

**South Island Aggregates, Lot 21
Historical Records Review**

**Land Remediation Section
Environmental Protection Division
Ministry of Environment**

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Background and Executive Summary

The Land Remediation Section (LRS) reviewed historical records provided to the Ministry of Environment by the Ministry of Energy and Mines (MEM) for Lot 21 located on Stebbings Road in the Shawnigan Lake area. The primary goal of the historical records review was to determine if the files contained adequate information to characterize soil deposited on the site and to determine if the soil was deposited in accordance with applicable regulatory requirements. Information in the historical records reviewed included: 1) the origin of arriving soil, 2) where received soil was deposited on the site, and 3) quality of the soil received relative to applicable human health and environmental standards of the Contaminated Sites Regulation (CSR). This report provides the findings of the LRS review.

It is important to note that the historical files provided by MEM were simply labelled Lehigh Northwest Materials and Victoria Materials Depot Ltd. No information was provided to directly link South Island Aggregates Lot 21 operations to the records. Therefore, information contained in the records provided cannot be directly linked to the latter company and Lot 21 without additional clarification. Further, upon review of the file contents, it was concluded that the records provided did not contain adequate information to sufficiently describe: the origin, deposition location, or environmental quality of soils arriving at Lot 21, assuming Lot 21 is actually the deposition site. Further, the information contained in the records is generally insufficient to be considered representative of the overall soil quality at the site due to a lack of specific information such as, geographical reference for soil deposition at the deposit site, and comprehensive chemical characterization for all soil received for deposit at Lot 21.

Regulatory Context

Provincial regulatory requirements for soil relocation are designed to prevent the inadvertent creation of new contaminated sites. The relocation of contaminated soil is regulated by provisions under section 55 of the *Environmental Management Act (EMA)*, Part 8 of the CSR, the Hazardous Waste Regulation, and for sites within the Agricultural Land Reserve, the *Agricultural Land Commission Act*. Except where soil is being relocated to a facility authorized to accept contaminated soils, such as a permitted landfill, soil which exceeds the applicable CSR Schedule 7, Standards Triggering Contaminated Soil Relocation Agreements [1], or the applicable CSR Schedule 10 Generic Numerical Soil and Water Standards [2], may not be relocated from a site in the absence of a contaminated soil relocation agreement (CSRA).¹

In consequence, when soil is removed from a contaminated source site for transport to, and deposit at, some other receiving site, and if the receiving site is not authorized under *EMA* (e.g. holds a permit or other approval) to accept the soil; and if the soil contains contaminant concentrations that exceed applicable soil quality standards of CSR Schedules 7 or 10, then a CSRA is required to relocate the soil. The soil quality standards of CSR Schedule 7 represent the

¹ The substances listed in CSR Schedule 10 are so infrequently seen at contaminated sites, that it is the ministry's policy not to require chemical analysis for Schedule 10 listed substances for the purposes of determining when a CSRA is required, unless overwhelming convincing evidence exists that the Schedule 10 listed substance is, or can reasonably be assumed to be, present in the soil to be relocated. Consequently, in vast majority of cases, for practicable purposes, the need to obtain a CSRA is based primarily on the Schedule 7 standards alone.

most stringent of the CSR Schedule 4 Generic Numerical Soil Standards [3] and the CSR Schedule 5 Matrix Numerical Soil Standards [4], provided for each associated land use, regardless of site-specific factors.

Methodology

Records and Permit Review

Records provided by MEM related to soil deposited at Lot 21 for the period of 2008-2013 were reviewed to determine if any deposited soil exceeded CSR Schedule 4 and/or 5 residential or industrial standards, or CSR Schedule 7 Soil Relocation to Nonagricultural Land standards.

The review was particularly interested in determining if any exceedances of Schedule 4 and/or 5 residential land use standards could be found for soil deposited in the area subject to the MEM permit (G-8-331) [5], which requires soil to meet CSR residential standards. Of equal interest was determining if any exceedances of the Schedule 4 and/or 5 industrial land use standards were recorded for the industrial areas of Lot 21 located outside of the area included in the MEM reclamation permit.

Primarily for the purposes of determining if CSRA's might have been required to deposit soil at Lot 21, records were also reviewed for any geographic information which might identify: 1) the originating site or source location of the site from which soil was sent to Lot 21 (i.e. the source sites for deposited soil) and 2) the actual locations at which soil was deposited on Lot 21.

Finally, the records relating to the chemical characterization of deposited soil at Lot 21 were also reviewed in an attempt to determine the overall quality of soil relocated and deposited at the site.

Results and Discussion

Records

The records contained the following information:

1. **Shipping slips for soil incoming to the site:** The shipping slips indicated weight of soil being deposited and general origin such as the contractor's name or the city from where the soil originated. Five shipping slips contained actual addresses for sites from which the soil was shipped. The SITE Registry was searched for the five sites and two of the sites were listed in the registry, which suggests that for at least those two sites, a need to obtain a Contaminated Soil Relocation Agreement (CSRA) in consequence of remediation activities performed on the source sites may have been triggered.
2. **Test results for Random Soil Tests:** The records included monthly summary sheets summarizing the results of random samples collected at Lot 21 on a daily basis. The summary record indicated whether or not action on the part of Lot 21 might have been required related to the acceptance of the soil for deposit, based on the results of the random soil testing program (e.g. Does the owner of the site need to be called about a

contaminated sample? Does soil need to be removed after dumping based on soil test results?).

