

June 22, 2016

**Public Works and Government Services Canada**

825 Admirals Road.  
Victoria, B.C.

**Attention: Ms. Melissa Piasta**

Dear Ms. Piasta:

We have received results for metal wipe samples collected from the floor of the Pumphouse at the Esquimalt Graving Dock. Samples were collected on June 8<sup>th</sup>, 2016 and we report the final results as follows.

**Background**

Summit Mechanical was contracted by Public Works and Government Services Canada to replace babbits in the pumps located on the lowest level of the Pumphouse. Prior to this work, Island EHS was contracted to take metal wipe samples from the area to establish a baseline of potential metals contamination in the vicinity of work.

Published guidelines are available for lead clearance; however, no published values were located for additional heavy metals. As such, extrapolation from current airborne exposure limits was devised for other metals of concern, similar to the WorkSafeBC model for lead. Tables 1 and 2, below, outline proposed guidelines for the final cleaning following heavy metal contamination

**Table 1: Dust-Wipe Clearance Levels for Lead (expressed in  $\mu\text{g}/\text{ft}^2$ )**

Metal	Floors/Walls
Lead	200

**Table 2: Suggested Dust-Wipe Clearance Levels for Heavy Metal (expressed in  $\mu\text{g}/\text{ft}^2$ )**

Metal	Floors/Walls
Arsenic	200
Barium	2000
Cadmium	40
Chromium	40
Cobalt	80
Copper	800
Manganese	800
Magnesium	2000
Nickel	200
Silver	40

**Methodology:**

Seven (7) samples, and the requisite field blank, were collected using standardized swabs and submitted to an accredited lab for analysis using procedures based on EPA 6010c R3. A surface area of 1 square foot was sampled.

## Results:

A summary excerpt of laboratory results, in relation to proposed clearance levels, is presented in Table 2 below. Full laboratory results have been appended.

Metal	Floors/Walls Allowable Limit	10611-4 Back Wall	10611-5 Front Wall Near Stairs	10611-6 East Wall Lower Level	10611-7 West End Floor	10611-8 East End Floor	10611-9 Lower Level Floor
Lead	200	94.3	67.2	112	2690	3280	3530

**Table 3: Dust-Wipe Clearance Levels (all values presented in  $\mu\text{g}/\text{ft}^2$ )**

Metal	Floors/Walls Allowable Limit	10611-4 Back Wall	10611-5 Front Wall Near Stairs	10611-6 East Wall Lower Level	10611-7 West End Floor	10611-8 East End Floor	10611-9 Lower Level Floor
Arsenic	200	<4	<2	<2	44	25.6	58.6
Barium	2000	92.8	14.5	18.1	1030	819	1650
Cadmium	40	<0.40	<0.40	<0.40	1.99	2.45	7.75
Cobalt	80	3	31.7	<1	20	15.4	43.2
Copper	800	156	23.6	40	1640	999	2490
Chromium	40	9	4.9	7.7	274	242	372
Manganese	800	201	37.8	28.4	1400	872	2200
Magnesium	2000	539	339	487	10,600	4610	18,000
Nickel	200	8.8	4.6	4.5	165	129	207
Silver	40	<0.60	<0.60	<0.60	0.74	<0.60	2.16

< indicates concentration is less than the limit of analytical detection

Lead concentrations on floors exceed WorkSafeBC. Concentrations of several other heavy metals exceed suggested levels on the floors.

## Discussion:

Wipe samples collected on the floor at the lower level of the Pumphouse exceed current WorkSafeBC guidelines for lead contamination. Concentrations of several other heavy metals exceed suggested levels on the floor as well. The level of contamination (sometimes reaching an order of magnitude above recommended levels) indicates significant contamination on the lower level of the Pumphouse.

