

## **FDOT Crossing Horizontal Directional Drill (HDD) Frac-Out Plan**

### **Introduction**

Controlling and maintaining fluid flow within the HDD bore during all installation stages is critical to the success of an HDD installation. While the HDD method is a proven technology, there are certain impacts that could occur as a result of the drilling, such as the inadvertent release of drilling fluid, which is a slurry of bentonite clay and water which is classified as non-toxic to the aquatic environment and is a non-hazardous substance. Drilling fluids that are released typically contain a lower concentration of bentonite when they surface because the bentonite is filtered out as it passes through existing sediments of varying types. However, if released into water bodies, bentonite has the potential to adversely impact fish and invertebrates. All drilling fluid components will be approved by the FDOT prior to use on the HDD installation.

While drilling fluid seepage associated with an inadvertent return is most likely to occur near the HDD bore entry and exit points, where the drill head is shallow, inadvertent returns can occur in any location along a HDD bore. This HDD Frac-Out Plan establishes operational procedures and responsibilities for the prevention, containment, and clean-up of inadvertent returns associated with the HDD for the Project. The HDD Contractor is responsible for the work and must adhere to this Plan during the HDD process.

The Contractor shall perform the project specific work in accordance with the FDOT Utility Permit and current Standards, Indexes and Utility Accommodation Manual.

- A. **BMPs:** The Contractor will implement the following Best Management Practices (BMPs) to minimize the potential for adverse FDOT right-of-way and environmental impacts during HDD activities.
1. BMPs for erosion control within the staging area shall be implemented at the start of Contractor mobilization and maintained at all times especially during the drilling, over reaming, and utility pipe pull-in operations to prevent off-site siltation and turbid discharges in excess of State Water Quality Standards pursuant to Rule 62-302, F.A.C. BMP methods shall include, but are not limited to, the immediate placement of turbidity containment devices such as turbidity screens, silt containment fence, hay bales, sand bags, earthen and stone berms, temporary containment swales, etc. to contain the drilling fluid. Earthen berms or swales shall not be utilized where they may impact wetlands or other surface waters.
  2. Drilling fluids for the HDD shall be a project specific homogenous mixture of non-toxic, non-environmentally hazardous, bentonite clay, potable water and polymer additive(s). All bentonite clay and polymer additives/stabilizing agents shall be pre-approved by the FDOT.

- B. **Frac-Out Prevention:** To provide an additional level of FDOT right-of-way, pavement and facilities protection, the following measures shall be taken to monitor any potential releases of drilling fluid.
1. Measures used to prevent frac-out during the HDD operation shall include maintaining the proper boring depth for the soil conditions along the drilling route as well as proper management of drilling fluids circulation pressure. Under the roadway, the minimum distance between the top of the over-ream hole and top of pavement shall be \_ #\_ feet as shown on the approved project drawings. This distance should be sufficient to prevent frac-out when drilling under the roadway with controlled and monitored drill fluid pressure.
  2. Drilling fluid returns (flow of drilling fluids to the HDD entry/exit pit location) will be continuously monitored visually during the installation.
  3. The volume and circulation pressure of drilling fluid in the HDD bore and over-ream shall be monitored at all times during the HDD operation. The HDD drill rig operator will monitor the downhole annular pressure at all times. Should a drop in volume occur, immediately conduct a visual inspection of both terrestrial and pavement portions of the HDD corridor. A visual inspection of all project area and adjacent waterbodies, and storm and sanitary sewer systems shall also be conducted.
  4. All drilling fluids associated with the HDD operation shall be contained onsite. The volume of the drilling fluids recirculation/solids settlement pit and onsite storage/frac tanks and watertight roll-off containers shall be determined by the HDD Contractor at the pre-construction meeting. As required during the HDD process, screened solids and surplus drilling fluid will be removed and disposed of off the project site at a location of the HDD Contractor's choice in accordance with applicable regulations. At the conclusion of all drilling operations, drilling fluid remaining in the pit will be settled, removed completely from the pit, and hauled to a disposal site of the HDD Contractor's choice in accordance with applicable regulations within 48 hours of the pipe pull-in. The pit(s) shall be backfilled in 8-inch lifts with FDOT Index 514 Optional Base Group 6 (Limerock-LBR 100) material and compacted in accordance with FDOT Standard Specification Section 120-8, 9, and 10. The paved and/or vegetated surface of the disturbed pit area shall be restored as specified.
  5. At all times, adequate protection will be taken to avoid impacts to FDOT right-of-way, pavement and structures, and Aquatic Preserve/Outstanding Florida Waters and contiguous wetlands. This shall include, but is not limited to halting of construction/drilling and/or placement of turbidity containment devices.
  6. A pump tanker or vactor truck shall be onsite and available at all times. The Contractor shall demonstrate to the FDOT and Owner/Permittee the contracted availability of additional pump tankers and/or vactor trucks if needed for surplus or frac-out drilling fluids.
  7. A spill kit (i.e., absorbent pads/brooms, shovels, goggles, gloves) shall be onsite and available at all times.