- 3. Analytical results:** Records included Exova laboratory datasheets for contaminant analyses of soil received for deposit, for select dates associated with Lot 21's random soil testing program. The laboratory results included assayed concentrations for metals, volatile petroleum hydrocarbons, extractable petroleum hydrocarbons, and mono-aromatic hydrocarbons. For each month during the period 2008-2013, typically two of the month's daily soil samples were sent for laboratory analysis. For example out of the 30 daily soil samples collected in May; two samples out of the 30 samples were analysed. The laboratory data sheets contained in the reviewed records indicated that the samples had been analyzed for the majority of the substances listed in CSR Schedule 7. The majority of samples did not show any exceedances of the Schedule 7 standards. For the few samples that did exceed the Schedule 7 standards, the exceedances were limited to metals. The analytical results for samples that did exceed Schedule 7 can be found in Table 1.

Permit review

According to the MEM permit G-8-331, soil deposited within the mine footprint or soils to be used for mine reclamation at Lot 21, must meet CSR residential standards. This requirement of the MEM permit is based on an assumed future use, following decommissioning of the mine, of the site for residential acreage subdivision [5]. Under the provisions of the CSR, industrial soil standards are applicable to that portion of Lot 21 which lies outside of the mine footprint.

Soil Origin and Deposition Location

Soil shipping slips contained in the records reviewed typically provided simple indications of a particular soil's origin, such as the contractor's name or the city of origin. Select shipping slips did contain an address and those soil samples which exceeded Schedule 4 and/or 5, or Schedule 7 standards are highlighted by yellow shading in Table 1.

The records reviewed did not contain any geographical reference locations relevant to where any particular load of imported soil was actually deposited on Lot 21. For example, no maps, latitude and longitudinal coordinates, or written description of the specific deposit sites were available.

Soil Quality

Soil quality in general was inferred through laboratory results available for typically two days of each month sampled from 2008-2013. The majority of sample analytical results were less than Schedule 4 and/or 5 soil standards for residential or industrial land uses and did not exceed Schedule 7 standards for soil relocation to non-agricultural land. However, 31 exceedances of Schedule 5 and/or Schedule 7 soil standards were noted out of a total of approximately 120 samples collected. These exceedances were limited to four metals: chromium, lead, tin and zinc, and are documented in Table 1. The 31 exceedances are not considered to be representative of overall soil quality at Lot 21 as typically only 2/30 samples collected each month were analysed.

The mine permit indicates the future use of the mine permit area is “residential acreage subdivision”. Future land use has implications for soil deposition if the arriving soil exceeds residential soils standards. For example, if soil which exceeds the Schedule 5 chromium standards for residential land was to be deposited within the mine permit area, then Lot 21 could be considered to be non-compliant with the MEM permit. Similarly, if soil which exceeds the Schedule 5 chromium industrial standard were to be deposited on that portion of Lot 21 which lies outside of the mine footprint, the site could be considered to be non-compliant with the CSR.

However, as the actual locations of potentially contaminated soil which exceeds CSR standards is unknown, it is difficult to determine if the exceedances seen in Table 1 are of any regulatory consequence.

Similarly, while the majority of sample analytical results did not exceed any applicable CSR standard, overall soil quality on the mine site cannot be accurately determined based on the information contained in the 2008-2013 records provided because of the limited number of samples submitted for laboratory analysis (i.e. laboratory analytical information was only available for approximately two samples per month spanning five years), and the lack of any geographical reference information to determine where on Lot 21 specific deposits of soil occurred.

Table 1. Laboratory results for 31 soil samples of a total of 120 soil samples assayed which exceeded CSR soil quality standards during the period representing 2008-2013 at Lot 21. Yellow shaded soil quality results (ug/g) highlight exceedances of Schedule 5 and Schedule 7 soil quality standards for chromium, lead, tin and zinc. None of the total 120 soil samples analyzed exceeded any CSR soil standard for: petroleum hydrocarbons, mono-aromatic hydrocarbons, polycyclic aromatic hydrocarbons or phenolics.

