

Questions about the Cobble Hill Landfill: Current status, Spill Prevention Order, and Final Closure Decision

1. What activities are allowed and not allowed to occur at the site and is the Stop Work Order still in place?

Because the site is a permitted mine under the *Mines Act*, both the Ministry of Environment and Climate Change Strategy (ENV) and the Ministry of Energy, Mines and Petroleum Resources (EMPR) have been involved in the oversight of the site, and remain in close communication about all actions at the site.

In January 2017, ENV suspended the waste discharge permit for the landfill and issued an initial Spill Prevention Order (SPO). In February, ENV canceled the waste discharge permit outright and expanded the SPO. That same month, EMPR issued a Stop Work Order for reasons that were unrelated to the permit cancellation or SPO requirements.

Under the Stop Work Order, the only allowable activities included monitoring, management of contaminated water, and maintenance and monitoring of the landfill cell in accordance with the Spill Prevention Order (SPO). Blasting, quarrying, removal or acceptance of materials, and other mining-related activities, were not permitted. That order was rescinded by EMPR in April 2019 and replaced with a new Permit that does not allow any mining activity, until a new mine plan is approved.

Since the SPO was issued, it has had two amendments and it remains in effect to lessen the risk of an escape or spill of contaminants from the landfill. Works required by ENV under the SPO, or implementation of the Final Closure Plan as approved by ENV, are permitted to occur under the new Permit.

2. *What is currently required and permitted to occur at the Cobble Hill Holdings landfill under the Spill Prevention Order (SPO)?*

The Named Parties are required to regularly inspect the works that are currently in place, collect and submit data, and not discharge leachate to the environment. They are not currently allowed to add any new material to the landfill, or make changes to the existing landfill and associated works except as identified in the approved Final Closure Plan. There is nothing specific or prescriptive in the SPO about how the Named Parties manage and remove the leachate from the site (as long as it is taken off-site to an authorized facility for discharge to the environment) and the SPO does not set requirements related to management or discharge of surface water runoff, movement of materials on or around the site outside of the landfill (except as identified in the Final Closure Plan), or other mining-related activities.

3. *Are drill holes, orange plugs, detonators and other items seen around the site evidence of recent blasting and mining activity?*

Blasting and other mining-related activities at the site fall under the jurisdiction of the Ministry of Energy, Mines and Petroleum Resources (EMPR). In response to questions and concerns from the public in late 2018, EMPR staff conducted an inspection and confirmed that there had not been any recent blasting or explosive activity on the mine site. Photos submitted by the public were examined and found to show old shock cord tubing and connectors, both of which are used in blasting but are not explosive materials. Although these items were found on the mine site, they were likely left over from activity pre-dating the Stop Work Order. Orange cones at or around the site were not there as a result of any recent blasting.

4. *How is leachate managed at the site? What happens to the leachate after it is collected?*

Currently, leachate generation is minimized by preventing rainwater infiltration through geomembrane capping of the landfill, and diverting stormwater and precipitation away from the landfill. Leachate that is generated within the landfill (as the soils continue to drain and dry) is collected in the engineered leachate collection system in the lined landfill. It drains via gravity to the storage facility which contains two 10,000 gallon leachate tanks and one 10,000 gallon leak detection tank. To ensure no leachate enters the environment through leaking or cracked tanks, all three tanks are located in a covered, locked facility that includes a secondary geomembrane liner and gravel cushion layer. In addition to the leachate collection system, there is a leak detection system installed underneath the primary geomembrane base liner and above the secondary clay base liner. To date, no leachate has been collected in the leak detection system.

Leachate is typically stored onsite until a worthwhile volume has been collected, and then it is transported off-site to an authorized disposal facility in accordance with the requirements of the Spill Prevention Order (SPO). Leachate tanks are equipped with liquid level sensors that auto-callout to operational staff as various levels in the tanks are reached. The Named Parties are required to test the raw leachate monthly as part of the monitoring requirements under the SPO. Whenever leachate is removed from the site, records of the disposal are provided to the ministry in the twice monthly data submissions. For example, the January 15 report notifies the ministry of pending leachate removal and the January 30 report provides records related to leachate disposal.

To meet requirements at the authorized off-site disposal facility, the Named Parties are currently polishing the leachate onsite utilizing bag filtration and the addition of Potassium Permanganate to reduce manganese levels to below 5 parts per million.

