APPENDIX D

OXYCHEM HORIZONTAL DIRECTIONAL DRILLING MONITORING AND CONTINGENCY PLAN

TETRA TECH

OxyChem Ethane Cracker, Markham Ethylene Pipeline, and San Patricio Pipeline Project

Horizontal Directional Drilling (HDD) Monitoring and Contingency Plan

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1.0 INTRODUCTION

Occidental Chemical Corporation (OxyChem) proposes to use Horizontal Directional Drilling (HDD) technology to install various waterbody crossings, railroad crossings, and roadway crossings for the proposed approximately 114.5-mile Markham Ethylene Pipeline Project (the Project). The Project will extend from OxyChem's proposed Ethane Cracker Facility located west of Ingleside in San Patricio County, Texas along a north/northeasterly alignment to their Markham Storage Hub located in Matagorda County, Texas. The Project will traverse Aransas, Calhoun, Jackson, Matagorda, Refugio, San Patricio, and Victoria Counties, Texas. HDD is a widely-used trenchless construction method which accomplishes the installation of pipelines and buried utilities with minimal impact to the feature being traversed. However, the HDD installation method involves the risk of failure when certain adverse subsurface conditions are encountered. The purpose of this document is to present contingency plans that may be implemented in order to complete the crossings successfully while minimizing environmental impacts in the event that unforeseen issues develop during HDD operations.

1.1 Background

The tools and techniques used in the HDD process are an outgrowth of the oil well drilling industry. The components of a HDD rig used for pipeline construction are similar to those of an oil well drilling rig with the major exception being that a HDD rig is equipped with an inclined ramp as opposed to a vertical mast. Drilling fluid is used throughout the operation to transport drilled spoil back to the surface, reduce friction, and stabilize the hole. HDD pilot hole operations are similar to those involved in drilling a directional oil well. Drill pipe and down-hole tools are generally interchangeable. Because of these similarities, the process is generally referred to as drilling as opposed to boring.

Installation of a pipeline by HDD is generally accomplished in three stages. The first stage consists of directionally drilling a small-diameter pilot hole along a designated directional path. The second stage involves enlarging this pilot hole to a diameter suitable for installation of the pipeline (in this case to accommodate the 8-inch ethylene pipeline). The third stage consists of pulling the prefabricated 8-inch pipeline segment into the enlarged hole.

1.2 Technical Team

In order to ensure the highest probability of success on the proposed HDD installation, OxyChem will assemble a technical team which includes consultants having expertise in HDD design, construction, and environmental issues specific to the proposed HDD crossing locations. This approach enhances the prospect of a successful HDD installation by bringing together more resources than those available to any single team member working independently.

2.0 FAILURE SCENARIOS

It is difficult to define a set of circumstances in advance that constitute "failure" of the HDD method; the decision to abandon HDD should take into account the unique conditions encountered on a given crossing. The following sections provide a discussion of operational issues that might ultimately lead to abandoning the HDD installation method.

2.1 Issues During Pilot Hole Drilling

Issues during pilot hole drilling generally occur in the form of high thrust or rotation loads on the drill string. This typically results from unconsolidated or coarse-grained material packing around the drill pipe as it is advanced. As friction on the drill string increases, the rig must apply greater torque and thrust. If the torque applied by the rig exceeds the strength of the drill pipe, the pipe will be sheared into two pieces, commonly referred to as "twisting off". Ultimately, friction can increase to the point that the drill string cannot be advanced or retracted, at which point it may be abandoned in place or parted by some means including intentionally twisting it off with the rig.

A skilled contractor will not continue drilling the pilot hole until the drill string becomes stuck. As loads on the drill string increase, the contractor will adjust drilling fluid properties and work the hole by tripping the drill string out and back in. These measures are generally successful and abandonment of an HDD crossing due to excessive loads is very rare during pilot hole drilling.

