS ( ) 3175

Site No. 08 Crew: DH, JS

Site Location: 1st St. & Ordnance Dr.

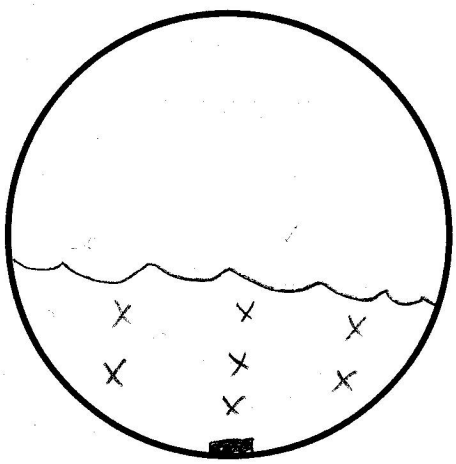
Inside Diameter	24 in.	Maximum Velocity	3.81 fps
Ruler Level	9.00 in.	Sensed Velocity	2.87 fps
Sensed Level	9.30 in.	*Check Sensed Velocity	3.55 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
3.57	3.77	3.58
3.27	3.81	3.66
	3.23	

2.77 - 2.93 - 2.82 - 2.98

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 9 / 12 / 08 Time: 12 : 40 Project No.: 08-070 Unit Serial # 0770

Line Segment US ( ) 3778 Line Segment DS ( ) 3175

Site No. 08 Crew: JS, RW

Site Location: 1st St & Ordinance Dr

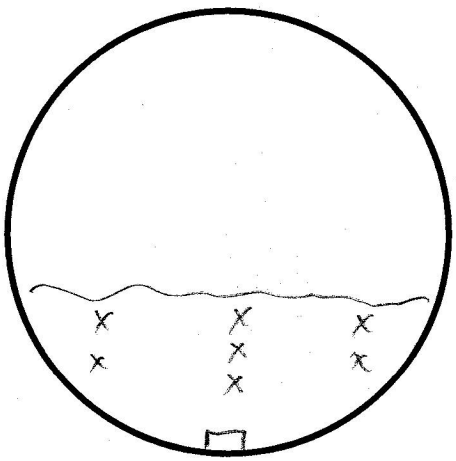
Inside Diameter	24 in.	Maximum Velocity	4.3 fps
Ruler Level	10 in.	Sensed Velocity	3.15 fps
Sensed Level	10.42 in.	*Check Sensed Velocity	3.47 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
3.46	4.30	4.06
3.04	3.85	2.58
	3.02	
3.08	3.30	3.11
3.04	2.99	2.99
	3.01	

SITE CALIBRATION AND PROFILE

Fort Leonard Wood

Date 09 / 17 / 08 Time: 11 : 13 Project No.: 08-070 Unit Serial # 0770

Line Segment US ( ) 3778 Line Segment DS ( ) 3175

Site No. 01 Crew: DH, JS

Site Location: 1st St. & Ordinance Dr.

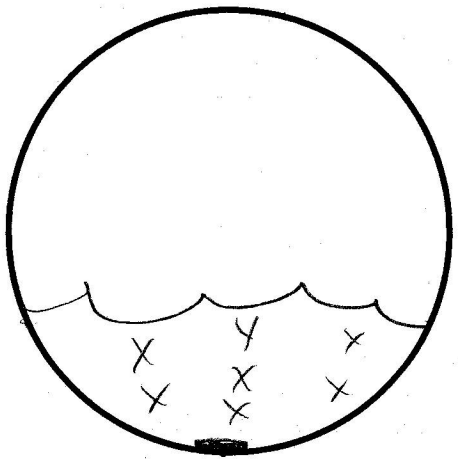
Inside Diameter	24 in.	Maximum Velocity	4.20 fps
Ruler Level	10.00 in.	Sensed Velocity	2.85 fps
Sensed Level	10.26 in.	*Check Sensed Velocity	3.84 fps

Flow in GPM-MGD _____ (default coefficient) Profiled Flow GPM-MGD Using (2D) _____

Profiled Flow GPM-MGD _____ New Coefficient _____

New Coefficient _____

COMMENTS:



2D		
LEFT	CENTER	RIGHT
3.92	4.15	4.20
3.65	3.98	3.49
	3.50	

2.89 - 2.85 - 2.85 - 2.83

CONFINED SPACE ENTRY PERMIT

COMPANY/LOCATION: Trekk / Ft Loon Wa | DEPARTMENT: Field | DATE: 9/8/08

CONFINED SPACE TO BE ENTERED: MH 3174 | PERMIT EXPIRATION DATE/TIME: 9/8/08 3:00

DESCRIPTION OF WORK TO BE PERFORMED: Install meter

NATURE OF HAZARDS IN CONFINED SPACE: (check)

