

Pengrowth Energy Corporation

RE: “08-35-063-11W5 Judy Creek” – ENVIRONMENTAL PLAN; CONTAINMENT AND RECOVERY STRATEGIES

The information within these strategies will contain detailed information on monitoring the site, product containment and recovery along the creek and within the beaver dam. These strategies will also include efforts at the break site and impact areas within the mixed forest including monitoring and mitigating any migration of product out of the point of release.

These recommendations are based on previous site activities, as well as current site conditions, containment and recovery operations currently being conducted. Any extreme changes in the watercourse, such as a 5 year flood, or weir / beaver dam breeches, will affect these recommendations drastically. Every effort will be taken to account for such unknown occurrences.

BACKGROUND INFORMATION

On June 26, 2011 at approximately 1600hrs a pipeline failure occurred. An estimated 80m³ was released; on June 29, 2011 a revised estimate of 100m³ was reported to the Regulators. The pipeline was carrying a sweet crude emulsion of light crude oil (~5%) and produced water (~95% / ~50,000ppm Cl-).

The released fluid traveled along the lease and into the ditch crossing the main access road and into a mixed forest, fluid also continued south along the west ditch line approximately 50m and then crossed the access road again; continued down the east ditch line with a small volume entering into Judy Creek. The creek flows north and east through a series of beaver dams to a natural underflow dam approximately 80m downstream that acts as natural containment. Due to the light properties of the oil sheen and fast current the sheen was moved through the underflow dam and continued another 400m to a large beaver dam (control point 1). The dam outflow allowed the product to continue downstream for approximately 400m to another beaver dam structure (control point 2). The Judy Creek eventually flows into the Freeman River over 10 km away.

Initial containment and recovery measures implemented by Pengrowth personnel on June 26, 2011 were the installation sand bags within the ditches and along the road. Absorbent boom was placed along the Judy Creek at multiple points up to 4km from point of entry. Vacuum trucks were also on site removing free fluid from the ditches. On June 27, 2011 lined containment bellholes were placed along the access road to divert any rainfall. On June 28, 2011 3 bellholes and trenches were installed within the mixed forest and creek boom from WCSS was installed along the creek to provide further containment.

Water samples were procured by Worley Parsons from the creek system and sent to an accredited laboratory (Maxxam) for RUSH analyses. Waters from within the creek, beaver dam and weir were field screened for chlorides and have been decreasing from a maximum concentration of 254ppm (recorded on June 26, 2011 at 9:00pm). As of 3:00pm June 29, 2011 chloride screens have been 0ppm.

The pipeline has been daylighted and exposed. All impacted soils were placed atop poly to provide containment.

Vacuum trucks were used to recover all accumulated fluids by the break site and along the ditch line.

Additional water samples were taken from upstream of the point of entry, and select areas within the creek system, as well as up and downstream of the Freeman River.

There was minor sheen; mainly organic visible within the second control point (farthest beaver dam). It does not appear that sheen has moved past the second control point.

A portable vacuum unit was used to recover any visible sheen contained by the sorbent booms.

On June 29, 2011 an inverted weir system was installed approximately 70m downstream from the point of entry; 10m upstream of the natural underflow dam. Work crews then began to remove the clean woody debris over the creek to gain access. Impacted woody debris was removed and placed within lined 1m³ tote bags for future removal. The portable vacuum unit was then used to recover any sheen at the weir as work crews cleared the creek.

Based on the background data, below are the proposed mitigation strategies.

Proposed Strategies:

SITE MONITORING

The site will be monitored continuously throughout the day.

1. Complete daily site inspections:
 - Monitoring for visible hydrocarbons, water depth, water flow rate, freeboard and boom condition at pre-selected monitoring locations (as stated above).
 - Daily temperature monitoring and weather forecasting.
 - Any changes in the water course, increases or decreases in the water flow, both upstream and downstream of the site.
 - Signs of wildlife activity in the area.
 - Condition of the access road.
2. Take photographs of any “out of the ordinary” observations.

