APPENDIX L HDD INADVERTENT RELEASE CONTINGENCY PLAN (PROJECT-SPECIFIC HDD CONTINGENCY PLAN)

Alaska LNG™

DRAFT HDD INADVERTENT RELEASE CONTINGENCY PLAN

USAI-P2-SPZZZ-00-000009-000

TABLE OF CONTENTS

1.0 INTRODUCTION

This Draft Horizontal Directional Drill (HDD) Inadvertent Release Contingency Plan (Plan) describes possible impacts, monitoring, and mitigation procedures associated with inadvertent fluid releases that may occur at locations where buried trenchless technology is used for pipeline construction (i.e. river crossings) activities. The intent of this Plan is to describe possible actions to be taken under various conditions of inadvertent fluid releases, should they occur. A final plan would be developed by each construction contractor for the site-specific conditions where the HDDs would occur under their scope of work.

1.1 INADVERTENT FLUID RELEASE DEFINITION

An inadvertent release occurs when the drilling fluid seeps from the borehole into fractures in the surrounding soil or rock and follows a path of least resistance. Drill fluid movement may occur in any direction. The drill fluid could potentially reach the ground surface or waterbody, or it may flow outward parallel to the ground surface and never reach the surface. Under these conditions, the drill rig operator (HDD Operator) may notice a loss of fluid pressure and/or reduction in return volumes.

An inadvertent release is defined as the unintentional or inadvertent loss of drilling fluids returns from the drilled borehole to a waterbody or to the ground surface, whether by a spill or other migration of drilling fluids into surface waters or onto the ground surface.

In some instances, there is a loss of drilling fluids by absorption of the geological formation. This may result in an apparent reduction in the return of fluids and cuttings, but are not considered an inadvertent fluid release under this Plan.

1.2 CONTINGENCY PLAN

This Plan describes preventive measures to be taken during HDD operations and how mitigation measures for surface releases of drilling fluids would be implemented. The Plan describes the surveyed horizontal directionally drilled path and prescribed distance either side of the path that is accessed and inspected throughout the drilling operation to monitor the alignment for inadvertent fluid releases. The primary concern during the execution of HDD operations is to reduce the risk of a drill failure, reduce the risk of inadvertent fluid releases, and ensure that successful mitigation measures are implemented. An Inadvertent Release Contingency Plan is a key component to executing a successful HDD. The pipeline Construction Contractor (Contractor) would develop site-specific mitigation measures for inadvertent releases. Site-specific protection measures would focus on prevention of inadvertent releases into a waterbody or the ground surface.

1.3 POTENTIAL ENVIRONMENTAL IMPACTS FROM INADVERTENT FLUID RELEASES

1.3.1 Inadvertent Releases to Water

An inadvertent fluid release directly into a surface waterbody (e.g., river) during HDD operations would be dissipated by the natural currents or blended with the existing suspended solids in the water column. The percentage change in the natural turbidity would depend on background turbidity levels and the volume of the inadvertent fluid release. In a large waterbody, the percentage increase would be very small, typically less than 1 percent as drill fluid is about 80 percent water and 20 percent bentonite clay. The bentonite clay would be carried some distance downstream as it settles out.

1.3.2 Inadvertent Fluid Releases to Wetlands

The degree of impact to a wetland would depend to a large extent on the size of the wetland, the type of wetland, the size of the release, the time of year when HDD operations occur, and use by wildlife. A small release to a large wetland would have a minimal impact. However, a release to a small wetland could have a larger impact. The release could temporarily affect water levels and the bentonite clay and cuttings could cover existing vegetation.

Efforts to contain and recover an inadvertent fluid release to a wetland in summer may cause disturbance of the wetland surface by equipment and personnel. Depending upon the location within the wetland, such disturbance could, when balanced against the size of the release, offset the benefit gained in removing the released fluids. A release in winter should have a comparatively smaller effect due to improved access to the site on frozen ground. If the release is quickly spotted, containment and recovery measures can be implemented soon thereafter. In addition, freezing air temperatures would slow the surface spread of the release and the frozen soils would minimize the extent of infiltration, thus likely reducing the affected area.

Because it is difficult to predict the net effect of an inadvertent fluid release and attempts to recover the fluids, any inadvertent fluid release to wetlands must be evaluated on a case-by-case basis and appropriate responses implemented.

1.3.3 Inadvertent Fluid Releases to Uplands

Environmental impacts would be limited, provided the release is quickly spotted. Typically, upland areas are readily accessible in both summer and winter by conventional construction equipment. Thus, containment and recovery of drilling fluids can be successfully implemented. Impacts may consist of temporary disturbance to vegetation and the removal of small soil volumes.