Personal protective equipment for people carrying out **routine work** in this area should be implemented immediately. These will include at a minimum:

- Gloves
- Disposable coveralls, or coveralls that remain on site and can be laundered
- Disposable foot coverings
- Respiratory (N95 disposable respirators)
- Worker decontamination as they leave the area
- Training for workers who have to be in the lower level of the Pumphouse
- Management plan to prevent, or minimize, future contamination

Cleaning of the floors on the lower level of the Pumphouse will need to be carried out. This work will require additional precautions exceeding those outlined above.

In addition to these worker safety recommendations, we also recommend that additional sampling be carried out in other areas of the Pumphouse. The levels of contamination found on the lower level suggest that significant contamination may be present in other areas of the building.

I hope this information is helpful to you and I look forward to working with you in the future.

Yours truly,

Island EHS



Robert Christi, B.Sc., MBA, CIH(1998-2015)  
Principal  
Field Investigation & Report

## **Appendix 1**

### **Laboratory Results**

Maxxam Job #: B645304  
Report Date: 2016/06/13

ISLAND EHS  
Client Project #: 10611

### ELEMENTS BY ATOMIC SPECTROSCOPY (WIPE)

Maxxam ID		OU1467	OU1468	OU1469	OU1470	OU1471	OU1472		
Sampling Date		2016/06/08 11:00	2016/06/08 11:00	2016/06/08 11:00	2016/06/08 11:00	2016/06/08 11:00	2016/06/08 11:00		
COC Number		493046-39-01	493046-39-01	493046-39-01	493046-39-01	493046-39-01	493046-39-01		
	UNITS	10611-4	10611-5	10611-6	10611-7	10611-8	10611-9	RDL	QC Batch
<b>Total Metals by ICP</b>									
Total Aluminum (Al)	ug	792	895	291	9810	7700	22600	4.0	8295556
Total Antimony (Sb)	ug	<4.0	<4.0	<4.0	123	24.0	25.3	4.0	8295556
Total Arsenic (As)	ug	12.5	<2.0	<2.0	44.4	25.6	58.6	2.0	8295556
Total Barium (Ba)	ug	92.8	14.5	18.1	1030	819	1650	0.060	8295556
Total Beryllium (Be)	ug	<0.20	<0.20	<0.20	0.28	<0.20	0.43	0.20	8295556
Total Boron (B)	ug	3.05	8.66	3.22	35.4	31.9	93.4	0.60	8295556
Total Cadmium (Cd)	ug	<0.40	<0.40	<0.40	1.99	2.45	7.75	0.40	8295556
Total Calcium (Ca)	ug	3530	8230	1380	46500	30300	82700	4.0	8295556
Total Chromium (Cr)	ug	9.03	4.91	7.71	274	242	372	0.60	8295556
Total Cobalt (Co)	ug	3.0	31.7	<1.0	20.0	15.4	43.2	1.0	8295556
Total Copper (Cu)	ug	156	23.6	39.6	1640	999	2490	1.0	8295556
Total Iron (Fe)	ug	13400	3600	3800	55800	72500	171000	0.50	8295556
Total Lead (Pb)	ug	94.3	67.2	112	2690	3280	3530	2.0	8295556
Total Magnesium (Mg)	ug	539	339	487	10600	4610	18000	2.0	8295556
Total Manganese (Mn)	ug	201	37.8	28.4	1400	872	2200	0.20	8295556
Total Molybdenum (Mo)	ug	<1.0	1.1	1.6	30.0	30.8	26.8	1.0	8295556
Total Nickel (Ni)	ug	8.8	4.6	4.5	165	129	207	1.0	8295556
Total Phosphorus (P)	ug	194	42.8	30.8	966	631	1630	6.0	8295556
Total Potassium (K)	ug	219	182	129	1770	951	3630	20	8295556
Total Selenium (Se)	ug	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	8295556
Total Silicon (Si)	ug	2480	657	479	26200	13000	22400	6.0	8295556
Total Silver (Ag)	ug	<0.60	<0.60	<0.60	0.74	<0.60	2.16	0.60	8295556
Total Sodium (Na)	ug	596	3220	1100	12100	1960	18100	6.0	8295556
Total Strontium (Sr)	ug	9.22	85.7	6.32	173	101	269	0.060	8295556
Total Sulphur (S)	ug	255	149	204	2190	1500	3330	4.0	8295556
Total Tin (Sn)	ug	21.5	3.8	3.7	1240	238	251	2.0	8295556
Total Titanium (Ti)	ug	59.1	266	18.4	725	489	1420	0.40	8295556
Total Vanadium (V)	ug	14.0	2.20	1.28	59.9	38.5	94.6	0.60	8295556
Total Zinc (Zn)	ug	562	209	257	2980	3380	9870	0.40	8295556
Total Zirconium (Zr)	ug	<1.0	100	<1.0	10.9	7.6	20.8	1.0	8295556
RDL = Reportable Detection Limit									