C. **Release Response Procedure:**

1. If the bore pressure is observed to be abnormally high or fluid loss is apparent and a release has occurred, the HDD Contractor has the following options (or any combination of these options):
  - a. Temporarily cease drilling operations and shut down mud pump delivering drilling fluids downhole;
  - b. Restart pump and stroke bore hole in 30-foot (+/-) lengths to restore circulation ("swab" the hole) as many as six times but no fewer than two times;
  - c. Introduce additional flow along the borehole starting at the entry/exit using "weeper" subs; and
  - d. Modify the drilling mud with a change in viscosity and/or lost circulation additives.
3. If the return drilling fluid is less than the projected amount to be recovered, the HDD Contractor shall immediately begin its search for the missing material in accordance with Section B.3. Once the drilling fluid and frac-out is located, then the drilling mud containment plan shall be immediately implemented.
4. If a frac-out is confirmed, all construction activity contributing to the frac-out shall cease immediately.
5. The Contractor shall notify the FDOT, Owner/Permittee, and any impacted utility owners upon confirmation of the occurrence. The notification shall include the time of the frac-out, location and impact on FDOT right-of-way, pavement and improvements, and the environmental conditions of the impacted area.
6. If the frac-out is observed during pull-back of the utility pipe, the following procedures will be followed:
  - The HDD Contractor shall implement all drilling fluid containment measures before continuing pull-back: and
  - The HDD Contractor will ensure all reasonable measures within the limitations of current technology have been taken to re-establish circulation; and
  - Continue the HDD utilizing a minimal amount of drilling fluid as required to penetrate the formation or to maintain a successful utility pipe pull back.
7. If the loss of drilling fluid or excess fluid pumping/recirculation pressure results in the heaving and/or settlement of FDOT pavement, curb, sidewalk and/or other infrastructure, the HDD Contractor shall immediately mobilize all equipment, manpower and devices to recover the drilling fluid, relieve the fluid pressure, stop any heaving or settlement of FDOT infrastructure and protect the public. The HDD Contractor shall prepare a remediation plan to repair, replace, or restore the affected FDOT infrastructure in accordance with FDOT Standards and Indexes, for approval by the FDOT prior to implementation.
8. Before continuing with the HDD operation, the HDD Contractor shall prepare and submit for FDOT and Owner/Permittee approval a revised plan for successful completion of the required project. The plan shall identify the manpower, equipment, drilling fluid, additives, pump pressures, original bore hole sealing, and bore path modifications that may be required.

D. **Drilling Mud Containment:**

1. The released drilling fluid and materials shall be contained immediately by BMPs listed in A.I. and the materials shall be removed by a pump or vacor truck.
2. The suction hose of the vacuum or pump shall be moved to minimize the removal of natural bottom material and the disturbance of any existing aquatic life and vegetation in any impacted water body.
3. Should the release of drilling fluids/materials discharge to a surface water, containment and clean-up with a vacuum or pumping system shall commence immediately and be completed within 24 hours.
4. Once the spill is contained, the collected fluid/material shall be properly disposed of by the HDD Contractor at an approved disposal site.
5. After containment/recovery of the drilling material/resources, the HDD Contractor shall prepare a detailed written report to be submitted to the FDOT, Owner/Permittee, and regulatory agencies and utilities having jurisdiction, within 10 business days, that summarizes the incident, including the following:
  - Details on the release event, including an estimate of the bentonite released;
  - The location and time of release;
  - The size of the area impacted, and the success of the clean-up action;
  - Name, firm, address and telephone number of HDD Contractor reporting;
  - Photos and/or digital recording of frac-out area and impacts;
  - Date and Time;
  - How the release occurred;
  - The type of activity that was occurring around the area of the inadvertent return;
  - Description of any sensitive areas and their location in relation to the inadvertent return;
  - Description of the methods used to clean up or secure the site;
  - Changes to the drilling fluid properties or drilling process (if any); and
  - the mitigation of any impacted FDOT and public utility infrastructure and water bodies from the frac-out.

