
**ESQUIMALT GRAVING DOCK
REPLACE MAIN DISTRIBUTION LINE (RMDL)
BC HYDRO (BCH) POINT OF DELIVERY (POD) SWITCHGEAR
ESQUIMALT, BRITISH COLUMBIA**

**APPENDIX A
PRE-CONSTRUCTION HAZARDOUS BUILDING
MATERIAL AND SURVEY REPORT**

Hazardous Building Material Assessment

Esquimalt Graving Dock – PWGSC Buildings



Prepared for:



Public Service Commission
of Canada

Commission de la fonction publique
du Canada

Environmental Services

Prepared by



**North West
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NWEG Project: 15458

EXECUTIVE SUMMARY

Introduction

North West Environmental Group Ltd. was retained by Public Works and Government Services Canada (PWGSC) Environmental Services to conduct a Hazardous Materials Assessment on the Public Works and Government Services Canada owned buildings located within the Esquimalt Graving Dock (EGD), Esquimalt BC.

The surveys were conducted on PWGSC owned buildings at the Esquimalt Graving Dock on various dates between October 24th - December 9th 2011.

Previous Hazardous Building Materials Assessment reports and documentation were reviewed and additional non-destructive floor-by-floor, room-by-room assessments of all building areas were conducted in order to identify hazardous materials and their condition.

Identification of all sampling locations were made on detailed floor plans, and a summary of remedial recommendations made by priority.

FINDINGS AND RECOMMENDATIONS

Asbestos

Asbestos-containing materials were found in various locations within the building fabric and mechanical systems of the PWGSC buildings.

Asbestos was identified in the following materials:

- Floor tiles (exposed and concealed)
- Sheet flooring (exposed and concealed)
- Floor mastic (concealed)
- Transite board
- Caulking (various)
- Cementitious Parging

Table 1: Asbestos Containing Materials Summary-Current Survey

Asbestos containing materials were identified to be in the following materials/locations:			
Sample ID	Building	Material	Recommendation
15458-58	Building 61 PWGSC Land Leased to Seaspan (Butler Buildings) – SJ39 Stores	Exterior Caulking – 7% Chrysotile Asbestos Content	Routine Surveillance: Institute routine surveillance of the ACM.
15458-59	Building 61 PWGSC Land Leased to Seaspan (Butler Buildings) – SJ40 Offices	Sheet Flooring (Brown & Beige) – 20% Chrysotile Asbestos Content	Proactive Removal or Routine Surveillance: Institute routine surveillance of the ACM.



NWEG #15458

See General Notes

Warning: in the event any additional suspect materials are encountered during renovation/repair activities, work on those materials should stop immediately and remain undisturbed until testing confirms the presence or absence of asbestos or other hazardous material

Asbestos containing materials were identified to be in the following materials/locations:			
15458-68	Building 31 PWGSC Owned Pump House	Concrete Cementitious Parging Compound – <1% Chrysotile Asbestos Content	Routine Surveillance: Institute routine surveillance of the ACM.
15458-73	Building 58 PWGSC Owned South Side Sub Station – Electrical Generator Room	Caulking (Tan) - South Door Frame – 2% Chrysotile Asbestos Content	Routine Surveillance: Institute routine surveillance of the ACM.
15458-83	Building 7 DND Property PWGSC Washroom (Back Lot) – Storage/Furnace Room	Floor Tile (White 12"x12") – 3% Chrysotile Asbestos Content	Routine Surveillance: Institute routine surveillance of the ACM.
15458-87	Building 7 DND Property PWGSC Washroom (Back Lot) – Women's Washroom	Sheet Flooring (Yellow/Brown – Bottom Layer) – 15% Chrysotile Asbestos Content	Repair and/or Proactive Removal
15458-89	Building 7 DND Property PWGSC Washroom (Back Lot) – Men's Washroom	Mastic – (2nd Layer under White Sheet Flooring) – <1% Chrysotile Asbestos Content	Routine Surveillance: Institute routine surveillance of the ACM.
15458-95	Tunnels	Transite Piping (Sewage Line) – 40% Chrysotile & 8% Crocidolite Asbestos Content	Routine Surveillance: Institute routine surveillance of the ACM.
15458-100	Building 9 PWGSC Old Guard House	Floor Tile (Beige 12"x12" – Bottom Layer) – 12% Chrysotile Asbestos Content	Routine Surveillance: Institute routine surveillance of the ACM.

In addition to the materials identified in Table 1, the following ACM were identified during the review of previous documents and reports.

Table 2: Asbestos Containing Materials Summary-Previous Surveys

Asbestos containing materials were identified to be in the following materials/locations:			
Sample ID	Building	Material	Recommendation
1865-10	Back Gate Guardhouse Siding and soffit	Exterior Cladding- 55% Chrysotile Asbestos Content	Routine Surveillance: Institute routine surveillance of the



NWEG #15458

See General Notes

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Lead

Table 3: Paint Chip Sampling Results

Sample	Description	Lead (%)
15458- 17	Pumphouse-Penstock Room (South Wall) Desc: Paint-Lt. Green	6.5
15458- 20	Pumphouse-Main Penstock Building Desc: Paint-Yellow/Lt.Blue int.Conc.Walls	<0.010
15458-23	Pumphouse-Main Penstock Building Desc: Paint- Grey-Exterior	0.093
15458-27	Site: Pumphouse - Welding Shop - South Wall, Yellow	1.9
15458-29	Site: Pumphouse - Welding Shop - South Wall, Lt. Green	0.27

Paint

Analysis of paint samples indicated that lead is present in concentrations ranging from 6.5% to a low of <0.010%. Samples were found to have lead concentrations in excess of the threshold specified in the federal *Surface Coatings Material Regulation SCMR* of 90 mg/kg for new paint acceptable for use in residential applications.

Overall, paint coatings were found to be in fair to good condition. Where damaged and deteriorating, paint should be removed following procedures designed to protect the workers from heavy metal exposure and to avoid the spread of contamination. Lead content of painted materials should not increase their disposal costs however; concentrated paint chips would need to be disposed as hazardous waste. Routine removal of lead paint is not recommended, rather it should be managed in place and removed on an “as needed” basis.

Polychlorinated Biphenyls (PCB) in Electrical Equipment

Fluorescent light fixtures were observed and appeared to be of a vintage often found to contain ballasts which Environment Canada (EC) has developed a guideline called - *Identification of Lamp Ballasts Containing PCBs –Environment Canada 1991*.

Manufacturers of ballasts and capacitors use distinct catalogue and date codes to identify their product, its date of manufacture, and, for some capacitors, its dielectric fluid. Fluorescent lamp ballasts are usually mounted between the fluorescent tubes on the light fixture and are shielded with a metal protective device which reduces heat radiation. Due to the fact the covers are easily broken and the risk of electrical shock when accessing the ballast, it is standard practice to make the observation that there is a potential for PCBs to be present and have the ballasts inspected prior to disposal.

The hazardous building material materials assessment report from NWEG in 2000 mentioned that many of these ballasts have already been removed.



NWEG #15458

See General Notes

Warning: in the event any additional suspect materials are encountered during renovation/repair activities, work on those materials should stop immediately and remain undisturbed until testing confirms the presence or absence of asbestos or other hazardous material

Inspect all light ballasts for the presence of PCB prior to disposal. PCB containing ballasts must be disposed as hazardous waste.

Mould

No mould or significant moisture issues were observed during the survey.

Hantavirus-Animal Droppings

Materials suspected of containing Hantavirus were not observed during the survey.

Workers accessing areas where rodent or other animal droppings are present must be informed of the potential risk of Hantavirus exposure and employ suitable precautions for personal protection and control of the spread of contamination.

Ozone Depleting Substances

Several pieces of equipment containing ozone depleting substances (ODS) were observed during this investigation. PWGSC maintains an active halocarbon inventory.

Crystalline Silica

Testing for crystalline silica in dust was not completed/conducted as part of this survey however it is known to be a component of concrete dust. All concrete, plaster and stucco is suspected of containing silica in crystalline and non-crystalline forms. Many of the removal techniques (grinding, cutting, chipping etc) for these materials can generate high levels of crystalline silica in the air.

Use wetting techniques and/or HEPA equipped extraction systems attached to drills and other power equipment where possible in order to decrease dust levels.

As per the clients request, non-invasive investigative techniques were used. Even with the most invasive survey techniques, however, it should be noted that the possibility remains for other concealed materials to be found during a renovation or demolition.

Warning: in the event any additional suspect materials are encountered during demolition or renovation activities, work on those materials must stop immediately and remain undisturbed until testing confirms the presence or absence of asbestos or other hazardous material. If this any materials suspected of containing asbestos or another hazardous material are disturbed during the work, all work shall stop until the area is contained, the hazard evaluated by a qualified professional and the hazardous materials, if indeed present, is safely managed by a qualified contractor.



NWEG #15458

See General Notes

Warning: in the event any additional suspect materials are encountered during renovation/repair activities, work on those materials should stop immediately and remain undisturbed until testing confirms the presence or absence of asbestos or other hazardous material

TABLE OF CONTENTS

EXECUTIVE SUMMARY	I
INTRODUCTION	I
FINDINGS AND RECOMMENDATIONS	I
LIST OF ACRONYMS	III
1.0 INTRODUCTION.....	1
2.0 SCOPE OF WORK.....	2
3.0 SITE DESCRIPTION.....	4
3.1 SITE LOCATION	4
4.0 REGULATORY FRAMEWORK, GUIDELINES AND CODES	5
4.1 FEDERAL OCCUPATIONAL HEALTH AND SAFETY	5
4.2 BC OCCUPATIONAL HEALTH AND SAFETY REGULATION	5
4.3 ENVIRONMENTAL MANAGEMENT ACT	5
4.4 BC OCCUPATIONAL HEALTH AND SAFETY REGULATION	6
4.5 HAZARDOUS PRODUCTS ACT, SURFACE COATING MATERIALS REGULATION	6
5.0 METHODOLOGY	10
ASBESTOS	10
6.0 FINDINGS AND RISK ASSESSMENT	13
6.1 ASBESTOS IN BULK BUILDING MATERIAL SAMPLES	13
6.2 LEAD	17
6.3 MOULD	19
6.4 HANTAVIRUS-ANIMAL DROPPINGS	19
6.5 OZONE DEPLETING SUBSTANCES	19
6.6 CRYSTALLINE SILICA	19
7.0 ABATEMENT COST ESTIMATE	21
8.0 BULK SAMPLES.....	22
BUILDING: 31 PWGSC OWNED PUMP HOUSE	27
BUILDING: 26 PWGSC PENSTOCK STRUCTURE	32
BUILDING: 32 PWGSC OWNED MIDDLE DOCK STAIRWELL	33
BUILDING: 29 PWGSC OWNED WELDING SHOP	34
BUILDING: 19 PWGSC ADMINISTRATION TRAILERS	35
BUILDING: PWGSC SECURITY TRAILER (H&S)	36
BUILDING: 18 PWGSC OWNED OPERATIONS BUILDING	37
BUILDING: 61 PWGSC LAND LEASED TO SEASPAN (BUTLER BUILDINGS)	41
BUILDING: 16 PWGSC OWNED ELECTRICAL SHOP BUILDING	43
BUILDING: 58 PWGSC OWNED SOUTH SIDE SUB STATION	44
BUILDING: 24 PWGSC OWNED MAIN SUB STATION	46
BUILDING: 30 PWGSC OWNED GARAGE	47
BUILDING: 41 PWGSC OWNED WINCH BUILDING	49
BUILDING: 7 PWGSC WASHROOM	50
BUILDING: 7 PWGSC WASHROOM TRAILER	51
BUILDING: 68 PWGSC WASHROOM TRAILER	53
BUILDING: 9 PWGSC OLD GUARD HOUSE	54
EGD SERVICE TUNNELS	55



CAISSONS 1 & 2	56
9.0 LIMITATION OF SURVEY.....	57
APPENDICES.....	59
APPENDIX A – SITE LOCATION AND SITE PLAN.....	60



LIST OF ACRONYMS

ACM	asbestos-containing materials
ALARA	As Low As Reasonably Achievable
AMP	Asbestos Management Program
CFCs	chlorofluorocarbons
EC	Environment Canada
EGD	Esquimalt Graving Dock
EMA	Environmental Management Act
HCFCs	hydrochlorofluorocarbons
HFCs	hydrofluorocarbons
HPA	Hazardous Products Act
HWR	Hazardous Waste Regulation
NWEG	North West Environmental Group
ODS	ozone-depleting substances
PCBs	Polychlorinated biphenyls (PCBs)
PWGSC	Public Works and Government Services Canada
SCMR	Surface Coating Materials Regulation
SOW	Statement of Work
WMO	United Nations World Meteorological Organization



1.0 INTRODUCTION

North West Environmental Group Ltd. was retained by Public Works and Government Services Canada (PWGSC) Environmental Services to conduct a Hazardous Materials Assessment Survey on the Public Works and Government Services Canada owned buildings located at the Esquimalt Graving Dock, Esquimalt BC. The facility is referred to as the “subject site” or “site” throughout this document. The site location is shown on Drawing 1.

The surveys were conducted between October 24th and December 9th 2011 by Julie Scott-Moncrieff, Jason Smit and Kris White, Industrial Hygienists from North West Environmental Group.

Note: this document is detailed review of hazardous materials found within the building fabric of the site; however, it cannot be considered an absolute listing of all hazardous materials present within the structure. Occupant supplies and processes were not generally considered except where they may have contaminated the building fabric and some materials may have been concealed within enclosed areas of the building structure and not visible to the inspectors at the time of the survey. In the event that materials suspected of containing asbestos, heavy metals or other hazardous components are uncovered or impacted during operations, maintenance, renovation, construction or demolition activities, all work must stop until such time as the materials can be evaluated by a qualified person and appropriate precautions are employed to protect workers and building occupants.



2.0 SCOPE OF WORK

The scope of work for this hazardous materials assessment survey was based on the *Scope of Work* (SOW) outlined by PWGSC-Environmental Services (date) and included the following tasks:

- Previous Hazardous Building Materials Assessment reports and documentation were reviewed, incorporating the pertinent and confirmed information into the current assessment. These included:
 - Hazardous Materials Report: Esquimalt Graving Dock: Rob Christie, NWEG (March 2000)
 - First Aid Washroom Hazardous Materials Survey (1999)
- Non-destructive floor-by-floor, room-by-room assessment of all building areas, identifying the location, accessibility to personnel, type of material (e.g. vinyl floor tiles, wall paint, thermostat) and condition of all asbestos-containing materials (including vermiculite insulation), lead materials, mercury containing equipment, ozone depleting substances and PCBs.

The following buildings were assessed:

- Building: 31 PWGSC Owned Pump House
- Building: 26 PWGSC Penstock Structure
- Building: 32 PWGSC Owned Middle Dock Stairwell
- Building: 29 PWGSC Owned Welding Shop
- Building: 19 PWGSC Administration Trailers
- Building: PWGSC Security Trailer (H&S)
- Building: 18 PWGSC Owned Operations Building
- Building: 61 PWGSC Land Leased To Seaspan (Butler Buildings)
- Building: 16 PWGSC Owned Electrical Shop Building
- Building: 58 PWGSC Owned South Side Sub Station
- Building: 24 PWGSC Owned Main Sub Station
- Building: 30 PWGSC Owned Garage
- Building: 41 PWGSC Owned Winch Building
- Building: 7 PWGSC Washroom Trailer
- Building: 68 PWGSC Washroom Trailer
- Building: 9 PWGSC Old Guard House
- Service Tunnels
- Caissons 1 & 2



- Sampling and subsequent analysis to ascertain the amount of hazardous materials within the buildings using a laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP), as per PWGSC Departmental Directive 057.
- Identification of all sampling locations on detailed floor plans, distinguishing between those that are confirmed to be hazardous and those that are not.
- A summary of remedial recommendations sorted by priority. Preparation of a separate summary of costs for repair, encapsulation or removal of the asbestos containing materials and other hazardous materials, presented as remedial options and report detailing the results, conclusions and recommendations as well as an abatement cost estimate, if necessary.



3.0 SITE DESCRIPTION

3.1 Site Location

The Esquimalt Graving Dock (EGD) is located in Esquimalt, BC, near the city of Victoria, on the southern tip of Vancouver Island. The site is located as shown on in Appendix A. EGD is owned by PWGSC and private shipyard companies lease space at the EGD for ship maintenance and buildings operations. This survey assessed buildings on site owned by PWGSC (excluded tenant owned buildings)

See Appendix A for map of Site Location and Plan.



4.0 REGULATORY FRAMEWORK, GUIDELINES AND CODES

4.1 Federal Occupational Health and Safety

In Federal jurisdictions, asbestos-containing materials (ACM) are regulated under the *Canada Labour Code, Part II*. Specifically, *Part X, Hazardous Substances*, provides the direction for the control of exposure to potentially toxic substances in the workplace. Under this regulation, employers are required to:

- Maintain a record of all hazardous materials;
- Undertake a hazard investigation by competent persons;
- Ensure materials are properly stored and handled;
- Post warning signs;
- Inform and educate employees regarding hazards; and
- Control exposure through substitution, engineering or protective equipment.

4.2 BC Occupational Health and Safety Regulation

Most of the employees working in the PWGSC buildings are Federal employees and are subject to the federal OHSA. However the majority of contractors and some site tenants Workplace health and safety is regulated in British Columbia by WorkSafeBC under the *Workers' Compensation Act* (effective April 15, 1998), as amended by *Workers' Compensation (Occupational Health and Safety) Amendment Act* (effective October 1, 1999). The Act defines the general duties and obligations of the employer, employees and others at the work site.

Under this regulation, employers are required to:

- Maintain a record of all hazardous materials;
- Undertake a hazard investigation by competent persons;
- Ensure materials are properly stored and handled;
- Post warning signs;
- Inform and educate employees regarding hazards; and
- Control exposure through substitution, engineering or protective equipment

WorkSafeBC Regulations apply to the handling of materials containing designated substances and the prevention of possible worker exposures. Permissible exposure limits to these designated substances, which include asbestos, lead, mercury and arsenic, are established by the American Conference of Governmental Industrial Hygienists (ACGIH) and adopted by WorkSafeBC.

4.3 Environmental Management Act



The *Environmental Management Act* (EMA), brought into force in July 2004, is the principle environmental statute in British Columbia. The EMA prohibits the introduction of waste into the environment in such a manner or quantity as to cause pollution, except in accordance with a regulation, permit, approval or code of practice issued under the Act. The Hazardous Waste Regulation (HWR) addresses the proper handling, transport and disposal of hazardous wastes, under provisions of the EMA. While the Provincial Regulations do not apply directly to the sites operated by the Federal Government, they do apply when the materials are removed from the site for disposal.

4.4 BC Occupational Health and Safety Regulation

WorkSafeBC Regulations apply to the handling of materials containing designated substances and the prevention of possible worker exposures. These designated substances, which include lead, mercury and arsenic, are established by the American Conference of Governmental Industrial Hygienists (ACGIH) and adopted by WorkSafeBC.

Where worker exposure to a designated substance may exceed 50% of the threshold limit value for a substance, WorkSafeBC requires that the employer establish an exposure control plan. All routes of entry must be considered when establishing the extent of worker exposure. Exposure limits are summarized in Table 4.4.1.

Table 4.4.1: ACGIH / WorkSafeBC Exposure Limits

<i>Substance [CAS No.]</i>	<i>Time Weighted Average (TWA)</i>
Asbestos - All forms [1332-21-4]	0.1 f/cc (F)
Lead - elemental and inorganic compounds, as Pb [7439-92-1]	0.05 mg/m ³
Silica, Crystalline - alpha quartz [14808-60-7; 1317-95-9] and Cristobalite, Respirable [14464-46-1] Revised 2006	0.025 mg/m ³

4.5 Hazardous Products Act, Surface Coating Materials Regulation

The *Hazardous Products Act (HPA), Surface Coating Materials Regulation (SOR/2005-109) (SCMR)* permits the advertising, sale and labeling of surface coatings (including paint) that meet the following criteria set out below. Quantities of lead and mercury are specifically limited. Other heavy metals are not addressed in this regulation.

There has been confusion in the past regarding the limits for lead and mercury in paint and how that relates to worker safety and disposal. An explanation of the SCMR limits for paint and mercury are included in this report to help alleviate this confusion. Although a given paint sample may have concentrations of lead and mercury lower than the limits specified within the SCMR, worker exposure may still occur if sufficient quantities of lead and/or mercury are inhaled, ingested or absorbed through the skin. The risk to workers posed by heavy metal containing coatings is proportional to the work undertaken. Heavy metal laden coatings that are not disturbed pose little risk to non-pre-school aged building occupants.



Lead

Paints containing lead may be advertised, sold or imported into Canada when under standardized testing conducted on a dried sample of the coating indicates that lead concentrations do not exceed 600 mg/kg.

In 2005 the *Federal Surface Coating Materials Regulation* was amended to reduce this threshold from 5,000 mg/kg to 600 mg/kg. As paints under this concentration of lead are acceptable for use in residential settings today, such coatings do not pose a significant hazardous material issue unless rendered airborne within a worker's breathing zone by fine dust generating processes.

Paints that exceed this concentration threshold are prohibited to be advertised, sold or imported into Canada unless they meet certain conditions of use and labeling. Permitted uses include:

- as an anti-corrosive or an anti-weathering coating applied on the interior or exterior surface of any building or equipment that is used for an agricultural or industrial purpose;
- as an anti-corrosive or an anti-weathering coating applied on any structure, other than a building, that is used for an agricultural, industrial or public purpose;
- as a touch-up coating for metal surfaces;
- on traffic signs;
- for graphic art on billboards or similar displays;
- for identification marks in industrial buildings; or
- as material for the purposes of arts, crafts or hobbies, other than material for use by children.

Polychlorinated Biphenyls

Polychlorinated biphenyls (PCBs) are regulated under both Federal (*Canadian Environmental Protection Act*) and Provincial (*BC Hazardous Waste Regulation*) legislation and must be treated as PCB waste and be stored and disposed of accordingly.

Each fluorescent light fixture removed during facility renovation or demolition should have the ballast checked to determine if it contains PCBs. Ballasts containing PCBs must be removed, sorted and transported to a licensed facility. Although rare, paints have been known to contain PCBs.

Ozone-depleting Substances (CFCs/ODS)

Chlorofluorocarbons (CFCs) are ozone-depleting substances (ODS) and a type of halocarbon. ODS are regulated by the *Canadian Environmental Protection Act* under the *Ozone-Depleting Substances Regulations 1998 SOR/99-7* and the *Federal Halocarbon Regulations (FHR) SOR/99-225*. Compounds that contain only chlorine, fluorine and carbon are called CFCs. These materials are used in refrigeration systems and in fire suppression systems. The other main refrigerants are



hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs) and blends of fluorocarbons (designated by "R").

In BC these substances are regulated under the BC Ozone Depleting Substances and Other Halocarbons Regulation.

While the regulations allow the continued use of halocarbon refrigerants, they strictly prohibit any person from releasing any halocarbons into the environment.

In the case of demolition, ODS will require proper recovery and disposal. The BC Ozone-Depleting Substances Regulations would also apply to any CFC/ODS abatement procedures. These regulations require that all ODS be collected, stored and recycled, or collected and disposed of accordingly.

Crystalline Silica

Crystalline silica is a substance which is considered hazardous by inhalation and can result in serious and sometimes fatal lung disease. The ACGIH and WorkSafeBC, under the Occupational Health and Safety Regulation and the Canada Labour Code specify an exposure limit of 0.025 mg/m³.

Paint

Paints often contain heavy metals as pigments and/or preservatives. Common heavy metal additives to paints are lead, mercury, and arsenic. Under specific circumstances, persons may be exposed to these metals by ingestion, skin absorption and/or inhalation.