1.4 INADVERTENT FLUID RELEASE PREVENTION

The first and most effective step in limiting the potential environmental impacts of inadvertent fluid releases from HDD operations is to prevent them from occurring in the first place. This can be partly accomplished by using a well-designed HDD profile. Secondly, proper preventative procedures need to be implemented during the construction phase.

1.4.1 Preliminary Investigations to Support Design

Precautionary measures incorporated into the design of the proposed drills to minimize the possibility of inadvertent fluid releases are described in the subsections below.

1.4.1.1 Site Investigations

A site investigation would provide some information regarding the nature of the subsurface conditions that would be encountered during the drilling phases of HDD. Knowledge of these conditions would allow for placement of a horizontal directionally drilled bore path that reduces the risk of inadvertent releases and allows the HDD Contractor to prepare an execution plan and an inadvertent release plan that addresses the sub-surface conditions.

1.4.1.2 Depth of Cover/Bore Location

Since the possibility of an inadvertent fluid release increases at shallow depths, the entry and exit points of each drill would be located in upland areas away from wetland areas, where practicable.

The likelihood of an inadvertent release decreases as the depth of the bore increases. The bore path would be located, where practicable, within finer grained soils or within competent bedrock where the risk of an inadvertent release is reduced.

1.4.2 Construction

Prior to the commencement of HDD operations, the Contractor would install containment structures at the entrance and exit points of the drill. Sand bags, silt fencing, earthen berms, vacuum pumps, and/or other materials determined necessary by the Contractor and Environmental Inspector would be staged on-site before drilling begins. Care would be taken to use structures that do not introduce alien or invasive species to an area.

To minimize the risk of an inadvertent release and to be best prepared to handle such a release should it occur, the HDD Contractor would generally work 24 hours per day using two 12 hour shifts. This provides the Contractor the greatest chance of maintaining hole integrity and avoiding upset conditions that could lead to an inadvertent release that are more likely to occur during start-up. The HDD Contractor would employ reasonable measures during drilling activities to minimize the occurrence of inadvertent fluid releases, as described below.

1.4.2.1 Casing

Contractors often use a short section of casing that is ‘dug in’ at the start of construction. This casing is intended to prevent inadvertent near-surface returns, and allows for easy monitoring of drilling mud return levels. The casing can either be driven in with a large hydraulic hammer or, possibly, in softer soils, pushed in with the drill rig.

Casing should be of sufficient length to seal into a suitable competent formation such as bedrock or cohesive stiff clay. The casing diameter should be greater than the final reaming pass to ensure down hole tools can easily enter the bottom of the casing throughout the entire drilling operation and pull back.

1.4.2.2 On-site Mud Engineer

A full-time, qualified, mud engineer would be on site. The on-site Mud Engineer would continuously monitor the drilling fluid circulation and returns, and ensure that the fluids handling equipment is operating within specified parameters (i.e., pressures, flow rates) for the observed soils conditions. The on-site Mud Engineer would continuously monitor returned cuttings for soil type and would modify the drilling fluid properties (i.e., viscosity, density) with appropriate non-toxic additives as deemed necessary to account for changes in soil conditions. [Note: Material Safety Data Sheets for drilling mud additives would be provided prior to construction.]

1.4.2.3 Controlled Drill Head Advance

Where possible at the beginning of HDD operations, the drill head would be initially advanced with minimum drilling fluid pressure to minimize inadvertent fluid releases in the relatively shallow depths that occur near the entry point. The HDD Operator would advance the drill head at a pace that permits soils cuttings sufficient time to be flushed from the borehole by the drilling fluids.

This reduces plugging and thereby maintains downhole pressures within acceptable levels. The maximum rate of advance would be set and periodically adjusted by the HDD Operator in coordination with the on-site Mud Engineer and as subsurface conditions change. If plugging occurs (i.e., return flow is diminished relative to fluid pumping rate), the rate of advance would be reduced, stopped, or reversed, as appropriate until the plug has been cleared.

1.4.2.4 Minimum Pump Pressure

Prior to beginning the bore, the HDD Operator would review the allowable fluid pressure graph that correlates downhole fluid pressure against overburden pressures. Drilling fluid pump pressure would be maintained near the minimum necessary to maintain good circulation and to keep the borehole clear of cuttings. In the event a reduction in circulation is observed and at the discretion of the on-site Mud Engineer, adjustments to drilling fluid properties (i.e., density, viscosity), rate of drill head advance, and reaming diameter would be considered before pump and downhole pressures are increased.