**E. Final Clean-Up:**

After completion of the HDD installation, site-specific clean-up measures will be developed by the HDD Contractor for approval by FDOT and Owner/Permittee. Potential for secondary impact from the clean-up process will be evaluated, along with the benefits of clean-up activities.

**1. The following measures are to be considered:**

- All materials and any rubbish-construction debris shall be removed from the construction zone at the end of each workday;
- Drilling mud will be removed by hand using shovels, buckets, and soft bristled brooms to minimize damage to existing vegetation;
- Freshwater washes may be employed if deemed beneficial and feasible;
- Containment structures will be pumped out and the ground surface scraped to bare topsoil, thereby minimizing loss of topsoil or damage to adjacent vegetation;
- The recovered drilling fluid will be recycled or disposed of at an approved upland location or disposal facility. No recovered drilling fluid will be disposed of in streams or storm drains;
- All protective BMP measures (fibre rolls, straw bale, silt fence, etc.) will be removed unless otherwise specified by the FDOT and Owner/Permittee; and
- All containment structures, containers and tanks will be removed.

**F. Failed HDD Installation**

While not anticipated, if an attempted HDD installation is unsuccessful, the proposed HDD alignment may be modified under the FDOT right of way infrastructure using the same general location to accommodate an additional HDD attempt, depending on the conditions that resulted in the HDD failure.

Prior to attempting a second HDD crossing, a risk mitigation meeting shall be held with the FDOT and Owner/Permittee to determine the cause of the initial failure and any mitigation measures that could be adopted to reduce the risk(s) during the second HDD attempt.

Potential causes that may lead to a failed HDD installation include:

1. Stuck or damaged utility pipe during pullback operations. This risk may be mitigated by:
  - Completing swab pass or passes to gauge the condition of the HDD bore by evaluating the drill rig effort required to pull tooling through the HDD bore;
  - Only commencing pullback operations after verification that the bore is adequately conditioned; and

- Minimizing the amount of downtime associated with delays during pullback operations.
2. Bore instability/collapse. This risk may be mitigated by:
    - Confirmation the alignment of the HDD profile is in favorable ground materials along the alignment that are not amenable to raveling causing collapse of the bore.
  3. Excess loss of drilling fluids and inability to remove cuttings from the bore. This risk is mitigated by:
    - Confirmation the alignment of the HDD profile is in favorable ground materials along the alignment;
    - Evaluating the required and allowable drilling fluid pressures for the installation and providing sufficient separation between the required and allowable drilling fluid pressures; and
    - Incorporating temporary casing pipe to support shallow soils.

If the HDD bore could not be advanced and abandonment is required, the bore hole will be grouted with an approved cement-based or bentonite material to fill the excavation and minimize risks of a potential groundwater flow pathway starting at the low point or end of the drill hole in accordance with [FDEP Rules 62-532.500(4)].

If an HDD installation is completed and the installed utility pipe was damaged to the point it could not be used for its intend purpose, the inside of the utility pipe shall be grouted with a cement based grout and the annular space around the pipe grouted for a distance of approximately 200 feet at each HDD entry and exit location. The above approach is as outlined in the US Army Corps of Engineers' "Guidelines for Installation of Utilities Beneath Corps of Engineers Levees Using Horizontal Directional Drilling" (Latorre et al. 2002) that requires backfilling with grout or bentonite.

In addition, any additional requirements set forth in permits for this HDD installation will be met in terms of abandonment.