Other than during the application process, the primary mechanism of exposure for workers would be the inhalation of dusts through activities such as sanding, scraping, drilling, crushing, heating, burning or other processes likely to damage the coatings themselves. Paints containing heavy metals pose little risk to workers when in good condition and when undisturbed.

Although limits are currently imposed in the quantities of lead permitted in paints intended for specific uses, lead content below these limits may still pose a health hazard if rendered airborne and inhaled, ingested or absorbed through the skin. The same applies to mercury. The Hazardous Products Act, Surface Coating Materials Regulation (SOR/2005-109) (SCMR) permits the advertising, sale and labeling of surface coatings (including paint) that meet the following criteria set out below. Quantities of lead and mercury are specifically limited. Other heavy metals are not addressed in this regulation.

In 1976, the amount of lead that could be added to interior paints was limited by law, but exterior paints could still contain higher amounts of lead, provided they carried a warning label. Under the Surface Coating Materials Regulations, which came into effect in 2005, the lead limit was further reduced (from Health Canada). The 600 mg/kg maximum total lead standard is the same as that proposed for paints and other liquid coating materials used for furniture, household products, children's products, and exterior and interior surfaces of any building frequented by children, under the recent



amendment to the Hazardous Products Act Liquid Coating Materials Regulations. It is also the same standard prescribed by the U.S. Consumer Product Safety Commission Regulation 16 CFR Part 1303, for paint and other liquid coatings for residential use, toys and furniture (97). This limit was determined by a risk assessment which calculated that 600 mg/kg of lead in paint was the threshold level, at or below which there would be no significant lead exposure if a child consumed a one square inch paint chip each day.

When lead is present in paint, there is a potential for airborne exposure of lead to workers. Airborne exposure can occur if the material is disturbed (especially if the lead containing materials are hand sanded); hand demolished and/or any other disturbances are made to the coating. An exposure control plan is necessary if workers are, or may be, exposed to lead in excess of 50 % of the exposure limit established by the Workers' Compensation Board (WorkSafeBC) for an 8 hours total weighted average exposure, or if exposure through any route of entry could cause elevated levels of lead in the blood. Lead precautions during demolition or renovation may be required, including the use of personal protective equipment for workers and/or dust suppression methods.



5.0 METHODOLOGY

The methodology of the survey is summarized in the following sections. Prior to all site work, a *Site Specific Health and Safety Plan* was developed and forwarded to PWGSC Environmental Services.

Asbestos

The asbestos survey methodology and sampling procedure are outlined in the following sections.

Survey Methodology

The survey was designed to determine the type and extent of asbestos containing material (ACM) presence within the subject site. The survey was non-destructive and therefore did not include areas that were inaccessible at the time of the survey. Where practicable, sample volumes were minimized to avoid unnecessary damage to building systems. Specific building material components were examined within the building and include, where applicable:

- Structural – all visible structural components including walls, roofs and supporting members
- Mechanical systems - insulation, domestic hot and cold water, and caulks.
- Architectural – systems including: texture coats, sheet flooring, vinyl floor tile, ceiling tile, wall board, drywall joint compound, asbestos sheet products.

Where materials were observed that were suspected of containing asbestos, representative samples were collected. One hundred and one (101) samples of materials suspected of containing asbestos were collected and submitted with a chain of custody to the contract laboratory.

A complete listing of all materials suspected of containing asbestos that were sampled, including the results of analysis is found in Section 6 of this report.

Sampling Procedures

Bulk Samples

Sampling procedures for various building materials vary somewhat depending on the exact conditions at each site. In all cases standardized protocols are used for collecting samples for asbestos analysis. All accessible suspect materials that were visually unique were sampled. Visually similar materials were only sampled once unless known to be heterogeneous such as drywall joint compound.

Sampled materials were cut down to the base substrate to ensure that a representative sample was collected.

Paint

Painted surfaces were scraped down to the base substrate to ensure that all layers of paint were included. Paint samples were tested using the following analytical method:

- Lead: EMSL (SW 846 3050B*/7000B) Lead in Paint Chips by Flame Atomic Absorption Spectrophotometer

A total of five paint chips were submitted to EMSL Analytical for analysis. The sample locations are shown on the floor plans

Polychlorinated Biphenyls (PCB)

The Site was surveyed for the presence of PCBs in electrical equipment. The primary source of PCBs was identified in fluorescent light ballasts which were evaluated according to the guideline developed by Environment Canada (EC) - *Identification of Lamp Ballasts Containing PCBs –Environment Canada 1991*.

Manufacturers of ballasts and capacitors use distinct catalogue and date codes to identify their product, its date of manufacture, and, for some capacitors, its dielectric fluid. Fluorescent lamp ballasts are usually mounted between the fluorescent tubes on the light fixture and are shielded with a metal protective device which reduces heat radiation. In order to determine if fluorescent light ballasts contain PCB's the metal protective cover is removed while the power is off to the fixture. With the ballast exposed the date code is visible and can be referenced in the EC guideline.

For ballasts not stamped "no PCB", in most cases, fluorescent light ballasts need to be removed from the fixture before the date of manufacture can be determined. The date of manufacture is critical in establishing whether PCB may be present in the ballast capacitor.

Ozone Depleting Substances (ODS) and Other Halocarbons

The subject building was inspected for the presence of devices that are known or suspected of containing to contain ODS or other halocarbons. Devices suspected of containing these materials were documented so that any hazardous materials can be removed prior to demolition or disposal of the equipment. These devices typically include refrigeration and air conditioning equipment.

Crystalline Silica

Testing for crystalline silica in dust was not completed/conducted as part of this survey however it is known to be a component of concrete dust. All concrete, plaster and stucco is suspected of containing silica in crystalline and non-crystalline forms. Many of the removal techniques (grinding, cutting, chipping etc) for these materials can generate high levels of crystalline silica in the air.

Mould

Within the BC Occupational Health and Safety Regulations, there are no established permissible exposure levels for mould spores in air. This means that there are no published concentrations above which worker exposure is deemed to be hazardous



and under which workers would not need respiratory protection. WorkSafeBC does, however, provide guidance on protocols for protecting workers from the hazards of airborne mould and bacteria within the section(s) of the Regulation guidelines addressing Indoor Air Quality.

Various other guidelines are provided for addressing mould in Canada including:

- The Institute of Inspection, Cleaning and Restoration and Certification (IICRC) standard S500 governing both water damage restoration and entitled: Standard for Professional Water Damage Restoration – S500. This document is approved by the American National Standards Institute (ANSI)
- Health Canada: Fungal contamination in public buildings: A guide to recognition and management, 1995
- Health Canada. Fungal Contamination in Public Buildings: Health Effects and Investigation Methods, 2004

These guidelines also state that any non-porous (metal, glass and hard plastics) and semi-porous (wood and concrete) materials that are structurally sound and visibly mouldy can be cleaned and re-used. However, porous materials such as ceiling tiles, wallpaper, insulation, drywall, and sometimes carpets with more than a small area of contamination should be removed and discarded.



6.0 FINDINGS AND RISK ASSESSMENT

The findings of the survey are discussed in the following sections. Photographs of sample locations are provided in Section 7.0. The asbestos risk assessment and indicative cost estimates are provided in this section. The analytical reports are provided in Appendix A.

6.1 Asbestos in Bulk Building Material Samples

A total of one hundred and one (101) samples of suspected asbestos containing materials were collected and submitted for analysis to the contract laboratory. The analytical results are provided both as an Excel Spreadsheet provided to the PWGSC-Environmental Services and attached as a pdf report in Appendix A.

Asbestos-containing materials were found in various locations within the building fabric and mechanical systems of the PWGSC buildings.

Asbestos was identified in the following materials:

- Floor tiles (exposed and concealed)
- Sheet flooring (exposed and concealed)
- Floor mastic (concealed)
- Transite board
- Caulking (various)
- Cementitious Parging

The roof structures, in most buildings, were not tested for the presence of asbestos so as not to disrupt the building envelope. Sampling will need to be undertaken prior to the commencement of any work and may require the presence of a qualified roofer to make good any damage to the roof membrane.

Recommendations are based on Public Works and Government Services Canada Departmental Policy 057 – Asbestos Management (DP 057).

Asbestos Containing Materials must be managed under the PWGSC Asbestos Management Plan (AMP). The AMP should conform to PWGSC Departmental Policy 057. The purpose of the AMP is to assist the organization in managing ACM in a systematic fashion to ensure identified ACM are managed in a safe manner which complies with the Canada Labour Code and WorkSafeBC guidelines.

ACM in good condition may be managed in place in accordance with the implementation of the Asbestos Management Plan (AMP). Institute routine surveillance of the ACM. Trained workers or contractors must use appropriate asbestos precautions (Type 1, Type 2 or Type 3) during disturbance of the remaining ACM.

Inspect all identified asbestos containing materials annually to identify any damage and ensure proper labeling is present.



Any damaged ACM found during future inspections, as well as ACM that could be impacted by any demolition or renovation activity, should be removed following procedures outlined in the AMP.

Throughout any abatement activities, appropriate air monitoring and inspection should be conducted by qualified personnel to ensure all contamination is contained and ACM are disposed of appropriately. It is recommended that a proper scope of work and asbestos removal specifications be written to ensure the complete and proper removal of all ACM.

Table 1: Asbestos Containing Materials Summary-Current Survey

Asbestos containing materials were identified to be in the following materials/locations:						
Sample ID	Building	Material	Access-ibility	Friability (F or N)	Condition (G/F/P)	Action Code
15458-58	Building 61 PWGSC Land Leased to Seaspam (Butler Buildings) – SJ39 Stores	Exterior Caulking – 7% Chrysotile Asbestos Content	A	N	G	ACTION 7
15458-59	Building 61 PWGSC Land Leased to Seaspam (Butler Buildings) – SJ40 Offices	Sheet Flooring (Brown & Beige) – 20% Chrysotile Asbestos Content	A	F	G	ACTION 5/7
15458-68	Building 31 PWGSC Owned Pump House	Concrete Cementitious Parging Compound – <1% Chrysotile Asbestos Content	A	N	F	ACTION 7
15458-73	Building 58 PWGSC Owned South Side Sub Station – Electrical Generator Room	Caulking (Tan) - South Door Frame – 2% Chrysotile Asbestos Content	A	N	G	ACTION 7
15458-83	Building 7 DND Property PWGSC Washroom (Back Lot) – Storage/Furnace Room	Floor Tile (White 12"x12") – 3% Chrysotile Asbestos Content	A	N	G	ACTION 7
15458-87	Building 7 DND Property PWGSC Washroom (Back Lot) – Women's Washroom	Sheet Flooring (Yellow/Brown – Bottom Layer) – 15% Chrysotile Asbestos Content	B	F	F	ACTION 6/5
15458-89	Building 7 DND Property PWGSC Washroom (Back Lot) – Men's Washroom	Mastic – (2nd Layer under White Sheet Flooring) – <1% Chrysotile Asbestos Content	C	N	G	ACTION 7
15458-95	Tunnels	Transite Piping (Sewage Line) – 40% Chrysotile & 8% Crocidolite Asbestos Content	B	N	F	ACTION 7



Asbestos containing materials were identified to be in the following materials/locations:						
15458-100	Building 9 PWGSC Old Guard House	Floor Tile (Beige 12"x12" – Bottom Layer) – 12% Chrysotile Asbestos Content	C	N	F	ACTION 7

In addition to the materials identified in Table 1, the following ACM were identified.

Table 2: Asbestos Containing Materials Summary-Previous Surveys

Asbestos containing materials were identified to be in the following materials/locations:						
Sample ID	Building	Material	Accessibility	Friability (F or N)	Condition (G/F/P)	Action Code
1865-10	Back Gate Guardhouse Siding and soffit	Exterior Cladding- 55% Chrysotile Asbestos Content	A	N	G	ACTION 7

Evaluation of asbestos containing materials is based on the condition of the material and its accessibility. Following are the guidelines used to evaluate ACMs and the action, if any, required to safely manage them.

Figure 1: Action Matrix from DP 057

ACCESS	CONDITION			
	GOOD	FAIR	POOR	DEBRIS
(A)	ACTION 5/7	ACTION 5/6	ACTION 3	ACTION 1
(B)	ACTION 7	ACTION 6/5	ACTION 3	ACTION 1
(C) exposed	ACTION 7	ACTION 6	ACTION 4	ACTION 2
(C) concealed	ACTION 7	ACTION 7	ACTION 4	ACTION 2
(D)	ACTION 7	ACTION 7	ACTION 7	ACTION 7

The following is excerpted from Public Works and Government Services Canada Departmental Policy 057 – Asbestos Management (DP 057).

Condition

Spray Applied Fireproofing, Insulation and Texture Finishes

In evaluating the condition of ACM spray applied as fireproofing, thermal insulation or texture, decorative or acoustic finishes, the following criteria apply;

GOOD	Surface of material shows no significant signs of damage, deterioration or delamination. Up to one percent visible damage to surface is allowed within range of GOOD. Evaluation of sprayed fireproofing requires the surveyor to be familiar with the irregular surface texture typical of sprayed asbestos products. GOOD condition includes unencapsulated or unpainted fireproofing or texture finishes, where no delamination or damage is observed, and encapsulated fireproofing or texture finishes where the encapsulation has been applied after the damage or fallout occurred.
POOR	Sprayed materials show signs of damage, delamination or deterioration. More than one percent damage to surface of ACM spray.



Mechanical Insulation

In evaluating the condition of mechanical insulation (on boilers, breeching, ductwork, piping, tanks, equipment etc.) the following criteria are used:

GOOD	Insulation is completely covered in jacketing and exhibits no evidence of damage or deterioration. No insulation is exposed. Includes conditions where the jacketing has minor surface damage (i.e., scuffs or stains), but the jacketing is not penetrated.
FAIR	Minor penetration damage to jacketed insulation (cuts, tears, nicks, deterioration or delamination) or undamaged insulation that has never been jacketed. Insulation is exposed but not showing surface disintegration. The extent of missing insulation ranges should be minor to none.
POOR	Original insulation jacket is missing, damaged, deteriorated or delaminated. Insulation is exposed and significant areas have been dislodged. Damage cannot be readily repaired.

Non-Friable and Potentially Friable Materials

Non-friable materials generally have little potential to release airborne fibres, even when damaged by mechanical breakage. However, some non-friable materials, i.e., exterior asbestos Concrete products, may have deteriorated so that the binder no longer effectively contains the asbestos fibres. In such cases of significantly deteriorated non-friable material, the material will be treated as a friable product.

Accessibility

The accessibility of building materials known or suspected of being ACM is rated according to the following criteria:

Access (A)	Areas of the building within reach (from floor level) of all building users. Includes areas such as gymnasiums, workshops, and storage areas where activities of the building users may result in disturbance of ACM not normally within reach from floor level.
Access (B)	Frequently entered maintenance areas within reach of maintenance staff, without need for a ladder. Includes: frequently entered pipe chases, tunnels and service areas or areas within reach from a fixed ladder or catwalk, i.e., tops of equipment, mezzanines.
Access (C) Exposed	Areas of the building above 8'0" where use of a ladder is required to reach the ACM. Only refers to ACM materials that are exposed to view, from the floor or ladder, without removing or opening other building components such as ceiling tiles, or service access doors or hatches. Does not include infrequently accessed service areas of the building.
Access (C) Concealed	Areas of the building which require removal of a building component including lay-in ceilings and access panels into solid ceiling systems. Includes rarely entered crawl spaces, attic spaces etc. Observations are limited to the extent visible from the access points.
Access (D)	Areas of the building behind inaccessible solid ceiling systems, walls, or mechanical equipment, etc., where demolition or the ceiling, wall or equipment etc., is required to reach the ACM. Evaluation of condition and extent of ACM is limited or impossible, depending on the surveyor's ability to visually examine the materials in Access D.



Figure 2: Action Key

Action 1	Immediate Clean Up of Debris That is Likely to be Disturbed Restrict access that is likely to cause a disturbance of the ACM DEBRIS and clean up ACM DEBRIS immediately. Utilize correct asbestos procedures. This action is required for compliance with regulatory requirements.
Action 2	Entry Into Areas with ACM Debris At locations where ACM DEBRIS can be isolated in lieu of removal or clean up, use appropriate means to limit entry to the area. Restrict access to the area to persons utilizing Type 2 asbestos-work precautions. The precautions will be required until the ACM DEBRIS has been cleaned up, and the source of the DEBRIS has been stabilized or removed.
Action 3	ACM Removal Required for Compliance Remove ACM for compliance with regulatory requirements. Utilize asbestos procedures appropriate to the scope of the removal work.
Action 4	Access into Areas Where ACM is Present and Likely to be Disturbed by Access Use asbestos precautions when entry or access into an area likely to disturb the ACM. ACTION 4 must be used until the ACM is removed (Use ACTION 1 or 2 if DEBRIS is present).
Action 5	Proactive ACM Removal Remove ACM in lieu of repair, or at locations where the presence of asbestos in GOOD condition is not desirable.
Action 6	ACM Repair Repair ACM found in FAIR condition, and not likely to be damaged again or disturbed by normal use of the area or room. Upon completion of the repair work, treat ACM as material in GOOD condition and implement ACTION 7. If ACM is likely to be damaged or disturbed during normal use of the area or room, implement ACTION 5.
Action 7	Routine Surveillance Institute routine surveillance of the ACM. Trained workers or contractors must use appropriate asbestos precaution during disturbance of the remaining ACM.

Note: any additional suspect materials encountered during renovation or demolitions activities must be left undisturbed until testing determines the presence or absence of asbestos or other hazardous material. In the event they are damaged or otherwise impacted, all work shall stop until appropriate control can be put in place to protect workers and the public.

6.2 Lead

Lead Paint

Lead was found in all but one sample of paint collected both on the interior and exterior of the buildings. The results vary from a high of 6.5% to a low of <0.010%. The sample from the Pumphouse (15458-20) was found to have a lead concentration below that of the detection limit (DL). Unfortunately the DL is higher than the SCMR limit for lead paint.



With this one exception, all samples were confirmed to exceed the concentration of lead permissible in new paint (0.009% - SCMR) threshold to be sold without notifying the consumer of its lead content.

Table 3: Paint Chip Sampling Results

Sample	Description	Lead (%)
15458- 17	Pumphouse-Penstock Room (South Wall) Desc: Paint-Lt. Green	6.5
15458- 20	Pumphouse-Main Penstock Building Desc: Paint-Yellow/Lt.Blue int.Conc.Walls	<0.010
15458-23	Pumphouse-Main Penstock Building Desc: Paint- Grey-Exterior	0.093
15458-27	Site: Pumphouse - Welding Shop - South Wall, Yellow	1.9
15458-29	Site: Pumphouse - Welding Shop - South Wall, Lt. Green	0.27

Overall, paint coatings were found to be in poor to good condition. Where damaged and deteriorating, paint should be removed following procedures designed to protect the workers from heavy metal exposure and to avoid the spread of contamination. Lead content of painted materials should not increase their disposal costs however; concentrated paint chips would need to be disposed as hazardous waste. Routine removal of lead paint is not recommended, rather it should be managed in place and removed on an “as needed” basis.

Elemental Lead

Lead within the copper water pipes/fittings was not tested for lead content however lead content in solder, especially from buildings of this vintage, is known to reach levels up to 98% lead.

If lead materials are found they are typically recognized as having significant salvage value, disposal therefore should not be a major concern. Workers should exercise caution if heat is to be used to melt any lead found as means of facilitating its extraction. Molten lead can produce significant quantities of inhalable lead fume which can pose a severe health hazard. The BC Occupational Health and Safety Regulation requires that worker exposure to airborne lead be kept below 0.05 mg/m³.

Polychlorinated Biphenyls (PCB) in Electrical Equipment

Fluorescent light fixtures were observed and appeared to be of a vintage often found to contain ballasts which Environment Canada (EC) has developed a guideline called - *Identification of Lamp Ballasts Containing PCBs –Environment Canada 1991*.

Manufacturers of ballasts and capacitors use distinct catalogue and date codes to identify their product, its date of manufacture, and, for some capacitors, its dielectric fluid. Fluorescent lamp ballasts are usually mounted between the fluorescent tubes on the light fixture and are shielded with a metal protective device which reduces heat radiation. Due to the fact the covers are easily broken and the risk of electrical shock



when accessing the ballast, it is standard practice to make the observation that there is a potential for PCBs to be present and have the ballasts inspected prior to disposal.

The Hazardous materials report from NWEG in 2000 mentioned that many of these ballasts have already been removed.

Inspect all light ballasts for the presence of PCB prior to disposal. PCB containing ballasts must be disposed of as hazardous waste.

6.3 Mould

No mould or significant moisture issues were observed during the survey.

6.4 Hantavirus-Animal Droppings

Materials suspected of containing Hantavirus were not observed during the survey.

Workers accessing areas where rodent or other animal droppings are present must be informed of the potential risk of Hantavirus exposure and employ suitable precautions for personal protection and control of the spread of contamination.

6.5 Ozone Depleting Substances

Several pieces of equipment containing ozone depleting substances (ODS) were observed during this investigation. PWGSC maintains an active halocarbon inventory.

6.6 Crystalline Silica

Testing for crystalline silica in dust was not completed/conducted as part of this survey however it is known to be a component of concrete dust. All concrete, plaster and stucco is suspected of containing silica in crystalline and non-crystalline forms. Many of the removal techniques (grinding, cutting, chipping etc) for these materials can generate high levels of crystalline silica in the air.

Use wetting techniques and/or HEPA equipped extraction systems attached to drills and other power equipment where possible in order to decrease dust levels.

As per the clients request, non-invasive investigative techniques were used. Even with the most invasive survey techniques, however, it should be noted that the possibility remains for other concealed materials to be found during a renovation or demolition.

Warning: in the event any additional suspect materials are encountered during demolition or renovation activities, work on those materials must stop immediately and remain undisturbed until testing confirms the presence or absence of asbestos or other hazardous material. If this any materials suspected of containing asbestos or another hazardous material are disturbed during the work, all work shall stop until the area is contained, the hazard evaluated by a qualified professional and the hazardous materials, if indeed present, is safely managed by a qualified contractor.





7.0 ABATEMENT COST ESTIMATE

- 1) Sheet flooring as identified in the hot water tank storage room of building 7 (PWGSC Washroom) should be repaired using Type 2 (moderate risk procedures) within the hot water tank storage room and adjacent woman's washroom.

**Cost for the repair of approximately 5 m² of flooring:
(including labor, materials, air sampling and inspection) is estimated at
\$ 1,200.00**





- 2) Sheet flooring as identified in building 61 (Butler Building SJ40 Offices) may be managed in place or be proactively removed using Type 3 (high risk procedures).

**Cost for the removal of this flooring (approximately 10 m²):
(including labor, materials, air sampling and inspection) is estimated at
\$ 20,000.00**



8.0 BULK SAMPLES

The following photoplate is a summary of the room by room assessment including samples collected.

Building: 38 PWGSC Owned Guard House – Old Front Gate	
Area: Old Front Gate	
Details: Ceiling: Drywall and plywood panels Walls: Drywall and plywood panels Flooring: Concrete and sheet flooring Roof: Asphalt shingles Construction Date:	
Area: Office and Bathroom	
Hazardous Materials Observed: <ul style="list-style-type: none">• Lead: [potential] Lead containing paint on walls and trim• Mercury containing equipment: Fluorescent light fixtures present• Ozone depleting substances: Fridge present• PCB's: [potential] Fluorescent light ballasts present• Mould: None observed	
Samples: 15458-10: Roof Shingles No Asbestos Detected 15458-11: Sheet Flooring- No Asbestos Detected 15458-12: Drywall Joint Compound - No Asbestos Detected 15458-13 : Washroom - Drywall Joint Compound - No Asbestos Detected	
Asbestos siding was not observed. Building envelope was brick and mortar.	

