SECTION 22 05 00 - PLUMBING

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 23 01 00.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings. In general, the work consists of, but is not limited to, the following:

Plumbing demolition and new plumbing fixture and piping installation.

RELATED WORK

Insulation is specified in Section 23 07 10.

Pipe hangers and supports are specified in Section 23 05 29.

QUALITY ASSURANCE

All materials and installations are to comply with the following. If conflicts occur between plumbing codes and the specifications, the most restrictive requirements shall govern.

National Electric Code
Florida Building Code
Florida Plumbing Code
Florida Energy Efficiency Code for Building Construction
Florida Administrative Code, 10D-10, Sanitary Facilities for Buildings Serving the Public and Places of Employment.
Accessibility Requirements Manual, Florida Board of Building Codes & Standards

Furnish and install equipment having the characteristics and accessories indicated on the drawings or in these specifications. The manufacturer's specifications for the models shown on the drawings or given as basis for design, plus all features, options, and accessories indicated on the drawings or in these specifications, whether or not standard for the model scheduled or offered as a substitute, shall constitute the minimum requirements for equipment furnished under this section.

SUBMITTALS

Submit to the Architect/Engineer for approval electronic copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Piping and Fittings

Plumbing fixtures

Valves, cleanouts, and floor drains

Proposed fire proofing systems at penetrations of rated walls.

Pipe hangers and supports.

CHANGES

The Drawings indicate generally the locations of plumbing fixtures, apparatus, piping, etc., and while these are to be followed as closely as possible, if before installation, it is found necessary to change the location of same to accommodate the conditions at the building, such changes shall be made without additional cost to the Owner and as directed by the Architect/Engineer.

PART 2 - PRODUCTS

MATERIALS WHICH PENETRATE FIRE WALLS

Where insulated piping or plastic materials penetrate fire walls, provide a UL listed systems for maintaining the rating.

Where bare-metal piping systems penetrate fire walls, provide a permanent sleeve which is grouted or rocked into wall. Provide a UL listed fire caulk for the annular space.

PLUMBING FIXTURES, TRIM AND FITTINGS

Furnish and install all plumbing fixtures and trim, floor drains and cleanouts as shown on the Drawings. Fixtures shall be as specified or equivalent quality fixtures by American Standard, Kohler, Universal Rundle or Eljer.

Provide all items of brass and chrome plated finish except where otherwise noted.

Brackets, Anchors, and Cleats: Furnish and install where required for support, conceal behind finished wall.

PIPING

Where more than one material is specified for a particular application, comply with Drawing Notes. Where interfacing with an existing system supply materials to match the existing. Where not connecting to existing and where not specified on the Drawings, then the Contractor may select from the options listed.

All materials shall comply with latest ASTM specifications in each instance that ASTM has specifications and standards relating to such materials.

Sanitary Waste and Vent

PVC DWV Soil Pipe, schedule 40, ASTM D2665

PVC Sewer Pipe, schedule 40, ASTM D2665

Copper tubing, Type L, conforming to ASTM B88, with brazed or solder-joint copper, brass or bronze fittings conforming to ANSI B16.18 or B16.22.

Copper tubing, DWV grade, hard temper conforming to ASTM B306, with solder joint, cast bronze fittings conforming to ANSI B16.23. Tubing larger than 2 inches shall use wrought copper fittings conforming to ANSI B16.29.

Domestic Water Pipe:

Above grade domestic water pipe shall be type L hard copper, conforming to ASTM B88. ProPress cast or wrought fittings per ASME B16.18 or B16.22. Where required solder fittings are acceptable

Piping below grade shall be annealed soft copper per ASTM B88. Limit fittings where possible.

Below Grade & Below Slab Piping & Fittings: Ductile iron pipe: AWWA C151, working pressure 150 psig, exterior and interior bituminous coating. Provide flanged and anchored connection to interior piping.

Below Grade Piping Alternative: PVC pipe: ASTM D2241, Class 150, working pressure 150 psig, fittings to be AWWA C151. J-M Ring-Tite or approved equal.

Below Piping Alternative 4” and Above: PVC pipe: AWWA C900, Class 150, working pressure 150 psig, fittings to be AWWA C151. J-M Ring Tite or approved equal.

Exposed Pipe in Toilet Areas:

Exposed pipe shall be chrome plated brass, American Brass Co., or equivalent. Furnish and install chrome plated brass wall plates.