Maxxam Job #: B645304  
Report Date: 2016/06/13

ISLAND EHS  
Client Project #: 10611

### ELEMENTS BY ATOMIC SPECTROSCOPY (WIPE)

<b>Maxxam ID</b>		OU1473		
<b>Sampling Date</b>		2016/06/08 11:00		
<b>COC Number</b>		493046-39-01		
	<b>UNITS</b>	<b>10611-10</b>	<b>RDL</b>	<b>QC Batch</b>
<b>Total Metals by ICP</b>				
Total Aluminum (Al)	ug	<4.0	4.0	8295556
Total Antimony (Sb)	ug	<4.0	4.0	8295556
Total Arsenic (As)	ug	<2.0	2.0	8295556
Total Barium (Ba)	ug	0.115	0.060	8295556
Total Beryllium (Be)	ug	<0.20	0.20	8295556
Total Boron (B)	ug	<0.60	0.60	8295556
Total Cadmium (Cd)	ug	<0.40	0.40	8295556
Total Calcium (Ca)	ug	34.5	4.0	8295556
Total Chromium (Cr)	ug	<0.60	0.60	8295556
Total Cobalt (Co)	ug	<1.0	1.0	8295556
Total Copper (Cu)	ug	<1.0	1.0	8295556
Total Iron (Fe)	ug	4.00	0.50	8295556
Total Lead (Pb)	ug	<2.0	2.0	8295556
Total Magnesium (Mg)	ug	21.3	2.0	8295556
Total Manganese (Mn)	ug	<0.20	0.20	8295556
Total Molybdenum (Mo)	ug	<1.0	1.0	8295556
Total Nickel (Ni)	ug	<1.0	1.0	8295556
Total Phosphorus (P)	ug	15.7	6.0	8295556
Total Potassium (K)	ug	51	20	8295556
Total Selenium (Se)	ug	<1.0	1.0	8295556
Total Silicon (Si)	ug	31.0	6.0	8295556
Total Silver (Ag)	ug	<0.60	0.60	8295556
Total Sodium (Na)	ug	105	6.0	8295556
Total Strontium (Sr)	ug	0.140	0.060	8295556
Total Sulphur (S)	ug	72.2	4.0	8295556
Total Tin (Sn)	ug	<2.0	2.0	8295556
Total Titanium (Ti)	ug	<0.40	0.40	8295556
Total Vanadium (V)	ug	<0.60	0.60	8295556
Total Zinc (Zn)	ug	90.1	0.40	8295556
Total Zirconium (Zr)	ug	<1.0	1.0	8295556
RDL = Reportable Detection Limit				

## **Appendix 2**

### **Photographs**



Sample: 10611 – 4  
Unit/Location: Lower Level Back Wall



Sample: 10611 – 5  
Unit/Location: Lower Level – Front Wall Near Stairs



Sample: 10611 – 6  
Unit/Location: Lower Level – East End Wall



Sample: 10611 - 7  
Unit/Location: Lower Level – East End Floor



Sample: 10611 – 8  
Unit/Location: Lower Level – Floor at Front of Stairs



Sample: 10611 – 9  
Unit/Location: Lower Level – Floor at East End Down Set of Stairs