TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

APPENDIX J – ONSHORE AND OFFSHORE HORIZONTAL DIRECTIONAL DRILL CONTINGENCY PLAN

NORTHEAST SUPPLY ENHANCEMENT PROJECT

January 2020

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

ONSHORE HORIZONTAL DIRECTIONAL DRILL CONTINGENCY PLAN

NORTHEAST SUPPLY ENHANCEMENT PROJECT

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LIST OF ACRONYMS AND ABBREVIATIONS

EI	Environmental Inspector
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
HDD	horizontal directional drill
NJDEP	New Jersey Department of Environmental Protection
PADEP	Pennsylvania Department of Environmental Protection
PFBC	Pennsylvania Fish and Boat Commission
Plan	Horizontal Directional Drill Contingency Plan
Transco	Transcontinental Gas Pipe Line Company, LLC.
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

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1 INTRODUCTION

Transcontinental Gas Pipe Line Company, LLC. (Transco) is proposing to use horizontal directional drill (HDD) construction methods as an alternative crossing method at four onshore locations throughout the Northeast Supply Enhancement Project (Project). Transco is currently conducting geotechnical studies at each proposed HDD crossing to evaluate the risks inherent in using the HDD crossing method and determine that each proposed HDD crossing is feasible. Transco has developed this Horizontal Directional Drill Contingency Plan (Plan) to establish procedures for handling these inherent risks, i.e., abandoned HDD drill holes, crossing contingency methods if the drill is abandoned, and to address potential impacts associated with inadvertent releases of drilling fluid returns during the HDD process. This Plan identifies operational procedures and responsibilities for abandoning HDD drill holes and the prevention, containment, and clean-up of drilling fluids that have ponded on the ground surface or within a water body in response to an inadvertent release of drilling fluid during HDD operations. The specific objectives of this Plan include:

- Defining the HDD process and how to identify when the HDD has failed and should be abandoned;
- Identifying the procedures that will be followed when an HDD drill hole has to be abandoned;
- Minimizing the potential for an inadvertent release of drilling fluids;
- Identifying the timely detection of an inadvertent release of drilling fluids;
- Providing for environmental protection of waterbodies and associated habitats, in the event an inadvertent release occurs;
- Establishing response procedures to address containment and clean-up of an inadvertent release of fluids; and
- Providing for notifying the appropriate parties and regulatory agencies in the event of an inadvertent release of fluids.

Transco will ensure that all contractors comply with the methods outlined herein during construction, restoration, and operation of the Project. Contractors will be trained on the requirements of this Plan during mandatory pre-construction environmental training. Compliance with these requirements will be documented in the field by Environmental Inspectors (EIs) in weekly construction inspection reports, which will be submitted to the Federal Energy Regulatory

Commission (FERC) for review and comment. This Plan is subject to revision based on new data or on agency recommendations.

2 HDD PROCESSES AND POTENTIAL CAUSES OF FAILURE

There are three basic steps to install a pipeline crossing using HDD:

1. Pilot hole drilling;
2. Hole reaming; and
3. Pipe pullback.

This section briefly describes the HDD process and some potential causes of failure associated with each installation step.

2.1 PILOT HOLE DRILLING

The first step in the HDD sequence is to drill the initial hole beneath the proposed crossing along a predetermined alignment. The pilot hole is drilled using either a downhole displacement mud motor connected to a tri-cone rotary bit or a jetting assembly. Drilling fluid pumped through the annulus of the drill pipe helps to expedite the mud motor or jetting assembly in cutting the soil, sediment, or rock strata. The drilling fluid also helps lubricate the drill stem, suspends and carries the drilled cuttings to the surface, and forms a wall cake to keep the hole open. The HDD drilling fluid is composed primarily of fresh water and bentonite, a naturally occurring, nonhazardous clay that serves as a viscosifier. If needed to manipulate the rheological properties for optimized drilling operations, the drilling fluid may also be augmented with starch, cellulose, non-toxic polymers, and/or crystalline silica. Control of the drill bit is achieved by using a non-rotating drill string with an asymmetrical leading edge. This leading edge creates a steering bias that is held in a precise position during drilling.

A successful pilot hole provides pertinent data that helps to determine the potential success of the crossing. Data obtained from the pilot hole includes the rate of penetration to be expected and confirmation of the geologic strata. The HDD contractor can then confirm a plan for enlarging the hole to the required diameter. The diameter required to install the pipeline will vary depending on the confirmed geologic strata and the HDD contractor's judgment.

Failure During the Pilot Hole Process

The failure mode that can occur during the drilling of the pilot hole is the hole collapsing on the drill pipe string. This is typically caused by either not being able to maintain a good bentonite wall cake to keep the hole stable or an unfavorable drilling stratum containing glacial till, highly fractured rock, non-cohesive alluvial material, or cobbles. If the hole collapses on the drill pipe and creates high friction on the drill pipe surface, the torque required to rotate the drill

pipe will likely increase. The increased friction may either bind the drill pipe in such a way that it cannot be moved or, if the torque applied to the drill pipe by the drill rig exceeds the strength of the drill pipe, the force may cause the drill pipe to either shear or twist into two or more pipes. The longer the drill length, the more probability there is of this type of failure if non-cohesive alluvial materials are present. Typically, HDD installation will be considered a failure if there are two unsuccessful attempts at completing the pilot hole. If this happens, Transco will follow its standard process of selecting and permitting, as necessary, another appropriate installation method.

2.2 HOLE REAMING

The second step consists of one or more hole-reaming passes. There are two types of tools that enlarge the pilot hole:

- Flycutters, used for most soil formations.
- Rock hole-opening tools, used for very dense soil or rock formations.

Typically, the hole-opening tool is attached to the drill pipe string that drills the pilot hole and is then rotated and pulled back towards the drill rig from the exit point. The number of reaming passes varies depending on the soil conditions and carrier pipe size. Depending on the stability of the hole, the HDD contractor may use a barrel reamer, typically several inches smaller than the outside diameter of the final hole-opening tool, and pull it through the hole immediately prior to pullback. This is typically referred to as a swab pass. The purpose of the swab pass is to ensure the establishment of a good drilling fluid wall cake, a clean hole, and a hole full of drilling fluid with the proper density. Drilling through rock formations typically requires multiple passes, with each pass increasing the diameter of the hole until the desired diameter is achieved. Drill pipe is typically added behind the tool at the exit to keep the drill pipe in the hole for the entire length of the crossing.

