

Hamlet of Cambridge Bay Subsurface Water Monitoring Plan

Prepared for:

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1.0 BACKGROUND

This monitoring plan is intended for use should the Hamlet of Cambridge Bay ever put into operation a hydrocarbon-impacted soil landfarm or should a spill of hydrocarbons occur. This location will hereafter be referred to as "The Site". This plan will enable the Hamlet to monitor and track any potential environmental impacts of such a landfarm or spill on the surrounding soil or subsurface water to the site.

2.0 WELL INSTALLATION

2.1 Well Locations and Number

The number and locations of the monitoring wells to be installed will be determined based on the extent or size of the future spill or landfarm. The monitoring wells should be concentrated down flow of the anticipated subsurface water flow. The subsurface water flow will be estimated to follow the elevation of the land and flow in a "downhill" manner towards the nearest body of water.

At least three monitoring wells should be installed. If the depth to subsurface water is measured, three wells will allow the Hamlet to 'triangulate' and calculate the subsurface water flow direction.

2.2 Well Drilling/Digging

Monitoring wells will ideally be installed in boreholes advanced using a rotary style driller. Recognizing that the isolated location of Cambridge Bay will limit the feasibility of a transporting in a rotary drilling machine, monitoring wells can also be installed in excavated holes. The boreholes or holes should be dug to 30 cm below the active layer.

The monitoring wells are composed of polyvinyl chloride (PVC) pipes. These pipes are perforated at the bottom section and solid the rest of the way. The perforated section of piping should extend above the anticipated active layer.

A porous, clean sand (purchased in bags) should be poured to approximately 0.5 to 1 feet above the perforated pipe. The rest of the hole should be backfilled with bentonite, or when less than three (3) metres and permitted by applicable regulations, backfilled with the excavated soil.

Error! Reference source not found. illustrates the general composition of a monitoring well.

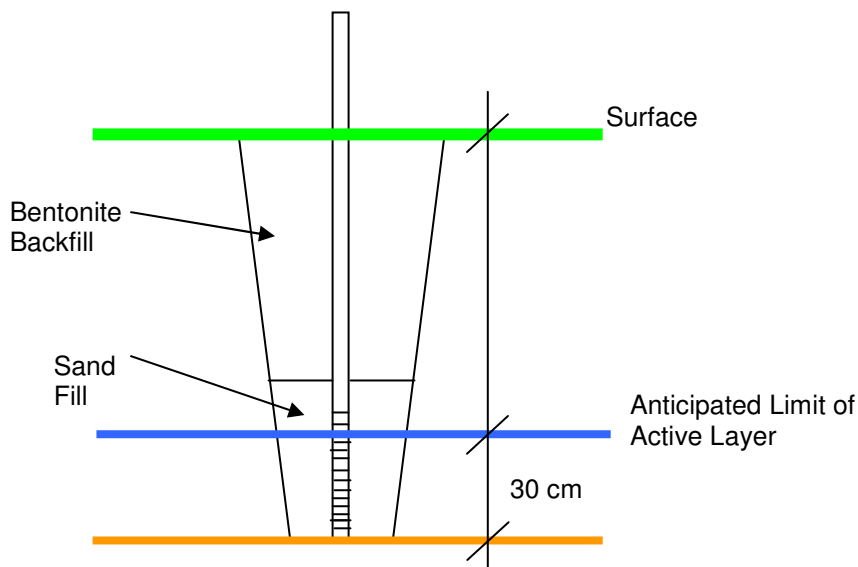


Figure 1 Monitoring Well

These wells should have a lockable cap or protective casing, which should be locked at all times when not being monitored.

2.3 Soil Sampling

As the monitoring well is being installed, the soil type and profile should be recorded. A soil sample every 2.5 feet (1 metre) should be collected in a clean, clear plastic bag with little headspace. If a hydrocarbon vapour monitoring device (GasTech) is present, it can be used to screen the soil and indicate where, if any, hydrocarbon contamination has impacted the soil. The One (1) "worst case" soil sample from each hole should be submitted for analysis of benzene, toluene, ethylbenzene and xylenes (BTEX) and petroleum hydrocarbon (PHC) fractions F1 to F4. The "worst case" can be determined by a GasTech or based on field observations of odour and staining.

During all sampling gloves will be worn.

3.0 SUBSURFACE WATER MONITORING

3.1 Subsurface Water Monitoring

Water monitoring should occur starting from a few days after well installation is complete.

If a GasTech is available, hydrocarbon vapours should be recorded for each monitoring well immediately after the lid is opened.

The depth to subsurface water should be measured and recorded using an interface probe.

A disposal plastic bailer should be used to monitor the surface of the subsurface water for hydrocarbon impact. The bailer is tied at the top end with clean string, and lowered until it gently reaches the subsurface water. Hydrocarbon impact would be seen as a greasy hydrophobic layer or sheen on top of the subsurface water surface, often darker than the subsurface water. If this hydrocarbon layer is seen, it should be purged out using the bailer into a jerry can for proper disposal.



Figure 2: Bailers

Note: picture obtained from Pioneer Groundwater Monitoring Products, <http://bailers.ca/osc/index.php/>

If an interface probe is unavailable, a bailer may be used to estimate the subsurface water level by recording the length from the top of the water level in the bailer along the string to the section of string level with the surface.

A new bailer should be used for each monitoring well, and the interface probe should be cleaned between uses.

If the subsurface water level is above the length of perforated pipe and the sand pack, subsurface water should be purged in the method listed in Section 3.2 after the depth to water level has been recorded. The bailer should then be used to check for hydrocarbon sheen on the subsurface water surface.

The frequency of water monitoring and checking for potential subsurface water impacts will vary depending on the nature and severity of the potential contamination.

3.2 Subsurface Water Sampling

Nitrile gloves should be worn at all times while obtaining a sample. Bottles should be carefully labeled with the date, time, location, and sample type and location.

At least three times the volume of the well and soil pack should be purged from the monitoring well, or the well is purged until it runs dry, before a sample is collected. This will ensure that the subsurface water sample is not taken from stagnant water.

Purging the subsurface water can be achieved two (2) ways: using waterra or using a bailer.

When waterra is used, a sterile foot valve will be inserted in the end of a clean waterra tube. This will allow for subsurface water to be handpumped out of the monitoring well. The waterra tube will then be inserted into the monitoring well, and cut approximately 0.5 metres above the top of the monitoring well. When the subsurface water sample is taken, the volatile elements (BTEX, PHC F1) should be sampled for first. Subsurface water hand pumped using waterra should be pumped gently to minimize volatilization of these compounds.

A bailer can also be used to purge subsurface water from the monitoring well until three well volumes are removed or the well is dry. This is done by lowering the bailer in the well, filling the bailer, dumping it, and repeating. This process can take longer than using a waterra.

Samples should be taken by lowering the bailer gently into the subsurface water level.

All the laboratory sampling requirements should be considered and met (adding preservatives, no head space).

Ten (10%) percent of all samples obtained should be a duplicate sample to act as quality control of the laboratory and field procedures.

Samples should be carefully packaged in a cooler to minimize potential breaking. Ice should be added, though in colder months the cooler should not be left outside to prevent water samples from freezing. A chain of custody form should be carefully filled out to match the field labeling, and the samples sent to the laboratory for testing within the time frame provided by the lab.

The frequency of water sampling will depend on the nature of the potential contamination, the subsurface water monitoring and previous subsurface water results.