Building: 38 PWGSC Owned Guard House – Old Front Gate

Area: New Guard House

Details:

- Constructed in 2000
- Ceiling: Drywall
- Walls: Glass and painted steel
- Flooring: Concrete
- Roof: Roof Membrane

Hazardous Materials Observed:

- Lead: [potential Lead containing paint on walls and trim
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent ballasts present
- Mould: None Observed

Samples:

15458-8: Drywall Joint Compound - No Asbestos Detected
15458-9 : Caulking – Exterior - No Asbestos Detected



Building: 67 PWGSC Washroom Trailer (A Lot)

Room: PWGSC Washroom Trailer

Details:

- Constructed in November 2000
- Ceiling: Wood Fiber Ceiling Tiles
- Walls: Wall Panels
- Flooring: Sheet Flooring




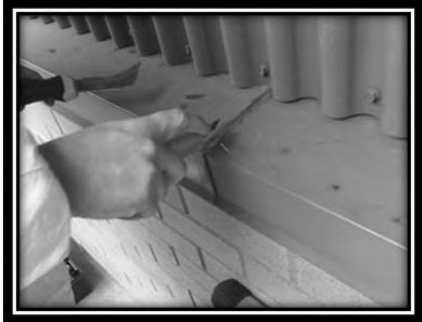
Hazardous Materials Observed:

- Lead: [potential] Lead containing paint on walls and trim
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-01: Sheet Flooring - No Asbestos Detected
15458-02: Roof Membrane Caulking - No Asbestos Detected



Building: 20 PWGSC Owned Main Washrooms	
<p>Room: Womens? ashroom</p> <p>Details:</p> <ul style="list-style-type: none"> • Estimated date of construction: 1997-1999 • Ceiling: Drywall • Walls: Cinder Block • Flooring: Concrete/Coating (Epoxy & Sealant) • Roof: Metal Sheeting 	
<p>Room: Men's Washroom</p> <p>Hazardous Materials Observed:</p> <ul style="list-style-type: none"> • Lead: [potential] Lead containing paint on walls and trim • Mercury containing equipment: Fluorescent light fixtures present • Ozone depleting substances: None Observed • PCB's: [potential] Fluorescent light ballasts present • Mould: None Observed <p>Samples: 15458-03: Drywall Joint Compound – Ceiling - No Asbestos Detected 15458-04: Beige Trowel on Flooring (Coating) - No Asbestos Detected</p>	 
<p>Area: Exterior of Building</p> <p>Hazardous Materials Observed:</p> <ul style="list-style-type: none"> • Lead: [potential] Lead containing paint on walls and trim • Mercury containing equipment: Fluorescent light fixtures present • Ozone depleting substances: None Observed • PCB's: [potential] Fluorescent light ballasts present • Mould: None Observed <p>Samples: 15458-03: Drywall Joint Compound – Ceiling - No Asbestos Detected 15458-04: Beige Trowel on Flooring (Coating) - No Asbestos Detected</p>	

Building: 20 PWGSC Owned Main Washrooms

Room: Mechanical Room

Hazardous Materials Observed:

- Lead: [potential] Lead containing paint on walls and trim
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-03: Drywall Joint Compound – Ceiling - No Asbestos Detected

15458-04: Beige Trowel on Flooring (Coating) - No Asbestos Detected



Building: 31 PWGSC Owned Pump House

Area: PWGSC Owned Pump House

Details:

- Constructed in 1925
- Ceiling: Concrete
- Walls: Brick & Mortar
- Flooring: Concrete
- Roof: Roof Membrane



Area: Scada Storage Room

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: Fridge(s) present
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-14: Drywall Joint Compound - No Asbestos Detected



Area: Work Shop

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-15: Caulking – Window - No Asbestos Detected



Area: Hydraulic Room

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-16: Brick Mortar - No Asbestos Detected



Building: 31 PWGSC Owned Pump House

Area: Main Floor

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-22: Caulking – Interior Window (Perimeter West Wall) - No Asbestos Detected
15458-24: Caulking – Exterior Window (Perimeter West Wall) - No Asbestos Detected
15458-25: Wall Coating – Interior Wall (Perimeter West Wall) - No Asbestos Detected
15458-26: Gasket – Compressor (A-13271) - No Asbestos Detected
15458-31: Brick Mortar – East Wall (Top of Stairs) - No Asbestos Detected



Area: Washroom (Main Floor)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-30: Drywall Joint Compound - No Asbestos Detected



Building: 31 PWGSC Owned Pump House

Area: Lunch Room (Second Floor)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: Fridge(s) Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

- 15458-32: Sheet Flooring (Grey) & Mastic - No Asbestos Detected
- 15458-33: Caulking/Putty Window - No Asbestos Detected
- 15458-34: Cementitious Wall Coating - No Asbestos Detected



Area: Lunch Room (Second Floor)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: Fridge(s) Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

- 15458-35: Drywall Joint Compound (West Wall) - No Asbestos Detected



Building: 31 PWGSC Owned Pump House

Area: Washroom (Second Floor)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-36: Drywall Joint Compound - No Asbestos Detected



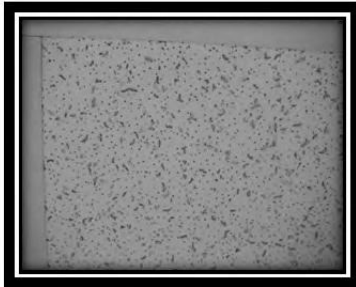
Area: Office (Main Floor)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: Fridge(s) Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-67: Drywall Joint Compound - No Asbestos Detected
15458-68: Concrete Cementitious - <1% Chrysotile Asbestos Content
15458-69: Acoustic Ceiling Tile - No Asbestos Detected



Building: 31 PWGSC Owned Pump House

Area: Basement

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-70: Gasket - No Asbestos Detected



Building: 26 PWGSC Penstock Structure

Area: PWGSC Penstock Structure

Details:

- Constructed in 1926
- Ceiling: Concrete
- Walls: Cinder Block
- Flooring: Concrete
- Roof: Concrete



Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-19: Caulking – Exterior - No Asbestos Detected

15458-20: Lead Paint - <0.010% w.t. – Yellow/Lt. Blue
Interior Concrete Walls (West Wall)

15458-21: Mortar – Expansion Joint - No Asbestos Detected

15458-23: Lead Paint 0.093% w.t. – Grey - Exterior Concrete
Walls



Building: 32 PWGSC Owned Middle Dock Stairwell

Area: PWGSC Owned Middle Dock Stairwell

Details:

- Constructed in 1926
- Ceiling: Concrete
- Walls: Cinder Block
- Flooring: Concrete
- Roof: Concrete



Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-17: Lead Paint 6.5% w.t. – Lt. Green - Interior Concrete Walls (South Wall)

15458-18: Wall Coating (South Wall) - No Asbestos Detected



Building: 29 PWGSC Owned Welding Shop

Area: PWGSC Owned Welding Shop

Details:

- Constructed in 1940
- Ceiling: Concrete
- Walls: Cinder Block
- Flooring: Concrete
- Roof: Concrete



Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-27: Lead Paint 1.9% w.t. – Yellow - South Interior Wall
15458-28: Cementitious Wall Coating (North Interior Wall) - No Asbestos Detected
15458-29: Lead Paint 0.27% w.t. – Lt. Green - South Interior Wall
Exhaust duct with black expansion gasket observed within Welding Shop and suspected of containing asbestos (not sampled).



Building: 19 PWGSC Administration Trailers

Area: PWGSC Administration Trailers

Details:

- Constructed in 1998
- Ceiling: Panel
- Walls: Drywall
- Flooring: Sheet Flooring
- Roof: Roof Membrane



Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: Fridge(s) Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-38: Shingle/Grip Mat - No Asbestos Detected
15458-39: Sheet Flooring (Cream) & Mastic - No Asbestos Detected
15458-40: Door Caulking - No Asbestos Detected
15458-41: Window Caulking - No Asbestos Detected



Building: PWGSC Security Trailer (H&S)

Area: PWGSC Security Trailer (H&S)

Details:

- Constructed in 2009
- Ceiling: Panel
- Walls: Wood Panel
- Flooring: Floor Tile
- Roof: Roof Membrane



Area: Orientation Training Room

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: Fridge(s) Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-37 Floor Tile – Grey 12"x12" & Mastic - No Asbestos Detected



Building: 18 PWGSC Owned Operations Building

Area: PWGSC Owned Operations Building

Details:

- Constructed in 2001
- Ceiling: Acoustic Ceiling Tile
- Walls: Drywall
- Flooring: Sheet Flooring
- Roof: Metal Sheeting



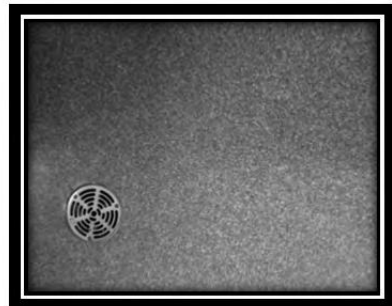
Area: Men's & Women's Bathroom (2nd Floor)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: Fridge(s) Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-42 Sheet Flooring (Green) & Mastic - No Asbestos Detected
15458-43 Drywall Joint Compound - No Asbestos Detected



Area: Kitchenette & Hallway (2nd Floor)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: Fridge(s) Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed



Building: 18 PWGSC Owned Operations Building

Samples:

15458-44: Drywall Joint Compound - No Asbestos Detected
15458-45: Acoustic Ceiling Tile - No Asbestos Detected



Area: Reception/Office Area

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-46: Drywall Joint Compound



Area: Hallway by Boardroom

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-47: Sheet Flooring (Lt. Blue) - No Asbestos Detected



Building: 18 PWGSC Owned Operations Building

Area: Boardroom

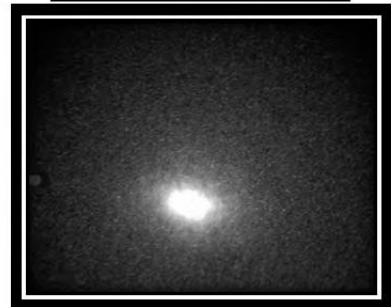
Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: Fridge observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-48: Sheet Flooring (Blue) & Mastic - No Asbestos Detected

15458-49: Drywall Joint Compound - No Asbestos Detected



Area: Open Office Area

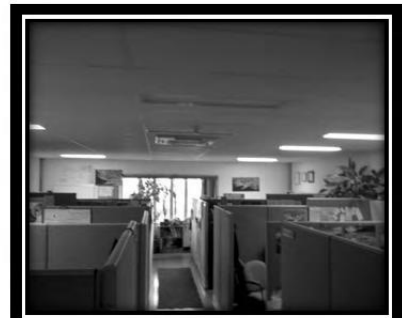
Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-50: Drywall Joint Compound - No Asbestos Detected

15458-51: Acoustic Ceiling Tile - No Asbestos Detected



Building: 18 PWGSC Owned Operations Building

Area: Entrance Hallway (Main Floor)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-52: Drywall Joint Compound - No Asbestos Detected



Area: Stairwell (Main Floor)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-53: Drywall Joint Compound - No Asbestos Detected

15458-54: Sheet Flooring (Lt. Green) - No Asbestos Detected



Area: Lunchroom (Main Floor)



Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: Fridge Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-55: Drywall Joint Compound - No Asbestos Detected



Building: 61 PWGSC Land Leased to Seaspan (Butler Buildings)	
Area: SJ39 Stores	
<p>Details:</p> <ul style="list-style-type: none"> • Construction Date Unknown • Ceiling: Metal Sheeting • Walls: Wood Panel/Metal Sheeting • Flooring: Concrete • Roof: Metal Sheeting 	
<p>Hazardous Materials Observed:</p> <ul style="list-style-type: none"> • Lead: [potential] Lead based paint on walls and equipment • Mercury containing equipment: Fluorescent light fixtures present • Ozone depleting substances: None Observed • PCB's: [potential] Fluorescent light ballasts present • Mould: None Observed <p>Samples: 15458-58: Caulking (Exterior) - Chrysotile 7%</p>	
Area: SJ40 Offices	
<p>Details:</p> <ul style="list-style-type: none"> • Construction Date Unknown • Ceiling: Wood Panel • Walls: Wood Panel • Flooring: Sheet Flooring • Roof: Shingle Roof 	

Building: 61 PWGSC Land Leased to Seaspan (Butler Buildings)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-59: Sheet Flooring (Brown & Beige) - Chrysotile 20% Asbestos Content

15458-60: Floor Tile – White 12"x12" - No Asbestos Content

15458-61: Coating (Balcony Steps) - No Asbestos Content



Building: 16 PWGSC Owned Electrical Shop Building

Area: Shop Building NS29

Details:

- Constructed in 2004
- Ceiling: Metal Sheeting
- Walls: Metal Sheeting/Drywall
- Flooring: Concrete/Sheet Flooring
- Roof: Metal Sheeting



Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: Fridge observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

- 15458-62: Sheet Flooring (Beige) - No Asbestos Content
- 15458-63: Sheet Flooring (Blue) - No Asbestos Content
- 15458-64: Drywall Joint Compound - No Asbestos Content
- 15458-65: Drywall Joint Compound - No Asbestos Content
- 15458-66: Drywall Joint Compound - No Asbestos Content



Building: 58 PWGSC Owned South Side Sub Station

Area: Building SJ23

Details:

- Constructed in 1926
- Ceiling: Concrete
- Walls: Concrete/Brick
- Flooring: Concrete
- Roof: Concrete



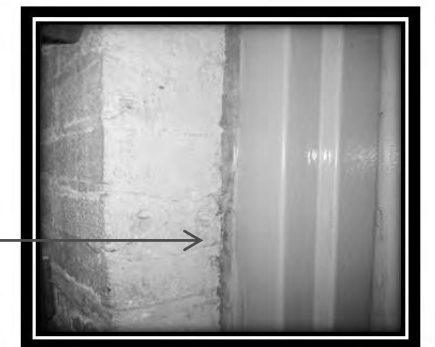
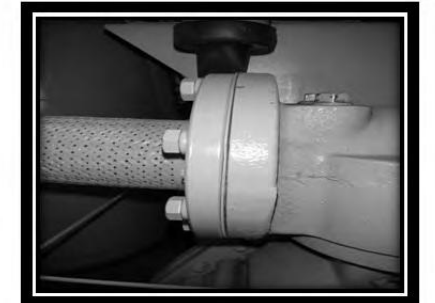
Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

- 15458-71: Gasket - No Asbestos Content
- 15458-72: Brick Mortar - No Asbestos Content
- 15458-73: Caulking - Chrysotile 2% Asbestos Content
- 15458-74: Firestopping (Cementitious) - No Asbestos Content
- 15458-75: Firestopping (Black Putty) - No Asbestos Content

Note: Expansion Gaskets observed in ducting are suspect of asbestos-containing. Not sampled.





Building: 24 PWGSC Owned Main Sub Station

Area: Main Sub Station

Details:

- Constructed in 1926
- Ceiling: Concrete
- Walls: Brick
- Flooring: Concrete
- Roof: Concrete



Area: Main Sub Station (Main Floor)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-76: Brick Mortar - No Asbestos Content

15458-77: Caulking (Window Frame) - No Asbestos Content

15458-78: Firestopping (Black Putty) - No Asbestos Content



Building: 30 PWGSC Owned Garage

Area: Garage NS4 (Exterior)

Details:

- Constructed in 1985
- Ceiling: Concrete/Metal Sheeting
- Walls: Concrete/Wood Panel/Metal Sheeting
- Flooring: Concrete
- Roof: Metal Sheeting/Roof Membrane



Area: Garage NS4 (Rear Building)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

- 15458-79: Putty (Window Frame) - No Asbestos Content
15458-80: Roof Tar - No Asbestos Content
15458-81: Cementitious Wall Coating - No Asbestos Content



Building: 30 PWGSC Owned Garage

Area: Garage NS4 (Front Building)

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: Fridge observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

No Samples Collected.



Building: 41 PWGSC Owned Winch Building

Area: Winch Building SJ22

Details:

- Constructed in 1940
- Ceiling: Metal Sheeting
- Walls: Metal Sheeting/Wood Paneling
- Flooring: Concrete
- Roof: Metal Sheeting



Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: None Observed
- Ozone depleting substances: Fridge observed
- PCB's: None Observed
- Mould: None Observed

Samples:

15458-82: Drywall Joint Compound - No Asbestos Content



Building: 7 PWGSC Washroom

Area: DND Property PWGSC Washroom

Details:

- Constructed in 2002
- Ceiling: Panel/Acoustic Ceiling Tile (Fibreglass)
- Walls: Drywall/Wood Paneling
- Flooring: Wood Panel Substrate
- Roof: Roof Membrane



Area: Rear Storage Room

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present, Thermostat
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-83: Floor Tile (12"x12" White) & Mastic - Storage/Furnace Room – Chrysotile 3% Asbestos Content
15458-84: Sheet Flooring (Peach) & Mastic - Storage/Locker Area - No Asbestos Content



Building: 7 PWGSC Washroom Trailer

Area: Women's Washroom

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present, Thermostat
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-85: Sheet Flooring (Layer 1) – Lt. Pink - No Asbestos Content

15458-86: Drywall Joint Compound - No Asbestos Content

15458-87: Sheet Flooring (Layer 2) – Yellow/Brown - Chrysotile 15% Asbestos Content



Building: 7 PWGSC Washroom Trailer

Area: Men's Washroom

Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present, Thermostat
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

- 15458-88: Drywall Joint Compound - No Asbestos Content
- 15458-89: Sheet Flooring (White) - No Asbestos Content
- 15458-89: Mastic - Chrysotile <1% Asbestos Content



Building: 68 PWGSC Washroom Trailer

Area: Washroom Trailer Electrical Shop

Details:

- Constructed in 1997
- Ceiling: Paneling
- Walls: Paneling
- Flooring: Wood Substrate
- Roof: Roof Membrane



Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: None Observed
- Ozone depleting substances: None Observed
- PCB's: None Observed
- Mould: None Observed

Samples:

- 15458-90: Caulking (Grey) - No Asbestos Content
- 15458-91: Sheet Flooring (Lt. Grey) - No Asbestos Content
- 15458-92: Caulking (Exterior) – Light Fixture - No Asbestos Content



Building: 9 PWGSC Old Guard House

Area: Old Guard House NS35

Details:

- Construction Date 2000
- Ceiling: Paneling
- Walls: Paneling
- Flooring: Wood Substrate
- Roof: Roof Membrane



Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

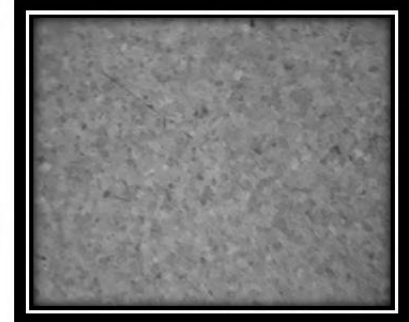
Samples:

15458-100: Floor Tile – Beige 12"x12" - 12% Chrysotile Asbestos Content (under Sheet Flooring)

15458-100: Mastic - No Asbestos Content

15458-101: Sheet Flooring – Lt. Brown Mosaic - No Asbestos Content

Note: Asbestos-Containing Siding (Exterior) and soffits are asbestos containing transite



EGD Service Tunnels

Area: Tunnels

Details:

- Constructed in 1926
- Ceiling: Concrete
- Walls: Concrete
- Flooring: Concrete

Hazardous Materials Observed:

Lead: [potential] Lead based paint on walls and equipment

Mercury containing equipment: Fluorescent light fixtures present

Ozone depleting substances: None Observed

PCB's: [potential] Fluorescent light ballasts present

Mould: None Observed

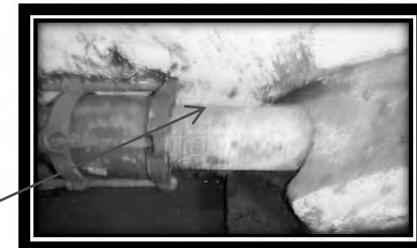
Samples:

15458-95: Transite Pipe (Sewage Line) - 40% Chrysotile, 8% Crocidolite Asbestos Content

15458-96: Gasket (Sewage Line Valve) - No Asbestos Content

15458-97: Firestopping - No Asbestos Content

15458-98: Canvass (Salt Water Line) - No Asbestos Content



Caissons 1 & 2

Area: Caissons

Details:

- Constructed in 1978
- Ceiling: Metal
- Walls: Metal
- Flooring: Metal



Hazardous Materials Observed:

- Lead: [potential] Lead based paint on walls and equipment
- Mercury containing equipment: Fluorescent light fixtures present
- Ozone depleting substances: None Observed
- PCB's: [potential] Fluorescent light ballasts present
- Mould: None Observed

Samples:

15458-99: Wall Insulation (Porthole) - No Asbestos Content



9.0 Limitation of Survey

This document details the methodology, findings and conclusions of this survey and assessment conducted on the subject site in October – December 2011.

Analytical results included in the report reflect the sampled materials at the specific sample locations. Visually similar materials were referenced to specific analyzed samples.

The survey of the building did not include destructive sampling which would permit an intrusive investigation of inaccessible wall and ceiling cavities. Limited access into interior and perimeter walls, voids, crawlspaces, and mechanical shafts was obtained for the investigation of insulation materials. It is possible that hazardous materials are present in these areas but were not identified. If materials suspected of containing asbestos or other hazardous materials are encountered during future renovations or demolition, they should be treated as hazardous proven otherwise. Locations and building materials that have not been surveyed should be considered potentially hazardous materials-containing until such time as they can be evaluated by a qualified person. Until such time as the material can be appropriately evaluated, all work that could impact the suspect materials shall cease in the affected areas until such time as appropriate precautions can be implemented to protect workers and others at the subject site.

Roofing materials may contain asbestos, however, due to the potential for damage to the building and its contents, full depth roofing core samples were not obtained from the roofing systems. Roofing materials should be sampled and analyzed for asbestos prior to disturbance in the event that roof repairs or replacement is required.

All vermiculite insulation should be considered as asbestos containing until such time as a comprehensive destructive testing sampling program is carried out within the building or structure. Asbestos containing vermiculite should be considered present within all concrete block walls, voids, and spaces including attics, walls, ceiling and floor voids.

Some materials cannot be reasonably surveyed without causing significant damage to the building structure or envelope systems. These materials should be assessed for risk specific to any planned renovations or demolition activities. Materials suspected of containing asbestos may be located in concealed locations on this site include:

- Materials inside double wall metal chimney sections,
- Concealed roofing, caulk and felts,
- Internal parts of appliances and white goods,
- Vermiculite in walls that do not have existing penetrations,
- Buried cement pipes, and
- Gaskets in pipe flanges and valves.

Other materials were not sampled for fear of causing damage to building systems including vibration dampeners and electrical wiring.

An asbestos risk assessment must be completed prior to any removal and/or alteration work in or on a building. Removal and/or alteration work requires control measures to be implemented in accordance with WorkSafeBC. Regulations. Protective personal equipment is required during any work or major alteration that may disturb synthetic or asbestos insulation and/or dust that may be present.

Yours very truly,

North West Environmental Group Ltd.