Details related to leachate management are included in Chapter 7 and Section 10.3 of the Final Closure Plan that was submitted to the ministry on January 31, 2019.

5. Are the Named Parties allowed to treat or filter leachate at the site?

Yes, there is nothing in the Spill Prevention Order (SPO) that prohibits the treatment or filtration of the leachate onsite prior to disposal. The filtering does not impact the raw leachate sampling being conducted in accordance with the SPO. The SPO requires that there be no discharge of leachate to the environment and stipulates that all leachate must be collected and taken to an authorized off-site disposal facility.

6. Is the absence of leachate being found in the leak detection system a signal that it doesn't work?

If the geomembrane barrier system at the base of the landfill and the leachate collection system are operating as designed, leachate should not be detected in the leak detection system. The geomembrane barrier system, leachate collection system, and leak detection system were all designed by engineers, with signed and sealed "as-built" engineering drawings submitted to the ministry.

Now that the soil is in place on top of the landfill base infrastructure, it is not possible to inspect the system without damaging the works and posing a significant risk of a spill or release of contaminants to the environment. However, test pits that were excavated immediately adjacent to the base of the landfill in September 2017 as part of the approved minor construction works did not reveal any indications (e.g. moisture, odours, etc.) that leachate was escaping the cell.

To ensure continued operation of the two base liners of the landfill and the leachate collection and leak detection systems, a comprehensive monitoring program is in place and results are being carefully reviewed on an ongoing basis. If needed, adjustments will be made to the monitoring program and other mitigation measures will be enacted to ensure there is a multi-barrier system for detecting any leaks before they become an issue in the environment.

7. *For how long will the site be monitored?*

The site will be monitored for the duration of the post-closure period, the length of which will depend on the data that is collected over time. The Final Closure Plan for the site proposes a 30-year post-closure period. The approved plan includes commitments for inspection and maintenance of the final cover and associated infrastructure, including the leachate and leak detection works, as well as leachate and environmental monitoring of groundwater and surface water. At this time it is expected that the nature of the wastes deposited in the landfill and the double encapsulation design of the landfill itself are such that the landfill will not pose a risk to human health or the environment beyond the post-closure period. However, and in accordance with standard ministry practice, the ministry may require a shorter or longer post-closure period, as well as alter the requirements, based on new information received over time.

8. *What efforts were taken by the ministry to review the adequacy of the existing and proposed engineering that was included in the Revised Final Closure Plan?*

The original closure plan for the site that is dated February 2017 was reviewed by Hemmera, an independent Qualified Professional (QP) hired by the ministry. Based on the review by Hemmera as well as ministry staff, the Minister gave directions to adjust the plan and an updated version was submitted in July 2017. The minister approved minor construction works in August 2017, and at that time ordered additional testing to be carried out by the Named Parties and their QP, Sperling Hansen Associates (SHA); the ministry concurrently hired its own independent QP, GHD Limited, to oversee the construction works. The purpose of the additional testing was to confirm the original engineering of the base liner as best as possible without damaging existing works, and also to install new wells to provide an early warning signal in the event of issues with the landfill base and/or leachate management systems. Since the minor construction, increased monitoring has been ongoing, and results were reviewed to inform the decision on the Final Closure Plan.

In late 2018, the Named Parties re-engaged SHA and they submitted proposed revisions to the Final Closure Plan in January 2019. These were carefully reviewed by ministry staff, assisted again by GHD Limited as an independent consulting QP. The reasons for the minister's decision to approve the plan are posted on the ministry's website.

9. *Why isn't the ministry concerned about soils with elevated sulphur content, which could react with water to produce acidic conditions and leaching of metals?*

Encapsulation and chemical treatment are two recognized methods of mitigating risks associated with sulphur-laden soils that may contain or produce acidic leachate as a result of oxidation to sulphate in the presence of water. In addition to being mixed with a product containing neutralizing properties, soils that were received at the site were deposited in a fully encapsulated landfill engineered to prevent exposure to water with geomembrane covers and water diversion works.

Any leachate that is generated within the landfill is collected, analyzed, and disposed offsite in accordance with Spill Prevention Order requirements. A review of leachate data indicates that acidic conditions are not occurring at this time. In the event that leachate does show acidic properties, the leachate is designed to be contained within the system, and can be neutralized and managed as needed onsite prior to off-site disposal.