Lavatory and Similar Waste Arms:

Type M or L copper water tube, Mueller or equivalent.

Urinal Waste Arms:

PVC.

Roof Drain Piping:

PVC DWV Soil Pipe, schedule 40, ASTM D2665

PVC Sewer Pipe, schedule 40, ASTM D2665

Below grade and below slab piping may be PVC pipe and fittings: schedule 40, conforming to ASTM D2665 or D2661 respectively.

PIPE ACCESSORIES:

Pipe sleeves: metal sized to allow minimum clearance between pipe and sleeves or insulation and sleeves.

Provide chrome-plated brass escutcheon plates where exposed pipe passes through walls, floors, or ceiling in finished areas.

Furnish and install dielectric or isolation fittings at all points where copper pipe connects to steel pipe.

Adjustable wrought clevis type hanger and rods: Anvil or equivalent. Provide copper hangers for copper piping.

Install water hammer arrestors as shown on the Drawings and where required by codes.

VALVES

Ball Valves: 125 lb., bronze ball valve.

TRAPS

For Lavatories and Sinks: Fully Cast Brass, 17ga., chrome plated.

TRAP PRIMERS

1/2 automatic trap primers: all bronze body with integral vacuum breaker and gasketed service cover.

PART 3- EXECUTION

INSTALLATION OF PIPING

Condensate piping shall be sloped same as sanitary waste and vent.

On vertical sanitary drain lines, connect all soil and waste inlets through sanitary tees, wyes, or wyes and eighth bends. Short radius fittings may be used for vent piping. On horizontal lines connect all waste and soil connections through wyes or wyes and eighth bends. Double branch fittings may be used on vertical lines and horizontal runs, providing proper grades can be maintained.

Make joints in PVC plastic pipe with solvent cement in accordance with pipe manufacturer's instructions.

Lay horizontal drain pipes to uniform grade; riser pipes, vertical. Make changes in directions of drain pipes with long bends. No screwed joints permitted in drain pipes, except as described herein.

Lay all sewers and branches, where practicable, on undisturbed earth cut at proper grade. Where laid on fill, provide adequate supports to maintain pitch of the line.

Sizes of risers and mains of water system piping shall be as designated on the Drawings. Verify any omitted sizes before installation.

Cover pipe openings at all times that the work is not in progress at that point.

Cut brass and copper pipe by means of hacksaw. Remove all burrs and metal chips, dirt, etc., before joining pipe. Chrome plated pipe shall show no wrench marks after installation; no threads shall show.

Adequately support all piping above floors inside the building from or on the building structure. Support piping suspended from the building structure by means of the specified pipe hangers and rods. Support interval shall be per FBC Plumbing Table 308.5.

Sanitary and storm drain piping shall be supported by at least one hanger on each full length of pipe close to hub where possible and at least one within 24 inches of each fitting, and wherever else required to prevent tendency toward deflection due to load. Provide a hanger at upper angle at each drop. Locate hangers adjacent to hubs on multiple fittings not more than four feet on centers.

For support spacing of all other horizontal piping refer to MSS-SP-69 and provide additional supports at valves, strainers, in line pumps and other heavy components. Provide a support within one foot of each elbow.

Vertical Pipe Supports: Up to 6 inch 60 feet long or not over 12-inch pipe up to 30 feet long, Riser clamps bolted to pipe below couplings, or welded to pipe and resting securely on the building structure. Vertical pipe larger than the foregoing, support on base elbows or tees, or substantial pipe legs extending to the building structure. Vertical runs less than 15 feet long may be supported by the hangers on the connecting horizontal runs.

Bases of drain stacks: If not buried in earth support on concrete, brick in cement mortar, or metal brackets permanently attached to building structure.

Make joints in PVC plastic pipe with solvent cement in accordance with pipe manufacturer's instructions.

Yard supply main piping: Piping shall be installed in strict accordance with the manufacturer’s recommendations. Provide 6” clean sand fill for pipe bedding. Insure minimum 18” of cover. Provide concrete thrust blocks at all changes of direction. Hand dig thrust block area just behind fittings. Bevel ends of PVC piping. Test piping in accordance with manufactures instruction.

INSTALLATION OF VALVES

Isolate all major piping assemblies as shown on the Drawings and as required for proper operation and maintenance. All valves shall be accessible. Provide valve boxes and access panels where required for accessibility.