A significant length of time may be needed to enlarge the hole to the required diameter. As the length of time to complete this process increases, the probability of failure also increases. This is especially true when drilling in a soil stratum that is loose or unstable (gravel or cobbles). At times, the loose material can be drilled very quickly, but maintaining an open hole through unstable soil strata over an extended period of time can be very difficult.

Failure During Hole Reaming

The main reason for failure during hole reaming is material collapsing into the hole, which in turn has been caused by a lack of an adequate bentonite wall cake. With each reaming pass, the large volume of drilling fluid being dispersed through the tool tends to expand into voids in the

annulus of the drilled hole. Because of the inability to support the soils, the hole becomes unstable and can lead to diminished drilling fluid returns. If the drilling fluid is no longer able to carry the drilled cuttings out of the hole, an excessive amount of cuttings would remain in the hole. The cuttings would slowly build up in the bottom of the hole, increasing the friction on the drill pipe and creating additional stress on the drill pipe. The increased friction can cause the drill pipe to slow or stop rotation to a point where the drill rig cannot supply enough torque to continue reaming without causing drill pipe failure. The two main types of failure in rock formations are the reaming tool breaking apart due to excessive wear on the tool, and weathered rock or cobbles collapsing into the hole.

If the penetration rates are extremely slow, excessive stress can occur on the arms holding the roller cutting cones. If the wear is too excessive, the roller cones can separate from the tool, leaving the tool unable to cut or rotate. If the tool can still be removed from the hole, and the missing pieces retrieved from the hole, the hole-opening pass may resume with different downhole tools.

HDD installation would be considered a failure after two unsuccessful attempts at retrieving tools or equipment downhole and if it has been determined that the hole reaming operation cannot be completed. If failure occurs, the HDD contractor shall then demobilize and remove the equipment from the site after approval from Transco. If this happens, Transco will follow its standard process of selecting and permitting, as necessary, another appropriate installation method.

2.3 PULLBACK

The last step to complete a successful installation is the pullback of the prefabricated pipeline into the enlarged hole. A reinforced pullhead is attached to the leading end of the pipe and to a swivel that is connected to the drill pipe. The swivel is placed between the drill pipe string and the carrier pipe to minimize rotation and torsion from being transferred to the pipeline.

The pipeline may be buoyant in the drilling fluid during the pullback process and may require the pipe to be filled with a calculated amount of water to keep the pipeline as close to neutral buoyancy as possible. The following problems could occur if the pipe is not allowed to remain neutrally buoyant in the hole during the pullback process:

- Skin friction of the pipeline will increase, which will then increase the load that the drill rig has to pull. The pipeline could be damaged if an excessive amount of pull tension has to be applied to the pipe to continue the pullback process.

- The leading edge of the pullhead could dislodge a cobble or rock fragment, binding the pipeline and making it impossible to move in either direction.
- The external coating could be damaged by sharp and/or protruding material and highly abrasive material (coarse sands).

The pull section is also supported with a combination of roller stands, pipe-handling equipment, and/or a floatation ditch to further minimize excessive tension on the pipe and prevent the carrier pipe from being damaged during the pullback process. HDD pipe will be coated with an abrasion-resistant overlay to prevent pipeline damage.

Failure During the Pullback Process

Failure of the pullback process occurs when the pipe becomes lodged in the hole and is unable to be moved in either direction. If this occurs, Transco and the contractor will assess the situation and determine the appropriate course of action. Transco will, based on site-specific conditions, conduct agency consultation if needed.

2.4 MECHANICAL FAILURES

This type of failure occurs if there is a major mechanical breakdown. If the drill pipe remains idle for an extended time, the material in the drilled hole annulus can seize the drill pipe string in place and prevent further movement such that the drill pipe may not continue to rotate or move in either direction. If this occurs during pilot hole drilling, the contractor will be required to change the alignment of the crossing to miss the abandoned hole and start the drilling process from the beginning.

HDD installation also may be considered a failure if after either repairing or replacing the broken drill rig or vital piece of ancillary equipment, the drill pipe, hole-opening tool, or pipeline cannot be rotated or pulled. If failure occurs, the HDD contractor shall then demobilize and remove the equipment from the site after approval from Transco. If this happens, Transco will follow its standard process of selecting and permitting, as necessary, another appropriate installation method.

3 SEALING ABANDONED HDD BOREHOLES

If for any reason an HDD hole must be abandoned, the HDD contractor will fill the abandoned hole with grout to completely seal it off. The top 5 feet of the abandoned hole will be filled with compacted soil to allow vegetation to reestablish. If deemed necessary by Transco, the HDD contractor may be required to complete grouting up to and including the entire abandoned hole to reduce the risk of ground subsidence, inadvertent drilling fluid returns from adjacent HDD alignments, or to comply with applicable regulatory requirements or other Project conditions.

The grout mixture used to abandon a borehole will consist of either a cement grout or cement/bentonite grout mixture that can be pumped downhole through the drill pipe used to drill/ream the hole. The grout mix (e.g., water/cement/bentonite ratios) will be designed generally for each HDD location based on the geologic formation(s) along the abandoned portion of the hole. Additional modifiers, such as those used in structural concrete, may be used to modify the flowability and/or set time of the grout. To grout the abandoned hole, the HDD contractor will extract all cutting tools (i.e., reamer and cutting heads) from the hole, advance the drill pipe into the hole to the required grout depth, and begin pumping the grout mixture while the drill pipe is extracted from the hole. The rate at which the drill pipe is extracted during grouting operations will be regulated to match the rate of grout placement.

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4 REDUCING THE RISK OF INADVERTENT DRILLING FLUID RETURNS

Drilling fluids have several functions that support an HDD installation. The primary functions include:

- Cooling and lubrication of drilling tools, drill pipe, and the carrier pipe.
- Rotation of the drill bit (using a positive displacement mud motor in bedrock installations).
- Suspension of cuttings within the drilling fluid/slurry mixture.
- Removal of soil/bedrock cuttings from the bore during each phase of the installation process.
- Providing a hydrostatic fluid pressure in the bore that offsets natural groundwater formation pressures.
- Stabilizing the bore and preventing raveling of surrounding soil/bedrock materials. Stabilization of the bore is provided from the combination of developing a low-permeability bentonite filter cake along the bore walls and applying a positive fluid pressure to the surrounding bore walls. This supporting pressure is derived from the presence of the column of drilling fluid within the bore.