Another issue that can occur during pilot hole drilling is a lack of directional control resulting in either a violation of pilot hole position tolerances or an unacceptable angular change. This can occur when the drill bit is deflected off a boulder or cobble lens or when attempting to penetrate a hard bedrock formation at depth. If left uncorrected, an unacceptable angular change can result in failure of the drill pipe due to a combination of excessive bending stress and rotation. However, redrilling efforts are usually successful and abandonment of an HDD crossing due to a lack of directional control is very rare.

Solution cavities, occasionally present in limestone formations, can cause serious issues on an HDD installation, especially during pilot hole drilling when the drill string is in compression. While the wall of a competent borehole serves to limit the deflection of the drill string, penetration of a void leaves the drill string unconstrained potentially allowing it to deflect substantially. Continued rotation of a drill string subjected to such a deflection often results in failure of the drill pipe due to low-cycle fatigue. If efforts to avoid extensive solution cavities are unsuccessful, the HDD installation method is typically abandoned.

2.2 Issues During Prereaming

Issues during prereaming generally involve excessive tensile or torsional loads when enlarging a pilot hole through hard rock or discontinuous materials such as fractured rock or glacial till. In this situation, application of excessive torque from the rig can result in the drill pipe being twisted off down-hole. Accumulation of cuttings in the hole can cause tensile loads to become excessive, ultimately resulting in the reamer becoming stuck. If the reamer cannot be freed, the drill pipe is generally twisted off, either intentionally or unintentionally, and both the reamer and some amount of drill pipe are abandoned down-hole.

A skilled contractor can typically avoid getting the reamer stuck down-hole. As loads increase, the contractor will adjust drilling fluid properties and trip the reamer out of the hole to mechanically displace material. A stuck reamer is more difficult to free up than a pilot hole drill bit; reamers are generally designed to move forward, not backward.

Prereaming through hard or unusually abrasive rock can lead to failure of reaming tools down-hole due to excessive wear. This often results in roller cones or other portions of the reaming tool being lost down-hole where they can present an obstacle to subsequent reaming passes or installation of the pipeline. Fishing operations to retrieve pieces of a reaming tool lost down-hole are time consuming and often unsuccessful.

Penetration of an artesian aquifer on an HDD installation can cause significant issues, especially during prereaming operations when attempting to move a large volume of material out of the hole. A steady flow of groundwater into the hole from an aquifer tends to bring in fine soils which eventually accumulate in the hole and can cause the reamer or drill pipe to bind. Additionally, a significant flow of water into the reamed hole can have a negative effect on drilling fluid properties. If drilling fluid returns to the HDD endpoints are maintained, the additional water returning to the surface can become overwhelming, resulting in drilling fluid storage and disposal issues.

2.3 Issues During Pullback

As with prereaming, issues during pullback generally involve excessive tensile or torsional loads which can ultimately result in the pull section becoming stuck. Excessive torque and pulling forces applied in an attempt to free the pipe can result in twisting off down-hole. Removal of the pull section from the hole can be difficult and is sometimes impossible. If a partially installed pull section cannot be withdrawn, the contractor's only option is to start over, offsetting to one side and drilling a new pilot hole. Pipe left in the hole has to be replaced and a new pull section has to be fabricated.

Stuck pipe can also occur due to the relative stiffness of the pull section. During prereaming operations, it is possible for the reaming tool to "walk" around a boulder since it is being pulled and followed by a slender 5-inch drill pipe. However, when the same boulder is encountered during pullback, the reamer is forced to cut through it by the relatively rigid pull section.

3.0 CONTINGENCY PLANS FOR SPECIFIC OPERATIONAL ISSUES

The following are courses of action to consider if serious operational issues occur. These contingency plans are meant to serve as guidelines and tools for advanced planning. The actual course of action to be employed will be based on an analysis of the conditions encountered during construction.

3.1 Twist off During Pilot Hole Drilling

If there is a reasonable chance that the bottom hole assembly and/or drill pipe lost down-hole can be retrieved using fishing tools, the contractor will commence with this method to retrieve equipment. Otherwise, the contractor will offset within the approved workspace as surveyed and redrill the pilot hole around the twisted off segment.