Leak detection systems are also in place to monitor the integrity of the liner, and seepage monitoring wells at the toe of the landfill are monitored to check for any evidence of the leachate signature within the groundwater. In addition, receiving environment (groundwater and surface water) monitoring is conducted to look for any indication of traces of landfill leachate signatures in the environment.

10. *What financial security is in place for the site? Will more financial security be collected if the Final Closure Plan is approved?*

The ministry currently holds \$220,000 of financial security for the site, in the form of an Irrevocable Letter of Credit. Additional security is held by the Ministry of Energy, Mines and Petroleum Resources for mine reclamation purposes. The financial security was collected under the requirements of the *Environmental Management Act* permit. The permit has since been cancelled, but the ministry continues to retain the security. The site is currently regulated under the Spill Prevention Order (SPO). The SPO authorities in the *Environmental Management Act* (Section 79) do not include provision to require additional security as part of a SPO or as part of something under a SPO, like the Final Closure Plan.

11. Can the ministry require that the fill on Lot 21 be used for final closure of the landfill on Lot 23?

The Final Closure Plan proposes to import fill material for a stabilizing wedge outside of the soil encapsulation cell. Section 4.8 of the Final Closure Plan provides details regarding the proposed quality of the soil to be imported but does not specify the source(s). In order to specify the source of soils to be used for the wedge, the Minister would need to have been satisfied that it is reasonable and necessary to do so in order to lessen the risk of a spill of leachate or contaminated soil from the landfill, and this was not the case.

12. How is the “2016 Landfill Criteria for Municipal Solid Waste” being applied at the site?

The 2016 Landfill Criteria (Criteria) is a ministry guidance document that does not stipulate mandatory requirements but identifies recommended practices that can be modified when technical justification is provided which demonstrates that proposed site-specific alternatives provide equivalent or better environmental protection. This guidance document is considered by ministry staff during the setting of legal standards at landfills in BC, but decision makers have the ability to require additional information and/or specify legal standards that are more or less stringent than the Criteria.

In the Spill Prevention Order and in related correspondence, the ministry has indicated that the 2016 version of the Landfill Criteria must be used as guidance for a Final Closure Plan for the landfill. Closure and post-closure activities in the Plan are expected to be consistent with details included in the Criteria, or include justification to demonstrate how proposed alternatives will adequately protect the environment. In approving the final closure plan, the ministry is satisfied that it is consistent with the Criteria, or where it is not consistent, justification has been provided. In fact, the proposed alternatives generally provide equivalent or better environmental protection.

The 2016 Landfill Criteria was posted in late August 2016, and was not yet in effect at the time of original landfill design or construction. Furthermore, because the Cobble Hill Holdings landfill already exists, some aspects of the Criteria are not applicable at this time, such as siting requirements and buffer zones, design standards for the landfill base liner and leachate collection system, and operational requirements that would apply at an active landfill site.

13. Will the ministry be taking steps to restrict access to the site?

Although the 2016 Landfill Criteria (Criteria) recommends that security fencing is installed around active landfills, the Criteria only apply at this site insofar as the practices pertain to final closure decisions under the Spill Prevention Order (SPO). The SPO required development of a Final Closure Plan for the landfill as a measure to lessen the risk of an escape or spill of polluting substances (which is the applicable legal test under Section 79 of the *Environmental Management Act*). General site access considerations are the purview of the Ministry of Energy, Mines and Petroleum Resources (EMPR) and actions have been taken by EMPR to halt mining-related activities at the site. Access restrictions will likely be considered by EMPR if mining activities are to resume in the future.

14. What requirements are in place for Qualified Professional (QP) involvement in this file and who can fulfill this role?

The Spill Prevention Order (SPO) requires the Named Parties to engage a QP to regularly do the following: inspect the works; monitor groundwater, surface water and leachate; and report to the ministry twice per month. The SPO is not prescriptive about who can perform this work, as long as the individual meets the definition of a QP as defined in the Landfill Criteria for Municipal Solid Waste, 2nd Edition, June 2016. In BC, systems are in place through professional associations to hold their members accountable, and these systems are in the process of being strengthened based on a [comprehensive review](#) of the professional reliance model in the Natural Resource sector. This includes the new *Professional Governance Act* which modernizes and strengthens the roles and expectations of qualified professionals. The ministry expects QPs to behave appropriately in accordance with their code of ethics and work within their area of practice, and takes very seriously any concerns about QP behaviour and encourages reporting of any concerns to applicable professional associations. A brand new [Professional Accountability Policy](#) has recently been put in place by the ministry and aspects of this policy have been put in place through the conditional approval of the Final Closure Plan by the minister: in particular, QPs must sign declaration forms and approval is required from the ministry before QPs can perform work to fulfill obligations in the SPO.