Prior to beginning construction, a specific scope of work will be developed for each trenchless crossing, and the contractor will be required to address all of the requirements in the specifications, plans, and scope of work. Transco's HDD contractor will be required to maintain a certified and approved drilling fluids engineer/technician on-site during all phases of the HDD installation to assist the HDD contractor with managing and optimizing drilling fluid functions.

The HDD profiles will be designed to extend into bedrock (Quarryville Loop only), where possible, and provide sufficient depth of cover to reduce the potential for inadvertent drilling fluid returns. During HDD installation, the HDD contractor will make every effort to maintain drilling fluid circulation and reduce the potential for inadvertent drilling fluid returns. The efforts may include but will not be limited to:

- Proper drilling fluids management.
- Daily inspection and repair of equipment components (e.g., drilling equipment, hydraulic hoses, and pumps).
- Using special downhole monitoring equipment to monitor fluid pressure.
- Using best management practices to remove cuttings from the hole and maintaining an open flow path from the downhole tooling to the drill rig.

- Using casing as needed to reduce the potential for inadvertent drilling fluid returns near the entry or exit points.
- Maintaining adequate drilling fluid flow rates and penetration rates.
- Using drilling fluid relief wells, if necessary.

If drilling fluid returns to the drill rig are lost during HDD operations, the HDD contractor will cease drilling operations and visually inspect the ground and water surfaces along the HDD alignment for inadvertent returns. The HDD contractor will make reasonable attempts to restore drilling fluid circulation, which may include:

- Extracting the downhole drill pipe string and tooling until drilling fluid returns are restored.
- Manipulating drilling fluid properties; consulting with the on-site drilling fluid engineer/technician.
- Installing small-diameter casing over the downhole drill pipe string through overburden soils.

If the integrity of the drilled hole or the HDD profile geometry is compromised through attempts to restore drilling fluid returns, the HDD contractor will notify Transco or the authorized representative. If it is determined that further attempts to restore drilling fluid returns may compromise the HDD installation or are unlikely to be successful, the HDD contractor will proceed with modified drilling procedures to reduce the risk of inadvertent drilling fluid returns. These procedures may include slowing the rate of penetration, drilling or reaming the hole from the other direction, using large-diameter casing, or installing drilling fluid relief wells, if necessary.

5 CONTINGENCY PLAN FOR DRILLING FLUID RELEASE AND MITIGATION

5.1 DRILLING FLUID CONTAINMENT, COLLECTION SUPPLIES, AND EQUIPMENT

The HDD contractor will monitor the HDD alignment for signs of inadvertent drilling fluid returns and will keep adequate spill containment and collection equipment and supplies on-site at all times to contain and collect any release of drilling fluids to the ground surface, wetlands, or waterbodies. All areas contaminated by drilling fluid migration and release will be cleaned up and restored to the original condition, according to applicable regulatory agency requirements, or as accepted by Transco and FERC. Equipment stored on-site for immediate response may include, but is not limited to:

- Silt fencing, sand bags, or straw bales for containment structures (certified weed-free);
- Stakes to secure bales;
- Straw logs (wattles or fiber rolls);
- Hand tools such as sledge hammers, push brooms, shovels, rakes, etc.;
- Several 5-gallon buckets and plastic sheeting;
- Several 55-gallon drums;
- Portable spill-containment booms, absorbent pads, turbidity curtains or other portable spill-containment kits;
- Leak-free hoses and portable pumps and
- Underwater boom and curtain.

5.2 MITIGATION OF INADVERTENT DRILLING FLUID RETURNS

If inadvertent drilling fluid returns are observed, the HDD contractor will immediately disengage the high pressure drilling fluid pumps, suspend drilling operations, and notify the EI(s) and Transco or their authorized representative. Transco or their authorized representative will notify all concerned parties and regulatory agencies. A complete list of appropriate regulatory agencies and their contact information will be prepared and distributed prior to construction. If inadvertent returns are observed in an upland area, the HDD contractor will:

- Take immediate measures to contain the inadvertent drilling fluid returns to the extent practicable.
- Collect the inadvertent drilling fluid returns using pumps and/or vacuum trucks, if the fluid is of sufficient volume.
- Document the size and impacts of the drilling fluids with photographs.

- Follow the direction of the on-site EI for cleanup and mitigation requirements.
- Remove the drilling fluids and restore the site to pre-existing conditions. Clean-up work will be performed by hand to the maximum extent possible. All collected materials will be disposed of at an approved location or processed through a drilling fluid separation plant.
- Document the cleanup procedures, changes made to the drilling fluid properties or drilling process to prevent future releases and photograph the conditions of the cleaned up area.
- Adjust drilling fluid properties to inhibit further flow through the leak origin, clear potential blockages in the HDD bore by extracting several or all drill pipe joints and tooling, and/or allow the area to sit or rest for a suitable period to allow the cracked pathway to close naturally.
- Evaluate any further steps that may increase the potential for regaining returns to entry/exit points. This may include advancing the tools in the opposite direction in an attempt to regain drilling fluid returns.
- Once the inadvertent drilling fluid returns are contained and collected, the HDD contractor may resume drilling operations using modified drilling techniques. These modified techniques will be used to reduce further inadvertent drilling fluid returns while maintaining full-time monitoring of the drilling fluid returns area to ensure that containment and collection measures are sufficient to handle any additional inadvertent returns that may result from resuming operations.
- If public health and safety are threatened by an inadvertent release, or if existing structures or transportation infrastructure are impacted, drilling operations will be immediately shut down until the threat is eliminated. Notifications will be made to all applicable parties, the measures listed above will all be instituted, and a thorough review of operations will be conducted. Damage attributed to an inadvertent release, would be assessed and repaired, if needed.