1.4.2.5 Drill Fluid Containment Pits

Pits that contain the drill fluid at both entry and exit points would be appropriately sized to handle the required fluid volumes including an appropriate safety factor. Pit sizing would consider the pullback phase when a large amount of drill fluid is expected to be displaced by the pipeline. The pits would be lined if required to reduce subsurface seepage and perimeter containment measures would be implemented as needed.

1.5 MONITORING OF HDD FOR SURFACE FLUID RELEASES

Monitoring for observable drill fluid releases at the surface would be done 24 hours per day during active drilling periods. Monitoring would focus on the area where the drill-bit is located. Floodlights may be used during night-time drilling operations as necessary. The HDD Operator would monitor any decrease in fluid pressure readings that may indicate drill fluid is escaping into a porous soil layer or through fractures in the soil. The amount of drilling mud that could be lost to the environment in the event of an inadvertent release depends on the size of the fracture and amount of head pressure. Because there would be monitoring for surfacing releases at all times in sensitive areas and with proper implementation of the Project entity's response plans, the extent of releases would be kept to a minimum.

1.5.1 Ground Surface Inspection

The HDD Operator would assign personnel to visually inspect the ground surface in uplands and wetlands along the drill alignment for indications of escaping drilling fluids as the drill head progresses. Inspections would be made relative to the rate of advance of the drill head, but an inspection pass would be made at least once every hour while pumping drilling fluids. Any indications of an inadvertent fluid release would be reported immediately to the HDD Operator. If operating parameters (i.e., fluctuations in fluid pressure or returns) indicate the possibility of drill fluid losses, the surface inspection would become continuous until; a surface release is located, measures to remedy the pressure and fluid losses using additives or other operational adjustments have been successful, or the drill is completed. Continuous monitoring would supplement the monitoring of operating parameters. Reasonable efforts would be made to locate the point of fluid losses, if possible, to assess if environmental damage has occurred. Inspections on uplands may be made on foot or from a vehicle. Site-specific summer wetland inspection methods would be reviewed and approved by the on-site Environmental Inspector following consultation with the regulatory agency representative, if present.

1.5.2 Surface Water Inspection

If flowing at the time of construction, the HDD Operator would assign personnel to visually inspect the waterbodies under which the drill is crossing for turbidity plumes that might indicate an inadvertent fluid release is occurring. In winter, suitably located water quality monitoring stations would be setup in a grid on the ice. Indications of an inadvertent fluid release would be reported

immediately to the HDD Operator. If operating parameters indicate the possibility of an inadvertent fluid release under water, the water inspection would become continuous until the location of the suspected inadvertent fluid release is found, the drill is completed, or measures to remedy the inadvertent fluid release using additives or other operations adjustments have been successful.

1.5.3 Special Safety Considerations

Monitoring in water or wetlands at night or in fog would require special safety precautions and equipment considerations, including the use of portable lights of sufficient power to effectively monitor the area. Monitoring in water or wetlands would be discontinued whenever conditions render the activity unsafe. At such time, the HDD Operator would determine if drilling can safely continue, subject to the Project entity's approval, while monitoring for fluid losses based on pump pressure and drilling fluids returns.

1.5.4 Notifications

Upon indication of fluid losses, the HDD Operator would notify the Environmental Inspector. Upon confirmation of an inadvertent fluid release, the Environmental Inspector would notify the appropriate regulatory agencies in compliance with permit stipulations and the land agent would notify the affected landowner(s).

1.6 INITIAL RESPONSE TO AN INADVERTENT FLUID RELEASE

As directed by the Project entity in consultation with the appropriate regulatory agencies, containment and recovery would be attempted if sensitive resources are threatened and conditions allow and if the containment and fluid recovery provide a net benefit to the resource

The HDD Contractor's initial response to a potential inadvertent fluid release would be as described below.