15. What are the factors that are contributing to variability and differences in water quality observed at the monitoring sites?

Water quality at the site is controlled by three separate but connected hydrologic components. These components are described as follows:

- 1. First is the interflow, which occurs at the contact between the loose quarry rock and bedrock. The interflow quality is influenced seasonally by precipitation such that the concentrations of water quality parameters are elevated at the beginning of the rainy season as a result of the fall flush. The flush mobilizes dust and oxidized materials that accumulated during the summer at the site. This is followed by a decrease in the concentrations due to the winter rain that inundates the interflow and dilutes its parameter concentrations. Finally, the concentrations increase again during the summer season with reduced flow and water stagnation, which increases the concentrations due to the residence time of water that reacts with the bedrock. The three seepage wells are installed within the interflow, and as such they exhibit the seasonal variability in water quality. They are located relatively close to the landfill in order to provide an early detection system of any leachate, but the conditions are highly variable due to the factors listed above, and they may also be more vulnerable to influences from current or historic surface activities in the quarry.*
- 2. The second hydrologic component is the bedrock groundwater system. Its parameter concentrations are generally stable throughout the year, but they may be elevated in different locations. The bedrock groundwater system was characterized and initially monitored by eight wells, but that number was reduced in recent years to four wells (sites: MW-2, -3S, -3D and -6). The difference in chemistry between the monitoring wells is controlled by the local geology and the residence time of water to react with that geology. The difference in chemistry between the seepage wells and the deep groundwater wells is due to the fact that they are monitoring two different hydrologic components of different origin and influence.*
- 3. The third hydrologic component represents the water contribution from the entire site to the ephemeral creek. This contribution includes surface runoff, the interflow and the discharge of groundwater from the bedrock. The three seasonal stages described under the interflow component show a similar patterns in water quality fluctuations observed at the sampling location in the creek (site SW-1). The first stage represents the fall flush characterized by elevated concentrations, followed by the high-flow, low-concentrations winter season. Lastly, the concentrations in the creek increase again during the summer season due to the increased groundwater proportion, which contains higher concentrations due to its interaction and reaction with the bedrock.*

16. Is the groundwater well MW-6 appropriate for use as a background well?

The original background monitoring well MW-4 was decommissioned and replaced in 2016 by a new background well referred to as MW-6. The location of MW-6 was appropriately selected for the background monitoring, because its location is south (up gradient) of the landfill and outside of its area of potential influence. After its installation and initial review of monitoring data, the ministry and other qualified professionals assessed the suitability of MW-6 as a background well. Analysis of water levels and groundwater quality collected from MW-6 confirmed that it is located hydraulically uphill or above the landfill and its geochemical character shows no evidence of influence from leachate. However, further analysis of its water quality shows that water in MW-6 is very hard and the concentrations of its key water quality parameters are notably higher than in the downgradient bedrock wells. The elevated hardness concentrations in groundwater at the upper portion of the quarry are likely attributed to its geology, specifically limestone lenses that are within the bedrock. This is supported by previous geological characterizations prior to construction of the landfill. Hence, ministry staff have recommended that MW-6 may not be suitable for continued background monitoring, because it provides little value to the monitoring program. Instead, monitoring efforts will be directed toward sampling new shallow wells to be installed as part of the Final Closure Plan.

17. Why is water quality in well MW-6 different than that of other wells?

As discussed in the responses above, the difference in chemistry between well MW-6 and other monitoring wells is a result of the local geology and the residence time of water to react with that geology.