Julie Scott-Moncrieff, B.Sc.,
Senior Occupational Hygienist



APPENDICES



NWEG #15458

See General Notes

59

Warning: in the event any additional suspect materials are encountered during renovation/repair activities, work on those materials should stop immediately and remain undisturbed until testing confirms the presence or absence of asbestos or other hazardous material

APPENDIX A – SITE LOCATION AND SITE PLAN

Drawing 1: Site Location (Google maps)

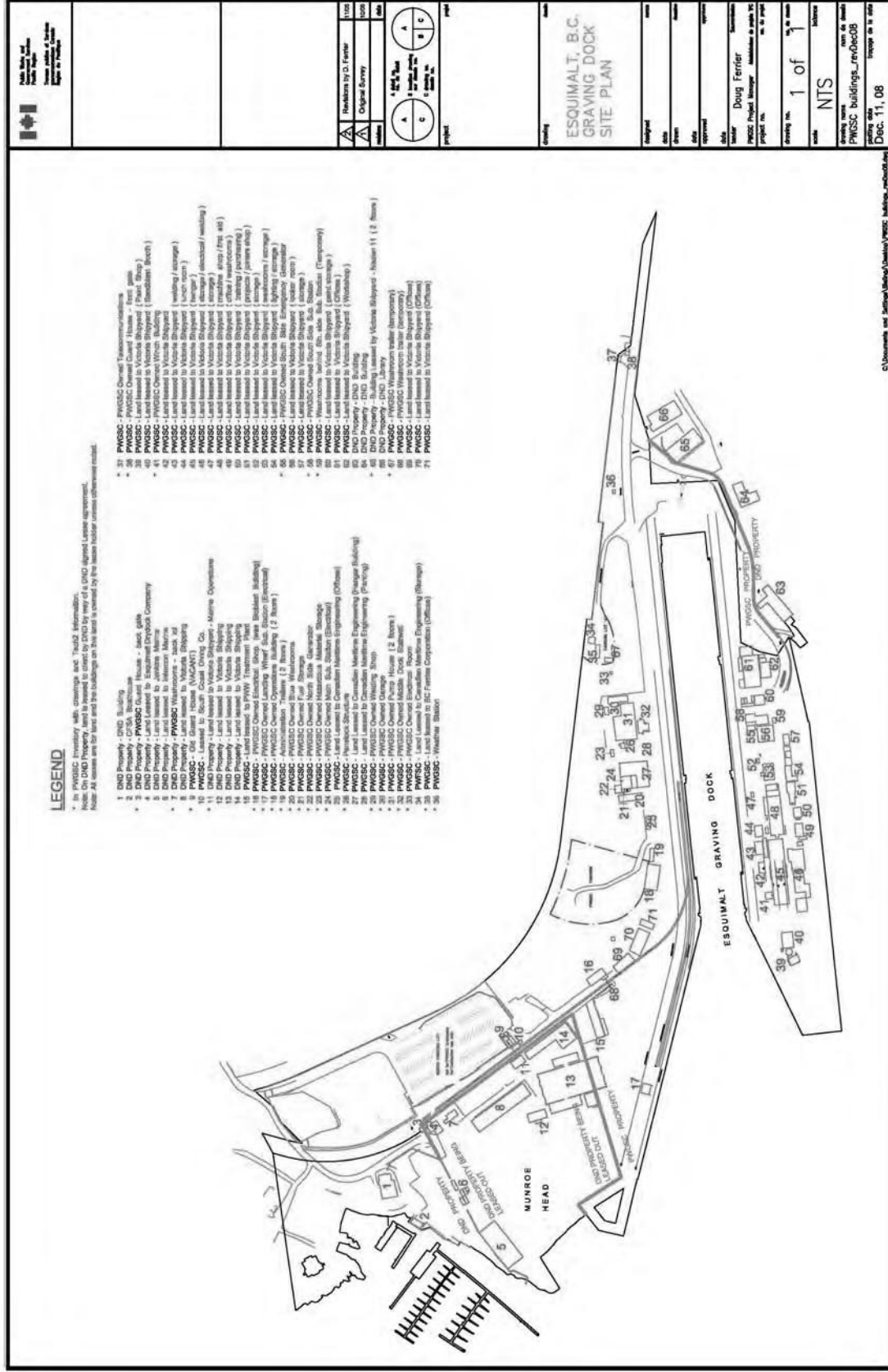


NWEG #15458

See General Notes

Warning: in the event any additional suspect materials are encountered during renovation/repair activities, work on those materials should stop immediately and remain undisturbed until testing confirms the presence or absence of asbestos or other hazardous material

Drawing 2: Site Plan



NWEG #15458

See General Notes

Warning: in the event any additional suspect materials are encountered during renovation/repair activities, work on those materials should stop immediately and remain undisturbed until testing confirms the presence or absence of asbestos or other hazardous material



**North West
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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

December 9, 2011

Site: **Esquimalt Graving Dock**

Sampled by: /Client Job or PO #
Project Number

**JS
15458**

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-01	Bldg 67 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Sheet Flooring	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass Cellulose	85 10 5
15458-02	Bldg 67 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Roofing Caulk	Various Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-03	Bldg 20 - PWGSC Owned Blue Washrooms - Men's Room	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-04	Bldg 20 - PWGSC Owned Blue Washrooms - Men's Room	10/24/11	EM	Beige Trowel on Flooring	Beige Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-05	Bldg 20 - PWGSC Owned Blue Washrooms - Exterior	10/24/11	EM	Caulk	Grey/Clear Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-06	Bldg 20 - PWGSC Owned Blue - Mechanical Room - South Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-07	Bldg 20 - PWGSC Owned Blue Washrooms - Mechanical Room - North Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-08	Bldg # - PWGSC New Guard Shack	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-09	Bldg # - PWGSC New Guard Shack - Exterior	10/24/11	EM	Caulk	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-10	Bldg 38 - PWGSC Owned Guard House - Front Gate - Exterior	10/24/11	EM	Shingles	Grey/Black Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15





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December 9, 2011

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**JS
15458**

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-11	Bldg 38 - PWGSC Owned Guard House - Office	10/24/11	EM	Sheet Flooring	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-12	Bldg 38 - PWGSC Owned Guard House - Office	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-13	Bldg 38 - PWGSC Owned Guard House - Washroom	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-14	Bldg 31 - PWGSC Owned Pump House - Scada Storage Room	10/28/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-15	Bldg 31 - PWGSC Owned Pump House - Work Shop	10/28/11	EM	Caulking - Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-16	Bldg 31 - PWGSC Owned Pump House - Hydraulic Room	10/28/11	EM	Brick Mortar/Firestopping	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-18	Bldg 32 - PWGSC Owned Middle Dock Stairwell (South Wall)	10/28/11	EM	Wall Coating	Grey/Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-19	Bldg 26 - PWGSC Penstock Structure (Exterior)	10/28/11	EM	Caulking - Hydraulic Cylinder Cover	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-21	Bldg 26 - PWGSC Penstock Structure (Interior)	10/28/11	EM	Mortar - Expansion Joint	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-22	Bldg 31 - PWGSC Owned Pump House - Perimeter West Wall	10/28/11	EM	Caulking - Interior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100





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Client: **PWGSC**

December 9, 2011

Site: **Esquimalt Graving Dock**

Sampled by: /Client Job or PO #
Project Number

JS
15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-24	Bldg 31 - PWGSC Owned Pump House - West Wall (Exterior)	10/28/11	EM	Caulking - Exterior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-25	Bldg 31 - PWGSC Owned Pump House - West Wall (Interior)	10/28/11	EM	Wall Coating - Interior Wall	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-26	Bldg 31 - PWGSC Owned Pump House - Mechanical	10/28/11	EM	Gasket - Compressor A-13271	Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-28	Bldg 29 - PWGSC Owned Welding Shop - (North Wall)	11/02/11	EM	Cementitious Wall Coating	Grey Non-Fibrous Heterogeneous	100	None Detected	0	None-Fibrous	100
15458-30	Bldg 31 - PWGSC Owned Pump House - Washroom (Main Floor)	11/02/11	EM	Drywall Joint Compound	White Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-31	Bldg 31 - PWGSC Owned Pump House - East Wall (Top of Stairs)	11/02/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-32 Layer 1	Bldg 31 - PWGSC Owned Pump House - Lunch Room	11/02/11	EM	Sheet Flooring - Greyish Green	Brown/Green Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous Synthetic	80 20
15458-32 Layer 2	Bldg 31 - PWGSC Owned Pump House - Lunch Room	11/02/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-33	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Windows)	11/02/11	EM	Caulking/Putty - Window	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-34 Layer 1	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Skim Coat	White Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100





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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

December 9, 2011

Site: **Esquimalt Graving Dock**

Sampled by: /Client Job or PO #
Project Number

JS
15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-34 Layer 2	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Base Coat	Grey Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-35	Bldg 31 - PWGSC Owned Pump House - Lunch Room (West Wall)	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-36	Bldg 31 - PWGSC Owned Pump House - Lunch Room - Washroom	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-37 Layer 1	Bldg ## - PWGSC Security Trailer (H&S Training)	11/03/11	EM	Floor Tile - 12"x12" Grey	Grey Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-37 Layer 2	Bldg ## - PWGSC Security Trailer (H&S Training)	11/03/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-38	Bldg 19 - PWGSC Administration Trailers - 2nd Floor - Deck Walkway	11/03/11	EM	Shingle/Grip Mat	Black Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15
15458-39 Layer 1	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Sheet Flooring - Cream w/ Tan	Grey Fibrous Heterogeneous	33	None Detected	0	Non-Fibrous Cellulose	85 15
15458-39 Layer 2	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Mastic	Yellow Non-Fibrous Heterogeneous	33	None Detected	0	Non-Fibrous	100
15458-39 Layer 3	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Backing	Brown Fibrous Heterogeneous	34	None Detected	0	Cellulose Non-Fibrous	85 15
15458-40	Bldg 19 - PWGSC Administration Trailers - Exterior	11/03/11	EM	Door Caulking	Tan Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100





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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

December 9, 2011

Site: **Esquimalt Graving Dock**

Sampled by: /Client Job or PO #
Project Number

JS
15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-41	Bldg 19 - PWGSC Administration Trailers - Exterior	11/03/11	EM	Window Caulking	Tan Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-42 Layer 1	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Men's Bathroom	11/17/11	EM	Sheet Flooring - Green	Green Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-42 Layer 2	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Men's Bathroom	11/17/11	EM	Mastic	Brown/Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-43	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Women's Bathroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-44	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Kitchenette/Hallway	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-45	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Kitchenette/Hallway	11/17/11	EM	Acoustic Ceiling Tile - 2'x4' - Large & Small Random Pinhole	Grey Fibrous Homogeneous	100	None Detected	0	Cellulose Mineral Wool Non-Fibrous	60 30 10
15458-46	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Reception/Office Area	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-47	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Hallway by Boardroom	11/17/11	EM	Sheet Flooring - Lt. Blue	Grey Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Cellulose	70 30
15458-48 Layer 1	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Sheet Flooring - Blue	Blue Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-48 Layer 2	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Mastic	Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100





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Client: **PWGSC**

December 9, 2011

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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-49	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-50	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Open Office Area	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-51	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Open Office Area	11/17/11	EM	Acoustic Ceiling Tile - 2'x4' - Large & Small Random Pinhole	Grey Fibrous Homogeneous	100	None Detected	0	Cellulose Mineral Wool Non-Fibrous	60 30 10
15458-52	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Entrance/Hallway	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-53	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Stairwell Bottom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-54	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Stairwell Bottom	11/17/11	EM	Sheet Flooring - Lt. Green	Green Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Glass	80 20
15458-55	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Lunchroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-56	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - Pipe Fitter Trailer	11/17/11	EM	Sheet Flooring - Grey	Grey Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Cellulose	80 20
15458-57	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - Pipe Fitter Trailer (Exterior)	11/17/11	EM	Caulking - Window Frame	Tan Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-58	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S.J39 Stores - (Exterior)	11/17/11	EM	Caulking	Black Fibrous Homogeneous	100	Chrysotile	7	Non-Fibrous	93





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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

December 9, 2011

Site: **Esquimalt Graving Dock**

Sampled by: Client Job or PO #
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15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-59	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - SJ40 Offices	11/17/11	EM	Sheet Flooring - Brown & Beige Squares	Grey Fibrous Homogeneous	100	Chrysotile	20	Non-Fibrous Cellulose	50 30
15458-60 Layer 1	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - SJ40 Offices	11/17/11	EM	Floor Tile - 12"x12" White with Beige Flecks	Grey Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-60 Layer 2	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - SJ40 Offices	11/17/11	EM	Mastic	Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-61	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - SJ40 Offices - Balcony Steps	11/17/11	EM	Coating	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-62	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Storage Room	11/21/11	EM	Sheet Flooring - Beige	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose	85 15
15458-63	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Stairway	11/22/11	EM	Sheet Flooring - Blue	Blue Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose Glass	82 15 3
15458-64	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Storage Room	11/23/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-65	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Mezzanine	11/24/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-66	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Mezzanine	11/25/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-67	Bldg 31 - PWGSC Owned Pump House - Office	11/28/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100





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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

December 9, 2011

Site: **Esquimalt Graving Dock**

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15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-68	Bldg 31 - PWGSC Owned Pump House - Office	11/28/11	EM	Concrete Cementitious	Grey Non-Fibrous Heterogeneous	100	Chrysotile	< 1	Non-Fibrous	100
15458-69	Bldg 31 - PWGSC Owned Pump House - Office	11/28/11	EM	Acoustic Ceiling Tile - 2'x2' - Random Fissure & Small Pinhole	Grey/White Fibrous Heterogeneous	100	None Detected	0	Cellulose Non-Fibrous Mineral Wool	60 20 20
15458-70	Bldg 31 - PWGSC Owned Pump House - Basement - Pump	11/28/11	EM	Gasket	Various Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Synthetic	90 10
15458-71	Bldg 58 - PWGSC Owned South Side Sub. Station - Compressor	11/28/11	EM	Gasket	Grey/Green Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Wollastonite	80 20
15458-72	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-73 Layer 1	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Caulking - Grey	Grey Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	98
15458-73 Layer 2	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Caulking - Tan	Tan Fibrous Heterogeneous	50	Chrysotile	2	Non-Fibrous	98
15458-74	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Firestopping (Cementitious)	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-75	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Firestopping (Black Putty)	Grey Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose	85 15
15458-76	Bldg 24 - PWGSC Owned Main Sub. Station	11/28/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100





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Client: **PWGSC**

December 9, 2011

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15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-77	Bldg 24 - PWGSC Owned Main Sub. Station	11/28/11	EM	Caulking - Window Frame	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-78	Bldg 24 - PWGSC Owned Main Sub. Station	11/28/11	EM	Firestopping (Black Putty)	Grey Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose	80 20
15458-79	Bldg 30 - PWGSC Owned Garage - Exterior	11/28/11	EM	Putty - Window Frame	Cream Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-80	Bldg 30 - PWGSC Owned Garage - Exterior	11/28/11	EM	Roof Tar	Black Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-81	Bldg 30 - PWGSC Owned Garage	11/28/11	EM	Cementitious Wall Coating	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-82	Bldg 41 - PWGSC Owned Winch Building	11/29/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-83 Layer 1	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Storage/Furnace Room	11/29/11	EM	Floor Tile - White 12" x 12"	Brown Non-Fibrous Heterogeneous	50	Chrysotile	3	Non-Fibrous	97
15458-83 Layer 2	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Storage/Furnace Room	11/29/11	EM	Mastic	Black Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-84 Layer 1	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Storage/Locker Room	11/29/11	EM	Sheet Flooring - Peach	Peach Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-84 Layer 2	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Storage/Locker Room	11/29/11	EM	Mastic	Brown Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous Cellulose	95 5





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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

December 9, 2011

Site: **Esquimalt Graving Dock**

Sampled by: /Client Job or PO #
Project Number

JS
15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-85 Layer 1	Bigd 7 - DND Property - PWGSC Washrooms (Back Lot) - Women's Washroom	11/29/11	EM	Sheet Flooring - Lt. Pink (Layer 1)	Pink Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-85 Layer 2	Bigd 7 - DND Property - PWGSC Washrooms (Back Lot) - Women's Washroom	11/29/11	EM	Mastic	Brown Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-86	Bigd 7 - DND Property - PWGSC Washrooms (Back Lot) - Women's Washroom	11/29/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-87	Bigd 7 - DND Property - PWGSC Washrooms (Back Lot) - Women's Washroom	11/29/11	EM	Sheet Flooring - Yellow/Brown (Layer 2)	Tan Non-Fibrous Heterogeneous	100	Chrysotile	15	Non-Fibrous Cellulose	80 5
15458-88	Bigd 7 - DND Property - PWGSC Washrooms (Back Lot) - Men's Washroom	11/29/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-89 Layer 1	Bigd 7 - DND Property - PWGSC Washrooms (Back Lot) - Men's Washroom	11/29/11	EM	Sheet Flooring - White	Grey/White Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous Cellulose Glass	75 20 5
15458-89 Layer 2	Bigd 7 - DND Property - PWGSC Washrooms (Back Lot) - Men's Washroom	11/29/11	EM	Mastic	Brown/Black Non-Fibrous Heterogeneous	50	Chrysotile	< 1	Non-Fibrous Cellulose	90 10
15458-90	Bigd 68 - PWGSC Washroom Trailer (Electrical Shop) - Exterior	11/29/11	EM	Caulking	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-91	Bigd 68 - PWGSC Washroom Trailer (Electrical Shop)	11/29/11	EM	Sheet Flooring - Lt. Grey	Grey/White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-92	Bigd 68 - PWGSC Washroom Trailer (Electrical Shop)	11/29/11	EM	Caulking	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100





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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

December 9, 2011

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15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-95	Tunnels - Sewage Line	12/07/11	EM	Transite Pipe	Grey Fibrous Heterogeneous	100	Chrysotile Crocidolite	40	Non-Fibrous	52
15458-96	Tunnels - Sewage Line - Valve	12/07/11	EM	Gasket	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-97	Tunnels	12/07/11	EM	Firestopping	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-98	Tunnels - Sewage Line	12/07/11	EM	Canvess	Brown Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Synthetic	50 50
15458-99	Cassion #1 - Porthole	12/07/11	EM	Insulation	Grey Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Mineral Wool Cellulose	40 30 30
15458-100 Layer 1	Bldg 9 - PWGSC Old Guard House	12/09/11	EM	Floor Tile - 12"x12" Beige	Brown Non-Fibrous Heterogeneous	50	Chrysotile	12	Non-Fibrous	86
15458-100 Layer 2	Bldg 9 - PWGSC Old Guard House	12/09/11	EM	Mastic	Yellow Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-101	Bldg 9 - PWGSC Old Guard House	12/09/11	EM	Sheet Flooring - Lt. Brown Mosaic	Grey/Tan/White Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose	80 20





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Customer ID: PAEC50
Customer PO:
Received: 12/05/11 9:00 AM
EMSL Order: 041131556

Fax: (250) 384-9865 Phone: (250) 384-9695
Project: **15458/PWGSC**

EMSL Proj:
Analysis Date: 12/9/2011

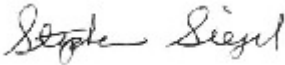
Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-100-Floor Tile <i>041131556-0001</i>	PWGSC OLD GUARD HOUSE - FLOOR TILE - 12"x12" BEIGE	Brown Non-Fibrous Heterogeneous		88% Non-fibrous (other)	12% Chrysotile
15458-100-Mastic <i>041131556-0001A</i>	PWGSC OLD GUARD HOUSE - FLOOR TILE - 12"x12" BEIGE	Yellow Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-101 <i>041131556-0002</i>	PWGSC OLD GUARD HOUSE - SHEET FLOORING - LT. BROWN MASTIC	Gray/Tan/White Fibrous Heterogeneous	20% Cellulose	80% Non-fibrous (other)	None Detected

Initial report from 12/09/2011 13:42:41

Analyst(s)

Erica Valent (3)



Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA-LAP, LLC-IHLAP Lab 100194, NYS ELAP 10872, NJ DEP 03036



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Customer ID: PAEC50
Customer PO:
Received: 12/05/11 9:00 AM
EMSL Order: 041131567

Fax: (250) 384-9865 Phone: (250) 384-9695
Project: **15458/PWGSC**

EMSL Proj:
Analysis Date: 12/7/2011

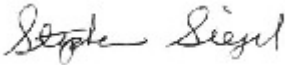
Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-95 041131567-0001	TUNNELS - SEWAGE LINE - TRANSITE PIPE	Gray Fibrous Heterogeneous		52% Non-fibrous (other)	40% Chrysotile 8% Crocidolite
15458-96 041131567-0002	TUNNELS - SEWAGE LINE - VALVE - GASKET	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-97 041131567-0003	TUNNELS - FIRESTOPPING	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-98 041131567-0004	TUNNELS - SEWAGE LINE - CANVESS	Brown Fibrous Heterogeneous	50% Synthetic	50% Non-fibrous (other)	None Detected
15458-99 041131567-0005	CASSION #1 - PORTHOLE - INSULATION	Gray Fibrous Heterogeneous	30% Min. Wool 30% Cellulose	40% Non-fibrous (other)	None Detected

Initial report from 12/07/2011 10:40:58

Analyst(s)

Frank Dicrescenzo (5)



Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA-LAP, LLC-IHLAP Lab 100194, NYS ELAP 10872, NJ DEP 03036



EMSL Analytical, Inc.