3.2 Solution Cavity Encountered During Pilot Hole Drilling

If the solution cavity is not extensive (i.e. extending no more than a few feet along the drilled path) and the bit successfully re-enters the formation after passing through the void, the contractor will proceed with the pilot hole at its discretion. If the solution cavity is extensive, the contractor will offset and begin a new pilot hole in an effort to avoid the solution cavity.

3.3 Twist Off During Prereaming

If the failure is to the pipe side of the reamer, the contractor will trip the reamer out with the rig, trip out the failed drill pipe with pipe side equipment, and trip back through the partially reamed pilot hole with a directional drilling assembly. If the failure is to the rig side of the reamer, the contractor will trip out the failed pipe on the rig side. The contractor will attempt to separate the drill pipe from the reamer on the pipe side of the reamer and recover the drill pipe using pipe side equipment. If it is possible to redrill around the reamer and reenter the completed pilot hole without violating pilot hole tolerances, the contractor will do so. If not, the contractor will offset and drill a new pilot hole.

3.4 Twist Off During Pullback

If possible, the contractor will recover the pull section using pipe side equipment or other means available. The contractor will trip out the failed drill pipe and trip back through the reamed hole with a directional drilling assembly. Otherwise, the contractor will salvage as much pipe as possible, offset, and begin a new pilot hole.

3.5 Failed Installation

A single occurrence of the scenarios described above would not constitute a failure. Typically, there would have to be at least two occurrences resulting in stuck or twisted off drill pipe before an HDD contractor would consider abandoning the crossing. At any of the proposed HDD locations, if the first attempt results in a failure, OxyChem will initiate the site specific contingency plans described above. Should any drilled or reamed hole need to be abandoned, it will be filled with a mixture of drilling fluid and drilled spoil.

4.0 DRILLING FLUID

All stages of HDD involve circulating drilling fluid from equipment on the surface, through a drill pipe to a down-hole bit or reamer, and back to the surface through the annular space between the pipe and the wall of the hole. Drilling fluid returns collected at the entry and exit points are stored in steel tanks and processed through a solids control system which removes spoil from the drilling fluid, allowing the fluid to be reused. The basic method used by the solids control system is mechanical separation using shakers, desanders, and desilters. Excess spoil and drilling fluid are transported to, and disposed of, at an approved disposal site.

Under ideal circumstances, drilling fluid exhausted at the bit or reamer will flow back to the entry or exit point through the drilled annulus. In practice, sometimes this happens inconsistently. Drilling fluid expended down-hole will flow in the path of least resistance. In the drilled annulus, this path may be an existing fracture or fissure in the soil. This can result in dispersal of drilling fluid into the surrounding soils (lost circulation) or discharge to the surface at some random location (inadvertent returns or frac-outs).

The geometry of the pipeline profile can also lead to inadvertent returns; if the profile forces the pipe to make a compound or excessively tight radius turn, downhole pressures can build and increase the potential for drilling mud seepage. The primary areas of concern for inadvertent returns are the entry and exit points as the drilling equipment is typically at depths of less than 12 to 20 feet at these locations. The likelihood of inadvertent returns decreases as the depth of the pipe increases. The most obvious signs that an inadvertent return has occurred are visible pooling of drilling mud on the surface, sudden decrease in mud volume returns during drilling, or loss of drilling mud pump pressure.