- ✓ Oxygen deficiency (Less than 19.5% at sea level)
- ✓ Flammable gases or vapors (greater than 10% of the lower flammable limit, or greater than 23.5% oxygen at sea level)
- ✓ Toxic gases or vapors (greater than the permissable exposure limit)
- ___ Mechanical hazards
- ___ Electrical shock
- ___ Materials harmful to the skin
- ✓ Engulfment
- ___ Configuration hazard
- ___ Other

EQUIPMENT REQUIRED FOR ENTRY AND WORK: (check)

- ___ Respirator
- ✓ Lifeline and safety harness
- ___ Protective clothing
- ___ Hearing protection
- ___ Other
- ___ Lighting (Explosive Proof)
- ___ Fire Extinguishers
- ✓ Emergency Escape Retrieval Equipment
- ___ Resuscitators — Inhalator

Electrical equipment/tools:

- ___ Low voltage
- ___ Ground-fault current interrupters
- ___ Approved for hazardous locations

Respiratory protection (specify)

Communication aid (specify): cell

Rescue equipment (specify): tripd w/winch

PREPARATION: (check)

- ___ Notify affected departments of service interruption
- ___ Isolate - blanked or double valve, with lock and tag.
- ___ Zero energy state (Lock Out all energy sources)
- ___ Cleaned, drained, washed and purged
- ✓ Ventilation to provide fresh air
- ✓ Emergency response team available
- ✓ Employees informed of specific confined space hazards
- ✓ Secure area (post, sign and flag)
- ✓ Procedures reviewed with each employee.
- ✓ Atmospheric test in compliance.
- ___ Attach hot work permit
- ___ Other

AUTHORIZED ENTRANTS:

Jeff Stacy

AUTHORIZED ATTENDANTS:

Dave Hamberlin

STAND BY SAFETY PERSONNEL:

TEST	Allowable Limits	Check (✓) if Required	In Result AM/PM	Out Result AM/PM	Result AM/PM	Result AM/PM	Result AM/PM	Result AM/PM
Time			11:00 AM	12:38 AM				
Oxygen-min.	19.5%	✓	19.9	18.8				
Oxygen-max.	23.5%	✓	20.8	20.8				
Flammability	10% LEL / LFL	✓	0	0				
H_2S	10 ppm	✓	0	3.0				
Toxic (specify)								
Cl_2	5 ppm							
CO	35 ppm	✓	0	0.0				
SO_2	2 ppm							
Heat	°F/°C							
Other								
Other								

Name of employee conducting atmospheric monitoring: Jeff Stacy

Instrument(s) used: MSA Solaris

Statement of acceptable entry conditions: Good

AUTHORIZATION:

I certify that all required precautions have been taken and necessary equipment is provided for safe entry and work in this confined space

Time: 9/8/08 11:00 Date: 9/8/08

Name (Print): Jeff Stacy

Signature:

TREKK DESIGN GROUP, LLC

Tabular Data Output

Site ID Fort Leonard Wood, MO - Meter 8

Start Date 9/8/2008
End Date 9/17/2008

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
0:00	0.00	1.55	1.63	1.63	1.83	1.87	1.92	2.91	1.79	1.54
0:15	0.00	1.58	1.72	1.53	1.94	1.59	1.77	2.55	1.71	1.42
0:30	0.00	1.48	1.78	1.43	1.87	1.73	1.82	2.84	1.83	1.46
0:45	0.00	1.31	1.75	1.54	1.87	1.79	1.73	2.49	1.72	1.35
1:00	0.00	1.55	1.65	1.42	1.87	1.69	1.87	2.52	1.65	1.41
1:15	0.00	1.38	1.61	1.35	1.93	1.67	1.62	2.50	1.70	1.50
1:30	0.00	1.30	1.62	1.43	1.69	1.85	1.62	2.40	1.72	1.41
1:45	0.00	1.47	1.51	1.40	1.78	2.08	1.71	2.35	1.78	1.36
2:00	0.00	1.55	1.65	1.56	1.77	1.65	1.76	2.41	1.62	1.48
2:15	0.00	1.27	1.63	1.52	1.68	1.89	1.92	2.54	1.48	1.22
2:30	0.00	1.38	1.75	1.37	1.72	1.64	2.17	2.11	1.52	1.28
2:45	0.00	1.39	1.42	1.25	1.80	1.66	2.81	2.49	1.53	1.30
3:00	0.00	1.35	1.46	1.26	1.63	1.73	3.17	2.38	1.60	1.26
3:15	0.00	1.30	1.63	1.36	1.81	1.60	3.72	2.21	1.60	1.26
3:30	0.00	1.44	1.59	1.31	1.78	1.55	4.75	2.42	1.49	1.22
3:45	0.00	1.28	1.56	1.30	1.73	1.62	6.74	2.20	1.73	1.35
4:00	0.00	1.36	1.53	1.43	2.08	1.72	8.46	2.33	1.75	1.31
4:15	0.00	1.38	1.50	1.42	1.77	1.58	8.82	2.57	1.96	1.41
4:30	0.00	1.30	1.69	1.47	1.99	1.76	9.84	2.40	1.73	1.35
4:45	0.00	1.45	1.85	1.85	2.16	1.84	9.84	3.00	1.89	1.51
5:00	0.00	2.25	2.47	2.36	2.80	2.13	10.31	3.36	2.36	2.32
5:15	0.00	2.56	2.85	2.65	2.73	2.19	9.62	3.58	2.59	2.69
5:30	0.00	2.58	2.52	2.84	2.89	2.48	10.40	3.52	2.74	2.60
5:45	0.00	2.52	2.36	2.71	3.14	2.48	9.98	3.31	2.77	2.74
6:00	0.00	2.41	2.31	2.71	2.62	2.13	9.65	3.05	2.65	2.24
6:15	0.00	2.11	2.27	2.47	2.46	2.03	9.99	3.16	2.42	2.23
6:30	0.00	2.39	2.23	2.39	2.55	1.93	10.38	3.05	2.50	2.32
6:45	0.00	2.16	2.62	2.48	2.51	2.01	10.37	3.30	2.64	2.32
7:00	0.00	2.69	3.28	2.70	3.07	2.36	9.53	3.31	2.94	2.85
7:15	0.00	3.03	3.24	3.23	3.03	2.27	10.15	3.58	3.00	2.83
7:30	0.00	2.58	3.17	2.54	3.22	2.31	10.25	3.22	3.11	3.00
7:45	0.00	2.63	3.06	2.59	3.04	2.35	9.74	3.03	2.89	2.49
8:00	0.00	3.15	2.55	2.67	2.75	2.53	9.34	3.13	2.64	2.57
8:15	0.00	2.75	2.68	2.65	2.52	2.22	9.72	2.85	2.55	2.46
8:30	0.00	2.68	2.70	2.82	2.67	2.49	9.38	2.94	2.51	2.63
8:45	0.00	2.54	2.63	2.69	2.81	2.29	9.91	2.88	2.49	2.19
9:00	0.00	2.40	2.78	2.56	2.81	2.17	10.32	3.11	2.42	2.29
9:15	0.00	2.68	2.53	2.65	2.58	2.10	9.17	2.87	2.39	2.44
9:30	0.00	2.38	2.54	2.23	2.88	2.21	9.50	3.07	2.47	2.49
9:45	0.00	2.20	2.61	2.72	2.71	2.37	8.80	2.95	2.47	2.21
10:00	0.00	2.24	2.24	2.27	2.68	2.12	8.67	3.05	2.54	2.29
10:15	0.00	2.27	2.50	2.55	2.52	2.15	7.68	2.96	2.21	2.22
10:30	0.00	2.04	2.33	2.43	2.64	2.24	8.39	3.09	2.31	2.65
10:45	0.00	2.26	2.76	2.86	2.87	2.25	7.18	3.32	2.13	2.26
11:00	0.00	2.34	2.70	2.33	2.84	2.33	8.44	3.01	2.34	2.64
11:15	0.00	2.21	2.49	2.43	2.64	2.15	7.86	3.14	2.37	0.00
11:30	0.00	2.13	2.48	2.32	2.69	2.14	7.83	2.86	2.23	0.00
11:45	0.00	2.36	2.41	2.36	2.83	2.13	6.63	3.09	2.53	0.00
12:00	0.00	2.29	2.64	2.71	2.55	2.35	6.89	2.94	2.63	0.00
12:15	0.00	2.32	2.49	2.50	2.73	2.21	6.29	2.77	2.56	0.00
12:30	0.00	2.04	2.42	2.33	2.60	2.32	6.42	2.75	2.50	0.00