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Attn: **Janet Peto**
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Customer ID: PAEC50
Customer PO:
Received: 11/21/11 9:00 AM
EMSL Order: 041130825

Fax: (250) 384-9865 Phone: (250) 384-9695
Project: **15458 PWGSC**

EMSL Proj:
Analysis Date: 11/28/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

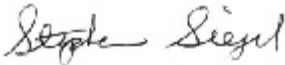
Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-67 041130825-0001	Bldg 31-PWGSC owned pump house-office - drywall joint compound	White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-68 041130825-0002	Bldg 31-PWGSC owned pump house-office - concrete cementitious	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	<1% Chrysotile
15458-69 041130825-0003	Bldg 31-PWGSC owned pump house-office - acoustic ceiling tile- 2x2 random fissure & small pinhole	Gray/White Fibrous Heterogeneous	60% Cellulose 20% Min. Wool	20% Non-fibrous (other)	None Detected
15458-70 041130825-0004	Bldg 31-PWGSC owned pump house-basement-pump - gasket	Various Fibrous Heterogeneous	10% Synthetic	90% Non-fibrous (other)	None Detected

Suggest TEM

Initial report from 11/28/2011 08:16:38

Analyst(s)

Melissa Klinedinst (1)
Naadira Carter (15)



Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

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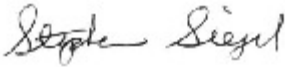
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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-71 041130825-0005	Bldg 58-PWGSC owned South side sub station-compres - gasket	Gray/Green Fibrous Heterogeneous	20% Wollastonite	80% Non-fibrous (other)	None Detected
15458-72 041130825-0006	Bldg 58-PWGSC owned South side sub station-electri - brick mortar	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-73-gray caulk 041130825-0007	Bldg 58-PWGSC owned South side sub station-electri - caulking	Gray Fibrous Heterogeneous	2% Glass	98% Non-fibrous (other)	None Detected
15458-73-tan caulk 041130825-0007A	Bldg 58-PWGSC owned South side sub station-electri - caulking	Tan Fibrous Heterogeneous		98% Non-fibrous (other)	2% Chrysotile
15458-74 041130825-0008	Bldg 58-PWGSC owned South side sub station-electri - firestopping (cementitious)	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

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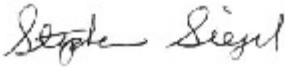
Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-75 041130825-0009	Bldg 58-PWGSC owned South side sub station-electri - firestopping (black putty)	Gray Fibrous Heterogeneous	15%	Cellulose	85% Non-fibrous (other) None Detected
15458-76 041130825-0010	Bldg 24-PWGSC owned main sub station - brick mortar	Gray Non-Fibrous Heterogeneous			100% Non-fibrous (other) None Detected
15458-77 041130825-0011	Bldg 24-PWGSC owned main sub station - caulking-window frame	Gray Non-Fibrous Heterogeneous			100% Non-fibrous (other) None Detected
15458-78 041130825-0012	Bldg 24-PWGSC owned main sub station - firestopping (black putty)	Gray Fibrous Heterogeneous	20%	Cellulose	80% Non-fibrous (other) None Detected
15458-79 041130825-0013	Bldg 30-PWGSC owned garage-exterior - putty-window frame	Cream Non-Fibrous Heterogeneous			100% Non-fibrous (other) None Detected

Suggest TEM

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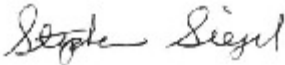
Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-80 <i>041130825-0014</i>	Bldg 30-PWGSC owned garage-exterior - rof tar	Black Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-81 <i>041130825-0015</i>	Bldg 30-PWGSC owned garage - cementitious wall coating	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

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Project: **15458/ PWGSC**

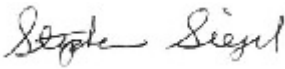
EMSL Proj:
Analysis Date: 11/21/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-62 041130296-0001	PWGSC ELECTRICAL SHOP BUILDING #16 - SHEET FLOORING- BEIGE	White Non-Fibrous Heterogeneous	15% Cellulose	85% Non-fibrous (other)	None Detected
15458-63 041130296-0002	PWGSC ELECTRICAL SHOP BUILDING #16 - SHEET FLOORING- BLUE	Blue Fibrous Heterogeneous	15% Cellulose 3% Glass	82% Non-fibrous (other)	None Detected
15458-64 041130296-0003	PWGSC ELECTRICAL SHOP BUILDING #16 - DRYWALL JOINT COMPOUND	White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-65 041130296-0004	PWGSC ELECTRICAL SHOP BUILDING #16 - DRYWALL JOINT COMPOUND	White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

Initial report from 11/21/2011 14:23:16

Analyst(s)
Adam Gart (5)


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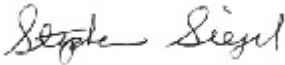
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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-66 041130296-0005	PWGSC ELECTRICAL SHOP BUILDING #16 - DRYWALL JOINT COMPOUND	White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

Initial report from 11/21/2011 14:23:16

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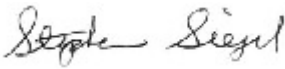
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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-42-Floor Tile 041130290-0001	PWGSC OPERATIONS BUILDING #11- 2ND FLOOR - SHEET FLOORING/GREEN	Green Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-42-Mastic 041130290-0001A	PWGSC OPERATIONS BUILDING #11- 2ND FLOOR - SHEET FLOORING/GREEN	Brown/Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-43 041130290-0002	PWGSC OPERATIONS BUILDING #11- 2ND FLOOR - DRYWALL JOINT COMPOUND	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Initial report from 11/18/2011 06:49:03

Analyst(s)

Nancy Stalter (5)
McLaughlin Paul (18)



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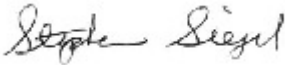
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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-44 041130290-0003	PWGSC OPERATIONS BUILDING #11- 2ND FLOOR - DRYWALL JOINT COMPOUND	White Non-Fibrous Homogeneous			100% Non-fibrous (other) None Detected
15458-45 041130290-0004	PWGSC OPERATIONS BUILDING #11- 2ND FLOOR - ACOUSTIC CEILING TILE 2X4 LARGE AND SMALL RANDOM PINHOLE	Gray Fibrous Homogeneous	60% Cellulose 30% Min. Wool		10% Non-fibrous (other) None Detected
15458-46 041130290-0005	PWGSC OPERATIONS BUILDING #11- 2ND FLOOR - DRYWALL JOINT COMPOUND	White Non-Fibrous Homogeneous			100% Non-fibrous (other) None Detected

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			% Fibrous	% Non-Fibrous	% Type
15458-47 041130290-0006	PWGSC OPERATIONS BUILDING #11- 2ND FLOOR - SHEET FLOORING/LIGHT BLUE	Gray Fibrous Homogeneous	30% Cellulose	70% Non-fibrous (other)	None Detected
15458-48-Floor Tile 041130290-0007	PWGSC OPERATIONS BUILDING #11- 2ND FLOOR - SHEET FLOORING/BLUE	Blue Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-48-Mastic 041130290-0007A	PWGSC OPERATIONS BUILDING #11- 2ND FLOOR - SHEET FLOORING/BLUE	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-49 041130290-0008	PWGSC OPERATIONS BUILDING #11- 2ND FLOOR - DRYWALL JOINT COMPOUND	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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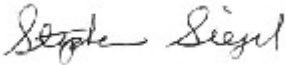
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			% Fibrous	% Non-Fibrous	% Type
15458-50 041130290-0009	PWGSC OPERATIONS BUILDING #11- 2ND FLOOR - DRYWALL JOINT COMPOUND	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-51 041130290-0010	PWGSC OPERATIONS BUILDING #11- 2ND FLOOR - ACOUSTIC CEILING TILE 2X4 LARGE AND SMALL RANDOM PINHOLE	Gray Fibrous Homogeneous	60% Cellulose 30% Min. Wool	10% Non-fibrous (other)	None Detected
15458-52 041130290-0011	PWGSC OPERATIONS BUILDING #11- MAIN FLOOR - DRYWALL JOINT COMPOUND	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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2950 Douglas Street
Unit 210
Victoria, BC V8T 4N4

Customer ID: PAEC50
Customer PO:
Received: 11/16/11 9:20 AM
EMSL Order: 041130290

Fax: (250) 384-9865 Phone: (250) 384-9695
Project: **#15458 PWGSC**

EMSL Proj:
Analysis Date: 11/17/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-53 041130290-0012	PWGSC OPERATIONS BUILDING #11- MAIN FLOOR - DRYWALL JOINT COMPOUND	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-54 041130290-0013	PWGSC OPERATIONS BUILDING #11- MAIN FLOOR - SHEET FLOORING/LIGHT GREEN	Green Fibrous Homogeneous	20% Glass	80% Non-fibrous (other)	None Detected
15458-55 041130290-0014	PWGSC OPERATIONS BUILDING #11- MAIN FLOOR - DRYWALL JOINT COMPOUND	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-56 041130290-0015	PWGSC BUTLER BUILDINGS #27- PIPE FITTER - SHEET FLOORING/GREY	Gray Fibrous Homogeneous	20% Cellulose	80% Non-fibrous (other)	None Detected

Initial report from 11/18/2011 06:49:03

Analyst(s) _____

Nancy Stalter (5)
McLaughlin Paul (18)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA-LAP, LLC-IHLAP Lab 100194, NYS ELAP 10872, NJ DEP 03036



EMSL Analytical, Inc.

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Project: **#15458 PWGSC**

EMSL Proj:
Analysis Date: 11/17/2011

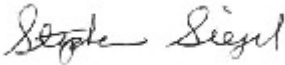
Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-57 041130290-0016	PWGSC BUTLER BUILDINGS #27- PIPE FITTER - CAULKING WINDOW FRAME	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-58 041130290-0017	PWGSC BUTLER BUILDINGS #27-SJ39 STPRE - CAULKING	Black Fibrous Homogeneous		93% Non-fibrous (other)	7% Chrysotile
15458-59 041130290-0018	PWGSC BUTLER BUILDINGS #27-SJ40 OFFICE - SHEET FLOORING/BROWN & BEIGE SQUARES	Gray Fibrous Homogeneous	30% Cellulose	50% Non-fibrous (other)	20% Chrysotile
15458-60-Floor Tile 041130290-0019	PWGSC BUTLER BUILDINGS #27-SJ40 OFFICE - FLOOR TILE 12X12 WHITE WITH BEIGE FLECKS	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Initial report from 11/18/2011 06:49:03

Analyst(s)

Nancy Stalter (5)
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Project: **#15458 PWGSC**

EMSL Proj:
Analysis Date: 11/17/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-60-Mastic 041130290-0019A	PWGSC BUTLER BUILDINGS #27-SJ40 OFFICE - FLOOR TILE 12X12 WHITE WITH BEIGE FLECKS	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-61 041130290-0020	PWGSC BUTLER BUILDINGS #27-SJ40 OFFICE - COATING	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Initial report from 11/18/2011 06:49:03

Analyst(s)

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Received: 10/31/11 8:30 AM
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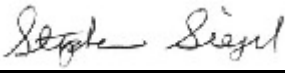
EMSL Proj:
Analysis Date: 11/3/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-37-Floor Tile 041128969-0001	EGD SAFETY & HEALTH TRAINING TRAILER - FLOOR TILE- 12" X 12" GREY	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-37-Mastic 041128969-0001A	EGD SAFETY & HEALTH TRAINING TRAILER - FLOOR TILE- 12" X 12" GREY	Tan Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-38 041128969-0002	EDG PROJECT TRAILER- 2ND FLOOR DECK WALKWAY - SHINGLE/ GRIP MAT	Black Fibrous Heterogeneous	15% Glass	85% Non-fibrous (other)	None Detected
15458-39-Linoleum 041128969-0003	EDG PROJECT TRAILER- 2ND FLOOR - SHEET FLOORING- CREAM W/TAN	Gray Fibrous Heterogeneous	15% Cellulose	85% Non-fibrous (other)	None Detected

Initial report from 11/03/2011 15:51:53

Analyst(s)
Johnny Yu (8)


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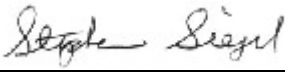
EMSL Proj:
Analysis Date: 11/3/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-39-Mastic 041128969-0003A	EDG PROJECT TRAILER- 2ND FLOOR - SHEET FLOORING- CREAM W/TAN	Yellow Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-39-Backing 041128969-0003B	EDG PROJECT TRAILER- 2ND FLOOR - SHEET FLOORING- CREAM W/TAN	Brown Fibrous Heterogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
15458-40 041128969-0004	EDG PROJECT TRAILER- EXTERIOR - DOOR CAULKING	Tan Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-41 041128969-0005	EDG PROJECT TRAILER- EXTERIOR - WINDOW CAULKING	Tan Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

Initial report from 11/03/2011 15:51:53

Analyst(s)
Johnny Yu (8)


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Customer ID: PAEC50
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Received: 10/26/11 2:55 PM
EMSL Order: 041128594

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Project: **15458 PWGSC**

EMSL Proj:
Analysis Date: 11/2/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-28 041128594-0001	Pumphouse - Welding Shop - North Wall - Cementitious Wall Coating	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-30 041128594-0002	Pumphouse - Washroom (Main Floor) - Drywall Joint Compound	White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-31 041128594-0003	Pumphouse - East Wall (Top of Stairs) - Brick Mortar	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-32-Linoleum 041128594-0004	Pumphouse - Lunch Room - Sheet Flooring - Greyish Green	Brown/Green Fibrous Heterogeneous	20% Synthetic	80% Non-fibrous (other)	None Detected
15458-32-Mastic 041128594-0004A	Pumphouse - Lunch Room - Sheet Flooring - Greyish Green	Tan Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

Initial report from 11/02/2011 09:27:18

Analyst(s)

Johnny Yu (10)

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Project: **15458 PWGSC**

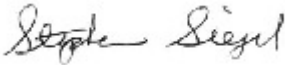
EMSL Proj:
Analysis Date: 11/2/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-33 041128594-0005	Pumphouse - Lunch Room - South Window - Caulking/Putty - Window	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-34-Skim Coat 041128594-0006	Pumphouse - Lunch Room - South Wall - Wall Coating on Concrete Substrate	White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-34-Base Coat 041128594-0006A	Pumphouse - Lunch Room - South Wall - Wall Coating on Concrete Substrate	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-35 041128594-0007	Pumphouse - Lunch Room - West Wall - Drywall Joint Compound	White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

Initial report from 11/02/2011 09:27:18

Analyst(s)
Johnny Yu (10)


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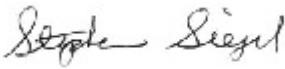
EMSL Proj:
Analysis Date: 11/2/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-36 041128594-0008	Pumphouse - Lunch Room - Washroom - Drywall Joint Compound	White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

Initial report from 11/02/2011 09:27:18

Analyst(s)
Johnny Yu (10)


Stephen Siegel, CIH, Laboratory Manager
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EMSL Order: 201113047

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Project: **15458 / PWGSC**

EMSL Proj:

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B*/7000B)

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
15458-27	0001		11/2/2011	1.9 % wt
Site: Pumphouse - Welding Shop - South Wall, Yellow				
15458-29	0002		11/2/2011	0.27 % wt
Site: Pumphouse - Welding Shop - South Wall, Lt. Green				

Initial report from 11/02/2011 13:54:47

Julie Smith - Laboratory Director
NJ-NELAP Accredited:04653
or other approved signatory

Reporting limit is 0.01 % wt. The QC data associated with these sample results included in this report meet the method quality control requirements, unless specifically indicated otherwise. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities.

* slight modifications to methods applied Samples received in good condition unless otherwise noted. Quality Control Data associated with this sample set is within acceptable limits, unless otherwise noted

Samples analyzed by EMSL Analytical, Inc. Westmont, NJ NELAP Certifications: NJ 04653, NY 10896, PA 68-00367, AIHA-LAP, LLC ELLAP 100194, A2LA 2845.01



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Received: 10/21/11 9:15 AM
EMSL Order: 041128206

Fax: (250) 384-9865 Phone: (250) 384-9695
Project: **15458/ PWGSC**

EMSL Proj:
Analysis Date: 10/28/2011

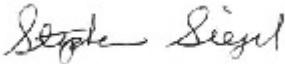
Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-14 041128206-0001	PUMPHOUSE-SCADA STORAGE ROOM - DRYWALL JOINT COMPOUND	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-15 041128206-0002	PUMPHOUSE-WORK SHOP (MAIN FLOOR) - CAULKING-WINDOW	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-16 041128206-0003	PUMPHOUSE-HYDRAULIC ROOM - BRICK MORTAR/ FIRESTOPPING	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-18 041128206-0004	PUMPHOUSE-PENSTOCK ROOM (SOUTH WALL) - WALL COATING	Gray/Green Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Initial report from 10/28/2011 20:15:04

Analyst(s)

McLaughlin Paul (10)



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EMSL Order: 041128206

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Project: **15458/ PWGSC**

EMSL Proj:
Analysis Date: 10/28/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-19 041128206-0005	PUMPHOUSE- MAIN PENSTOCK BUILDING - CAULKING- HYDRAULIC CYLINDER COVER	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-21 041128206-0006	PUMPHOUSE- MAIN PENSTOCK BUILDING - MORTAR- EXPANSION JOINT	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-22 041128206-0007	PUMPHOUSE- WEST WALL - CAULKING- INTERIOR WINDOW	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-24 041128206-0008	PUMPHOUSE- WEST WALL - CAULKING- EXTERIOR WINDOW	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Initial report from 10/28/2011 20:15:04

Analyst(s)

McLaughlin Paul (10)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA-LAP, LLC-IHLAP Lab 100194, NYS ELAP 10872, NJ DEP 03036



EMSL Analytical, Inc.

200 Route 130 North, Cinnaminson, NJ 08077

Phone: (800) 220-3675 Fax: (856) 786-5974 Email: cinnaslab@EMSL.com

Attn: **Janet Peto**
North West Environmental Group
2950 Douglas Street
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Customer ID: PAEC50
Customer PO:
Received: 10/21/11 9:15 AM
EMSL Order: 041128206

Fax: (250) 384-9865 Phone: (250) 384-9695
Project: **15458/ PWGSC**

EMSL Proj:
Analysis Date: 10/28/2011

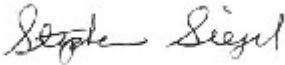
Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-25 041128206-0009	PUMPHOUSE- WEST WALL - WALL COATING- INTERIOR WALL	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-26 041128206-0010	PUMPHOUSE- MECHANICAL - GASKET- COMPRESSOR A- 13271	Green Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Initial report from 10/28/2011 20:15:04

Analyst(s)

McLaughlin Paul (10)



Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

November 30, 2011

Site: **Esquimalt Graving Dock**

Sampled by: Client Job or PO #
Project Number

JS
15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-01	Bldg 67 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Sheet Flooring	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass Cellulose	85 10 5
15458-02	Bldg 67 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Roofing Caulk	Various Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-03	Bldg 20 - PWGSC Owned Blue Washrooms - Men's Room	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-04	Bldg 20 - PWGSC Owned Blue Washrooms - Men's Room	10/24/11	EM	Beige Trowel on Flooring	Beige Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-05	Bldg 20 - PWGSC Owned Blue Washrooms - Exterior	10/24/11	EM	Caulk	Grey/Clear Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-06	Bldg 20 - PWGSC Owned Blue - Mechanical Room - South Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-07	Bldg 20 - PWGSC Owned Blue Washrooms - Mechanical Room - North Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-08	Bldg ## - PWGSC New Guard Shack	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-09	Bldg ## - PWGSC New Guard Shack - Exterior	10/24/11	EM	Caulk	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-10	Bldg 38 - PWGSC Owned Guard House - Front Gate - Exterior	10/24/11	EM	Shingles	Grey/Black Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-11	Bldg 38 - PWGSC Owned Guard House - Office	10/24/11	EM	Sheet Flooring	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-12	Bldg 38 - PWGSC Owned Guard House - Office	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-13	Bldg 38 - PWGSC Owned Guard House - Washroom	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-14	Bldg 31 - PWGSC Owned Pump House - Scada Storage Room	10/28/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-15	Bldg 31 - PWGSC Owned Pump House - Work Shop	10/28/11	EM	Caulking - Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-16	Bldg 31 - PWGSC Owned Pump House - Hydraulic Room	10/28/11	EM	Brick Mortar/Firestopping	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-18	Bldg 32 - PWGSC Owned Middle Dock Stairwell (South Wall)	10/28/11	EM	Wall Coating	Grey/Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-19	Bldg 26 - PWGSC Penstock Structure (Exterior)	10/28/11	EM	Caulking - Hydraulic Cylinder Cover	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-21	Bldg 26 - PWGSC Penstock Structure (Interior)	10/28/11	EM	Mortar - Expansion Joint	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-22	Bldg 31 - PWGSC Owned Pump House - Perimeter West Wall	10/28/11	EM	Caulking - Interior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-24	Bldg 31 - PWGSC Owned Pump House - West Wall (Exterior)	10/28/11	EM	Caulking - Exterior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-25	Bldg 31 - PWGSC Owned Pump House - West Wall (Interior)	10/28/11	EM	Wall Coating - Interior Wall	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-26	Bldg 31 - PWGSC Owned Pump House - Mechanical	10/28/11	EM	Gasket - Compressor A-13271	Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-28	Bldg 29 - PWGSC Owned Welding Shop - (North Wall)	11/02/11	EM	Cementitious Wall Coating	Grey Non-Fibrous Heterogeneous	100	None Detected	0	None-Fibrous	100
15458-30	Bldg 31 - PWGSC Owned Pump House - Washroom (Main Floor)	11/02/11	EM	Drywall Joint Compound	White Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-31	Bldg 31 - PWGSC Owned Pump House - East Wall (Top of Stairs)	11/02/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-32 Layer 1	Bldg 31 - PWGSC Owned Pump House - Lunch Room	11/02/11	EM	Sheet Flooring - Greyish Green	Brown/Green Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous Synthetic	80 20
15458-32 Layer 2	Bldg 31 - PWGSC Owned Pump House - Lunch Room	11/02/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-33	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Windows)	11/02/11	EM	Caulking/Putty - Window	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-34 Layer 1	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Skim Coat	White Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100



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November 30, 2011

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15458**

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-34 Layer 2	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Base Coat	Grey Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-35	Bldg 31 - PWGSC Owned Pump House - Lunch Room (West Wall)	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-36	Bldg 31 - PWGSC Owned Pump House - Lunch Room - Washroom	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-37 Layer 1	Bldg ## - PWGSC Security Trailer (H&S Training)	11/03/11	EM	Floor Tile - 12"x12" Grey	Grey Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-37 Layer 2	Bldg ## - PWGSC Security Trailer (H&S Training)	11/03/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-38	Bldg 19 - PWGSC Administration Trailers - 2nd Floor - Deck Walkway	11/03/11	EM	Shingle/Grip Mat	Black Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15
15458-39 Layer 1	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Sheet Flooring - Cream w/ Tan	Grey Fibrous Heterogeneous	33	None Detected	0	Non-Fibrous Cellulose	85 15
15458-39 Layer 2	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Mastic	Yellow Non-Fibrous Heterogeneous	33	None Detected	0	Non-Fibrous	100
15458-39 Layer 3	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Backing	Brown Fibrous Heterogeneous	34	None Detected	0	Cellulose Non-Fibrous	85 15
15458-40	Bldg 19 - PWGSC Administration Trailers - Exterior	11/03/11	EM	Door Caulking	Tan Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100

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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC** **November 30, 2011**

Site: **Esquimalt Graving Dock** Sampled by: /Client Job or PO # **JS**

Project Number **15458**

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-41	Bldg 19 - PWGSC Administration Trailers - Exterior	11/03/11	EM	Window Caulking	Tan Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-42 Layer 1	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Men's Bathroom	11/17/11	EM	Sheet Flooring - Green	Green Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-42 Layer 2	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Men's Bathroom	11/17/11	EM	Mastic	Brown/Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-43	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Women's Bathroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-44	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Kitchenette/Hallway	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-45	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Kitchenette/Hallway	11/17/11	EM	Acoustic Ceiling Tile - 2'x4' - Large & Small Random Pinhole	Grey Fibrous Homogeneous	100	None Detected	0	Cellulose Mineral Wool Non-Fibrous	60 30 10
15458-46	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Reception/Office Area	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-47	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Hallway by Boardroom	11/17/11	EM	Sheet Flooring - Lt. Blue	Grey Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Cellulose	70 30
15458-48 Layer 1	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Sheet Flooring - Blue	Blue Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-48 Layer 2	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Mastic	Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100



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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

Site: **Esquimalt Graving Dock**

November 30, 2011

Sampled by: Client Job or PO #	JS
Project Number	15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-49	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-50	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Open Office Area	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-51	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Open Office Area	11/17/11	EM	Acoustic Ceiling Tile - 2'x4' - Large & Small Random Pinhole	Grey Fibrous Homogeneous	100	None Detected	0	Cellulose Mineral Wool Non-Fibrous	60 30 10
15458-52	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Entrance/Hallway	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-53	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Stairwell Bottom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-54	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Stairwell Bottom	11/17/11	EM	Sheet Flooring - Lt. Green	Green Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Glass	80 20
15458-55	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Lunchroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-56	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - Pipe Fitter Trailer	11/17/11	EM	Sheet Flooring - Grey	Grey Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Cellulose	80 20
15458-57	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - Pipe Fitter Trailer (Exterior)	11/17/11	EM	Caulking - Window Frame	Tan Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-58	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - SJ39 Stores - (Exterior)	11/17/11	EM	Caulking	Black Fibrous Homogeneous	100	Chrysotile	7	Non-Fibrous	93



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-59	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J40 Offices	11/17/11	EM	Sheet Flooring - Brown & Beige Squares	Grey Fibrous Homogeneous	100	Chrysotile	20	Non-Fibrous Cellulose	50 30
15458-60 Layer 1	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J40 Offices	11/17/11	EM	Floor Tile - 12"x12" White with Beige Flecks	Grey Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-60 Layer 2	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J40 Offices	11/17/11	EM	Mastic	Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-61	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J40 Offices - Balcony Steps	11/17/11	EM	Coating	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-62	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Storage Room	11/21/11	EM	Sheet Flooring - Beige	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose	85 15
15458-63	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Stairway	11/22/11	EM	Sheet Flooring - Blue	Blue Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose Glass	82 15 3
15458-64	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Storage Room	11/23/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-65	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Mezzanine	11/24/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-66	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Mezzanine	11/25/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-67	Bldg 31 - PWGSC Owned Pump House - Office	11/28/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-68	Bldg 31 - PWGSC Owned Pump House - Office	11/28/11	EM	Concrete Cementitious	Grey Non-Fibrous Heterogeneous	100	Chrysotile	< 1	Non-Fibrous	100
15458-69	Bldg 31 - PWGSC Owned Pump House - Office	11/28/11	EM	Acoustic Ceiling Tile - 2'x2' - Random Fissure & Small Pinhole	Grey/White Fibrous Heterogeneous	100	None Detected	0	Cellulose Non-Fibrous Mineral Wool	60 20 20
15458-70	Bldg 31 - PWGSC Owned Pump House - Basement - Pump	11/28/11	EM	Gasket	Various Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Synthetic	90 10
15458-71	Bldg 58 - PWGSC Owned South Side Sub. Station - Compressor	11/28/11	EM	Gasket	Grey/Green Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Wollastonite	80 20
15458-72	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-73 Layer 1	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Caulking - Grey	Grey Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	98
15458-73 Layer 2	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Caulking - Tan	Tan Fibrous Heterogeneous	50	Chrysotile	2	Non-Fibrous	98
15458-74	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Firestopping (Cementitious)	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-75	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Firestopping (Black Putty)	Grey Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose	85 15
15458-76	Bldg 24 - PWGSC Owned Main Sub. Station	11/28/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100