Lost circulation and inadvertent returns are occurrences in pipeline installation by HDD and do not prevent completion. However, impacts may be realized if drilling fluid inadvertently returns to the surface at a location on a waterbodies' banks or within a waterbody. Drilling parameters may be adjusted to maximize circulation and minimize the risk of inadvertent returns. The most effective way to minimize environmental impact associated with HDD drilling fluids is to maintain drilling fluid circulation to the extent practical. However, resources spent in an effort to maintain circulation should be weighed against the potential benefits achieved through full circulation. It should be recognized that in subsurface conditions which are not conducive to annular flow, restoration of circulation may not be practical or possible. In such cases, environmental impact can often be minimized most effectively by completing HDD operations in the shortest possible amount of time. It should be noted that maintaining circulation will also be required when the native material does not have the frictional characteristics required to maintain hole stability without the presence of mud provided under pressure. It should also be noted that the possibility of lost circulation and inadvertent returns might not be entirely eliminated from any drilling operation.

4.1 Drilling Fluid Functions

The principal functions of drilling fluid in HDD pipeline installation are listed below.

- **Hydraulic Excavation.** On crossings through soft soils, soil is excavated by erosion from high velocity fluid streams through jet nozzles on bits or reaming tools.

- **Transmission of Hydraulic Power.** On crossings through harder soils or rock, power required to turn a bit and mechanically drill a hole is transmitted to a down-hole motor by the drilling fluid.

- **Transportation of Spoil.** Drilled spoil, consisting of excavated soil or rock cuttings, is suspended in the fluid and carried to the surface by the fluid stream flowing in the annulus between the pipe and the wall of the hole.

- **Hole Stabilization.** Stabilization of the drilled hole is accomplished by the drilling fluid building up a “wall cake” which seals pores and holds soil particles in place. This is critical in HDD pipeline installation as holes are often in unconsolidated formations and are uncased.

- **Cooling and Cleaning of Cutters.** Drilled spoil build-up on bit or reamer cutters is removed by high velocity fluid streams directed at the cutters. Cutters are also cooled by the fluid.

- **Reduction of Friction.** Friction between the pipe and the wall of the hole is reduced by the lubricating properties of the drilling fluid.

- **Modifications of Soil Properties.** Mixing of the drilling fluid with the soil along the drilled path facilitates installation of a pipeline by reducing the shear strength of the soil to a near fluid condition. The resulting soil mixture can then be displaced as a pipeline is pulled into it.

4.2 Drilling Fluid Composition

The major component of drilling fluid used in HDD pipeline installation is fresh water. In order for water to perform the required functions, it is generally necessary to modify its properties by adding a viscosifier. The viscosifier used almost exclusively in HDD drilling fluids is a naturally-occurring bentonite clay typically mined by “open pit” methods from locations in Wyoming and South Dakota. Bentonite is soft clay, formed by the weathering of volcanic ash, with the unique characteristic of swelling to several times its original volume when in contact with water. It is not a hazardous material as defined by the U.S. Environmental Protection Agency’s characteristics of ignitability, corrosivity, reactivity, or commercial chemicals. It is also used to seal earth structures such as ponds or dams and as a suspending component in livestock feeds.

Bentonite is an effective waterproofing agent; however, if inadvertently released into waterbodies and wetlands by a frac-out, it can create turbid conditions in waterbodies or result in filling of wetlands. Careful monitoring along with early detection and containment of inadvertent returns will help minimize any adverse effects of bentonite to wetlands and waterbodies.

The properties of bentonite used in drilling fluids are often enhanced by the addition of polymers. This enhancement typically involves increasing the yield. That is, reducing the amount of dry bentonite required to produce a given amount of drilling fluid. Untreated bentonite yields in excess of 85 barrels (3,570 gallons) of drilling fluid per ton of material. Addition of polymers to produce high yield bentonite can increase the yield to more than 200 barrels (8,400 gallons) per ton of material. Typical HDD drilling fluids are made with high yield bentonite and are composed of less than 4% viscosifier by volume, with the remaining components being water and drilled spoil.

4.3 Disposal of Excess Drilling Fluid

Disposal of excess drilling fluid will be the responsibility of the selected HDD contractor. Prior to beginning HDD operations, OxyChem shall provide the drilling contractor with a drilling fluid disposal procedure that shall comply with all environmental regulations, right-of-way and workspace agreements, and permit requirements.