Time	Mon 9/8/2008	Tue 9/9/2008	Wed 9/10/2008	Thu 9/11/2008	Fri 9/12/2008	Sat 9/13/2008	Sun 9/14/2008	Mon 9/15/2008	Tue 9/16/2008	Wed 9/17/2008
12:45	0.00	2.37	2.57	2.49	2.66	2.56	5.99	2.95	2.37	0.00
13:00	0.00	2.25	2.34	2.52	2.87	2.35	6.27	3.12	2.55	0.00
13:15	0.00	2.28	2.62	2.51	2.95	2.28	5.96	2.74	2.49	0.00
13:30	0.00	2.47	2.57	2.57	2.67	2.37	6.44	2.71	2.54	0.00
13:45	2.46	2.42	2.47	2.64	3.04	2.40	6.36	3.18	2.34	0.00
14:00	2.31	2.30	2.43	2.68	2.99	2.30	5.30	3.11	2.70	0.00
14:15	2.34	2.53	2.49	3.00	2.67	2.20	5.63	3.20	2.60	0.00
14:30	2.48	2.46	2.67	2.62	2.72	2.58	5.57	2.71	2.38	0.00
14:45	2.42	2.92	2.81	2.29	2.71	2.05	5.55	2.36	2.28	0.00
15:00	2.56	2.89	2.73	2.82	2.80	2.19	5.08	2.75	2.30	0.00
15:15	2.66	2.89	2.83	2.74	2.55	2.29	5.03	2.56	2.50	0.00
15:30	2.36	2.38	2.61	2.58	2.44	2.49	4.77	2.88	2.40	0.00
15:45	2.77	2.30	2.45	2.63	2.41	2.35	5.15	3.09	2.35	0.00
16:00	2.48	2.56	2.44	2.54	2.59	2.30	4.66	2.41	2.33	0.00
16:15	2.31	2.55	2.75	2.30	2.73	2.42	4.41	2.52	2.44	0.00
16:30	2.27	2.36	2.48	2.32	2.56	2.28	4.13	2.57	2.43	0.00
16:45	2.09	2.36	2.44	2.63	2.52	2.19	4.53	2.47	2.25	0.00
17:00	2.51	2.60	2.49	2.40	2.37	2.20	3.91	2.35	2.40	0.00
17:15	2.41	2.26	2.28	2.37	2.80	2.13	4.39	2.56	2.26	0.00
17:30	2.46	2.24	2.31	2.39	2.82	2.24	4.33	2.29	2.28	0.00
17:45	2.26	2.05	2.18	2.47	2.36	2.13	4.09	2.51	2.26	0.00
18:00	2.39	2.50	2.35	2.48	2.57	2.40	4.23	2.32	2.25	0.00
18:15	2.39	2.27	2.55	2.78	2.85	2.13	4.16	2.53	2.29	0.00
18:30	2.41	2.60	2.49	2.65	2.29	2.44	4.21	2.61	2.31	0.00
18:45	2.37	2.42	2.30	2.74	2.63	2.39	4.27	2.42	2.28	0.00
19:00	2.23	2.49	2.45	2.84	2.45	2.70	4.34	2.47	2.43	0.00
19:15	2.53	2.59	2.71	3.48	2.96	2.47	4.32	2.57	2.42	0.00
19:30	2.88	2.61	2.59	2.91	2.92	2.34	4.06	2.52	2.33	0.00
19:45	2.81	2.73	2.48	3.01	2.48	2.05	4.02	2.97	2.33	0.00
20:00	2.66	2.57	2.74	3.38	2.56	2.44	3.94	2.92	2.23	0.00
20:15	3.27	2.97	3.06	3.51	2.85	2.99	4.32	2.91	2.48	0.00
20:30	3.59	3.39	3.40	3.64	2.80	3.21	5.06	3.49	2.95	0.00
20:45	3.92	3.78	3.52	4.20	3.60	3.64	4.99	3.92	3.59	0.00
21:00	4.27	4.09	3.69	4.75	3.57	4.03	5.21	4.16	3.55	0.00
21:15	4.31	3.69	3.86	4.11	3.67	3.82	4.39	4.08	3.54	0.00
21:30	3.59	3.42	2.97	3.69	3.52	3.30	3.98	3.39	3.40	0.00
21:45	2.90	3.03	2.73	3.04	2.86	3.03	4.21	2.77	2.93	0.00
22:00	2.52	2.28	2.47	2.99	2.52	2.46	3.36	2.65	2.35	0.00
22:15	2.22	2.03	2.41	2.75	2.54	2.33	3.26	2.28	2.03	0.00
22:30	2.20	2.29	2.21	2.41	1.96	2.13	3.11	2.18	1.94	0.00
22:45	2.10	1.89	2.01	2.36	2.05	1.85	3.17	2.18	1.73	0.00
23:00	2.14	2.05	1.90	2.16	2.00	1.87	2.94	1.95	1.75	0.00
23:15	1.59	1.62	1.90	2.11	2.10	1.94	3.09	1.84	1.54	0.00
23:30	1.64	1.67	1.65	2.03	1.92	1.91	2.44	1.92	1.48	0.00
23:45	1.62	1.88	1.84	1.89	1.76	1.92	2.74	1.85	1.48	0.00
Average	**1.10**	**2.50**	**2.38**	**2.44**	**2.52**	**2.23**	**5.81**	**2.79**	**2.30**	**0.93**
Max.	**4.31**	**4.09**	**3.86**	**4.75**	**3.67**	**4.03**	**10.40**	**4.16**	**3.59**	**3.00**
Min.	**0.00**	**1.62**	**1.42**	**1.25**	**1.63**	**1.55**	**1.62**	**1.84**	**1.48**	**0.00**

All Values in Million Gallons per Day (mgd)