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Site: **Esquimalt Graving Dock** Sampled by: /Client Job or PO # **JS**

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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-77	Bldg 24 - PWGSC Owned Main Sub. Station	11/28/11	EM	Caulking - Window Frame	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-78	Bldg 24 - PWGSC Owned Main Sub. Station	11/28/11	EM	Firestopping (Black Putty)	Grey Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose	80 20
15458-79	Bldg 30 - PWGSC Owned Garage - Exterior	11/28/11	EM	Putty - Window Frame	Cream Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-80	Bldg 30 - PWGSC Owned Garage - Exterior	11/28/11	EM	Roof Tar	Black Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-81	Bldg 30 - PWGSC Owned Garage	11/28/11	EM	Cementitious Wall Coating	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-82	Bldg 41 - PWGSC Owned Winch Building	11/29/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-83 Layer 1	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Storage/Furnace Room	11/29/11	EM	Floor Tile - White 12" x 12"	Brown Non-Fibrous Heterogeneous	50	Chrysotile	3	Non-Fibrous	97
15458-83 Layer 2	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Storage/Furnace Room	11/29/11	EM	Mastic	Black Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-84 Layer 1	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Storage/Locker Room	11/29/11	EM	Sheet Flooring - Peach	Peach Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-84 Layer 2	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Storage/Locker Room	11/29/11	EM	Mastic	Brown Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous Cellulose	95 5



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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

November 30, 2011

Site: **Esquimalt Graving Dock**

Sampled by: Client Job or PO #
Project Number

JS
15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-85 Layer 1	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Women's Washroom	11/29/11	EM	Sheet Flooring - Lt. Pink (Layer 1)	Pink Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-85 Layer 2	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Women's Washroom	11/29/11	EM	Mastic	Brown Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-86	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Women's Washroom	11/29/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-87	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Women's Washroom	11/29/11	EM	Sheet Flooring - Yellow/Brown (Layer 2)	Tan Non-Fibrous Heterogeneous	100	Chrysotile	15	Non-Fibrous Cellulose	80 5
15458-88	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Men's Washroom	11/29/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-89 Layer 1	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Men's Washroom	11/29/11	EM	Sheet Flooring - White	Grey/White Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous Cellulose Glass	75 20 5
15458-89 Layer 2	Bldg 7 - DND Property - PWGSC Washrooms (Back Lot) - Men's Washroom	11/29/11	EM	Mastic	Brown/Black Non-Fibrous Heterogeneous	50	Chrysotile	< 1	Non-Fibrous Cellulose	90 10
15458-90	Bldg 68 - PWGSC Washroom Trailer (Electrical Shop) - Exterior	11/29/11	EM	Caulking	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-91	Bldg 68 - PWGSC Washroom Trailer (Electrical Shop)	11/29/11	EM	Sheet Flooring - Lt. Grey	Grey/White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-92	Bldg 68 - PWGSC Washroom Trailer (Electrical Shop)	11/29/11	EM	Caulking	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100



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15458-93	Bldg 3 - DND Property - PWGSC Guard House (Back Gate)	11/29/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	None Detected	100	Non-Fibrous	100
15458-94 Layer 1	Bldg 3 - DND Property - PWGSC Guard House (Back Gate)	11/29/11	EM	Floor Tile - White 12" x 12"	White Non-Fibrous Heterogeneous	None Detected	50	Non-Fibrous	100
15458-94 Layer 2	Bldg 3 - DND Property - PWGSC Guard House (Back Gate)	11/29/11	EM	Mastic	Black Non-Fibrous Heterogeneous	None Detected	50	Non-Fibrous	100



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15458-01	Bldg 67 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Sheet Flooring	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass Cellulose	85 10 5
15458-02	Bldg 67 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Roofing Caulk	Various Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-03	Bldg 20 - PWGSC Owned Blue Washrooms - Men's Room	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-04	Bldg 20 - PWGSC Owned Blue Washrooms - Men's Room	10/24/11	EM	Beige Trowel on Flooring	Beige Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-05	Bldg 20 - PWGSC Owned Blue Washrooms - Exterior	10/24/11	EM	Caulk	Grey/Clear Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-06	Bldg 20 - PWGSC Owned Blue - Mechanical Room - South Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-07	Bldg 20 - PWGSC Owned Blue Washrooms - Mechanical Room - North Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-08	Bldg ## - PWGSC New Guard Shack	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-09	Bldg ## - PWGSC New Guard Shack - Exterior	10/24/11	EM	Caulk	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-10	Bldg 38 - PWGSC Owned Guard House - Front Gate - Exterior	10/24/11	EM	Shingles	Grey/Black Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15



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15458-11	Bldg 38 - PWGSC Owned Guard House - Office	10/24/11	EM	Sheet Flooring	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-12	Bldg 38 - PWGSC Owned Guard House - Office	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-13	Bldg 38 - PWGSC Owned Guard House - Washroom	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-14	Bldg 31 - PWGSC Owned Pump House - Scada Storage Room	10/28/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-15	Bldg 31 - PWGSC Owned Pump House - Work Shop	10/28/11	EM	Caulking - Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-16	Bldg 31 - PWGSC Owned Pump House - Hydraulic Room	10/28/11	EM	Brick Mortar/Firestopping	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-18	Bldg 32 - PWGSC Owned Middle Dock Stairwell (South Wall)	10/28/11	EM	Wall Coating	Grey/Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-19	Bldg 26 - PWGSC Penstock Structure (Exterior)	10/28/11	EM	Caulking - Hydraulic Cylinder Cover	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-21	Bldg 26 - PWGSC Penstock Structure (Interior)	10/28/11	EM	Mortar - Expansion Joint	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-22	Bldg 31 - PWGSC Owned Pump House - Perimeter West Wall	10/28/11	EM	Caulking - Interior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100



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15458-24	Bldg 31 - PWGSC Owned Pump House - West Wall (Exterior)	10/28/11	EM	Caulking - Exterior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-25	Bldg 31 - PWGSC Owned Pump House - West Wall (Interior)	10/28/11	EM	Wall Coating - Interior Wall	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-26	Bldg 31 - PWGSC Owned Pump House - Mechanical	10/28/11	EM	Gasket - Compressor A-13271	Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-28	Bldg 29 - PWGSC Owned Welding Shop - (North Wall)	11/02/11	EM	Cementitious Wall Coating	Grey Non-Fibrous Heterogeneous	100	None Detected	0	None-Fibrous	100
15458-30	Bldg 31 - PWGSC Owned Pump House - Washroom (Main Floor)	11/02/11	EM	Drywall Joint Compound	White Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-31	Bldg 31 - PWGSC Owned Pump House - East Wall (Top of Stairs)	11/02/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-32 Layer 1	Bldg 31 - PWGSC Owned Pump House - Lunch Room	11/02/11	EM	Sheet Flooring - Greyish Green	Brown/Green Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous Synthetic	80 20
15458-32 Layer 2	Bldg 31 - PWGSC Owned Pump House - Lunch Room	11/02/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-33	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Windows)	11/02/11	EM	Caulking/Putty - Window	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-34 Layer 1	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Skim Coat	White Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100



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15458-34 Layer 2	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Base Coat	Grey Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-35	Bldg 31 - PWGSC Owned Pump House - Lunch Room (West Wall)	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-36	Bldg 31 - PWGSC Owned Pump House - Lunch Room - Washroom	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-37 Layer 1	Bldg ## - PWGSC Security Trailer (H&S Training)	11/03/11	EM	Floor Tile - 12"x12" Grey	Grey Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-37 Layer 2	Bldg ## - PWGSC Security Trailer (H&S Training)	11/03/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-38	Bldg 19 - PWGSC Administration Trailers - 2nd Floor - Deck Walkway	11/03/11	EM	Shingle/Grip Mat	Black Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15
15458-39 Layer 1	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Sheet Flooring - Cream w/ Tan	Grey Fibrous Heterogeneous	33	None Detected	0	Non-Fibrous Cellulose	85 15
15458-39 Layer 2	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Mastic	Yellow Non-Fibrous Heterogeneous	33	None Detected	0	Non-Fibrous	100
15458-39 Layer 3	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Backing	Brown Fibrous Heterogeneous	34	None Detected	0	Cellulose Non-Fibrous	85 15
15458-40	Bldg 19 - PWGSC Administration Trailers - Exterior	11/03/11	EM	Door Caulking	Tan Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100



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15458-41	Bldg 19 - PWGSC Administration Trailers - Exterior	11/03/11	EM	Window Caulking	Tan Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-42 Layer 1	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Men's Bathroom	11/17/11	EM	Sheet Flooring - Green	Green Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-42 Layer 2	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Men's Bathroom	11/17/11	EM	Mastic	Brown/Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-43	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Women's Bathroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-44	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Kitchenette/Hallway	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-45	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Kitchenette/Hallway	11/17/11	EM	Acoustic Ceiling Tile - 2'x4' - Large & Small Random Pinhole	Grey Fibrous Homogeneous	100	None Detected	0	Cellulose Mineral Wool Non-Fibrous	60 30 10
15458-46	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Reception/Office Area	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-47	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Hallway by Boardroom	11/17/11	EM	Sheet Flooring - Lt. Blue	Grey Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Cellulose	70 30
15458-48 Layer 1	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Sheet Flooring - Blue	Blue Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-48 Layer 2	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Mastic	Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100



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15458-49	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-50	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Open Office Area	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-51	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Open Office Area	11/17/11	EM	Acoustic Ceiling Tile - 2'x4' - Large & Small Random Pinhole	Grey Fibrous Homogeneous	100	None Detected	0	Cellulose Mineral Wool Non-Fibrous	60 30 10
15458-52	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Entrance/Hallway	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-53	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Stairwell Bottom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-54	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Stairwell Bottom	11/17/11	EM	Sheet Flooring - Lt. Green	Green Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Glass	80 20
15458-55	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Lunchroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-56	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - Pipe Fitter Trailer	11/17/11	EM	Sheet Flooring - Grey	Grey Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Cellulose	80 20
15458-57	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - Pipe Fitter Trailer (Exterior)	11/17/11	EM	Caulking - Window Frame	Tan Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-58	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J39 Stores - (Exterior)	11/17/11	EM	Caulking	Black Fibrous Homogeneous	100	Chrysotile	7	Non-Fibrous	93



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15458-59	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - SJ40 Offices	11/17/11	EM	Sheet Flooring - Brown & Beige Squares	Grey Fibrous Homogeneous	100	Chrysotile	20	Non-Fibrous Cellulose	50 30
15458-60 Layer 1	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - SJ40 Offices	11/17/11	EM	Floor Tile - 12"x12" White with Beige Flecks	Grey Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-60 Layer 2	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - SJ40 Offices	11/17/11	EM	Mastic	Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-61	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - SJ40 Offices - Balcony Steps	11/17/11	EM	Coating	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-62	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Storage Room	11/21/11	EM	Sheet Flooring - Beige	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose	85 15
15458-63	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Stairway	11/22/11	EM	Sheet Flooring - Blue	Blue Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose Glass	82 15 3
15458-64	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Storage Room	11/23/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-65	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Mezzanine	11/24/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-66	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Mezzanine	11/25/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-67	Bldg 31 - PWGSC Owned Pump House - Office	11/28/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100



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15458-68	Bldg 31 - PWGSC Owned Pump House - Office	11/28/11	EM	Concrete Cementitious	Grey Non-Fibrous Heterogeneous	100	Chrysotile	< 1	Non-Fibrous	100
15458-69	Bldg 31 - PWGSC Owned Pump House - Office	11/28/11	EM	Acoustic Ceiling Tile - 2'x2' - Random Fissure & Small Pinhole	Grey/White Fibrous Heterogeneous	100	None Detected	0	Cellulose Non-Fibrous Mineral Wool	60 20 20
15458-70	Bldg 31 - PWGSC Owned Pump House - Basement - Pump	11/28/11	EM	Gasket	Various Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Synthetic	90 10
15458-71	Bldg 58 - PWGSC Owned South Side Sub. Station - Compressor	11/28/11	EM	Gasket	Grey/Green Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Wollastonite	80 20
15458-72	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-73 Layer 1	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Caulking - Grey	Grey Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	98
15458-73 Layer 2	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Caulking - Tan	Tan Fibrous Heterogeneous	50	Chrysotile	2	Non-Fibrous	98
15458-74	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Firestopping (Cementitious)	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-75	Bldg 58 - PWGSC Owned South Side Sub. Station - Electrical Generator Room	11/28/11	EM	Firestopping (Black Putty)	Grey Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose	85 15
15458-76	Bldg 24 - PWGSC Owned Main Sub. Station	11/28/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100



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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

Site: **Esquimalt Graving Dock**

November 28, 2011

Sampled by: / Client Job or PO #	JS
Project Number	15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-77	Bldg 24 - PWGSC Owned Main Sub. Station	11/28/11	EM	Caulking - Window Frame	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-78	Bldg 24 - PWGSC Owned Main Sub. Station	11/28/11	EM	Firestopping (Black Putty)	Grey Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose	80 20
15458-79	Bldg 30 - PWGSC Owned Garage - Exterior	11/28/11	EM	Putty - Window Frame	Cream Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-80	Bldg 30 - PWGSC Owned Garage - Exterior	11/28/11	EM	Roof Tar	Black Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-81	Bldg 30 - PWGSC Owned Garage	11/28/11	EM	Cementitious Wall Coating	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100



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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

November 21, 2011

Site: **Esquimalt Graving Dock**

Sampled by: Client Job or PO #
Project Number

**JS
15458**

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-01	Bldg 67 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Sheet Flooring	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass Cellulose	85 10 5
15458-02	Bldg 67 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Roofing Caulk	Various Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-03	Bldg 20 - PWGSC Owned Blue Washrooms - Men's Room	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-04	Bldg 20 - PWGSC Owned Blue Washrooms - Men's Room	10/24/11	EM	Beige Trowel on Flooring	Beige Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-05	Bldg 20 - PWGSC Owned Blue Washrooms - Exterior	10/24/11	EM	Caulk	Grey/Clear Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-06	Bldg 20 - PWGSC Owned Blue - Mechanical Room - South Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-07	Bldg 20 - PWGSC Owned Blue Washrooms - Mechanical Room - North Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-08	Bldg ## - PWGSC New Guard Shack	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-09	Bldg ## - PWGSC New Guard Shack - Exterior	10/24/11	EM	Caulk	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-10	Bldg 38 - PWGSC Owned Guard House - Front Gate - Exterior	10/24/11	EM	Shingles	Grey/Black Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15



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15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-11	Bldg 38 - PWGSC Owned Guard House - Office	10/24/11	EM	Sheet Flooring	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-12	Bldg 38 - PWGSC Owned Guard House - Office	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-13	Bldg 38 - PWGSC Owned Guard House - Washroom	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-14	Bldg 31 - PWGSC Owned Pump House - Scada Storage Room	10/28/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-15	Bldg 31 - PWGSC Owned Pump House - Work Shop	10/28/11	EM	Caulking - Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-16	Bldg 31 - PWGSC Owned Pump House - Hydraulic Room	10/28/11	EM	Brick Mortar/Firestopping	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-18	Bldg 32 - PWGSC Owned Middle Dock Stairwell (South Wall)	10/28/11	EM	Wall Coating	Grey/Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-19	Bldg 26 - PWGSC Penstock Structure (Exterior)	10/28/11	EM	Caulking - Hydraulic Cylinder Cover	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-21	Bldg 26 - PWGSC Penstock Structure (Interior)	10/28/11	EM	Mortar - Expansion Joint	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-22	Bldg 31 - PWGSC Owned Pump House - Perimeter West Wall	10/28/11	EM	Caulking - Interior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100



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November 21, 2011

Site: **Esquimalt Graving Dock**

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15458**

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-24	Bldg 31 - PWGSC Owned Pump House - West Wall (Exterior)	10/28/11	EM	Caulking - Exterior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-25	Bldg 31 - PWGSC Owned Pump House - West Wall (Interior)	10/28/11	EM	Wall Coating - Interior Wall	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-26	Bldg 31 - PWGSC Owned Pump House - Mechanical	10/28/11	EM	Gasket - Compressor A-13271	Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-28	Bldg 29 - PWGSC Owned Welding Shop - (North Wall)	11/02/11	EM	Cementitious Wall Coating	Grey Non-Fibrous Heterogeneous	100	None Detected	0	None-Fibrous	100
15458-30	Bldg 31 - PWGSC Owned Pump House - Washroom (Main Floor)	11/02/11	EM	Drywall Joint Compound	White Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-31	Bldg 31 - PWGSC Owned Pump House - East Wall (Top of Stairs)	11/02/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-32 Layer 1	Bldg 31 - PWGSC Owned Pump House - Lunch Room	11/02/11	EM	Sheet Flooring - Greyish Green	Brown/Green Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous Synthetic	80 20
15458-32 Layer 2	Bldg 31 - PWGSC Owned Pump House - Lunch Room	11/02/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-33	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Windows)	11/02/11	EM	Caulking/Putty - Window	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-34 Layer 1	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Skim Coat	White Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-34 Layer 2	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Base Coat	Grey Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-35	Bldg 31 - PWGSC Owned Pump House - Lunch Room (West Wall)	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-36	Bldg 31 - PWGSC Owned Pump House - Lunch Room - Washroom	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-37 Layer 1	Bldg ## - PWGSC Security Trailer (H&S Training)	11/03/11	EM	Floor Tile - 12"x12" Grey	Grey Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-37 Layer 2	Bldg ## - PWGSC Security Trailer (H&S Training)	11/03/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-38	Bldg 19 - PWGSC Administration Trailers - 2nd Floor - Deck Walkway	11/03/11	EM	Shingle/Grip Mat	Black Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15
15458-39 Layer 1	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Sheet Flooring - Cream w/ Tan	Grey Fibrous Heterogeneous	33	None Detected	0	Non-Fibrous Cellulose	85 15
15458-39 Layer 2	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Mastic	Yellow Non-Fibrous Heterogeneous	33	None Detected	0	Non-Fibrous	100
15458-39 Layer 3	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Backing	Brown Fibrous Heterogeneous	34	None Detected	0	Cellulose Non-Fibrous	85 15
15458-40	Bldg 19 - PWGSC Administration Trailers - Exterior	11/03/11	EM	Door Caulking	Tan Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-41	Bldg 19 - PWGSC Administration Trailers - Exterior	11/03/11	EM	Window Caulking	Tan Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-42 Layer 1	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Men's Bathroom	11/17/11	EM	Sheet Flooring - Green	Green Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-42 Layer 2	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Men's Bathroom	11/17/11	EM	Mastic	Brown/Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-43	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Women's Bathroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-44	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Kitchenette/Hallway	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-45	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Kitchenette/Hallway	11/17/11	EM	Acoustic Ceiling Tile - 2'x4' - Large & Small Random Pinhole	Grey Fibrous Homogeneous	100	None Detected	0	Cellulose Mineral Wool Non-Fibrous	60 30 10
15458-46	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Reception/Office Area	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-47	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Hallway by Boardroom	11/17/11	EM	Sheet Flooring - Lt. Blue	Grey Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Cellulose	70 30
15458-48 Layer 1	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Sheet Flooring - Blue	Blue Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-48 Layer 2	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Mastic	Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-49	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-50	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Open Office Area	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-51	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Open Office Area	11/17/11	EM	Acoustic Ceiling Tile - 2'x4' - Large & Small Random Pinhole	Grey Fibrous Homogeneous	100	None Detected	0	Cellulose Mineral Wool Non-Fibrous	60 30 10
15458-52	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Entrance/Hallway	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-53	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Stairwell Bottom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-54	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Stairwell Bottom	11/17/11	EM	Sheet Flooring - Lt. Green	Green Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Glass	80 20
15458-55	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Lunchroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-56	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - Pipe Fitter Trailer	11/17/11	EM	Sheet Flooring - Grey	Grey Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Cellulose	80 20
15458-57	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - Pipe Fitter Trailer (Exterior)	11/17/11	EM	Caulking - Window Frame	Tan Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-58	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - SJ39 Stores - (Exterior)	11/17/11	EM	Caulking	Black Fibrous Homogeneous	100	Chrysotile	7	Non-Fibrous	93



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15458-59	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J40 Offices	11/17/11	EM	Sheet Flooring - Brown & Beige Squares	Grey Fibrous Homogeneous	100	Chrysotile	20	Non-Fibrous Cellulose	50 30
15458-60 Layer 1	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J40 Offices	11/17/11	EM	Floor Tile - 12"x12" White with Beige Flecks	Grey Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-60 Layer 2	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J40 Offices	11/17/11	EM	Mastic	Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-61	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J40 Offices	11/17/11	EM	Coating	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-62	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Storage Room	11/21/11	EM	Sheet Flooring - Beige	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose	85 15
15458-63	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Stairway	11/22/11	EM	Sheet Flooring - Blue	Blue Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Cellulose Glass	82 15 3
15458-64	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Storage Room	11/23/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-65	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Mezzanine	11/24/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-66	Bldg 16 - PWGSC Owned Electrical Shop Building - NS29 - Mezzanine	11/25/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-01	Bldg 67 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Sheet Flooring	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass Cellulose	85 10 5
15458-02	Bldg 67 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Roofing Caulk	Various Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-03	Bldg 20 - PWGSC Owned Blue Washrooms - Men's Room	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-04	Bldg 20 - PWGSC Owned Blue Washrooms - Men's Room	10/24/11	EM	Beige Trowel on Flooring	Beige Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-05	Bldg 20 - PWGSC Owned Blue Washrooms - Exterior	10/24/11	EM	Caulk	Grey/Clear Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-06	Bldg 20 - PWGSC Owned Blue - Mechanical Room - South Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-07	Bldg 20 - PWGSC Owned Blue Washrooms - Mechanical Room - North Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-08	Bldg ## - PWGSC New Guard Shack	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-09	Bldg ## - PWGSC New Guard Shack - Exterior	10/24/11	EM	Caulk	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-10	Bldg 38 - PWGSC Owned Guard House - Front Gate - Exterior	10/24/11	EM	Shingles	Grey/Black Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-11	Bldg 38 - PWGSC Owned Guard House - Office	10/24/11	EM	Sheet Flooring	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-12	Bldg 38 - PWGSC Owned Guard House - Office	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-13	Bldg 38 - PWGSC Owned Guard House - Washroom	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-14	Bldg 31 - PWGSC Owned Pump House - Scada Storage Room	10/28/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-15	Bldg 31 - PWGSC Owned Pump House - Work Shop	10/28/11	EM	Caulking - Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-16	Bldg 31 - PWGSC Owned Pump House - Hydraulic Room	10/28/11	EM	Brick Mortar/Firestopping	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-18	Bldg 32 - PWGSC Owned Middle Dock Stairwell (South Wall)	10/28/11	EM	Wall Coating	Grey/Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-19	Bldg 26 - PWGSC Penstock Structure (Exterior)	10/28/11	EM	Caulking - Hydraulic Cylinder Cover	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-21	Bldg 26 - PWGSC Penstock Structure (Interior)	10/28/11	EM	Mortar - Expansion Joint	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-22	Bldg 31 - PWGSC Owned Pump House - Perimeter West Wall	10/28/11	EM	Caulking - Interior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100