The method of disposal applied to each crossing will be dependent upon applicable regulations. Potential disposal methods include transportation to a remote disposal site and land farming on the construction right-of-way or an adjacent property. Land farming involves distributing the excess drilling fluid evenly over an open area and mechanically incorporating it into the soil. Where land farming is employed, the condition of the land farming site will be governed by OxyChem’s standard clean up and site restoration specifications.

4.4 Minimization of Environmental Impact

The most effective way to minimize environmental impact associated with HDD drilling fluids is to maintain drilling fluid circulation to the maximum extent practical. However, resources spent in an effort to maintain circulation should be weighed against the potential benefits achieved through full circulation. It should be recognized that in subsurface conditions which are not conducive to annular flow, restoration of circulation may not be practical or possible. In such cases, environmental impact can often be minimized most effectively by completing HDD operations in the shortest possible amount of time.

Steps which may be taken by the contractor to either prevent lost circulation or regain circulation include, but are not limited to, the following:

- Size the hole frequently by advancing and retracting the drill string in order to keep the annulus clean and unobstructed.
- When drilling fluid flow has been suspended, establish circulation slowly and before advancing.
- Minimize annular pressures by minimizing density and flow losses. Viscosity should be minimal, consistent with hole cleaning and stabilization requirements.
- Minimize gel strength.
- Control balling of material on bits, reaming tools, and pipe in order to prevent a plunger effect from occurring.
- Control penetration rates and travel speeds in order to prevent a plunger effect from occurring.
- Seal a zone of lost circulation using a high viscosity bentonite plug.
- Suspend drilling activities for a period of six to eight hours.

If inadvertent surface returns occur on dry land, it will be the responsibility of the HDD contractor to contain, collect, and restore the disturbed area. Should inadvertent returns occur within a wetland or waterbody, OxyChem will notify appropriate parties and evaluate the potential impact of the returns in order to determine an appropriate course of action. Entry and exit pits should be enclosed by silt fences and straw as these areas are candidate areas for inadvertent returns due to their shallow depth.

4.5 Requirements of HDD Contractor

The following requirements will be placed on the HDD contractor with respect to drilling fluid related issues and are presented below.

- **Instrumentation.** CONTRACTOR shall at all times provide and maintain instrumentation which accurately locates the pilot hole, measures drill string axial and torsional loads, and measures drilling fluid discharge rate and pressure. OxyChem will have access to these instruments and their readings at all times. A log of all recorded readings shall be maintained and will become a part of the "As-Built" information to be supplied by CONTRACTOR.

- **Composition.** The composition of all drilling fluids proposed for use shall be submitted to OxyChem for approval. No fluid will be approved or utilized that does not comply with permit requirements and environmental regulations.

- **Recirculation.** CONTRACTOR shall maximize recirculation of drilling fluid surface returns. CONTRACTOR shall provide solids control and fluid cleaning equipment of a configuration and capacity that can process surface returns and produce drilling fluid suitable for reuse. OxyChem may specify standards for solids control and cleaning equipment performance or for treatment of excess drilling fluid and drilled spoil.

- **Loss of Circulation.** CONTRACTOR shall employ its best efforts to maintain full annular circulation of drilling fluids. Drilling fluid returns at locations other than the entry and exit points shall be minimized. In the event that annular circulation is lost, CONTRACTOR shall take steps to restore circulation.

4.6 Inadvertent Returns

If inadvertent surface returns of drilling fluids occur in dry lands, they shall be immediately contained with hand-placed barriers (i.e. surrounded by hay bales, sand bags, silt fences, etc.) and collected using pumps as practical. If the amount of the surface return is not great enough to allow practical collection, the affected area shall be diluted with fresh water and the fluid will be allowed to dry and dissipate naturally. If the amount of the surface return exceeds that which can be contained with hand-placed barriers, small collection sumps (less than 5 cubic yards) may be used. If the amount of the surface return exceeds that which can be contained and collected using small sumps, drilling operations shall be suspended until surface return volumes can be brought under control.