- Upon first indication of a potential inadvertent fluid release, the HDD Operator would reduce drilling fluid circulating pressure, continue rotation of the drill string, and continue to advance the drill head in an attempt to stop or substantially reduce the inadvertent fluid release rate as well as avoiding the creation of a downhole cavity.
- If the inadvertent fluid release is initially or subsequently confirmed by an observed release of fluids to the surface or an observed turbidity plume in water, the HDD Operator would attempt to advance the drill head past the known point of the inadvertent fluid release.
- If the release of drilling fluids continues unabated at a rate that threatens to expand to a rate otherwise deemed excessive by the Environmental Inspector (in consultation with the regulatory agency representative, if present), or completion of the drill is in jeopardy due to failure to remove cuttings from the borehole, advancement of the drill would be temporarily suspended.
- The HDD Operator may continue to rotate the drill string in the borehole and circulate fluids at a lower pressure that does not result in continued fluid release at the inadvertent fluid release point, to keep the borehole open or to keep the fluids from freezing.
- If the inadvertent fluid release occurs affecting a wetland, the HDD Operator would consult with the Environmental Inspector regarding appropriate containment and recovery methods before continuing with the drill.
- If the inadvertent fluid release occurs in uplands, the HDD Operator may continue advancing the drill, provided the released fluids are contained and removed and after confirmation that cuttings are being returned at a sufficient rate to ensure successful completion of the borehole.

- The HDD Operator may also continue to advance the drill if; the release is to open water, the release does not obstruct a navigation channel, or the release doesn't accumulate in wetlands and the cuttings are being returned at a sufficient rate to ensure successful completion of the borehole. The advance of the drill head may result in a reduction of the inadvertent releases as the drill moves away from the downhole leakage zone. If, however, the Environmental Inspector (in consultation with the regulatory agency representative, if present) deems the resulting turbidity plume to be excessive, the HDD Operator would temporarily suspend drilling until necessary corrective measures are successfully implemented.
- The On-site Mud Engineer would record all parameters being tracked at the time of inadvertent fluid release, including fluid circulating pressure, fluid mixture composition, fluid viscosity, location and depth of the drill head, location of the inadvertent fluid release, rate of drill advance, and time of day. The HDD Operator would keep a log of all activities associated with the attempts to control the inadvertent fluid release.

1.7 CONTAINMENT AND REMOVAL

Containment and removal of drilling fluid releases from an inadvertent fluid release would be performed where practical and where there would be a net benefit in the reduction of environmental impacts.

1.7.1 Surface Waters

Containment and removal of drilling fluids released to surface waters as a result of an inadvertent fluid release is generally impractical and ineffective in a large waterbody due to the difficulty in containing the release and because of subsequent dilution and dispersion in the water column. If, however, the Environmental Inspector (in consultation with the regulatory agency representative, if present) considers the resulting plume excessive, or the plume may directly and negatively impact sensitive resources or an adjacent wetland, the HDD Operator would implement the following containment measures.

- Depending upon the depth and velocity of water and surface conditions, floating silt booms, anchored in place, would be placed over the location of the inadvertent fluid release. Silt booms would be stored on site and the purpose of the containment is to confine the suspended solids until some observable degree of settling can occur. Removal of the diluted drilling fluids is not anticipated, unless dictated by unusual circumstances, and approved by the Project entity.
- The containment would remain in place until the inadvertent fluid release stops, and settling of fluids renders the turbidity inside the containment similar to the adjacent waters based on visual inspection or the threat to the sensitive resource has passed.

1.7.2 Wetlands

Containment and removal of released drilling fluids from an inadvertent fluid release to wetlands would be performed when there is a net benefit in the reduction of impacts, as determined by the following actions.

- Upon confirmation of an inadvertent fluid release in wetlands, the HDD Operator would assist the Environmental Inspector in measuring the area directly affected by the released drilling fluids. The area affected may be estimated from a distance, if access to the affected area for measurement would result in additional unacceptable impacts.
- The Environmental Inspector would characterize the type of impact (e.g., temporary, permanent, vegetation only, change in surface hydrology) caused by the released fluids.