If the inadvertent returns are observed in an environmentally or culturally sensitive area, the HDD contractor will, in addition to the measures listed above, contain the inadvertent returns with straw bales or sand bags, without additional disturbance, if possible.

In addition to the measures noted above, Transco will contain any inadvertent releases that may occur within a waterbody using the following procedure:

- The inadvertent release area will be monitored for up to four hours to determine if the drilling mud congeals. Bentonite will usually harden, effectively sealing the inadvertent release location.
- The appropriate regulatory agencies and the property owner representative will be consulted regarding the next action(s) to take from among the following choices:
    - If drilling mud congeals, take no other action that could potentially suspend sediments in the water column.
    - If drilling mud does not congeal, erect isolation/containment environment (underwater boom and curtain).
    - If the release becomes excessively large, a spill response team will be called in to contain and clean up excess drilling mud in the water. Phone numbers of spill response teams in the area will be on-site.

After the inadvertent drilling fluid return has been assessed, the HDD contractor and Transco will make every effort to determine why the seepage occurred. Once the cause of the drilling fluid release has been determined, measures will be developed to control the factors causing the seepage and to minimize the chance of recurrence. Developing the corrective measure will be a joint effort of Transco and the HDD contractor and will be site- and problem-specific.

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6 ENVIRONMENTAL INSPECTION TRAINING, AND PRE-CONSTRUCTION NOTIFICATIONS

An EI experienced in HDD and associated environmental protection measures will work with the contractor to verify that the proper equipment and materials are available on-site at all times and that the necessary procedures are followed on a daily basis. Prior to the start of construction, the EI will conduct a training session with all key HDD contractors, drilling, and inspection personnel. All such personnel will be thoroughly trained in the applicable inadvertent release of drilling fluid contingency plan procedures. On-site safety and environmental protection meetings will provide ongoing communications and awareness measures regarding prevention, mitigation, and response associated with potential inadvertent drilling fluid releases.

Visual observations along the land and water portions of the HDD alignment will be completed on a regular basis throughout the drilling program. The frequency of these observations will be greatest during the pilot bore and initial reaming passes, where the probability of an inadvertent release of drilling fluid event occurring is the highest.

Transco will notify all affected landowners by mail at least two weeks in advance of the commencement of construction. Affected landowners includes directly impacted landowners, abutters, and identified NSAs. The notification will include contact information for land representatives that may be contacted for issues related to noise, vibrations, or inadvertent returns.

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7 CONTACT INFORMATION

Transco will provide a technical consultant on-site during the HDD process to keep adequate documentation such as daily progress reports, as-built information, etc., describing the events leading up to the failure. Transco will then submit this documentation to the necessary agencies for their review and approval that the drill has failed at the present alignment. The HDD contractor will not demobilize until Transco approval has been received.

The following Project representatives will be notified in the event of an inadvertent release of drilling fluids:

Transco

Joseph Dean
Manager, Environmental Permitting
2800 Post Oak Blvd
Houston, TX 77056
Phone: 713-215-3427

The following regulatory agency representatives will be notified in the event of an inadvertent release of drilling fluids:

FERC

Christine Allen
Project Manager
Federal Energy Regulatory Commission
888 First Street NE
Washington DC, 20426
Phone: 202-502-8056

Additional Agencies for Notification

- U.S. Army Corps of Engineers (USACE) - [Contact information to be provided prior to construction]
- U.S. Fish and Wildlife Service (USFWS) - [Contact information to be provided prior to construction]
- Pennsylvania Department of Environmental Protection (PADEP) - [Contact information to be provided prior to construction]
- New Jersey Department of Environmental Protection (NJDEP) - [Contact information to be provided prior to construction]

If the release is within a stream or wetland, the following agencies must be contacted within two hours:

- PA Fish and Boat Commission (PFBC);
- NJ Department of Environmental Protection (NJDEP); and
- United States Fish and Wildlife Service, in the event of potential impacts on federally listed species.
- (Contact information to be provided prior to construction.)

An incident report (see Appendix A) should be prepared for hazardous waste releases and submitted as soon as possible but not later than 15 days after the spill. The report should include, at a minimum:

- an updated listing of all the information provided in the verbal notification;
- actions taken to respond to and contain the release;
- any known or anticipated acute or chronic health risks associated with the release;
- a summary of all actions taken by the owner or operator to prevent a recurrence; and
- other information as may be required.

APPENDIX A

ENVIRONMENTAL INCIDENT REPORT

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Environmental Incident Report	
Location (Facility/Specific Location):	
Date Incident Occurred:	
Time Incident Occurred:	
Type of Incident (Check all that apply):	
☐ Contaminated Groundwater/Soil ☐ Fish Kill ☐ Hazardous Substance Spill/Release ☐ Migratory Bird ☐ Other _____	☐ Oil Spill ☐ PCB Spill ☐ Storage Tank (leak or other problem) ☐ Wildlife Concern
If Spill:	
Type of Substance:	
Origin of Substance:	
Amount (if known):	
Spill On (floor, ground, water):	
Oil Spill to Water or Storm Drain (If any selection is entered, written notice to EPA is due within 60 days)	☐ Spill greater than 1,000 gallons ☐ Two spills > 42 gal. within a 12-month period Date of Previous Spill _____
Description of Incident (include cause, if known, specific location, amount, duration, and impact on environment)	

Immediate Action/Cleanup Procedures			
Action Taken or Planned to Prevent Recurrence			
Notifications Made			
	Name	Date	Time
Emergency Response Coordinator			
Other facility Personnel			
Environmental Services			
State Agency			
National Response Center			
Other (i.e., Local Agency)			

Regulatory Personnel on the Scene (Name and Agency)	
Site Contact for Additional Information (Name and Title)	**Telephone Number** (With Area Code)
Incident Reported By (Name and Title)	**Telephone Number** (With Area Code)
Form Completed By (Signature)	**Date** (MM/DD/YYYY)