If inadvertent surface returns of drilling fluids occur in wetlands and waterbodies, containment devices including, but not limited to, turbidity screens and silt containment fences shall be placed around the site of inadvertent returns to create a containment area. Following the completion of construction, the contractor will be responsible for the removal of containment devices and will correct any erosion or shoaling that has the potential to adversely impact the wetland or waterbody.

If inadvertent surface returns of drilling fluids occur in wetlands, the contractor will determine and implement any modifications to the drilling technique or composition of the drilling mud (e.g., thickening mud with increased bentonite content) to minimize or prevent continued release of drilling mud. If the release occurs within the wetland, reasonable measures will be taken to reestablish circulation. The release will be evaluated to determine if containment structures are warranted and can effectively contain the release as well as determine if the containment structures will cause additional adverse environmental impact. Coordination with applicable regulatory agencies will determine any final clean up measures. If the drill hole is abandoned, the hole will be sealed by pumping thickened drill mud into the hole as the drill assembly is extracted. OxyChem will fill the drill end points at the surface with soil and grade the location to its original contour.

5.0 DRILLING FLUID MONITORING PROTOCOL

In order to ensure that HDD operations are conducted in accordance with established requirements and standard HDD industry practice, OxyChem will provide an inspector to monitor the HDD contractor's performance at the jobsite. The primary functions of OxyChem's inspector will be to document construction activities, report on the HDD contractor's performance, and notify the OxyChem Project Manager if the HDD contractor fails to conform to established requirements. Established requirements to which the HDD contractor must conform include, but are not limited to, the construction drawings, technical specifications, permits, easement agreements, and contractor submittals.

The monitoring protocol which will be applied by OxyChem's inspector relative to drilling fluid related issues is described in detail on the following pages.

The drilling fluid monitoring protocol will vary depending upon the following operational conditions.

Condition 1: Full Circulation

Condition 2: Loss of Circulation

Condition 3: Inadvertent Returns

5.1 Monitoring Protocol for Condition 1 – Full Circulation

When HDD operations are in progress and full drilling fluid circulation is being maintained at one or both of the HDD endpoints, the following monitoring protocol will be implemented.

- The presence of drilling fluid returns at one or both of the HDD endpoints will be periodically documented.

- Land-based portions of the drilled alignment will be periodically walked and visually inspected for signs of inadvertent drilling fluid returns as well as surface heaving and settlement. Waterways will be visually inspected from the banks for a visible drilling fluid plume.

- Drilling fluid products present at the jobsite will be documented.

If an inadvertent drilling fluid return is detected during routine monitoring, the monitoring protocol associated with Condition 3 will immediately be implemented.

5.2 Monitoring Protocol for Condition 2 – Loss of Circulation

When HDD operations are in progress and drilling fluid circulation to the HDD endpoints is lost or severely diminished, the following monitoring protocol will be implemented.

- OxyChem's inspector will notify the Project Manager that drilling fluid circulation to the HDD endpoints has been lost or severely diminished.

- OxyChem's inspector will document steps taken by the HDD contractor to restore circulation. Should the contractor fail to comply with the requirements of the HDD Specification, OxyChem's inspector will notify the Project Manager so that appropriate actions can be taken.

- If circulation is regained, OxyChem's inspector will inform the Project Manager and resume the monitoring protocol associated with Condition 1.

- If circulation is not re-established, OxyChem's inspector will increase the frequency of visual inspection along the drilled path alignment as appropriate. Additionally, OxyChem's inspector will document periods of contractor downtime (during which no drilling fluid is pumped) and the contractor's drilling fluid pumping rate in case it should become necessary to estimate lost circulation volumes.

5.3 Monitoring Protocol for Condition 3 – Inadvertent Returns

If an inadvertent return of drilling fluids is detected, the following monitoring protocol will be implemented.