Install service valve for hot and cold water at each plumbing fixture.

INSTALLATION OF TRAPS

Trap each fixture by water sealing trap placed as near the fixture as possible.

Vent all traps and place within 5 feet of the fixture which it serves unless otherwise noted.

INSTALLATION OF PIPE SLEEVES

Install pipe sleeves at all locations where pipe passes through walls, floors, or ceilings above or below grade. Sleeves shall extend above floor a minimum of 1". Seal floor sleeves in concrete floors with mortar. Coordinate sleeve size with piping and firestopping requirements in advance.

Where subject to moisture or weather, seal sleeves with watertight sealant.

INSTALLATION OF FIXTURES, TRIM, AND FITTINGS

Install the fixtures, trim and fittings specified, taking care to properly anchor each fixture.

Installation of carriers shall comply with manufacturers' maximum recommendations. Carriers shall be bolted to floor slab using all bolt holes or slots provided on carrier. Bolt size shall match hole or slot. Provide lock washer on each bolt. Use "Red Head" self-drilling anchors as manufactured by Phillips Drill Co. or approved equal product to set bolts.

When the use of a wrench is necessary on chrome plated piping, protect the pipe from marring by use of felt or cloth wrapping beneath wrench jaws.

INSULATION

Insulate all domestic hot water lines.

Insulate all interior condensate piping with ¾" thick elastomeric closed cell foam insulation. Insulation shall have a flame spread of less than 25 and a smoke developed rating of 50 or less as tested by ASTM C534, E84, UL-723 and NFPA 255.

Hot water pipe insulation shall be rigid glass fiber insulation with a nominal density of 3 pounds per cubic foot with a thermal conductivity of not more than 0.23 at 75 deg F mean temperature. Insulation cover shall be an all-service jacket with double self-sealing laps, with self-sealing butt strips. Insulation thickness shall be per FBC Energy Conservation Table C403.2.10 and as follows:

1" thick for pipe sizes 1-1/4" and smaller.
1-1/2" thick for pipe sizes 1-1/2" and larger.

Insulate all domestic cold-water lines subject to ambient conditions. Use closed-cell elastomeric thermal insulation, minimum density of 5.5 pounds per cubic foot with a thermal conductivity of not more than 0.27 at 75 deg F mean temperature. The material shall have a flame spread of 25 or less and a smoke-developed rating of 50 or less as tested by ASTM C534, E84 (25/50) UL-723 (25-50) and NFPA 255 (25-50). Seal all joints, seams, etc. air tight. Insulation thickness shall be per FBC Energy Conservation Table C403.2.10 and as follows:

1/2" thick for pipe sizes 1-1/4" and smaller.
1" thick for pipe sizes 1-1/2" and larger.

Pipe insulation is not required in crawl spaces where located more than 10’ from a ventilation opening.

Install insulation in accordance with manufacturer's recommendations.

TESTS AND INSPECTIONS

Make all water and air tests of the piping systems in the presence of and to the satisfaction of the Architect/Engineer or his designated representative. Conduct these tests at such places and with timing to permit work to proceed with as little interruption as possible. Make tests before work is concealed.

Test water piping to hydrostatic pressure at 125 psi and hold for 4 hours.

After the installation of sanitary piping and before the pipe is concealed or the fixtures are installed, cap or plug the ends of the system and fill all lines with water to top of vents above roof and allow to stand until a thorough inspection has been made. Should leaks appear, repeat the tests until the system is tight.

STERILIZATION

The sterilization process shall comply with all governing regulations and with the sterilization procedures recommended by the American Water Works Association. The chlorination process may be simplified by first flushing the system thoroughly clean, then charging with water containing a minimum of 50 parts per million of chlorine, allowing this to stand for 24 hours, then thoroughly flushing. After sterilization and final flushing, the local health authority is to be notified and their approval obtained in writing. Provide copies to the Construction Manager, engineer and Owner. Include a copy in the close out manual.

END OF SECTION

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221101 - HORIZONTAL DIRECTIONAL DRILLING (HDD)

PART 1 -GENERAL

1.00 DESCRIPTION:

These specifications are for the horizontal directional drilling (HDD) and testing of the proposed waterline.