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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

November 21, 2011

Site: **Esquimalt Graving Dock**

Sampled by: Client Job or PO #
Project Number

JS
15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-24	Bldg 31 - PWGSC Owned Pump House - West Wall (Exterior)	10/28/11	EM	Caulking - Exterior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-25	Bldg 31 - PWGSC Owned Pump House - West Wall (Interior)	10/28/11	EM	Wall Coating - Interior Wall	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-26	Bldg 31 - PWGSC Owned Pump House - Mechanical	10/28/11	EM	Gasket - Compressor A-13271	Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-28	Bldg 29 - PWGSC Owned Welding Shop - (North Wall)	11/02/11	EM	Cementitious Wall Coating	Grey Non-Fibrous Heterogeneous	100	None Detected	0	None-Fibrous	100
15458-30	Bldg 31 - PWGSC Owned Pump House - Washroom (Main Floor)	11/02/11	EM	Drywall Joint Compound	White Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-31	Bldg 31 - PWGSC Owned Pump House - East Wall (Top of Stairs)	11/02/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-32 Layer 1	Bldg 31 - PWGSC Owned Pump House - Lunch Room	11/02/11	EM	Sheet Flooring - Greyish Green	Brown/Green Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous Synthetic	80 20
15458-32 Layer 2	Bldg 31 - PWGSC Owned Pump House - Lunch Room	11/02/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-33	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Windows)	11/02/11	EM	Caulking/Putty - Window	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-34 Layer 1	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Skim Coat	White Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-34 Layer 2	Bldg 31 - PWGSC Owned Pump House - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Base Coat	Grey Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-35	Bldg 31 - PWGSC Owned Pump House - Lunch Room (West Wall)	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-36	Bldg 31 - PWGSC Owned Pump House - Lunch Room - Washroom	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-37 Layer 1	Bldg ## - PWGSC Security Trailer (H&S Training)	11/03/11	EM	Floor Tile - 12"x12" Grey	Grey Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-37 Layer 2	Bldg ## - PWGSC Security Trailer (H&S Training)	11/03/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-38	Bldg 19 - PWGSC Administration Trailers - 2nd Floor - Deck Walkway	11/03/11	EM	Shingle/Grip Mat	Black Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15
15458-39 Layer 1	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Sheet Flooring - Cream w/ Tan	Grey Fibrous Heterogeneous	33	None Detected	0	Non-Fibrous Cellulose	85 15
15458-39 Layer 2	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Mastic	Yellow Non-Fibrous Heterogeneous	33	None Detected	0	Non-Fibrous	100
15458-39 Layer 3	Bldg 19 - PWGSC Administration Trailers - 2nd Floor	11/03/11	EM	Backing	Brown Fibrous Heterogeneous	34	None Detected	0	Cellulose Non-Fibrous	85 15
15458-40	Bldg 19 - PWGSC Administration Trailers - Exterior	11/03/11	EM	Door Caulking	Tan Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-41	Bldg 19 - PWGSC Administration Trailers - Exterior	11/03/11	EM	Window Caulking	Tan Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-42 Layer 1	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Men's Bathroom	11/17/11	EM	Sheet Flooring - Green	Green Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-42 Layer 2	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Men's Bathroom	11/17/11	EM	Mastic	Brown/Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-43	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Women's Bathroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-44	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Kitchenette/Hallway	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-45	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Kitchenette/Hallway	11/17/11	EM	Acoustic Ceiling Tile - 2'x4' - Large & Small Random Pinhole	Grey Fibrous Homogeneous	100	None Detected	0	Cellulose Mineral Wool Non-Fibrous	60 30 10
15458-46	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Reception/Office Area	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-47	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Hallway by Boardroom	11/17/11	EM	Sheet Flooring - Lt. Blue	Grey Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Cellulose	70 30
15458-48 Layer 1	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Sheet Flooring - Blue	Blue Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-48 Layer 2	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Mastic	Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100



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15458-49	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Boardroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-50	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Open Office Area	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-51	Bldg 18 - PWGSC Owned Operations Building - 2nd Floor - Open Office Area	11/17/11	EM	Acoustic Ceiling Tile - 2'x4' - Large & Small Random Pinhole	Grey Fibrous Homogeneous	100	None Detected	0	Cellulose Mineral Wool Non-Fibrous	60 30 10
15458-52	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Entrance/Hallway	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-53	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Stairwell Bottom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-54	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Stairwell Bottom	11/17/11	EM	Sheet Flooring - Lt. Green	Green Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Glass	80 20
15458-55	Bldg 18 - PWGSC Owned Operations Building - Main Floor - Lunchroom	11/17/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-56	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - Pipe Fitter Trailer	11/17/11	EM	Sheet Flooring - Grey	Grey Fibrous Homogeneous	100	None Detected	0	Non-Fibrous Cellulose	80 20
15458-57	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - Pipe Fitter Trailer (Exterior)	11/17/11	EM	Caulking - Window Frame	Tan Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-58	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S339 Stores - (Exterior)	11/17/11	EM	Caulking	Black Fibrous Homogeneous	100	Chrysotile	7	Non-Fibrous	93



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15458**

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-59	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J40 Offices	11/17/11	EM	Sheet Flooring - Brown & Beige Squares	Grey Fibrous Homogeneous	100	Chrysotile	20	Non-Fibrous Cellulose	50 30
15458-60 Layer 1	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J40 Offices	11/17/11	EM	Floor Tile - 12"x12" White with Beige Flecks	Grey Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-60 Layer 2	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J40 Offices	11/17/11	EM	Mastic	Yellow Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-61	Bldg 61 - PWGSC Land Leased to Victoria Shipyards (Butler Buildings) - S,J40 Offices - Balcony Steps	11/17/11	EM	Coating	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-01	Bldg 20 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Sheet Flooring	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass Cellulose	85 10 5
15458-02	Bldg 20 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Roofing Caulk	Various Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-03	Bldg 13 - PWGSC Washroom Building - Men's Room	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-04	Bldg 13 - PWGSC Washroom Building - Men's Room	10/24/11	EM	Beige Trowel on Flooring	Beige Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-05	Bldg 13 - PWGSC Washroom Building - Exterior	10/24/11	EM	Caulk	Grey/Clear Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-06	Bldg 13 - PWGSC Washroom Building - Mechanical Room - South Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-07	Bldg 13 - PWGSC Washroom Building - Mechanical Room - North Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-08	Bldg 21 - PWGSC New Guard Shack	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-09	Bldg 21 - PWGSC New Guard Shack - Exterior	10/24/11	EM	Caulk	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-10	Bldg 22 - PWGSC Old Guard Shack - Exterior	10/24/11	EM	Shingles	Grey/Black Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15



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15458-11	Bldg 22 - PWGSC Old Guard Shack - Office	10/24/11	EM	Sheet Flooring	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-12	Bldg 22 - PWGSC Old Guard Shack - Office	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-13	Bldg 22 - PWGSC Old Guard Shack - Washroom	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-14	Bldg 17 - PWGSC Pumpphous - Scada Storage Room	10/28/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-15	Bldg 17 - PWGSC Pumpphous - Work Shop	10/28/11	EM	Caulking - Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-16	Bldg 17 - PWGSC Pumpphous - Hydraulic Room	10/28/11	EM	Brick Mortar/Firestopping	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-18	Bldg 16B - PWGSC Penstock Building (South Wall)	10/28/11	EM	Wall Coating	Grey/Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-19	Bldg 16A - PWGSC Main Penstock Room (Exterior)	10/28/11	EM	Caulking - Hydraulic Cylinder Cover	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-21	Bldg 16A - PWGSC Main Penstock Room (Interior)	10/28/11	EM	Mortar - Expansion Joint	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-22	Bldg 17 - PWGSC Pumpphous - Perimeter West Wall	10/28/11	EM	Caulking - Interior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100



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15458-24	Bldg 17 - PWGSC Pumphouse - West Wall (Exterior)	10/28/11	EM	Caulking - Exterior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-25	Bldg 17 - PWGSC Pumphouse - West Wall (Interior)	10/28/11	EM	Wall Coating - Interior Wall	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-26	Bldg 17 - PWGSC Pumphouse - Mechanical	10/28/11	EM	Gasket - Compressor A-13271	Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-28	Bldg 18 - PWGSC Welding Shop - (North Wall)	11/02/11	EM	Cementitious Wall Coating	Grey Non-Fibrous Heterogeneous	100	None Detected	0	None-Fibrous	100
15458-30	Bldg 17 - PWGSC Pumphouse - Washroom (Main Floor)	11/02/11	EM	Drywall Joint Compound	White Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-31	Bldg 17 - PWGSC Pumphouse - East Wall (Top of Stairs)	11/02/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-32 Layer 1	Bldg 17 - PWGSC Pumphouse - Lunch Room	11/02/11	EM	Sheet Flooring - Greyish Green	Brown/Green Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous Synthetic	80 20
15458-32 Layer 2	Bldg 17 - PWGSC Pumphouse - Lunch Room	11/02/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-33	Bldg 17 - PWGSC Pumphouse - Lunch Room (South Windows)	11/02/11	EM	Caulking/Putty - Window	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-34 Layer 1	Bldg 17 - PWGSC Pumphouse - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Skim Coat	White Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-34 Layer 2	Bldg 17 - PWGSC Pumphouse - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Base Coat	Grey Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-35	Bldg 17 - PWGSC Pumphouse - Lunch Room (West Wall)	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-36	Bldg 17 - PWGSC Pumphouse - Lunch Room - Washroom	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-37 Layer 1	Bldg 10 - PWGSC Security Trailer (H&S Training)	11/03/11	EM	Floor Tile - 12"x12" Grey	Grey Non-Fibrous Homogeneous	50	None Detected	0	Non-Fibrous	100
15458-37 Layer 2	Bldg 10 - PWGSC Security Trailer (H&S Training)	11/03/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-38	Bldg 12 - PWGSC Project Trailer - 2nd Floor - Deck Walkway	11/03/11	EM	Shingle/Grip Mat	Black Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15
15458-39 Layer 1	Bldg 12 - PWGSC Project Trailer - 2nd Floor	11/03/11	EM	Sheet Flooring - Cream w/ Tan	Grey Fibrous Heterogeneous	33	None Detected	0	Non-Fibrous Cellulose	85 15
15458-39 Layer 2	Bldg 12 - PWGSC Project Trailer - 2nd Floor	11/03/11	EM	Mastic	Yellow Non-Fibrous Heterogeneous	33	None Detected	0	Non-Fibrous	100
15458-39 Layer 3	Bldg 12 - PWGSC Project Trailer - 2nd Floor	11/03/11	EM	Backing	Brown Fibrous Heterogeneous	34	None Detected	0	Cellulose Non-Fibrous	85 15
15458-40	Bldg 12 - PWGSC Project Trailer - Exterior	11/03/11	EM	Door Caulking	Tan Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100



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15458-41	Bldg 12 - PWGSC Project Trailer - Exterior	11/03/11	EM	Window Caulking	Tan Non-Fibrous Heterogeneous	100	0
							100



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Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-01	Bldg 20 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Sheet Flooring	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass Cellulose	85 10 5
15458-02	Bldg 20 - PWGSC Washroom Trailer (A-Lot)	10/24/11	EM	Roofing Caulk	Various Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-03	Bldg 13 - PWGSC Washroom Building - Men's Room	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-04	Bldg 13 - PWGSC Washroom Building - Men's Room	10/24/11	EM	Beige Trowel on Flooring	Beige Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-05	Bldg 13 - PWGSC Washroom Building - Exterior	10/24/11	EM	Caulk	Grey/Clear Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-06	Bldg 13 - PWGSC Washroom Building - Mechanical Room - South Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-07	Bldg 13 - PWGSC Washroom Building - Mechanical Room - North Wall	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-08	Bldg 21 - PWGSC New Guard Shack	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-09	Bldg 21 - PWGSC New Guard Shack - Exterior	10/24/11	EM	Caulk	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-10	Bldg 22 - PWGSC Old Guard Shack - Exterior	10/24/11	EM	Shingles	Grey/Black Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous Glass	85 15



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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

November 3, 2011

Site: **Esquimalt Graving Dock**

Sampled by: Client Job or PO #
Project Number

**JS
15458**

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-11	Bldg 22 - PWGSC Old Guard Shack - Office	10/24/11	EM	Sheet Flooring	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-12	Bldg 22 - PWGSC Old Guard Shack - Office	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-13	Bldg 22 - PWGSC Old Guard Shack - Washroom	10/24/11	EM	Drywall Joint Compound Only	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-14	Bldg 17 - PWGSC Pumphouse - Scada Storage Room	10/28/11	EM	Drywall Joint Compound	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-15	Bldg 17 - PWGSC Pumphouse - Work Shop	10/28/11	EM	Caulking - Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-16	Bldg 17 - PWGSC Pumphouse - Hydraulic Room	10/28/11	EM	Brick Mortar/Firestopping	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-18	Bldg 16B - PWGSC Penstock Building (South Wall)	10/28/11	EM	Wall Coating	Grey/Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-19	Bldg 16A - PWGSC Main Penstock Room (Exterior)	10/28/11	EM	Caulking - Hydraulic Cylinder Cover	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-21	Bldg 16A - PWGSC Main Penstock Room (Interior)	10/28/11	EM	Mortar - Expansion Joint	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-22	Bldg 17 - PWGSC Pumphouse - Perimeter West Wall	10/28/11	EM	Caulking - Interior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100



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15458**

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-24	Bldg 17 - PWGSC Pumphouse - West Wall (Exterior)	10/28/11	EM	Caulking - Exterior Window	Grey Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-25	Bldg 17 - PWGSC Pumphouse - West Wall (Interior)	10/28/11	EM	Wall Coating - Interior Wall	White Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-26	Bldg 17 - PWGSC Pumphouse - Mechanical	10/28/11	EM	Gasket - Compressor A-13271	Green Non-Fibrous Homogeneous	100	None Detected	0	Non-Fibrous	100
15458-28	Bldg 18 - PWGSC Welding Shop - (North Wall)	11/02/11	EM	Cementitious Wall Coating	Grey Non-Fibrous Heterogeneous	100	None Detected	0	None-Fibrous	100
15458-30	Bldg 17 - PWGSC Pumphouse - Washroom (Main Floor)	11/02/11	EM	Drywall Joint Compound	White Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-31	Bldg 17 - PWGSC Pumphouse - East Wall (Top of Stairs)	11/02/11	EM	Brick Mortar	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-32 Layer 1	Bldg 17 - PWGSC Pumphouse - Lunch Room	11/02/11	EM	Sheet Flooring - Greyish Green	Brown/Green Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous Synthetic	80 20
15458-32 Layer 2	Bldg 17 - PWGSC Pumphouse - Lunch Room	11/02/11	EM	Mastic	Tan Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-33	Bldg 17 - PWGSC Pumphouse - Lunch Room (South Windows)	11/02/11	EM	Caulking/Putty - Window	Grey Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-34 Layer 1	Bldg 17 - PWGSC Pumphouse - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Skim Coat	White Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100



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Asbestos Analysis of Bulk Materials using Polarized Light Microscopy

Client: **PWGSC**

Site: **Esquimalt Graving Dock**

November 3, 2011

Sampled by: / Client Job or PO #	JS
Project Number	15458

Sample Number	Location	Date Analysed	Analyst	Description	Phase	%	Asbestos	%	Other Materials	%
15458-34 Layer 2	Bldg 17 - PWGSC Pumpphous - Lunch Room (South Wall)	11/02/11	EM	Wall Coating on Concrete Substrate Base Coat	Grey Non-Fibrous Heterogeneous	50	None Detected	0	Non-Fibrous	100
15458-35	Bldg 17 - PWGSC Pumpphous - Lunch Room (West Wall)	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100
15458-36	Bldg 17 - PWGSC Pumpphous - Lunch Room - Washroom	11/02/11	EM	Drywall Joint Compound	White Non-Fibrous Heterogeneous	100	None Detected	0	Non-Fibrous	100



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Received: 11/25/11 10:30 AM
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EMSL Proj:
Analysis Date: 11/29/2011

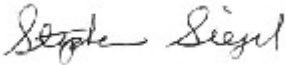
Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-82 041131067-0001	BLDG. 41 - PWGSC OWNED WINCH BUILDING - DRYWALL JOINT COMPOUND	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-83-Floor Tile 041131067-0002	BLDG. 7 DND PROPERTY - PWGSC WASHROOM - FLOOR TILE - WHITE 12"x12"	Brown Non-Fibrous Heterogeneous		97% Non-fibrous (other)	3% Chrysotile
15458-83-Mastic 041131067-0002A	BLDG. 7 DND PROPERTY - PWGSC WASHROOM - FLOOR TILE - WHITE 12"x12"	Black Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-84-Flooring 041131067-0003	BLDG. 7 DND PROPERTY - PWGSC WASHROOM - SHEET FLOORING - PEACH	Peach Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

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Analyst(s)

Anne Paul (18)



Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

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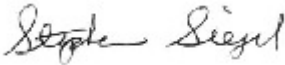
Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-84-Mastic 041131067-0003A	BLDG. 7 DND PROPERTY - PWGSC WASHROOM - SHEET FLOORING - PEACH	Brown Non-Fibrous Heterogeneous	5% Cellulose	95% Non-fibrous (other)	None Detected
15458-85-Flooring 041131067-0004	BLDG. 7 DND PROPERTY - PWGSC WASHROOM - SHEET FLOORING - LT. PINK (LAYER 1)	Pink Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-85-Mastic 041131067-0004A	BLDG. 7 DND PROPERTY - PWGSC WASHROOM - SHEET FLOORING - LT. PINK (LAYER 1)	Brown Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

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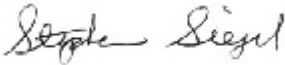
Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-86 041131067-0005	BLDG. 7 DND PROPERTY - PWGSC WASHROOM - DRYWALL JOINT COMPOUND	White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-87 041131067-0006	BLDG. 7 DND PROPERTY - PWGSC WASHROOM - SHEET FLOORING - YELLOW/BROWN (LAYER 2)	Tan Non-Fibrous Heterogeneous	5% Cellulose	80% Non-fibrous (other)	15% Chrysotile
15458-88 041131067-0007	BLDG. 7 DND PROPERTY - PWGSC WASHROOM - DRYWALL JOINT COMPOUND	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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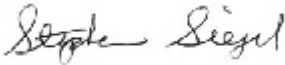
Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-89-Flooring <i>041131067-0008</i>	BLDG. 7 DND PROPERTY - PWGSC WASHROOM - SHEET FLOORING - WHITE	Gray/White Non-Fibrous Heterogeneous	20% Cellulose 5% Glass	75% Non-fibrous (other)	None Detected
15458-89-Mastic <i>041131067-0008A</i>	BLDG. 7 DND PROPERTY - PWGSC WASHROOM - SHEET FLOORING - WHITE	Brown/Black Non-Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	<1% Chrysotile
15458-90 <i>041131067-0009</i>	BLDG. 68 PWGSC WASHROOM TRAILER - CAULKING	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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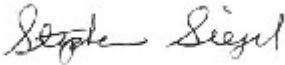
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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-91 041131067-0010	BLDG. 68 PWGSC WASHROOM TRAILER - SHEET FLOORING - LT. GREY	Gray/White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
15458-92 041131067-0011	BLDG. 68 PWGSC WASHROOM TRAILER - CAULKING	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-93 041131067-0012	BLDG. 3 DND PROPERTY - PWGSC GUARD - DRYWALL JOINT COMPOUND	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
15458-94-Floor Tile 041131067-0013	BLDG. 3 DND PROPERTY - PWGSC GUARD - FLOOR TILE - WHITE 12"x12"	White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

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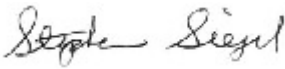
Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15458-94-Mastic 041131067-0013A	BLDG. 3 DND PROPERTY - PWGSC GUARD - FLOOR TILE - WHITE 12"x12"	Black Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

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**ESQUIMALT GRAVING DOCK
REPLACE MAIN DISTRIBUTION LINE (RMDL)
BC HYDRO (BCH) POINT OF DELIVERY (POD) SWITCHGEAR
ESQUIMALT, BRITISH COLUMBIA**

**APPENDIX B
ARCHAEOLOGICAL OVERVIEW ASSESSMENT**



REPORT

NON-PERMIT REPORT

Archaeological Overview Assessment of the Esquimalt Graving Dock, Public Works and Government Services Canada, Esquimalt, BC

Submitted to:

Public Works and Government Services Canada

Katrina Johnston
Senior Environmental Specialist
401-1230 Government Street
Victoria, BC
V8W 3X4

Submitted by:

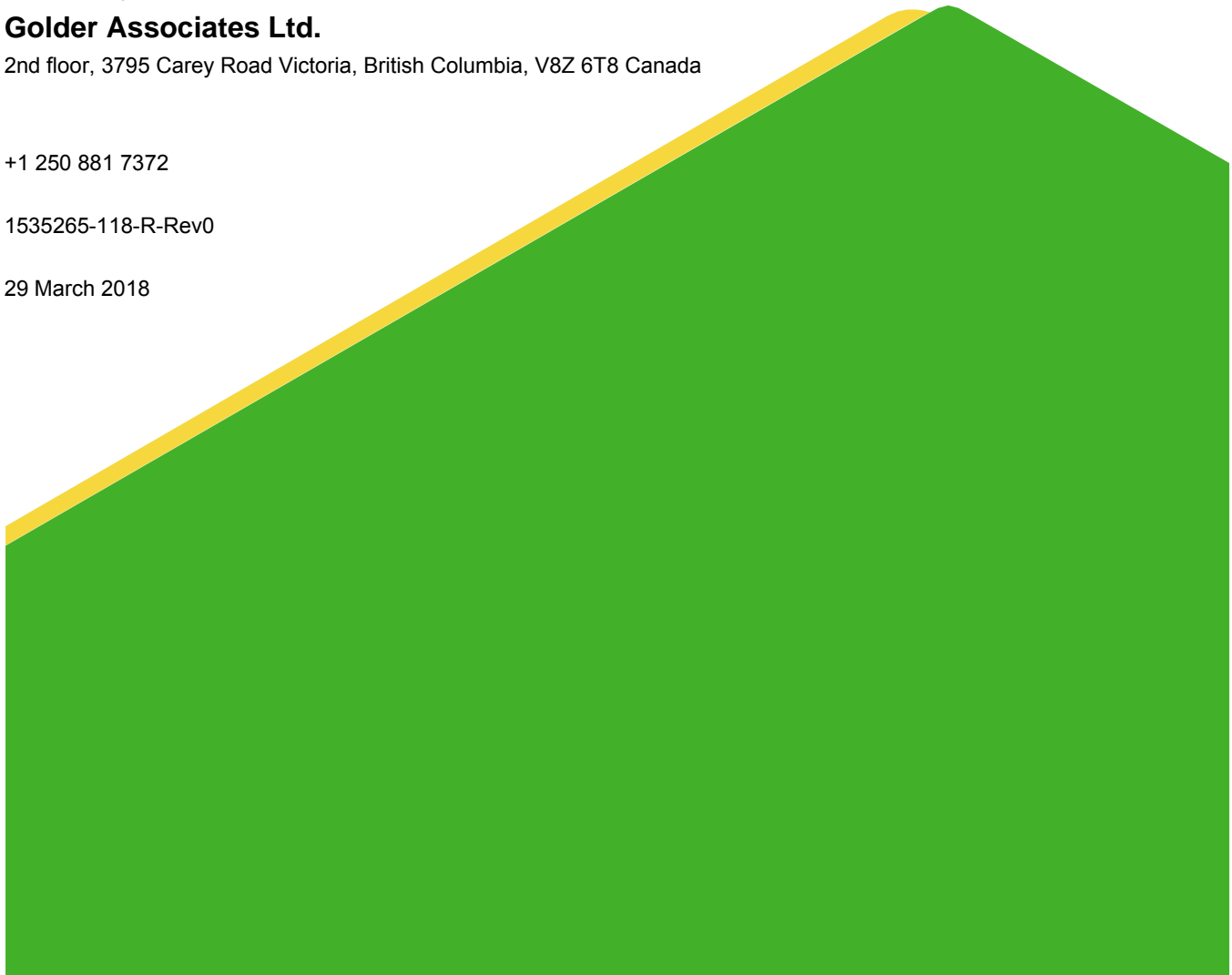
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1535265-118-R-Rev0

29 March 2018



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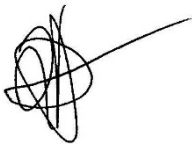
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CREDITS

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GIS Modelling	Colin Bakermans, BSc Jonathan Pokotylo, BSc
Report Review	Ben Hjermstad

Executive Summary

In 2010, at the request of Public Works and Government Services Canada, Golder Associates Ltd. undertook an archaeological overview assessment of Department of Public Works and Government Services Canada property at the Esquimalt Graving Dock, as well as Department of National Defence properties at Munroe Head and the Canadian Forces Sailing Association (now under the jurisdiction of Public Works and Government Services Canada), and leased Lot 203 on the New Songhees Indian Reserve No. 1A. The Project area encompasses 31.1 hectares along the north shore of Constance Cove in the Esquimalt Harbour, Esquimalt, British Columbia. First Nations identified by the British Columbia Ministry of Aboriginal Relations and Reconciliation as having Aboriginal interests that extend into the Project area include: the Esquimalt Nation, the Songhees Nation, the Pauquachin First Nation, the Tsartlip First Nation, the Tsawout First Nation, the Tseycum First Nation, as well as the member First Nations of the Hul'qumi'num Treaty Group (the Lake Cowichan First Nation, the Cowichan Tribes, the Stz'uminus First Nation, the Lyackson First Nation, the Penelakut Tribe, the Halalt First Nation) and the Te'mexw Treaty Association (Scia'new First Nation, the Snaw-naw-as First Nation, the Malahat First Nation, the T'Sou-ke First Nation, and the Songhees Nation).