- OxyChem's inspector will inform the Project Manager that an inadvertent drilling fluid return has occurred and provide documentation with respect to the location, magnitude, and potential impact of the return.

- If the inadvertent return occurs on land, OxyChem's inspector will document steps taken by the HDD contractor to contain and collect the return. Should the contractor fail to comply with the requirements of the HDD Specification, OxyChem's inspector will notify the Project Manager so that appropriate actions can be taken.

- If the inadvertent return occurs in a waterbody or wetland, OxyChem, in coordination with appropriate parties, will determine the impact of the inadvertent return.

- If it is determined that the inadvertent return has minimal impact, HDD operations will continue. OxyChem's inspector will monitor and document the inadvertent return as well as periods of contractor downtime and the contractor's drilling fluid pumping rate in case it should become necessary to estimate inadvertent return volumes.

- If it is determined that the return does create a significant impact, drilling operations will be suspended until containment measures can be implemented by the contractor. Documentation of any containment measures employed will be provided by OxyChem's inspector. Once adequate containment measures are in place, the contractor will be permitted to resume drilling operations subject to the condition that drilling operations will again be suspended should the measures fail. OxyChem's inspector will periodically monitor and document both the inadvertent return and the effectiveness of the containment measures. Periods of contractor downtime and the contractor's drilling fluid pumping rate will also be documented in case it should become necessary to estimate inadvertent return volumes. Upon completion of the HDD installation, OxyChem will ensure that the inadvertent drilling fluid returns are cleaned up to the satisfaction of governing agencies and any affected parties.

6.0 NOTIFICATION

In the event of an inadvertent drilling fluid return within a waterway, OxyChem will contact applicable agencies by telephone and/or facsimile, detailing:

- The location and nature of the inadvertent return;
- Corrective actions being taken; and
- The nature of the impact caused by the inadvertent return.

Specifically, the following entities will be contacted:

Lloyd Mullins or Reagan Richter
US Army Corps of Engineers
5151 Flynn Parkway, Suite 306
Corpus Christi, Texas 78411
(361) 814-5847 ext 1003 or 1005 Office
(361) 814-5912 Fax
Henry.I.Mullins@usace.army.mil
Reagan.Richter@usace.army.mil

Clare Lee
Environmental Contaminant Biologist
US Fish and Wildlife Service
c/o TAMU-CC Ecological Services Field Office Corpus Christi
6300 Ocean Drive, Unit 5837
Corpus Christi, Texas 78412
(361) 994-9005 ext 248 Office
(361) 533-6056 Fax
Clare.Lee@fws.gov

Alex Nuñez
Texas Parks and Wildlife Department, Coastal Fisheries – Ecosystem Resource Program
Program Kills and Spills Team, Region 4 Coastal Ecologist
NRC Building, Suite 2501
6300 Ocean Dr., Unit 5846
Corpus Christi, Texas 78412
(361) 825-3246 Office
(361) 658-3181 Cell
(361) 825-3248 Fax
(281) 842-8100 24-Hour Phone
alex.nunez@tpwd.state.tx.us

7.0 RESPONSE EQUIPMENT

All containment equipment and materials including, but not limited to, sandbags, sumps, silt fences, hay bales, turbidity barriers, portable pumps, lumber for temporary shoring, and hand tools will be stored at the drilling sites. The contractor will also provide a light tower in case of cleanup operations needed after dark and heavy equipment such as backhoes that can be used in the control and cleanup of inadvertent returns. The contractor is responsible for implementing these devices immediately upon detection of an incident.

8.0 POST-CONSTRUCTION MEASURES

Any areas disturbed by HDD drilling activities will be stabilized to control erosion. Stabilization will be accomplished with: sod or seed comparable to composition of adjacent areas in upland locations; native plantings and seeds in wetlands; and native seed mixes favorable for Greater Attwater's Prairie Chicken in areas already maintained for the benefit of this species. Such stabilization will be completed to prevent erosion, siltation, and turbid run-off.