1.01 SCOPE OF WORK:

A. The Contractor shall furnish and install underground pressure water mains using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring. This Work shall include all drilling equipment, materials, piping, appurtenances, and labor for the complete and proper installation, testing, and placing into service of pressurized mains; and all required environmental protection and restoration requirements.

1.02 QUALITY ASSURANCE:

A. Entry and exit points shall be as shown on the drawings, unless otherwise approved in writing by the Engineer. The Contractor shall employ licensed, professional land surveyors to locate the entry and exit points, and to establish horizontal and vertical datum for the bore and the pipe layout and fabrication areas.

B. The Directional Boring operation is to be operated in a manner to eliminate the discharge of water, drilling mud, and cuttings to any nearby water bodies, or to the land areas involved during the construction process. If inadvertent spills to nearby water bodies occur, the Contractor shall immediately provide environmental controls and clean up to the satisfaction of, and at no additional expense to BDC.

C. Best Management Practices (BMP's) for erosion control within the Contractor's work area shall be implemented and maintained at all times during drilling and back-reaming operations to prevent siltation and turbid discharges in excess of State Water quality Standards pursuant to Rule 62-302, F.A.C. Methods shall include, but are not limited to the immediate placement of turbidity containment devices such as turbidity screen, silt containment fence, hay bales, and earthen berms, etc. to contain the drilling mud.

D. The Contractor's operations shall be in conformance with the Directional Crossing Contractors Association (DCCA) published guidelines (latest edition) and pipe manufacturer's guidelines and recommendations.

1.03 GENERAL:

A. Provide the following equipment and materials for the horizontal directional drilling installation of pressure mains:

1. A directional drilling rig of enough capacity to perform the bore and pullback operations
2. A drilling fluid mixing, delivery, and recovery system of enough capacity to complete the crossing
3. A drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused
4. A magnetic guidance system to accurately guide boring operations

5. A vacuum truck of enough capacity to handle the drilling fluid volume
6. Trained and competent personnel shall operate the system
7. Miscellaneous equipment and materials required to complete the installation in accordance with the plans and permit requirements

B. All equipment shall be in good, safe operating condition with enough supplies, materials, and spare parts on hand to maintain the system in proper working order throughout the drilling and pressure main installation.

1.04 WATER MAINS:

A. Pipe shall be fusible HDPE pipe with ductile iron pipe size (DIPS) outside diameters (OD) in accordance with AWWA C906. The dimension ratio (DR) of the pipe shall be DR-11 and shall be suitable to withstand the pull-back forces required for the directional drilling without any permanent deformation in the pipe section or strength.

B. Fusible HDPE pipe for horizontal directional drilling applications shall be joined by means of zero leak-rate thermal heat butt-fusion welds. Joints shall provide axial pullout resistance. The bending radius pressure main shall not exceed 80 percent (0.80 X) of the manufacturer's recommended maximum bending radius for the size and type of pipe. Pipe for potable water applications shall be NSF Approved.

C. The tracer wire shall be a direct burial #10 AWG high-strength copper-clad steel with a 30-mil high-density polyethylene coating on the outside for protection. The tracer wire shall be rated for 30 volts and meet APWA color coding requirements for the utility application. Approved products include Copperhead Industries, LLC - #10 AWG HS-CCS Tracer Wire; Pro-Line Safety Products - #10 AWG Pro-Trace HF-CCS Tracer Wire; or approved equal.

1.05 INSTALLATION:

A. Erosion and sedimentation control measures and on-site containers shall be installed to prevent drilling mud from spilling out of entry and/or exit pits. Drilling mud shall be disposed of off-site in accordance with local, state, and federal requirements and/or permit conditions.

B. Pilot Hole: Pilot hole shall be drilled on bore path with no deviations greater than 2% of depth over a length of 100-feet. If the pilot hole does deviate from bore path more than 2% of depth in 100-feet, the Contractor shall notify BDC. BDC may require the Contractor to pullback and re-drill from the location along bore path before the deviation.

C. Reaming: Upon successful completion of pilot hole, the Contractor will ream the borehole to a minimum of 25% greater than outside diameter of pipe using the appropriate tools. Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.

D. Pullback: After successfully reaming borehole to the required diameter, Contractor shall put the pipe through the borehole. In front of the pipe shall be a swivel and barrel reamer to compact bore-hole walls. Once pullback operations have commenced, operations must continue without interruption until pipe is completely pulled into borehole. During pullback operations, the Contractor shall not apply more than the maximum safe pipe pull pressure at any time. A break away head rated at the maximum safe pull pressure shall be utilized.