Transcontinental Gas Pipe Line Company, LLC

OFFSHORE HORIZONTAL DIRECTIONAL DRILL CONTINGENCY PLAN

NORTHEAST SUPPLY ENHANCEMENT PROJECT

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1 INTRODUCTION

Transcontinental Gas Pipe Line Company, LLC. (Transco) is proposing to use horizontal directional drill (HDD) construction methods as an alternative crossing method at two offshore locations throughout the Northeast Supply Enhancement Project (Project). Transco conducted geotechnical studies at each proposed HDD crossing to evaluate the risks inherent in using HDD crossing methods and determined that each proposed HDD crossing is feasible. Transco has developed this Horizontal Directional Drill Contingency Plan (Plan) to establish procedures for handling these inherent risks, e.g., abandoned HDD drill holes, crossing contingency methods if the drill is abandoned, and to address potential impacts associated with inadvertent releases of drilling fluid returns during the HDD process. This Plan identifies operational procedures and responsibilities for abandoning HDD drill holes, and the prevention, containment, and clean-up of drilling fluids that have ponded on the ground surface or within a water body in response to an inadvertent release of drilling fluid event during HDD operations. The specific objectives of this Plan include:

- Defining the HDD process and how to identify when the HDD has failed and should be abandoned;
- Identifying the procedures that will be followed when an HDD drill hole has to be abandoned;
- Minimizing the potential for an inadvertent release of drilling fluids;
- Identifying the timely detection of an inadvertent release of drilling fluids;
- Providing for environmental protection of waterbodies and associated habitats, in the event an inadvertent release occurs;
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- Providing for notifying the appropriate parties and regulatory agencies, in the event an inadvertent release of fluids.

Transco will ensure that all contractors comply with the methods outlined herein during construction, restoration, and operation of the Project. Contractors will be trained on the requirements of this Plan during mandatory pre-construction environmental training. Compliance with these requirements will be documented in the field by Environmental Inspectors (EIs) in weekly construction inspection reports, which will be submitted to the Federal Energy Regulatory

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2 HDD PROCESSES AND POTENTIAL CAUSES OF FAILURE

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The first step in the HDD sequence is to drill the initial hole beneath the proposed crossing along a predetermined alignment. The pilot hole is drilled using either a downhole displacement mud motor connected to a tri-cone rotary bit or a jetting assembly. Drilling fluid pumped through the annulus of the drill pipe helps to expedite the mud motor or jetting assembly in cutting the soil, sediment, or rock strata. The drilling fluid also helps lubricate the drill stem, suspends and carries the drilled cuttings to the surface, and forms a wall cake to keep the hole open. The HDD drilling fluid is composed primarily of fresh water and bentonite, a naturally occurring, nonhazardous clay that serves as a viscosifier. If needed to manipulate the rheological properties for optimized drilling operations, the drilling fluid may also be augmented with starch, cellulose, non-toxic polymers, and/or crystalline silica. Control of the drill bit is achieved by using a non-rotating drill string with an asymmetrical leading edge. This leading edge creates a steering bias that is held in a precise position during drilling.

A successful pilot hole provides pertinent data that helps to determine the potential success of the crossing. Data obtained from the pilot hole includes the rate of penetration to be expected and confirmation of the geologic strata. The HDD contractor can then confirm a plan for enlarging the hole to the required diameter. The diameter required to install the pipeline will vary depending on the confirmed geologic strata and the HDD contractor's judgment.

Failure during the Pilot Hole Process

The failure mode that may occur during the pilot hole drilling is the hole collapsing on the drill pipe string. This is typically caused by either not being able to maintain hole stability or unfavorable drilling strata that contain non-cohesive alluvial material, e.g., gravel and/or cobbles. If the hole collapses on the drill pipe and creates high friction on the drill pipe surface, the torque required to rotate the drill pipe will likely increase. The increased friction may either bind the drill

pipe in such a way that it cannot be moved or, if the torque applied to the drill pipe by the drill rig exceeds the strength of the drill pipe, the force may cause the drill pipe to either shear or twist into two or more pieces. The longer the drill length, the more probability there is of this type of failure if non-cohesive alluvial materials are present. Typically, HDD installation will be considered a failure if there are two unsuccessful attempts at completing the pilot hole. If this happens, Transco will review an alternate crossing profile or location for the HDD.

2.2 HOLE REAMING

The second step consists of one or more hole-reaming passes. There are two types of tools that enlarge the pilot hole:

- Flycutters, used for most soil and sediment formations.
- Rock hole-opening tools, used for very dense soil, sediment, or rock formations.

Typically, the hole-opening tool is attached to the drill pipe string that drills the pilot hole and is then rotated and pulled back towards the drill rig from the exit point. The number of reaming passes varies depending on the soil/sediment conditions and carrier pipe size. Depending on the stability of the hole, the HDD contractor may use a barrel reamer, typically several inches smaller than the outside diameter of the final hole-opening tool, and pull it through the hole immediately prior to pullback. This is typically referred to as a swab pass. The purpose of the swab pass is to ensure the establishment of a good drilling fluid wall cake, a clean hole, and a hole full of drilling fluid with the proper density. Drilling through rock formations typically requires multiple passes, with each pass increasing the diameter of the hole until the desired diameter is achieved. Drill pipe is typically added behind the tool at the exit to keep the drill pipe in the hole for the entire length of the crossing.

A significant length of time may be needed to enlarge the hole to the required diameter. As the length of time to complete this process increases, the probability of failure also increases. This is especially true when drilling in a soil/sediment stratum that is loose or unstable (gravel or cobbles). At times, the loose material can be drilled very quickly, but maintaining an open hole through the unstable soil/sediment strata over an extended period of time can be very difficult.

Failure during the Hole Reaming Process

The main reason for failure during hole reaming is material collapsing into the hole, which in turn has been caused by a lack of an adequate bentonite wall cake. With each reaming pass, the large volume of drilling fluid being dispersed through the tool tends to expand into voids in the annulus of the drilled hole. Because of the inability to support the soils/sediments, the hole

becomes unstable and can lead to diminished drilling fluid returns. If the drilling fluid is no longer able to carry the drilled cuttings out of the hole, an excessive amount of cuttings would remain in the hole. The cuttings would slowly build up in the bottom of the hole, increasing the friction on the drill pipe and creating additional stress on the drill pipe. The increased friction can cause the drill pipe to slow or stop rotation to a point where the drill rig cannot supply enough torque to continue reaming without causing drill pipe failure. The two main types of failure in rock formations are the reaming tool breaking apart due to excessive wear on the tool and weathered rock or cobbles collapsing into the hole.