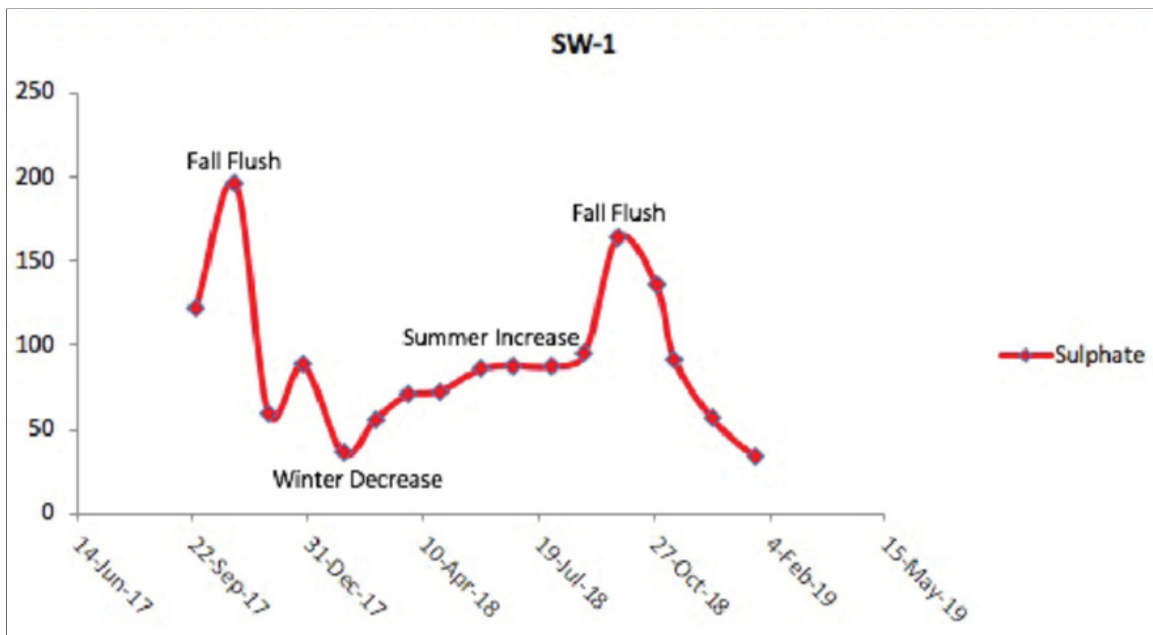
18. Why are levels of parameters such as chloride, sulphate and calcium elevated at monitoring site SW-1, compared with other surface waters in the Shawnigan watershed? Does this indicate that the landfill is leaking?

In general, comparison of water quality from one area of the watershed to another may not be appropriate, because the areas may be vastly different in terms of their hydrology and environmental setting (e.g. geology), as well as other historical and current land use activities.

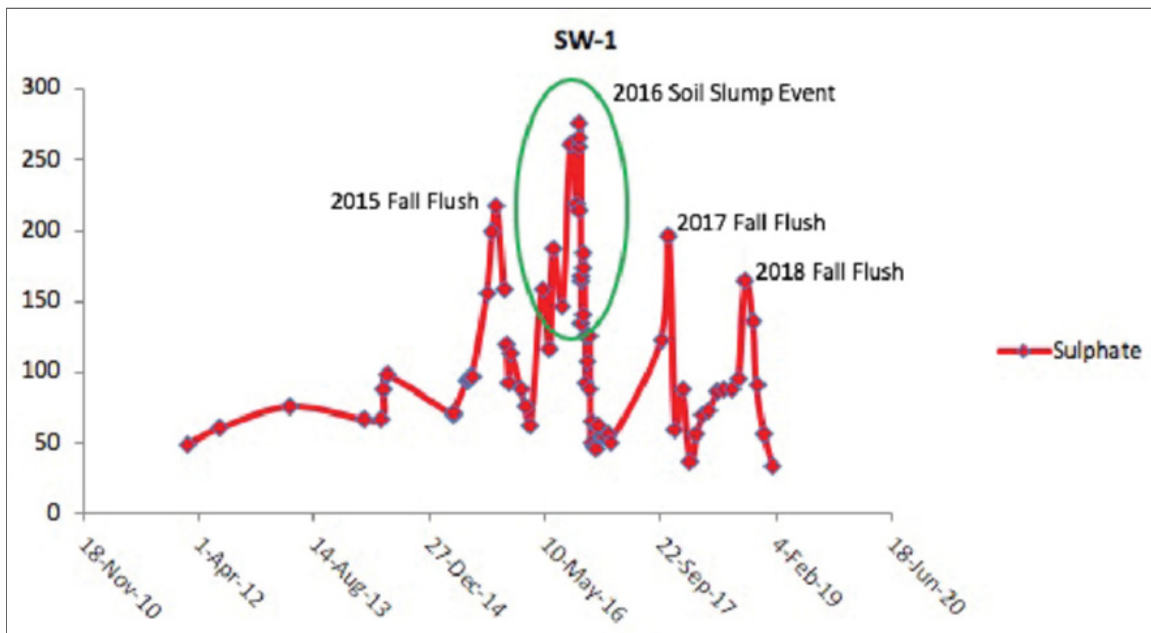
More specifically, monitoring site SW-1 is located at the start of an ephemeral creek. SW-1 receives all water from the site, including surface runoff, the interflow and the discharge of groundwater from the bedrock. Groundwater levels (i.e. the water table) and chemistry indicate that groundwater is hydraulically connected to the creek, which means that during low flow conditions, such as in the summer season, water at SW-1 is actually daylighting groundwater.