E. During pullback, drilling fluid pressures and flow rates shall be continuously monitored. The pressures shall be monitored at the pump and within the annular space with a down hole pressure sensing tool located within thirty (30) feet of the drilling head.

F. Tracer Wire: A minimum of three continuous tracer wires shall be attached with nylon wire (“zip”) ties at different radial locations around the pipe to ensure continuity in at least one wire subsequent to installation. Contractor shall be required to provide as many wires as necessary to maintain continuity throughout the length of the directional bore. Splices along the length of the bore shall be permitted only in the event of a break in the tracer wire during installation. In such event, the wire shall be joined using a proper sized swage crimp on stripped bare wire ends with a double heat-shrink wrap.

G. The pipe entry area shall be graded to provide support for the pipe to allow free movement into the borehole. The pipe shall be guided in the borehole to avoid deformation of, or damage to, the pipe. If unexpected subsurface conditions are encountered during the bore, the procedure shall be stopped. The installation shall not continue until BDC has been consulted.

H. The pipe shall be pulled back through the borehole using the wet insertion construction technique. The pipe shall be installed full of water.

I. The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, movement or distortion of surface features.

J. A boring log shall be kept with horizontal and vertical location every 10-feet prior to over ream and product pipe pullback. The horizontal location of the bore shall be marked in the field during the bore. The Surveyor shall locate these marks and include this information with the bore depths in the Record Drawings. The Surveyor may make a note on the drawing page containing the directional drill and provide an exception for the directional drill only, as the directional drill route cannot be uncovered and physically located.

K. The contractor shall be considered as having completed the requirements of any directional boring when he has successfully completed the work and tested the pipe to the satisfaction of the BDC construction project manager.

L. At the completion of construction, the Contractor shall remove all temporary facilities installed by the Contractor. Unused soil, aggregate, and other materials shall be removed and disposed of at approved sites in accordance with all Federal, State, and Local regulations. Any damage to streets, lawns, common areas, and sidewalks shall be restored to original or better conditions. All disturbed areas shall be re-vegetated.

1.06 TESTING:

A. Perform hydrostatic testing for leakage following installation of the directional drill.

B. The total test duration (time), including initial pressurization, initial expansion, and time at test pressure must not exceed 8-hours. If the test is not completed due to leakage, equipment failure, etc., the test section shall be depressurized and allowed to "relax" for a minimum of 8-hours before it is brought back up to test pressure. The test procedure consists of the initial expansion phase and leakage test phase.

C. The test pressure for all pressure pipe shall be 150-psi.

D. Initial Expansion Phase: During the initial expansion phase, the test section is pressurized to the test pressure and enough make-up liquid is added each hour for 3- hours to return to test pressure.

E. Leakage Test Phase: The leakage test phase follows immediately and shall be either 2 or 3-hours in duration. At the end of the time test, the test section shall be returned to test pressure by adding a measured amount of liquid. The amount of make-up liquid added shall not exceed the values provided in the following Table.

Pressure Test Table - Allowance for Make-up Water Under Pressure*								
Test Duration (hours)	2	4	6	8	12	16	20	24
	Allowance/100-feet of Pipeline (gallons)							
2	0.11	0.25	0.60	1.00	2.30	3.30	5.50	8.90
3	0.19	0.40	0.90	1.50	3.40	5.50	8.00	13.30
*Applies to test period and not to initial expansion phase								

Mandrel Testing: Perform mandrel testing through the entire length of the installed pipe. The mandrel size shall be 90% of the inside diameter of the pipe.

PART 2 -FRAC-OUT PLAN

2.00 INTRODUCTION

This horizontal directional drilling frac-out contingency and response plan provides preventive and mitigative measures to be used by FDEP Bureau of Design and Construction and its contractor during pipeline installation near the Wakulla Springs State Park spring head using horizontal directional drilling (HDD) technology. HDD is a proven and widely-accepted trenchless construction technique that is often preferred for its minimal impact to the ground surface and the environment. Although the great majority of HDD installations are completed without incident, it is possible for the drilling fluid used in the HDD process to be inadvertently released to the ground surface, and this plan outlines the approach to manage this risk. This is a preliminary plan, and more specific procedures will be developed by the contractor based on site-specific conditions prior to the start of drilling, and submitted to the construction manager for review and approval.