If the penetration rates are extremely slow, excessive stress can occur on the arms holding the roller cutting cones. If the wear is too excessive, the roller cones can separate from the tool, leaving the tool unable to cut or rotate. If the tool can still be removed from the hole, and the missing pieces retrieved from the hole, the hole opening pass may resume with different downhole tools.

HDD installation would be considered a failure after two unsuccessful attempt at retrieving tools or equipment downhole and if it has been determined that the hole reaming operation cannot be completed. If failure occurs, the HDD contractor shall then demobilize and remove the equipment from the site after approval from Transco. If this happens, Transco will review an alternate crossing profile of location for the HDD.

2.3 PULLBACK PROCESS

The last step to complete a successful installation is the pullback of the prefabricated pipeline into the enlarged hole. A reinforced pullhead is attached to the leading end of the pipe and to a swivel that is connected to the drill pipe. The swivel is placed between the drill pipe string and the carrier pipe to minimize rotation and torsion from being transferred to the pipeline.

The pipeline may be buoyant in the drilling fluid during the pullback process and may require the pipe to be filled with a calculated amount of water to keep the pipeline as close to neutral buoyancy as possible. The following problems could occur if the pipe is not allowed to remain neutrally buoyant in the hole during the pullback process:

- Skin friction of the pipeline will increase, which will then increase the load that the drill rig has to pull. The pipeline could be damaged if an excessive amount of pull tension has to be applied to the pipe to continue the pullback process.
- The leading edge of the pullhead could dislodge a cobble or rock fragment, binding the pipeline and making it impossible to move in either direction.

- The external coating could be damaged by sharp and/or protruding material and highly abrasive material (coarse sands).

The pull section is also supported with a combination of roller stands, pipe-handling equipment, and/or a floatation ditch to further minimize excessive tension on the pipe and prevent the carrier pipe from being damaged during the pullback process. The HDD pipe will be coated with an abrasion-resistant overlay to prevent pipeline damage.

Failure During the Pullback Process

Failure of the pullback process occurs when the pipe becomes lodged in the hole and is unable to be moved in either direction. If this occurs, Transco and the contractor will assess the situation and determine the appropriate course of action. Transco will, based on site-specific conditions, conduct agency consultation if needed.

2.4 MECHANICAL FAILURES

This type of failure occurs if there is a major mechanical breakdown. If the drill pipe remains idle for an extended time, the material in the drilled hole annulus can seize the drill pipe string in place and prevent further movement such that the drill pipe may not continue to rotate or move in either direction. If this occurs during pilot hole drilling, the contractor will be required to change the alignment of the crossing to miss the abandoned hole and start the drilling process from the beginning.

HDD installation method may be considered a failure if after either repairing or replacing the broken drilling rig or vital piece of ancillary equipment, the drill pipe, hole-opening tool, or pipeline cannot be rotated or pulled. If failure occurs, the HDD contractor shall then demobilize and remove the equipment from the site after approval from Transco. If this happens, Transco will review an alternate crossing profile of location for the HDD.

3 SEALING ABANDONED HDD BOREHOLES

If for any reason an HDD hole must be abandoned, the HDD contractor will fill the abandoned hole with grout to completely seal it off. The HDD contractor will grout the top 5 vertical feet of the abandoned hole at the onshore entry side of the crossing by inserting a grout tremie pipe into the drilled hole annulus. The grout will be a cement-type grout. As the grout is pressured into the drilled hole annulus, the tremie pipe will be extracted from the hole so the grout mixture is allowed to sufficiently displace any drilling fluid that may have remained within the hole. The top 12 inches of the hole will be backfilled with the native material, and the HDD contractor will not demobilize until Transco approval has been received.

For offshore entry/exit holes, the minimum extent of grouting will be to completely seal and fill the upper 30 feet of the hole entirely with grout. The top 5 feet of the hole will be backfilled with native material. In the event native material is not available, Transco will use a clean, compatible material to backfill the hole. If deemed necessary by Transco, the HDD contractor may be required to complete grouting up to and including the entire abandoned hole to reduce the risk of inadvertent drilling fluid returns from adjacent HDD alignments, or to comply with applicable regulatory requirements or other Project conditions.

The cement grout mixture used to abandon a borehole will be pumped downhole through the drill pipe used to drill/ream the hole. The grout mix will be designed generally for each HDD location based on the geologic formation(s) along the abandoned portion of the hole. Additional modifiers, such as those used in structural concrete, may be used to modify the viscosity and/or set time of the grout. To grout the abandoned hole, the HDD contractor will extract all cutting tools (i.e., reamer and cutting heads) from the hole, advance the drill pipe into the hole to the required grout depth, and begin pumping the grout mixture while the drill pipe is extracted from the hole. The rate at which the drill pipe is extracted during grouting operations will be regulated to match the rate of grout placement.

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4 REDUCING THE RISK OF INADVERTENT DRILLING FLUID RETURNS

Drilling fluids have several functions that support an HDD installation. The primary functions include:

- Cooling and lubrication of drilling tools, drill pipe, and the carrier pipe.
- Rotation of the drill bit (using a positive displacement mud motor in bedrock installations).
- Suspension of cuttings within the drilling fluid/slurry mixture.
- Removal of soil/sediment/bedrock cuttings from the bore during each phase of the installation process.
- Providing a hydrostatic fluid pressure in the bore that offsets natural groundwater formation pressures.
- Stabilizing the bore and preventing raveling of surrounding soil/sediment/bedrock materials. Stabilization of the bore is provided from the combination of developing a low-permeability bentonite filter cake along the bore walls and applying a positive fluid pressure to the surrounding bore walls. This supporting pressure is derived from the presence of the column of drilling fluid within the bore.

Prior to beginning construction, a specific scope of work will be developed for each trenchless crossing, and the contractor will be required to address all of the requirements in the specifications, plans, and scope of work. Transco's HDD contractor will be required to maintain a certified and approved drilling fluids engineer/technician on-site during all phases of the HDD installation process to assist the HDD contractor with managing and optimizing drilling fluid functions.

