Attachment E

Horizontal Directional Drill
Frac-out Contingency Plan

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1. Introduction

This Horizontal Directional Frac-out Contingency Plan provides specific procedures and steps to contain the inadvertent releases of drilling mud (frac-outs) for water bodies that are crossed using horizontal direction drilling (HDD) techniques.

2. Drilling Fluid and Drilling Fluid System

The HDD process involves the use of a drilling fluid (also referred to as drilling mud) made up primarily of water. Bentonite clay is added to the water to enhance lubricating, spoil transport and caking properties of the drilling fluid. Bentonite is a naturally occurring, non-toxic, inert substance that meets NSF/ANSI 60 NSF Drinking Water Additives Standards and is frequently used for drilling potable water wells.

The primary purpose of drilling fluid is to power the downhole cutting tools, remove cuttings from the drill hole, stabilize the hole, and act as a coolant and lubricant during the drilling process.

The drilling fluid is prepared in a mixing tank containing both new and clean recycled drilling fluid. The fluid is pumped at rate of 100 to 1,000 gallons per minute (gpm) through the center of the drill pipe to the cutters. Return flow is through the annulus created between the wall of the boring and the drill pipe. The cuttings are then carried back to either the entry or the exit pit, depending on a combination of elevation difference and drilling/hole opening direction. Once in the entry pit, the fluid moves to the pickup pit to be pumped to the fluid processing equipment. Typically, shaker screens, desanders and desilters remove increasingly finer cuttings from the drilling fluid. The cleaned and recycled fluid is returned to the mixing tank and pumps for reuse in the borehole. Cuttings and bentonite mud (clay) are often desirable for agricultural applications and would either be made available to landowners for use or disposed of in a landfill. Landowners would be instructed that any beneficial use of the bentonite must include safeguards to keep the material separated from public water ways.

The HDD method has the potential for loss or seepage of drilling fluid into the native material through which the drill passes. In some cases, the drilling fluid may be forced to the surface resulting in what is commonly referred to as an inadvertent release or a frac-out. While one of the positive aspects of the HDD method is the avoidance surface disturbance, surface disturbances may occur when there is an inadvertent release of drilling fluid. Drilling fluid release is typically caused by pressurization of the drill hole beyond the containment capability of the overburden soil material or due to inherent weaknesses within the overlying soils such as a fissure or other pathway. In some cases, the pathway can be associated with boreholes advanced for geotechnical investigations or by bridge or building pilings.

The HDD operation is a closed system to minimize the discharge of drilling mud, fluids, and cuttings outside of the work area. In order to minimize the possibility of fluid escape, berms shall be used to contain the drilling fluids. The drilling fluids are cleaned and recycled to the extent possible. Tanks or dumpsters will be installed in lined pits. Care will be taken to prevent the fluids from getting into the soil and to prevent groundwater from entering the pits. Any drilling mud that inadvertently exits at points other than the entry and exit points shall be contained and collected to the extent practical, and the HDD contractor shall immediately notify a Keystone representative.

3. HDD Contractor Responsibilities and Requirements

The HDD contractor is responsible for execution of the HDD operation, including actions for detecting and controlling the inadvertent release of drilling fluid. Keystone will closely supervise the progress and actions of the HDD contractor through the use of onsite inspection teams.

The HDD contractor will be required to prepare a project specific Spill Preventation Control and Countermeasure Plan which includes project specific procedures concerning monitoring and response to frac-outs; including specific project and agency notification protocol. This plan will be reviewed and approved by Keystone prior to initiation of construction.

The Contractor will be equipped with a tracked hydraulic excavator, straw or hay bales, stakes to secure bails, silt fence, sand bags, shovels, pumps, and any other materials or equipment necessary to contain and clean up inadvertent releases.

A vacuum truck will be on call during drilling operations.

Ancillary items that will be readily available during drilling operations include: a light tower in case cleanup operations are needed after dark, a boat with relevant safety equipment during the crossing of large water bodies, and flexible plastic piping for potential mitigation where small creeks or drainages are involved.

4. Fracture Detection

Drilling crews and the Keystone inspection personnel will be responsible for the monitoring and detection of frac-outs. The most obvious signs of a frac-out are the visible pooling of drilling mud on the surface, a sudden decease in mud volume returns during drilling operations, or loss in drilling mud pump pressure. Drilling and mud system personnel will observe the volume of drilling fluid return and immediately report reductions to the foreman and Keystone personnel. The mud system operator will monitor actual drilling fluid volumes from the pumps and the return flow from the borehole. The operator will alert the on-site personnel if there is a significant variance. In the event of partial circulation loss, pumping of drilling fluid may be reduced to reduce pressure applied to native formation materials.