The HDD process utilizes pressurized drilling fluids to achieve a variety of goals, including:

- Suspending and transferring soil cuttings to the ground surface at the bore entry or exit point
- Stabilizing the walls of the borehole to prevent borehole collapse
- Lubricating the drill string and, during pullback, the product pipe, to reduce frictional resistance
- Offset groundwater pressure to prevent flushing of the borehole
- Cooling the downhole equipment and cutting tools

HDD operations potentially pose a risk to water bodies and land-based features through inadvertent returns of pressurized drilling fluid to the surface, commonly referred to as “frac-outs” or “releases.” A frac-out occurs when the drilling fluid is released to the ground surface through pathways in the soil. Drilling fluid typically consists of a mixture of bentonite, fresh water, and soil cuttings. Bentonite is a natural clay, which is extremely hydrophilic and can absorb up to ten times its weight in water. A bentonite-based drilling fluid usually contains no more than 5 percent bentonite. Other additives

such as attapulgite clay or synthetic polymers can be added to improve performance. These mixtures are not hazardous or toxic, but could potentially affect the water quality of a water body if introduced, or cause damage to a surface feature such as a roadway.

Frac-outs can occur at any place along an HDD installation, although the potential is higher for occurrence near the entry and exit points (locations where soil cover over the advancing drill bit is relatively shallow). The contingency and response plan detailed in the following sections outlines measures:

- To minimize the potential for releases
- To monitor for the timely detection of frac-outs
- To minimize the impact should a frac-out occur through containment, corrective action, and cleanup
- For notification of affected parties

2.01 PLANNING AND PREVENTION

All work will be performed in accordance with environmental permits and regulations. The contractor will use nontoxic bentonite or polymer mixtures of drilling mud to ensure that, if a frac-out occurs, it will not result in toxicity to marine life in stream.

The contractor performing the HDD must have experienced personnel onsite who are familiar with and experienced with the procedures for this type of installation. Before drilling activities begin, the contractor must submit any certifications and documentation for key personnel who will be performing drilling work, including the field supervisor, drill rig operator, steering hand, and pipe fusion welder. A trenchless construction inspector must be present for all HDD activities.

Before pilot drilling commences, a safety meeting is required, when the approved site-specific frac-out contingency plan will be discussed. The field crew members will review the procedures for preventing frac-outs and monitoring for frac-out detection, along with a review of the protocols for responding to a release, including the storage location of the response equipment and materials.

Prior to drilling, the entry and exit areas will be clearly marked and the limits of the work area(s) will be flagged. Erosion and sediment controls (including silt fencing, straw wattles, and temporary sediment trap) will be employed at the entry and exit worksites. In addition, containment equipment including earth-moving equipment, portable pumps, straw bales and straw wattles, hand tools, silt fencing, turbidity screens, sand bags, silt curtain for in-water work, and/or lumber will be stored in a readily available location at the project site. A vacuum truck will be on site or on call to be employed as necessary.

2.02 MONITORING PROCEDURES

Once drilling begins, the contractor will continuously monitor operations for evidence of an inadvertent release, such as abnormally high annular pressures or loss of circulation. The borehole pressure will be maintained as low as possible for a successful drilling operation, and will be continuously monitored by the contractor to identify abnormal changes, excessive increases, and loss of fluid volume or return flows.

The drilling fluid components will be continually tested and adjusted to adapt to the conditions of the subsurface. The contractor will monitor and document drilling fluid properties.

During all pilot drilling, reaming, and pullback operations, the contractor will visually inspect along the borehole alignment, including surface waters along the path, for evidence of a release. The monitor will have communication equipment, such as a radio or mobile phone, operational at all times during HDD activities, and will maintain direct communication with the HDD control cab. The drill rig operator will inform the alignment monitor in the case that, given the current mud pressures, volumes, and circulation, the operator believes there is an elevated risk for a frac-out event.

HDD operations during the crossing may be performed 24 hours per day to minimize the risk of HDD failure. Continuous operation maintains borehole integrity and minimizes the risk of borehole collapse, annular pressure spikes, and drill string or product pipe seizing. If operations continue before or after daylight hours, the worksite(s) will be well-lit using floodlights to allow for release detection, as well as a safe work environment.