The HDD profiles will be designed to provide sufficient depth of cover to reduce the potential for inadvertent drilling fluid returns. During HDD installation, the HDD contractor will make every effort to maintain drilling fluid circulation and reduce the potential for inadvertent drilling fluid returns. The efforts may include but will not be limited to:

- Proper drilling fluids management.
- Daily inspection and repair of equipment components (e.g., drilling equipment, hydraulic hoses, and pumps).
- Using special downhole monitoring equipment to monitor fluid pressure.
- Using best management practices to remove cuttings from the hole and maintaining an open flow path from the downhole tooling to the drill rig.

- Using casing as needed to reduce the potential for inadvertent drilling fluid returns near the entry or exit points.
- Maintaining adequate drilling fluid flow rates and penetration rates.

If drilling fluid returns to the drill rig are lost during HDD operations, the HDD contractor will cease drilling operations and visually inspect the water surfaces along the HDD alignment for inadvertent returns. The HDD contractor will make reasonable attempts to restore drilling fluid circulation, which may include:

- Extracting the downhole drill pipe string and tooling until drilling fluid returns are restored.
- Manipulating drilling fluid properties, consulting with the on-site drilling fluid engineer/technician.
- Installing small-diameter casing over the downhole drill pipe string through overburden soils.

If the integrity of the drilled hole or the HDD profile geometry is compromised through attempts to restore drilling fluid returns, the HDD contractor will notify Transco or the authorized representative. If it is determined that further attempts to restore drilling fluid returns may compromise the HDD installation or are unlikely to be successful, the HDD contractor will proceed with modified drilling procedures to reduce the risk of inadvertent drilling fluid returns. These procedures may include slowing the rate of penetration, drilling or reaming the hole from the other direction, or using large-diameter casing, if necessary.

5 CONTINGENCY PLAN FOR DRILLING FLUID RELEASE AND MITIGATION

5.1 DRILLING FLUID CONTAINMENT, COLLECTION SUPPLIES, AND EQUIPMENT

The HDD contractor will monitor the HDD alignment for signs of inadvertent drilling fluid returns and will keep adequate spill containment and collection equipment and supplies on-site at all times to contain and collect any release of drilling fluids to the ocean. All areas contaminated by drilling fluid migration and release will be cleaned up and restored to the original condition, according to applicable regulatory agency requirements, or as accepted by Transco and FERC. Equipment stored on-site for immediate response may include, but is not limited to:

- Several 5-gallon buckets and plastic sheeting;
- Several 55-gallon drums;
- Portable spill containment booms, absorbent pads, turbidity curtains or other portable spill containment kits;
- Leak-free hoses and portable pumps; and
- Underwater boom and curtain.

5.2 MITIGATION OF INADVERTENT DRILLING FLUID RETURNS

If inadvertent drilling fluid returns are observed, the HDD contractor will immediately disengage the high pressure drilling fluid pumps, suspend drilling operations, and notify the EI(s) and Transco or their authorized representative. Transco or their authorized representative will notify all concerned parties and regulatory agencies. A complete list of appropriate regulatory agencies and their contact information will be prepared and distributed prior to construction.

5.2.1 Onshore Returns

If inadvertent drilling fluid returns are detected onshore, the drilling crew will take immediate corrective action. For the duration of drilling operations, the drilling personnel will be aware of what containment materials would be needed when responding to an onshore release of drilling fluid and will have these items available on-site. Since inadvertent drilling fluid returns can be easily controlled onshore, these materials will be stored in the entry site work area along with spill kits. Containment items may include lumber for temporary shoring, sand bags, portable pumps, hand tools, silt fencing, and hay bales. The HDD contractor will also keep heavy equipment that can be used to control and clean up the drilling fluids (e.g., excavators and backhoes) in accessible locations. Transfer pumps, hoses, and possibly vacuum trucks may be used if necessary for transferring any inadvertent drilling fluid released onshore. After removal of

the released drilling fluid, the release area will be returned as close to the original condition as feasible. It may be necessary to store the drilling fluid on-site before disposal.

In the event of an inadvertent return onshore the HDD contractor will:

- Take immediate measures to contain the inadvertent drilling fluid returns to the extent practicable.
- Collect the inadvertent drilling fluid returns using pumps and/or vacuum trucks, if of sufficient volume.
- Document the size and impacts of the drilling fluids with photographs.
- Follow the direction of the on-site EI for cleanup and mitigation requirements.
- Remove the drilling fluids and restore the site to pre-existing conditions. Clean-up work will be performed by hand to the maximum extent possible. All collected materials will be disposed of at an approved location or processed through the drilling fluid-separation plant.
- Document the cleanup procedures, changes made to the drilling fluid properties or drilling process to prevent future releases, and photograph the conditions of the cleaned up area.
- Adjust drilling fluid properties to inhibit further flow through the leak origin, clear potential blockages in the HDD bore by extracting several or all drill pipe joints and tooling, and/or allow the area to sit or rest for a suitable period to allow the cracked pathway to naturally close.
- Evaluate any further steps that may increase the potential for regaining returns to entry/exit points. This may include advancing the tools in the opposite direction in an attempt to regain drilling fluid returns.
- Once the inadvertent drilling fluid returns are contained and collected, the HDD contractor may resume drilling operations using modified drilling techniques. These modified techniques will be used to reduce further inadvertent drilling fluid returns while maintaining full-time monitoring of the inadvertent drilling fluid returns area to ensure that containment and collection measures are sufficient to handle any additional inadvertent returns that may result from resuming operations.

If the inadvertent returns are observed in an environmentally or culturally sensitive area, the HDD contractor will, in addition to the measures listed above, contain the inadvertent returns with straw bales or sand bags, if practical without additional disturbance, if possible.

In addition to the measures noted above, Transco will:

- Notify the appropriate regulatory agencies and the property owner representative regarding their next course of action(s) to protect the sensitive resource.
- If the release becomes excessively large, a spill response team will be called in to contain and clean up excess drilling mud. Phone numbers of spill response teams in the area will be on-site.

After the inadvertent drilling fluid return has been assessed, the HDD contractor and Transco will make every effort to determine why the seepage occurred. Once the cause of the drilling fluid release has been determined, measures will be developed to control the factors causing the seepage and to minimize the chance of recurrence. Developing the corrective measure will be a joint effort of Transco and the HDD contractor and will be site- and problem-specific.