Groundwater has generally higher concentrations of water quality parameters compared to surface water. This is because groundwater movement through the bedrock is slow, which allows groundwater to react with and become enriched by the bedrock.

Since September 2017, the landfill monitoring frequency has been increased to monthly. As a result, 17 months of monitoring at SW-1 provides a robust water quality dataset. That dataset indicates three hydrologic stages and related water quality fluctuations. The first stage is short and is characterized by increased parameter concentrations as a result of the fall flush, which mobilizes dust and oxidized material that accumulated at the site during the summer season. This is followed by the second stage, characterized by a decrease in concentrations due to winter rains that inundate the system and dilute its water quality. Finally, the third stage is characterized by an increase in concentrations during the summer season due to the increased groundwater contribution to SW-1, which contains higher concentrations of water quality parameters. This relationship is illustrated in the sulphate graphs below.



Finally, review of water quality data collected from SW-1 indicates that parameter concentrations are generally within their baseline range. This is illustrated in the graph below. Although the fall flush was not recorded until 2015, the graph indicates that the recent concentrations of sulphate are largely unchanged from their baseline concentrations.



19. There have been occasional hydrocarbon detections in some of the monitoring wells. Is this an indication that the landfill is leaching into the groundwater?

Detectable concentrations of hydrocarbons were measured in some monitoring wells at the landfill prior to any waste deposition. Hydrocarbons continue to be occasionally detected in the interflow and bedrock wells as recently as 2018. Given that the hydrocarbon concentrations in leachate are either non-detectable or low, the landfill is an unlikely source of hydrocarbons in groundwater. Also, because hydrocarbons have been found in monitoring wells that are located hydraulically uphill from the landfill, this further suggests that the source of hydrocarbons may not be attributed to the landfill. However, the Ministry acknowledges that hydrocarbons in groundwater at the landfill are inadequately characterized and that additional investigations, analysis and forensics are required to identify and eliminate the source(s). The ministry has required changes to the monitoring plan to address this issue in the future.

Questions about Historical Activities that Occurred at the Site while the Permit was in Effect

20. Why is the landfill allowed on this property when the Cowichan Valley Regional District (CVRD) indicates that it does not conform to the local zoning requirements?

Zoning and land use planning fall within local government jurisdiction and are outside of the Ministry of Environment and Climate Change Strategy's mandate and zoning on its own cannot directly influence permitting decisions under the *Environmental Management Act*. The ministry, however, does assess specific site conditions during the authorization process and requires suitable facility design to ensure environmental protection. While the ministry is aware that the CVRD has indicated the landfill does not conform to local zoning requirements, the BC Court of Appeal has provided guidance regarding this matter. Specifically, the BC Court of Appeal ruled that reclamation is an integral part of quarrying and that the Cobble Hill Holdings landfill facility reclaims the South Island Aggregates quarry, and the regulation of quarries and their related site reclamation activities are not subject to local zoning bylaws.

21. Why would there be a vac truck on the site?

From time to time the Named Parties need to conduct maintenance of the onsite works to ensure their continued functioning and to comply with the Spill Prevention Order (SPO). For example, in January 2019 a vac truck was onsite to clean up some sediment from the lock block enclosure surrounding the leachate storage tanks. This work was unrelated to leachate and/or contaminated soil management, and was done for maintenance and safety reasons. Vac trucks also transport leachate from the collection system to an approved off-site waste management facility in accordance with the SPO requirement.

22. Did observations which revealed wetness on the exposed area at the toe of the landfill indicate that the landfill was leaking?