3. Daily review of the crew task logs and verbal communication with the field crews and site manager will be completed. The implementation of the product recovery techniques will be completed based on site information.
4. Daily water sampling by WorleyParsons and via field screening at designated monitoring stations.
5. Terrain conductivity survey of the release path.

PRODUCT CONTAINMENT

Based on previous site activities, the following containment and recovery operations will proceed.

1. Installation of an inverted weir system within Judy Creek. Based on visual observations of the creek bottom and larger pockets of water, a retention pond will not be dug within the creek.
2. Weir will be maintained daily, recovering any accumulation of debris or sheen. As weirs are a temporary containment measure, it will be understood that in the event of heavy precipitation that the weirs will possibly breach. To mitigate any release during these peak water sheds, containment booms will be set in place upstream of the weirs.
3. Additional containment boom will be installed downstream of the weir at the natural underflow dam to collect any accumulation of sheen that would result from agitation of the weir waters prior to discharge (i.e. removal of woody debris).
4. Areas along the banks of the creek where surface product/sheen leaching or capillary action is present will be amended with peat moss until the areas can be cleaned by manual or mechanical means. The peat moss will aid in hydrocarbon stabilization and allow easy manual or mechanical recovery.
5. Additional containment boom will be added as required to prevent further movement of sheen at the beaver dam outflow.
6. Bell holes and trenches were installed within the mixed forest area at the delineated points.

PRODUCT RECOVERY

1. The source or point of entry has been cleared of vegetation and the soils will be excavated to prevent further entry.
2. The grass at the toe of the slope and the creek has been cut to below water level to allow any sheen to be moved to the containment boom.
3. The creek will be cleared of woody debris; crews will then proceed to move the product to recovery areas. The product recovery areas will be at weir and localized areas within the creek.
4. Product movement will consist of crews repositioning the larger woody debris (logs) within the creek to allow water to flush naturally. In areas where the product is stranded in the undercut banks, a low volume flush with a water pump will be used to allow the water to lift the product out allowing movement back into the main water channel. This water flushing technique will only be conducted on the undercut areas of the creek and not on the banks or where soil is present, thus reducing the 'footprint' we are leaving and the possibility of stratifying the oil within a sediment layer.
5. Any oily woody debris will be placed within 1m³ tote bags for later disposal.
6. Product recovery at the weir and the localized areas within the creek will be conducted using either the portable vacuum unit or hand skimming techniques. The recovery at these areas will allow for easier management of the creek waters and product, reducing potential downstream impacts if the weir was to breach or through large accumulation of product at the weir.
7. The absorbent booms will be monitored on a daily basis, if any product or debris accumulation occurs within the containment booms hand skimming techniques will be implemented, or absorbents will be utilized for product recovery. All recovered material will either be stored within 45 gallon barrels or 1m³ tote bags. Once full, the barrels or bags will be stored on secondary containment in the form of poly and then managed under ERCB directive 55 and 58.
8. Work crews will then walk the creek and complete peat amendments on areas the exhibit sheen accumulation. The peat will be allowed to absorb the sheen and be removed via hand skimming techniques.
9. Bell holes and trenches will be monitored on a daily basis. Fluid will be pumped from the bell holes into tanks and sent for disposal.

IMPACTED SHORELINE RECOVERY EFFORTS

A shoreline assessment will then be completed. Due to low volume sheen impact and possible weather constraints a non-detailed shoreline assessment will be completed.

SURFACE WATER MONITORING

Surface water sampling will consist of field screening the lined containment pits and bellholes for Chlorides (Cl-) before fluid removal. Select areas along the creek system will also be field screen for Cl-.

Worley Parson will continue to sample the creek waters at select locations two times daily. Sample locations are to identify any sheen or odor present.

HEAVY PERCIPITATION CONDITIONS

In the event that weather conditions are not conducive for the above operations, such as a one in five year flood; the following actions are recommended.

1. Halt current operations to evaluate safety.
2. Secure the site by ensuring containment boom is at the pre-selected areas to maintain surface containment.
3. Monitor activities and increase sampling program based on discussions with AENV.