5.2.2 Offshore Returns

A significant inadvertent return occurring offshore may be detected by a visible plume. Minor seepage, however, may be difficult to detect because of currents and the high specific gravity of the drilling fluid. If an inadvertent drilling fluid release is detected offshore, outside of the exit pit, it will be monitored and documented. Drilling activities may be temporarily suspended to evaluate possible implementation of mitigation measures to regain hole integrity. Drilling activities will not be suspended unless the volume of inadvertent drilling fluid returns creates an immediate threat to public health and safety. If an extended shutdown were required to try to reduce the turbidity or amount of drilling fluid being released, it could lead to a hole collapse and, ultimately, a failure in the HDD. This could require drilling a new hole and would therefore extend the duration of the Project.

Removal of drilling fluid surfacing offshore is not feasible because of the strong currents in the area. The exit pit is designed to contain the exiting fluid and cuttings. Drilling fluid returns and cuttings entering the exit pit will be left to naturally dissipate or settle into the excavated pit. Any inadvertent leakage would be expected to disperse naturally with the currents.

In the event an inadvertent return is observed offshore the following actions will be taken:

- The magnitude of the offshore return will be qualitatively determined.
- If warranted by the volume of the drilling fluid return, drilling fluid pumps will be stopped.

- The Transco representative will be notified and will contact the appropriate agencies.
- Drilling fluid properties will be adjusted to inhibit further flow through the leak origin; potential blockages in the HDD bore will be cleared by extracting several or all drill pipe joints and tooling; and/or the area will be left to sit or rest for a suitable period to allow the cracked pathway to naturally close.
- Any further steps that may increase the potential for regaining returns to entry/exit points will be evaluated. This may include tripping the tools in the opposite direction in an attempt to regain drilling fluid returns.

After the inadvertent drilling fluid return has been assessed, the HDD contractor and Transco will make every effort to determine why the seepage occurred. Once the cause of the drilling fluid release has been determined, measures will be developed to control the factors causing the seepage and to minimize the chance of recurrence. Developing the corrective measure will be a joint effort of Transco and the HDD contractor and will be site- and problem-specific.

6 ENVIRONMENTAL INSPECTION AND TRAINING

An EI experienced in HDD and associated environmental protection measures will work with the contractor to verify that the proper equipment and materials are available on-site at all times and that the necessary procedures are followed on a daily basis. Prior to the start of construction, the EI will conduct a training session with all key HDD contractors, drilling, and inspection personnel. All such personnel will be thoroughly trained in the applicable inadvertent release of drilling fluid contingency plan procedures. On-site safety and environmental protection meetings will provide ongoing communications and awareness measures regarding prevention, mitigation, and response associated with potential inadvertent drilling fluid releases.

Visual observations along the land and water portions of the HDD alignment will be completed on a regular basis throughout the drilling program. The frequency of these observations will be greatest during the pilot bore and initial reaming passes where the probability of an inadvertent release of drilling fluid event occurring is the highest.

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7 CONTACT INFORMATION

Transco will provide a technical consultant on-site during the HDD process to keep adequate documentation such as daily progress reports, as-built information, etc., describing the events leading up to the failure. Transco will then submit this documentation to the necessary agencies for their review and approval that the drill has failed at the present alignment. The HDD contractor will not demobilize until Transco approval has been received.

The following Project representatives will be notified in the event of an inadvertent release of drilling fluids:

Transco

Joseph Dean
Manager, Environmental Permitting
2800 Post Oak Blvd
Houston, TX 77056
Phone: 713-215-3427

The following regulatory agency representatives will be notified in the event of an inadvertent release of drilling fluids:

FERC

Christine Allen
Project Manager
Federal Energy Regulatory Commission
888 First Street NE
Washington DC, 20426
Phone: 202-502-8056

Additional Agencies for Notification

- U.S. Army Corps of Engineers (USACE) – *(Contact information to be provided prior to construction)*
- U.S. Fish and Wildlife Service (USFWS) - *(Contact information to be provided prior to construction)*
- U.S. Coast Guard (offshore only) - *(Contact information to be provided prior to construction)*
- New Jersey Department of Environmental Protection (NJDEP) - *(Contact information to be provided prior to construction)*
- New York State Department of Environmental Conservation (NYSDEC) – *(Contact information to be provided prior to construction)*

An incident report (see Appendix A) should be prepared for hazardous waste releases and submitted as soon as possible but not later than 15 days after the spill. The report should include, at a minimum:

- an updated listing of all the information provided in the verbal notification;
- actions taken to respond to and contain the release;
- any known or anticipated acute or chronic health risks associated with the release;
- a summary of all actions taken by the owner or operator to prevent a recurrence; and
- other information as may be required.

APPENDIX A

ENVIRONMENTAL INCIDENT REPORT

Environmental Incident Report	
Location (Facility/Specific Location):	
Date Incident Occurred:	
Time Incident Occurred:	
Type of Incident (Check all that apply):	
☐ Contaminated Groundwater/Soil ☐ Fish Kill ☐ Hazardous Substance Spill/Release ☐ Migratory Bird ☐ Other _____	☐ Oil Spill ☐ PCB Spill ☐ Storage Tank (leak or other problem) ☐ Wildlife Concern
If Spill:	
Type of Substance:	
Origin of Substance:	
Amount (if known):	
Spill On (floor, ground, water):	
Oil Spill to Water or Storm Drain (If any selection is entered, written notice to EPA is due within 60 days)	☐ Spill greater than 1,000 gallons ☐ Two spills > 42 gal. within a 12-month period Date of Previous Spill _____
Description of Incident (include cause, if known, specific location, amount, duration, and impact on environment)	

Immediate Action/Cleanup Procedures			
Action Taken or Planned to Prevent Recurrence			
Notifications Made			
	Name	Date	Time
Emergency Response Coordinator			
Other facility Personnel			
Environmental Services			
State Agency			
National Response Center			
Other (i.e., Local Agency)			

Regulatory Personnel on the Scene (Name and Agency)	
Site Contact for Additional Information (Name and Title)	**Telephone Number** (With Area Code)
Incident Reported By (Name and Title)	**Telephone Number** (With Area Code)
Form Completed By (Signature)	**Date** (MM/DD/YYYY)