5. Corrective Action for an Inadvertent Release

In the event of an inadvertent release to the surface at locations other than the borehole location, the following actions will be taken:

If the release is large, mud circulation will cease immediately as practical. If the spill is small to moderate the contractor will continue circulation in order to maintain pressure in the hole. Maintaining circulation will also be necessary if the native material does not have the frictional characteristics necessary to maintain hole stability without the presence of mud provided under pressure.

In all cases, the contractor will also proceed as follows:

- Contain any drilling fluid that has surfaced (See section 6)
- Notify the Keystone representative
- Reduce circulation pressure and evaluate the circumstances leading to circulation loss to determine if the fracture can be sealed
- Thicken the drilling fluid to attempt to seal off the location of the release as practical.

6. Containment of Drilling Fluid Release

Immediately following the detection of the inadvertent drilling fluid release, containment and clean-up operations shall commence. For releases on land, Contractor shall use straw bales, silt fences, sand bags and earth berms to prevent fluid from migrating or flowing from the immediate area of the discharge. If the volume released is too small for containment measures or, if the release occurs in an environmentally sensitive area where release of containments can cause additional damage, the receiving area will be allowed to dry naturally. If there is a threat to a sensitive resource, or a threat to public safety, HDD activities will cease immediately until a plan to proceed is discussed.

Other containment measures include the following:

- Additional berms may be constructed around the release area as directed by the Keystone representative to prevent release of materials into the adjacent water body

- If the amount of fluid released is large enough to prevent practical collection, the affected area will be diluted with fresh water and allowed to dry. Measures will be implemented (berm, silt fence, and/or hay bale installation) to prevent silt laden water from flowing into the water body.

- If hand tools cannot contain a small on-land release, small collection sumps may be constructed to pump the released material into the mud processing system.

- Sump pumps or vacuum trucks will be used to remove and dispose of any drilling fluids as needed.

In cases of inadvertent releases to open water or flooded wetlands, it may be impractical or impossible to contain the release. For releases in shallow water, the HDD contractor will install staked sediment barriers as described in the Keystone Construction Mitigation and Reclamation Plan. Removal by vacuum truck may be attempted if deemed appropriate. The decision to proceed with the drilling operation will be at the sole discretion of the Keystone representative after all practical methods to seal off the location of the discharge have been attempted. Keystone will notify the appropriate authorities for downstream water intakes of the existence and location of any plume that extends more than 1,000 yards from the worksite. Underwater releases are typically allowed to dissipate since, by design, the HDD contractor would seek to avoid placing equipment within the water body. Water sampling equipment will be available for use by site inspectors to evaluate turbidity levels.

7. Clean-up of Releases

The clean-up shall commence after the release is contained. Clean-up shall include removal of all visible drilling fluid located in accessible areas. Removal methods will vary based on the volume of the release and the site specific conditions. Removal equipment may include vacuum trucks, loader and track hoe buckets, small pumps, shovels and buckets. If the release occurs in a sensitive area, it may be necessary to pump the fluid into an upland area for additional containment and disposal. After removal of the released drilling fluid, the release area will be returned as close to the original condition as possible. It may be necessary to store the drilling fluid residue on-site prior to disposal. If so, the necessary storage methods will be utilized to avoid future releases.

8. Agency Notification Procedures

If an inadvertent release is discovered, steps will be taken to contain the release as described in Section 6. Notification procedures for Keystone construction management personnel and regulatory agencies are as follows:

a) When monitoring indicates that an in-stream release has occurred, the Keystone representative will immediately notify the appropriate Federal and State Agencies as soon as possible. The nature of the release will be described and corrective actions will be detailed. The notified agencies will determine whether the implementation of additional measures is required. If it is determined that the release can not be remedied without causing additional adverse impact to the environment, Keystone will request agency approval to continue drilling operations. This data will be provided as specified in the project specific notification protocol established for HDD installations.

b) If downstream migration is imminent and, if water quality will be affected, downstream users will be contacted by Keystone. Relevant contact information will be gathered prior to commencement of construction operations and maintained on site as part of the project specific notification protocol.