2.03 RESPONSE PROCEDURES

Should the results of the monitoring indicate that a frac-out is suspected, a monitor will be immediately dispatched to visually observe the area of the alignment. The contractor will take a combination of the following response procedures to minimize the volume of drilling fluid that is released and mitigate the severity of the potential frac-out:

- Decrease pump pressure
- Slow the advance rate
- Pull the drill string back
- Temporarily stop drilling operations and shut down mud pump
- Swab the borehole
- Adjust the drilling fluid parameters
- Make a slight change in the borepath alignment

If the frac-out is confirmed by an observed release to the surface or turbidity plume in the water, the contractor will attempt to advance the drill head past the known frac-out point. The contractor may determine that sealing a fissure is required.

In the event of a release, the contractor will assess the amount and location of the release, document the impact with notes and photographs, and then take corrective actions to contain the released fluid.

Land Release

If a land release is detected, the contractor will take immediate corrective action to contain the release and to prevent or minimize migration off site or into the water.

- The contractor will create a containment area by installing berms, silt fences, and/or straw bales to prevent drilling fluid or silt-laden water from flowing along the ground.
- The containment measures will be focused particularly between the location of the release and the stream to prevent mud flow into the water.
- Construct pits and/or berms using hand tools and/or heavy equipment around the frac-out point to contain further releases onto the ground.
- Contractor will employ a vacuum truck as necessary to assist in the removal of the released fluid. Submersible pumps will be placed within the release area to capture material until the vacuum truck arrives.

- If the amount of an on-land release does not allow practical collection, the affected area will be diluted with fresh water and allowed to dry.
- If the release cannot be contained, drilling operations will be suspended until appropriate containment is in place. Small collection sumps may be constructed to pump the released fluid back into the mud processing system.
- After the HDD installation is complete, the frac-out area will be cleaned and all drilling mud disposed at an appropriate facility. All containment structures will be removed.

Waterbody Release

If release occurs within a waterbody, such as the stream, the contractor will take immediate corrective action to contain the release and minimize the impact to marine life and human health & safety.

- In shallow water, the contractor may install temporary dams with sandbags to isolate the released fluid from migrating further into the waterbody. Contractor will employ a vacuum truck as necessary to assist in the removal of the released fluid.
- Wherever necessary, the contractor will create a containment area by installing a silt curtain around the area of turbidity.
- Waterbody releases will be evaluated based on the extent and accessibility of the release area to determine the best method of cleanup. In some cases, recovery and cleanup of drilling fluid released into large bodies of water are not practical, as recovery measures have potentially greater impact to the environment than allowing the water-soluble drilling fluid to dissipate slowly.
- Whenever possible, the released fluid will be removed from the site and disposed at an appropriate facility. All containment structures will be removed.
- If the release cannot be contained, drilling operations will be suspended until appropriate containment is in place.

After successful containment and removal of the released material, operations will be able to continue (with the appropriate agencies' approval). All the activities associated with the frac-out response will be documented, and measures to prevent another release will be discussed.

2.04 NOTIFICATION

In the event of an inadvertent release, the contractor will take immediate corrective action, as identified above, to contain the release and to minimize or prevent impacts. The contractor will immediately notify FDEP park personnel at Wakulla Springs State Park and FDEP Bureau of Design and Construction (BDC). The BDC within 24 hours will notify the Florida Department of Environmental Protection permitting authority of the release.

The following information will be provided:

- Date and time of inadvertent release
- Location(s) of release and proximity to sensitive feature
- Quantity and type of material released and amount of recovered materials
- Containment and cleanup measures that have been completed and that are planned

The Contractor will work with the respective agencies to identify and complete any additional containment or cleanup measures.

2.05 ABANDONMENT

A borehole will need to be abandoned if a frac-out cannot be avoided, or if a frac-out has occurred that cannot be controlled, and mitigation measures have been determined to not be affective. The borehole will be completely abandoned, grouted, and a new alignment determined. Any borehole abandonment locations will be documented and shown on as-built documents.

The following steps will be implemented during abandonment of the borehole:

- Determine the new alignment for the HDD crossing.
- Insert casing, as necessary to remove the pilot string.
- Pump a thick grout plug into the borehole to securely seal the abandoned borehole.

END OF SECTION 221101