- The Environmental Inspector would seek concurrence of the characterization from the regulatory agency representative, if present.
- The HDD Operator and the Environmental Inspector would jointly estimate the additional area, if any, likely to be affected if drilling operations were to proceed and the drilling fluids were not contained and removed.
- In consultation with the HDD Operator, the Environmental Inspector would estimate and characterize the additional impacts to wetlands likely to occur as a result of accessing the affected area for containment and removal of the drilling fluids.
- The Environmental Inspector would estimate any reduction in impacts that might be achieved if the released fluids were removed.
- The total actual impacts, plus the estimated impacts from continuation of an uncontained release, would be compared to the total actual impacts, plus the estimated impacts from accessing the area for containment and removal, less the estimated reduction in impacts as a result of recovery of the fluids. When making this comparison, some consideration and judgment should be given to the types of impacts and value of the resources affected, if dissimilar. The action resulting in the least overall impact would generally be selected, unless there are mitigating circumstances or as otherwise instructed by the regulatory agency representative, if present.
- If the decision is to forgo containment and proceed with the drill, the Environmental Inspector would continue to observe the location of the inadvertent fluid release. If the impacts continue to increase, the Environmental Inspector would periodically repeat the process of characterization described above until such time as containment and removal are justified or the drill is complete.
- In the event of excessive and uncontrolled discharges of drilling fluids to wetlands, the Project entity and the HDD Operator would determine a course of action. The inadvertent fluid release would be successfully stopped through adjustments in mud mixture or drilling techniques or the addition of plugging agents or the released fluids are contained and recovered from the wetlands. No containment or recovery activities would be allowed in the wetlands without agency approval. If this cannot be achieved, the borehole would be abandoned.
- Prior to commencement of any HDD, the HDD Operator would ensure that appropriate equipment is available at each drill location to contain and recover drilling fluid flow from inadvertent fluid releases into wetlands.
- If it is determined (as described above) that the released drilling fluid is to be contained and recovered, the HDD Operator would direct the placement of the equipment at the obvious point or points of inadvertent fluid release and transfer the contained fluids to a holding tank for reuse or disposal. A mobile vacuum pump or vacuum truck may be used to pump the drilling mud from the contained area and it would be disposed of or returned to the drill rig return pit.
- All access to the wetland would be conducted in a manner that causes the least impact to wetland vegetation and surface hydrology. Because of site specific variables such as distance from open water, surface hydrologic conditions, and vegetation cover, the selection of the most appropriate summer access method (e.g., using shallow draft boats or on foot) must be made on a case-by-case basis, subject to approval by the Environmental Inspector. In summer, the least number of personnel and equipment necessary to accomplish the task safely and in a timely manner would be deployed into the wetland as described above.
- Following containment and removal, the HDD Operator would continue to monitor the location for additional releases and the remainder of the drill for new inadvertent fluid releases as the drill progresses.
- Whether or not containment and recovery is performed, all impacts to wetlands from inadvertent fluid releases would be measured, assessed, and recorded by the Environmental

Inspector with assistance from the HDD Operator to determine if any additional measures may be necessary.

- Upon completion of the boring, the HDD Operator would ensure that all containment and recovery equipment, tools, supplies, materials, wastes, and debris are removed from the wetland work area.

1.7.3 Uplands

- The HDD Operator would use, as necessary, the appropriate combination of sand bags, hay bales, silt fence, pumps, hoses, and holding tanks to most effectively contain and remove drilling fluids from upland areas. The HDD Superintendent would determine what appropriate equipment and materials are to be used, with approval of the Environmental Inspector.
- The HDD Operator would instruct the recovery crew to pump the contained and recovered fluids to on site tanks for subsequent reuse, if the On-site Mud Engineer determines the fluids are reusable. Otherwise, the fluids would be transported off site for disposal. A mobile vacuum pump or vacuum truck may be used to pump the drilling mud from the contained area.
- The Project entity would obtain landowner permission prior to accessing any off right-of-way upland sites for fluids containment and removal operations, except in an emergency where inaction would pose an imminent threat to human health, sensitive resources, or property.

1.8 IMPACT ASSESSMENT

The Environmental Inspector would characterize the environmental impacts from the release of drilling fluids following completion of the drill including the extent of the plume, the area affected by recovery efforts, the type of wetland and vegetation impacted, changes to wetland elevation and hydrology, and whether the impacts are permanent or temporary. The Environmental Inspector would seek concurrence with the regulatory agency representative, if present. A report of the assessment would be provided to the regulatory agency representative as required for determination of any further action.

1.9 CLEANUP

Upon completion of drilling activity, the containment structures would be removed. The drill entry and exit areas and any additional temporary work spaces would be restored as described in the Alaska LNG Project *Erosion Control, Revegetation, and Maintenance Plan*. Once the area is cleaned up, it would be restored as necessary using appropriate methods.

Samples of the spent fluid and cuttings would be acquired and analyzed for contamination prior to disposal. With the permission of the landowner and applicable regulatory authorities, drill fluid and cuttings would be spread over the subsoil layer in the construction right-of-way, covered with loose surface material or mulch or other suitable covering, and reseeded. Alternatively, drill fluid and cuttings may be mixed with native soil and placed in an excavated pit and covered with an appropriate thickness of subsoil and recontoured. A suitable surface material would then be placed followed by appropriate reseeding measures. Alternatively, waste may be collected, transported and disposed of off-site at an approved location.