

Frac Out Management Plan

CONTINGENCY PLAN – FRAC OUT

FRAC OUT

Frac out is defined as the loss of return fluids to the terrestrial and/or aquatic environment and is identified either via visual assessment or drilling fluid system loss monitored the Drilling/Steering Engineer.

The Drilling/Steering Engineer would be the first authority to suspect/identify and confirm if a loss of return fluid occurs and if this has resulted in a terrestrial and/or aquatic frac out. In the potential instance of significant fluid loss, HDD works and operations are immediately suspended, and the Project Manager is informed of the occurrence before commencement of visual confirmation of Frac out to the terrestrial and/or aquatic environment. The onsite drill crew is immediately engaged to respond to the Frac out occurrence location.

Frac Out Prevention

Pre-Drilling

The Drilling Contractor in consultation with the John Holland reviews' the potential variables that can pre-emptively avoid Frac out occurrence including the bore design profile, the known ground conditions and the pipeline depth of cover, ensuring that there is negligible risk of drilling fluid losses. Any and all supplementary concerns are to be brought to the Project Managers attention.

It is noted that most losses occur in the first few meters (up to 20m) from the entry or exit points, where the pipe is at its shallowest. Entry is adequately banded off, so that any leakage that does occur is directed back into the mud return pit on the HDD entry pad of casing on Entry will eliminate this risk.

While geotechnical investigation has been completed, unexpected ground conditions may not support the pressure required for the drilling fluid to return to the entry, carrying out the cuttings. Should the ground not be suitable a revised mud programme may be required, and potential implemented, after consultation with John Holland.

During Drilling

Throughout the drilling process the 'feed' rate, pressure and the 'effectiveness' of the bentonite slurry (drilling fluid) application are to be continually monitored, reviewed and assessed by the Drilling/Steering Engineer via the drilling fluid volume tracking procedure.

The drilling fluid volume tracking procedure consists of regular and accurate checks made periodically throughout drilling operations to ensure that any fluid loss is pre-emptively detected, potentially before visual identification of frac out occurrence.

The procedure involves a volumetric balance measuring the volume of drilling fluid mixed and comparing it to the volume that the fluid is occupying, given the incremental length and size of the bore hole. These two values are readily measured onsite, and comparisons of the values efficiently identify the volume of drilling fluid lost.

In the event that the bentonite slurry (drilling fluid) application exhibits any abnormal characteristics, and/or there is any reason to suspect losses (or potential for losses) the drilling process is suspended immediately, and further investigation and visual assessment conducted before re-commencement of HDD operations. Any suspension of HDD operations due to suspected loss of drilling fluid is immediately communicated to John Holland.

The prevention and mitigation controls implemented during HDD operations are the responsibility of the Drilling/Steering Engineer.

Response

In the event, of potential frac out, HDD operations are suspended immediately, the Contractor is immediately informed by the Drilling/Steering Engineer and the onsite drill crew is engaged to remediate the Frac out occurrence immediately. The crew typically consist of personnel, equipped and trained in effective frac out

control and remediation measures. Frac out stations are available at the Drillers pads sites, potentially consisting of any of the following:

- Sandbags
- Husk socks
- Lay flat hose with flex drive/sykes pumps
- Vacuum truck
- Floating boom with silt curtain

General Frac Out Procedure

All HDD works and operations are immediately suspended, including the recycling of drilling fluid. On suspension of works, pressure has dissipated the fluid that remains in the system into the bore hole where it should remain.

1. Contractor is informed immediately of Frac out occurrence
2. Determine the location and extent of the Frac out
3. Deploy crew immediately to Frac out location for control and remediation
4. Transport of additional resources and equipment to Frac out location
5. Allocation of all the Drilling Contractors personnel to assist with Frac out control and remediation
6. Review of Frac out occurrence for potential modification of HDD project requirements
7. Terrestrial Frac out procedure
8. Inclusive of General Frac out procedure
9. Containment of the area with sandbags, and/or silt fencing to surround and contain the drilling fluid
10. If available and access allows, a mobile vacuum truck will be deployed to pump the drilling fluid from the containment area and recycled to the return pit.

If unavailable or access is limited, flex drive/sykes pumps will be used to pump the drilling fluid from the contained area and recycled to the return pit by way of the mud return line

Upon review, drilling fluid additives would be utilised to help seal the Frac out before the commencement of full HDD works and operations

HOLE COLLAPSE

Project variable and unexpected ground conditions may result in potential hole collapse.

To ensure hole integrity is maintained in the event of Hole collapse, a tail string will be utilised during the reaming operations. If hole collapse does occur we will review the following elements in our procedure prior to continuing on with further drilling operations.

- Drilling fluid design
- Reaming procedures
- Working hours

GROUND CONDITIONS

If an unexpected change in ground conditions is encountered, drilling operations will be stopped, and the following elements of our procedures will be reviewed to ensure down-hole tooling and drilling fluid design suit the changed ground conditions.

- Drilling Head
- Type of reamers required
- Drilling fluid design

EQUIPMENT BREAKAGE RECOVERY

In the event of breakage of the down-hole assembly or drill pipe the following procedures will be engaged to recover any equipment from the borehole.

There are a variety of standard tools to recover the down-hole assemblies that may have broken off. These tools have been widely used in HDD operations and have proven to be very successful in down-hole assembly recovery.

These tools include:

- Overshots (Located at Short notice)

- Spears (Located at Short notice)
- Taper Taps (Located on Site)
- Junk baskets (Fabricate on Site)
- Magnets (Located at Short notice)
- Wash over pipe (Located at Short notice)
- Bumper subs and jars (Located at Short notice)
- Packer & Grouting (Located on Site)

Where recovery is not successful and the equipment is in a position that is accessible via excavation (i.e. close to entry or exit points), the equipment will be recovered by this means.

If either of these two (2) methods is not successful, the equipment will be abandoned down hole and a new pilot hole drilled on a varied alignment.

During Pilot Hole Operations

Attempts will be made to fish the equipment out of the hole using various tools made specifically for this purpose. If this is not successful and the equipment is in a position that is accessible via excavation (i.e. close to entry or exit points), the equipment will be recovered by this means. If either of these two (2) methods is not successful, the equipment will be abandoned down hole and a new pilot hole attempted.

During Reaming Operations

As it is planned to utilise a tail string, the equipment will be removed from the hole by withdrawing the tail string from the bore hole from the exit side. If some reason this is not possible fishing attempts will be made in an effort to retrieve the equipment. If this is not successful and excavation is not a possibility, the equipment will be abandoned, and the hole re-drilled on a varied alignment.