RESULTS OF ANALYSIS/ Sample Description	Schedule 5 - Matrix Numerical Soil Standards for Residential Land Use		Schedule 5 - Matrix Numerical Soil Standards for Industrial Land Use			Schedule 7 - Standard Triggering Contaminated Soil Relocation Agreements	Vancouver Island Paving	District of Saanich 9321 Rd	Alpine Disposal Montreal	Victoria Drain Service Consulting	2144 Quimper/Wessner	Acura/Copley Bros Construction	GHAG Construction	Harrist St	725 Belmont	1236 Chapman/Dun Edge	100 Birk Gorge Rd, 430 City of Victoria	Larry Davies Williams/Jaymar Contracting	1985 Beach/RG Excavating	3330 Richmond/Davis Contracting	Threepoint Construction Services	City of Victoria/011 Bank St	Victoria Drain Service/Regina	Five Star Paving/Bushby			
	HH - Intake of Contaminated Soil	HH - Groundwater used for drinking water	Eco - Toxicity to Soil Inverts and Plants	HH - Intake of Contaminated Soil	HH - Groundwater used for drinking water	Eco - Toxicity to Soil Invert and Plants	Soil Relocation to Nonagricultural Land	03/25/2013	04/17/2013	06/28/2013	03/15/2012	07/04/2012	02/01/2011	07/19/2011	09/09/2011	10/12/2011	10/17/2011	05/06/2010	03/30/2009	04/15/2009	05/04/2009	09/30/2009	10/13/2009	01/21/2008	07/11/2008	07/22/2008	10/07/2008
Duplicate Samples																											
Date Sampled																											
Time Sampled																											
ALS Sample ID																											
Matrix																											
Sample Depth (m)																											
Physical Tests																											
Moisture																											
pH (1:2 soil:water)																											
Metals																											
Aluminum (Al)																											
Antimony (Sb)							20																				
Arsenic (As)	100	15	50	300	15	100	15										17										
Barium (Ba)	6500	400	1000	>1000 mg/g	400	1500	400										576										
Beryllium (Be)							4																				
Boron (B)																											
Cadmium (Cd)	3		70	3500		500	1.5										17.4										
Calcium (Ca)																											
Chromium (Cr)	100	60	300	20000	60	700	60	106		65.6				66	65.5	89.4											
Cobalt (Co)							50																				
Copper (Cu)	15000		150	200000		250	90									102	1500										
Iron (Fe)																											
Lead (Pb)	400		1000	4000		2000	100	191	251			238	110		165	123	242	254	391			114	110			401	
Magnesium (Mg)																											
Manganese (Mn)																											
Mercury (Hg)	15	NS	100	2000	NS	150	15	4.3																			
Molybdenum (Mo)							10										11.5										
Nickel (Ni)							100																				
Phosphorus (P)																											
Potassium (K)																											
Selenium (Se)							3																				
Silver (Ag)							20																				
Sodium (Na)	>1000 mg/g	15000	200	>1000 mg/g	15000	1000	200																				
Strontium (Sr)																											
Tin (Sn)							50	6.1								22.2						102		16.9	15.9	10.1	
Titanium (Ti)																											
Vanadium (V)							200																				
Zinc (Zn)	10000		450	>1000 mg/g		600	150	214	318	153		363	200		186	220	1600	180	150	263		154				154	

Conclusion

A review was completed by the Land Remediation Section of historical records from 2008-2013 pertaining to soil quality at Lot 21, as part of an attempt to determine if soils imported and deposited at Lot 21 exceed the applicable CSR human and environmental health protective soil standards. Overall, the information contained in the files would appear to be insufficient to definitively determine the origin of deposited soil at Lot 21, the location of deposited soil on Lot 21, or the overall quality of soil at the site.

Soil origin and soil deposition on site: The records reviewed contained incomplete geographic information related to the origin of imported soil deposited at Lot 21, and no information related to where imported soil was actually deposited on site. For example, the majority of shipping slips displayed the contractor's name and/or city of soil origin, no specific addresses, or latitudes and longitudes of where soil was deposited on site. Due to this lack of geographical reference material, the link between soil quality from each truck load and specific location on site remains unclear.

Soil Quality: The records contained limited laboratory analytical results from soil sampling on trucks. Select soil samples exceeded Schedule 4 and/or Schedule 5 and/or Schedule 7 CSR soil standards as indicated in Table 1. The majority of soil samples did not exceed CSR standards. However, the laboratory results cannot definitively determine overall soil quality at Lot 21, because only two samples per month were analyzed and one sample per load may not be an adequate indicator of the soil quality for each truck load.

Overall, the information contained in the historical records from 2008-2013 is inadequate to determine the soil quality, soil origin, and soil deposition locations. Geographical reference information, more specific soil origin information, and additional laboratory test results could be useful tools to help determine if soils deposited on Lot 21 are exceeding applicable human health or environmental standards in British Columbia.

References

[1] *Contaminated Sites Regulation*, BC Reg. 375/96. Schedule 7 Standards Triggering Soil Relocation Agreements

[2] *Contaminated Sites Regulation*, BC Reg. 375/96. Schedule 10 Generic Numerical Soil Standards

[3] *Contaminated Sites Regulation*, BC Reg. 375/96. Schedule 4 Generic Numerical Soil Standards

[4] *Contaminated Sites Regulation*, BC Reg. 375/96. Schedule 5 Matrix Numerical Soil Standards

[5] Province of British Columbia Ministry of Energy, Mines, and Petroleum Resources. 2010. *Sand and Gravel Permit Approving Work System and Reclamation Program*. Issued to South Island Aggregates Ltd. Mine permit number: 1610452.