In May 2016 the ministry received photos and documentation from the public indicating concerns about possible leakage from the landfill. These reports were taken very seriously and were immediately and extensively investigated. The site operator's engineer as well as a contracted geotechnical engineer carefully reviewed the situation and confirmed that the pockets of moisture were likely infiltrated and trapped rainwater, as the outer berm and adjacent pit floor are not impervious to rain. Small amounts of water could also result from the clay compaction liner as it compresses due to the weight of the soil placed in the landfill. Based on this investigation, the ministry does not believe that the pockets of moisture indicated that the liner was leaking.

23. How did the ministry respond to questions about possible excavator tracks on the base liner during its installation?

In July 2016 the ministry received photos and documentation from the public indicating concerns about what appeared to be excavator tracks on the liner. These reports were taken very seriously and were immediately investigated onsite by both the Ministry of Environment and Climate Change Strategy and Ministry of Energy, Mines and Petroleum Resources staff. Based on site observations, it was confirmed that the photos of the patterning on the liner were consistent with that which would be expected to occur during factory welds of the liner. Irregular wrinkling in liners can also result from thermal expansion and contraction, and wrinkles in liners are routinely added to allow for contraction of the liner in cold weather. While at the site, provincial government staff also viewed actual excavator tracks on waste pieces of liner and noted the marked difference between factory weld markings vs. deeply and clearly imprinted excavator track indentations which would cause significant damage.

24. Is there hazardous waste in the soil?

The permit only allowed acceptance of soils that do not qualify as hazardous waste based on definitions in the Hazardous Waste Regulation, and there is no significant evidence to support the presence of hazardous waste soil in the landfill. Upon request by the ministry, copies of all records and supporting data and information related to soil received at the site were provided by the site operator for examination. Following extensive review of the information for inspection purposes (See Ministry Inspection Report # 29047 which is posted online for further details), the ministry was satisfied that soils deposited at the landfill complied with permit requirements.

25. Did the landfill permit allow for acceptance of high sulphur soils, such as those from Pacific Coast Terminals?

The permit itself does not specify a concentration limit for sulphur in soils since this element is not listed in the schedules of the Contaminated Sites Regulation. To ensure protection of the environment for all parameters, the permit required that all leachate and contact water be collected and treated to achieve strict water quality guidelines before release into the environment, and provisions in the *Environmental Management Act* related to not causing pollution were also always in effect.

26. What measures were put in place to mitigate risks associated with potential acidic leachate generation?

Qualified professionals (QPs) were hired by the site operator to specifically identify appropriate mitigation measures for managing soils with high sulphur content. Based on the information from the QPs, the site operator ensured that soils of this type were disposed in a fully encapsulated landfill cell to limit exposure to oxygen. In addition, documentation was provided to the ministry confirming that sulphur-rich soils from Pacific Coast Terminals (PCT) was mixed with a soil stabilizing agent similar in properties to Portland Cement at the source location (PCT Terminal), and again at the landfill site prior to placement of the soil in the cell.

27. What was being mixed in the soil in approximately late 2015 and early 2016 when a fly ash truck was observed at the site? Is this allowed?

The ministry received photos and documentation from the public indicating concerns about application of material from a truck labelled as “fly ash” that was observed at the site. Concerns were also raised about dust generation during the application of material from the truck to the soils. Though contaminated soils and associated ash were acceptable materials at the landfill, the ministry followed up with the site operator and confirmed that a manufactured commercial product containing a fly ash/cement blend was being utilized as a geotechnical amendment to stabilize the soils. Documentation for the product was provided to the ministry and additional dust suppression methods and additional air sampling were implemented at that time as part of a dust management plan.

The use of material containing fly ash as a stabilizing and neutralizing agent in the landfill was being utilized under the direction of a qualified professional in accordance with approved operating plans to achieve geochemical stabilization. In this case, fly ash was not being placed in the landfill for disposal, and therefore fly ash disposal was not mentioned in quarterly or annual reports.

28. Why weren't the Code of Practice for Soil Amendment (CoPSA) requirements followed when using the fly ash mix?

The CoPSA is not applicable in this circumstance as it is relevant to the application of ash to land for agronomic purposes. Ministry staff reviewed the use of the mixture with the site operator, and the stabilizing ash/cementitious product was used in accordance with the operator's approved operating plans and manuals and its use was not prohibited by the permit.