The purpose of the overview is to provide Public Works and Government Services Canada with geographic information system-based maps illustrating locations of potential archaeological sensitivity and risk management strategy for proceeding with future development within the Esquimalt Graving Dock. The overview provides recommendations regarding the need for, and scope of, further archaeological work. This is the second update to the archaeological overview assessment, the first being completed in 2012, and incorporates the results of projects undertaken since the last update to revise the locations of potential archaeological sensitivity.

The archaeological overview assessment consisted of a review of readily available data regarding local and regional prehistory, history, ethnography, and the environment of the Project area. Included in this review were archaeological site records, archaeological overview and impact assessment reports on file with Public Works and Government Services Canada, as well as with the Archaeology Branch at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development. Geotechnical studies, aerial photos, and historical maps specific to the Project area were included in the literature review.

Six registered archaeological sites are located within the Project area: DcRu-6, DcRu-12, DcRu-789, DcRu-790, DcRu-1255 and DcRu-1256. DcRu-6 is located on the south side of the Esquimalt Graving Dock and extends south and west around Pilgrim Cove. Cultural material from this site is also located immediately east of the Graving Dock and north of the Guard House. The site contains human remains, as well as stratified deposits containing diagnostic materials dating back 2,000 years. DcRu-12 is a shell midden site containing human burials that is located in the northwest portion of the Munroe Head property and extends north to Ashe Head and Lot 203 on the New Songhees Indian Reserve No. 1A. DcRu-789 and DcRu-790 consist of small intact shell midden deposits located west and northeast of the Pump House. DcRu-1255 consists of intermittent pockets of disturbed, low density shell midden located along the north security fence from Parking Lot A to Parking Lot B, and northwest of Lot B. DcRu-1256 is a designated location for stockpiling of archaeological sediments recovered during development from locations across the Graving Dock. The site is located within the green-space at the head of the Graving Dock.

Borehole logs from previous geotechnical investigations suggest that buried shell midden deposits may be present elsewhere in the Project area. Intact soils and sediments were also encountered below fill at depths ranging from approximately 0.25 m to 2.9 m at various locations within the Project area. Therefore, the potential for encountering further buried intact archaeological deposits exists within select locations within the Project area.

A geographic information system based archaeological potential model and management system was designed for the Project area. This model provides predictions of archaeological sensitivity and serves as a guide for application of the management system. This management system consists of a series of alternate responses that are proposed for known archaeological sites, locations of archaeological potential, and different degrees of development impact. The system proposed highlights avoidance when this is feasible, but includes provisions for archaeological impact assessment, archaeological mitigation and/or archaeological monitoring of select areas by professional archaeologists where appropriate. Archaeological responses to development would be dependent on the severity of the proposed impacts and the archaeological sensitivity of the terrain. For instance, pre-development archaeological impact assessment is proposed when previously recorded archaeological sites would be affected, or when proposed development activities may affect landforms considered to be of high archaeological potential. Monitoring would take place in areas of moderate heritage sensitivity as a means of discovering archaeological sites that might require further assessment and/or mitigation. It is recommended that future archaeological assessment and mitigation results be incorporated into the model to increase the effectiveness of subsequent stages of system implementation.

Table of Contents

1.0 INTRODUCTION	1
2.0 HERITAGE LEGISLATION	2
3.0 PROJECT AREA	3
3.1 Physical Setting	3
3.2 Potential Impacts	4
3.3 Cultural Setting	4
3.3.1 Archaeological Setting	4
3.3.1.1 Esquimalt Graving Dock	5
3.3.1.2 Munroe Head and Canadian Forces Sailing Association Properties	11
3.3.1.3 Pilgrim Cove, CFSA, Munroe Head and EGD Waterlots	12
3.3.1.4 Lot 203, Songhees IR No. 1A	13
3.3.2 Ethnographic Setting	13
3.3.2.1 First Nations Place Names and Esquimalt Harbour	14
3.3.3 Historic Setting	14
4.0 METHODS	16
4.1 Introduction	16
4.2 Literature Review	16
4.3 Archaeological Modeling	16
4.3.1 Category Rankings	17
4.3.1.1 Slope	17
4.3.1.2 Proximity to the Ocean	17
4.3.1.3 Previously Recorded Archaeological Sites	17
4.3.1.4 Archaeological Assessment Data	18
4.3.1.5 Geotechnical Data	18
5.0 RESULTS	19
5.1 Previously Recorded Archaeological Sites within the Project Area	19
5.1.1 DcRu-6	19

5.1.2	DcRu-12	19
5.1.3	DcRu-789	19
5.1.4	DcRu-790	20
5.1.5	DcRu-1255	20
5.1.6	DcRu-1256	20
5.2	Previous Geotechnical Studies within the Study Area	20
5.3	Archaeological Potential Model	21
6.0	RECOMMENDATIONS	23
6.1	Introduction	23
6.2	Management Concerns	23
6.3	Future Investigations	24
6.4	Conclusion	24
7.0	LIMITATIONS AND USE OF REPORT	25
8.0	CLOSURE	26
9.0	REFERENCES	27

TABLES

Table 1: Archaeological Management Matrix	22
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FIGURES

Figure 1: Project Location

Figure 2: Project Properties

Figure 3: Location of known Archaeological Sites and previous Archaeological Studies

Figure 4: Borehole Locations

Figure 5: Archaeological Potential Model

APPENDICES

APPENDIX A

Compilation of Archaeological Reports Referenced in Archaeological Overview Assessment of the Esquimalt Graving Dock, Public Works and Government Services Canada, Esquimalt, BC

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been contracted by Public Works and Government Services Canada (PWGSC) to develop an archaeological overview assessment for PWGSC property at the Esquimalt Graving Dock (EGD), Munroe Head, the Canadian Forces Sailing Association (CFSA), and leased Lot 203 on the New Songhees Indian Reserve (IR) No. 1A, located in Esquimalt, BC (Figures 1 and 2). The purpose of this assessment is to provide PWGSC with a process for managing archaeological sites within this Project area. As such, this report presents a model that can be used by PWGSC to determine where archaeological resources can reasonably be expected to be identified in the Project area. Strategies are then identified that will allow planners to best manage potential archaeological risks in advance of future development activities.

This report provides a summary of the results of the AOA, including the archaeological predictive model and management program developed for the Project area. Section 2.0 provides a summary of current federal legislation and policy for the protection of archaeological sites. Section 3.0 describes the location of the Project area, including local and regional environmental characteristics and the cultural history of the region. Emphasis is placed on previous archaeological research in the Project area. Section 4.0 presents a summary of the methodologies employed and descriptions of the quantitative and qualitative techniques used in identification and analysis of the archaeological potential throughout the Project area. Section 5.0 describes the results of the background review and the predictive model. Section 6.0 provides recommendations for the future management of archaeological resources and archaeological resource potential in the Project area. Maps showing the Project area, previous investigation areas, borehole locations and the potential model can be found at the end of the report.

2.0 HERITAGE LEGISLATION

The proposed Project area is situated on federally owned and leased lands. Federal legislation applies to all properties that fall under federal jurisdiction, including lands belonging to federal departments such as PWGSC, or locations where the federal government has some regulatory control. There is no comprehensive federal statute directing how (or whether) a given department is supposed to treat archaeological issues on its lands (Government of Canada 1988). In the absence of comprehensive cultural resource management legislation, federal land managers rely on general policies applicable to all departments such as the *Canadian Environmental Assessment Act* (CEAA 2012), and the Treasury Board Policy on Management of Real Property (2013), as well as appropriate provincial legislation, including the British Columbia *Heritage Conservation Act* (HCA).

Legislative protection for archaeological sites on federal lands exists within the somewhat limited provisions of the *Canadian Environmental Assessment Act* and the associated *Reference Guide on Physical and Cultural Heritage Resources* (CEAA 2016). While the CEAA states that consideration must be given to cultural heritage resources in federal environmental assessments, it does not provide the methods as to how these resources are to be managed. This archaeological overview assessment (AOA) was conducted in general accordance with the British Columbia Archaeology Branch, Ministry of Forests, Lands, Natural Resource Operations and Rural Development's (2009) *Archaeological Overview Assessments as General Land Use Planning Tools – Provincial Standards and Guidelines* to demonstrate due diligence. As outlined by the Archaeology Branch, the objectives of an AOA study are to (1) assess the archaeological potential of the Project area; (2) identify the need and appropriate scope of further archaeological assessment, and (3) identify areas where archaeological sites are apparently absent, implying low or no archaeological potential (Archaeology Branch 2009).

Under the terms of the HCA, all archaeological sites that predate AD 1846 are automatically protected. Certain sites, including burials and rock art sites, that have historical or archaeological value are protected regardless of age. Heritage wrecks, consisting of the remains of vessels or aircraft after two or more years have passed since they sank, crashed, or were abandoned, are also protected under the HCA. Wreck sites may also be protected under federal statute if it is determined that they possess characteristics of national historic significance (Historic Sites and Monuments Board of Canada 2000).

3.0 PROJECT AREA

The Project area encompasses approximately 31.1 hectares along the north shore of Constance Cove in the Esquimalt Harbour, Esquimalt, BC. The Project area encompasses the EGD and associated waterlot; Munroe Head, including the intertidal zone; the CFSA and the associated waterlot; and leased Lot 203 located on the New Songhees IR No. 1A (Figure 2). It is bounded on the east by the E&N rail bed, on the south by Pilgrim Cove, and on the north by the Esquimalt Indian Reserve. Water depths in the Project area range from the upper intertidal in specific locations like Munroe Head, to a general offshore depth of just over 12 m Chart Datum.

The Project area has been extensively developed over the past 150 years resulting in substantial alterations to the shore line through cutting, blasting and filling, and to the ocean floor through dredging. Today the Project area is a mix of landscaped green space with intact Garry oak stands and natural rock outcrops, and developed areas consisting of gravel, asphalt and concrete covered roads, parking areas and work areas underlain with fill to varying depths over either native soils and sediments or bedrock. Numerous administrative, maintenance and storage buildings are located throughout the Project area, as well as portable trailers and temporary structures. The most dominant industrial feature is the graving dock itself, which at 357 m long and 38 m wide, is the largest solid-bottom commercial dry dock on the west coast of North America.

3.1 Physical Setting

The Project area is situated within the Eastern Vancouver Island Ecoregion, within the Nanaimo Lowland Ecoregion. The Project area is located in the Coastal Douglas-fir (CDF) Biogeoclimatic Zone (Nuszdorfer et al 1991; Meidinger and Pojar 1991). The CDF Biogeoclimatic Zone is limited in extent, encompassing portions of southeast Vancouver Island, several of the islands in the Strait of Georgia, and a narrow strip of the adjacent mainland (Nuszdorfer et al 1991:82-83). The CDF lies within the rain shadow of the Vancouver Island and Olympic Mountains. As such, climate in the CDF is characterized by warm dry summers and mild wet winters; mean annual precipitation values are relatively low when compared with those of the adjacent Coastal Western Hemlock Biogeoclimatic Zone (Nuszdorfer et al 1991:82-83).

Douglas fir (*Pseudotsuga menziesii*) is the most common tree species found within CDF forests. Other common forest constituents include Western redcedar (*Thuja plicata*), grand fir (*Abies grandis*), arbutus (*Arbutus menziesii*), Garry oak (*Quercus garryana*), and red alder (*Alnus rubra*). Western hemlock (*Tsuga heterophylla*) occurs infrequently within the CDF (Nuszdorfer et al 1991:82-83). The use of cedar by First Nations was common in the past and is evidenced, for example, by bark strip and plank removal scars on trees. The slow burning bark of Douglas fir would have served as an excellent source of fuel, and the wood would also be used for many utilitarian purposes.

Many of the plants and animals found within the CDF were, and continue to be, important to First Nations. Particular locations within the landscape would be seasonally attractive due to various factors such as the ripening of berries, seasonal migrations of fish or waterfowl, and availability of potable water. Additional information regarding the use of local floral and faunal resources used by First Nations can be found in Barnett (1955), Suttles (1958, 1960, 1968, 1987, 1990), Turner (1995), and Turner and Bell (1971).

Fish and shellfish were very important to coastal First Nations subsistence. Rockfish (family *Scorpaenidae*), greenling, flatfish (family *Pleuronectidae*), sculpins (family *Cottidae*) clams (family *Veneridae*), mussels (family *Mytilidae*) and cockles (family *Cardiidae*) among others, were available year-round in the estuaries (Barnett 1955; Suttles 1968, 1987, 1990). Herring (*Clupea pallasii*) were harvested in vast quantities in sheltered waters in the late winter during the spawning season (Barnett 1955; Suttles 1968, 1987, 1990). Freshwater fish,

such as trout (e.g., *Oncorhynchus mykiss*), were available in the lakes, streams, and marshes. However, the most culturally significant fishes were the five species of salmon: Coho, Chinook, Pink, Sockeye, and Chum (*Oncorhynchus kisutch*, *Oncorhynchus tshawytscha*, *Oncorhynchus gorbuscha*, *Oncorhynchus nerka*, and *Oncorhynchus keta*) that spawn in the region's rivers and streams. Salmon were taken in large quantities by reef netting in Juan de Fuca and Haro Straits and during the fall spawning season in local streams and rivers (Duff 1964; Barnett 1955; Suttles 1990). These fish were smoked and stored for use during the winter months.

Additional information regarding First Nations use of local floral and faunal resources can be found in Barnett (1955), Suttles (1987, 1990), Turner (1995), and Turner and Bell (1971).

3.2 Potential Impacts

Alteration of the landscape can result in the damage or complete destruction of all or portions of archaeological sites. These alterations often involve the displacement of artifacts, resulting in the loss of valuable contextual information, or may involve the destruction of the artifacts and features themselves, resulting in complete information loss. While these losses are permanent and irreversible, they can be offset through implementation of effective mitigation procedures.

Development activities have the potential to impact archaeological sites by disturbing cultural deposits and features, damaging artifacts and fossils, hindering or increasing access to sites and destroying contextual information that is essential for interpreting site function and/or age. Development and operational activities that would be considered to have a high impact on archaeological sites would include, but not be limited to, excavation, grading, levelling, landscaping, dredging and demolition. Developments considered to have a moderate impact to archaeological sites include paving and augering. Low impact activities include on-going operational activities such as vehicle use that will not disturb surface soils and sediments.

3.3 Cultural Setting

3.3.1 Archaeological Setting

A great deal of terrestrial-based archaeological research and assessment has taken place in the southern Strait of Georgia region, particularly in the Victoria area and the Lower Mainland. The research undertaken has contributed to the development of a regional chronology that spans over 8,500 years (Matson 1976, 1992). Comparatively little is known about the early occupation of southern Vancouver Island. However, the archaeological record over the past 5,000 years or so reveals an increasing reliance on salmon, along with the corresponding development of complex societies, with evidence of wealth accumulation, hereditary status, social stratification, semi-sedentism and population aggregation. Expected precontact archaeological sites in the Project area would include shell middens, house structures, lithic scatters, trails, canoe runs and human burials.

Marine-based archaeological research and assessment activity in the southern Strait of Georgia region has not matched that of terrestrial-based archaeology. However, an understanding of general sea level change since the early Holocene and the precontact use of intertidal areas indicate that archaeological sites are found below the modern tide level. Expected archaeological site types that may be encountered, include, but are not limited to canoe runs, remnants of reef net fishing, and clam harvesting locales. Canoe runs are located in the intertidal zone and are characterized by linear areas cleared of stones that are often associated with village sites (Petzelt 2004: 5). Clam beds are represented by terrace-like modifications created with rock placement, also located in the intertidal zone (Williams 2006). Reef net sites are characterized by anchor stone accumulations

located on the shallow sub-tidal seafloor typically in areas with reefs and active tidal currents (Easton 1985a, 1985b, 1986; Moore and Mason 2010).

Heritage wrecks can also be found in areas covered by water. The most common form of vessel loss in protected environments, and especially in anchorages or near docks, is abandonment (Richards 2008). Abandoned vessels are often located in shallow or intertidal water. In urban or industrial settings these wrecks may eventually be covered with landfill placed as part of foreshore development. In all conditions, they become protected under the *HCA* two years after sinking.

A considerable amount of AIA has been previously completed in Esquimalt Harbour in general, and in the Project area specifically (Figure 3). These include multiple AIAs at the Munroe Head/CFSA Property and at EGD. An AOA of the CFSA, Munroe Head and EGD waterlots has also been developed. A summary of this previously completed archaeological work is found in the following Sections.

3.3.1.1 *Esquimalt Graving Dock*

In 2003, Millennia (2003c) conducted an archaeological inventory and mitigative data recovery at the EGD (Figure 3). Millennia conducted a data recovery program at DcRu-6 (originally registered as DcRu-760) prior to the construction of a new access road at this location. Observed cultural materials suggest that a permanent or semi-permanent village was located at this shell midden site (Millennia 2003c). Excavation resulted in the recovery of evidence of house features, as well as over 200 artifacts indicative of a late Locarno Beach occupation that were radiocarbon dated to 2090 ± 80 BP. Millennia was unable to determine the total number of dwellings present, or their size and orientation, due to the limited area of the site exposed during excavation. Human remains from at least six individuals were also collected during the mitigation and were reinterred adjacent to the site (Figure 5). To minimize disturbances to this significant archaeological site, the access road was re-engineered to cap the archaeological deposits.

As part of the inventory, all of the approximately 220 cubic metres of soils and sediments machine excavated during construction were passed through a 1.9 cm ($\frac{3}{4}$ inch) wire mesh screen to recover any remaining cultural materials, including human remains. Portions of the screened material were then placed along the boulevard on the north side of the South Jetty Access Road (Millennia 2003c). The remainder was used as fill in the “gully portion” of the sloped area to the east of the graving dock (Figure 5).

The following year, Millennia (2004a) monitored the installation of a fence on the south side of the EGD South Jetty Access Road within the known boundary of site DcRu-6. Fifteen fencepost holes and two gatepost holes were excavated. Thirteen contained cultural deposits, including one which contained intact cultural deposits. Millennia recommended that DcRu-6 be avoided and that where avoidance is not possible, modifications to the development should occur to minimize disturbance to archaeological deposits and an AIA should be completed prior to development.

Millennia (2004a) conducted an archaeological inventory of the EGD in 2004 (Figure 3). Two previously unrecorded archaeological shell midden sites were located during the inventory study, DcRu-789 and DcRu-790. Faunal remains, shell, fire-altered rock, and a carved siltstone artifact were recovered from DcRu-789 (Millennia 2004a:11). Intact shell midden deposits were observed at DcRu-790 near the remains of a building foundation (Millennia 2004a:13). Millennia concluded that these midden deposits either underlie the building foundation or that they were removed when the building was constructed (Millennia 2004a:17). Millennia recommended an AIA be completed prior to any ground altering activity in or near these known archaeological sites.

Millennia conducted further archaeological monitoring at DcRu-6 in 2005 (Figure 2). Work was initiated after possible shell midden deposits were observed during the excavation of a trench to replace an existing drainage pipe east and south of the graving dock (Millennia 2005). Millennia screened the impacted cultural deposits and monitored the excavation of the remaining trench, as well as a utilities trench along the north side of the entrance road located northeast of the dock. Disturbed and intact cultural material was observed during the monitoring program. The observed stratigraphy at DcRu-6 consisted of layers of fill lying atop undisturbed cultural deposits (Millennia 2005:12-16). Bone, antler, and lithic artifacts were recovered during monitoring of the drainage pipe, including a rare elk antler comb (Millennia 2005:21). Given the small area examined and the inability to excavate evaluative test units (EUs), Millennia could not assess the significance of the cultural deposits. As a result, Millennia recommended that an AIA be conducted in advance of any future work on both the north and south sides of the EGD that may result in disturbance to surface soils and sediments (Millennia 2005: 22).

At the request of Stantec Consulting Ltd. (Stantec), Golder (2009a) undertook an AIA of that portion of the proposed E&N Railway Trail which is located on federal lands (Figure 3). The proposed trail right-of-way (ROW) parallels the west side of the E&N Railway along the length of PWGSC EGD property, extending approximately 2 m inside the PWGSC property line. No archaeological materials were observed as a result of the AIA. Due to its proximity to previously recorded archaeological site DcRu-12, Golder recommended monitoring by a qualified archaeologist during construction of the portion of the trail which traverses the North Parking Lot within the EGD.

At the request of PWGSC, Golder (2009b) undertook archaeological monitoring of a geo-environmental testing program in select areas across the EGD (Figure 3). Geo-environmental samples were collected using hand augers, mechanical drilling and vacuum extraction. Shell fragments representing both intact and disturbed midden were observed in 17 of 113 test locations. Crushed shell deposits were observed eroding from exposed soils at four additional locations adjacent to these geo-environmental test locations. The cultural deposits observed in this monitoring program are likely associated with previously recorded archaeological sites DcRu-6, 12 and 790. Golder recommended that archaeological impact assessment and/or archaeological monitoring be conducted in locations of high archaeological potential in advance of future developments that have the potential to impact intact soils and sediments in the location of these observed cultural deposits.

At the request of PWGSC, Golder (2010a) undertook an AIA of proposed upgrades to the North Area Parking Lot within the EGD (Figure 3). The project area was located within the boundaries of previously recorded archaeological site DcRu-12 at the north end of the parking lot. Proposed Project works involved the removal (through blasting, chipping and grading) of approximately 1,950 m³ of bedrock and approximately 300 m³ of soil overburden. Subsurface archaeological shell midden associated with charcoal and highly fragmentary faunal remains, including elk (*Cervus canadensis*), were observed in one of the shovel tests. Golder recommended archaeological monitoring of any disturbances to intact or previously disturbed archaeological deposits along the west margin of the project area, in the vicinity of the observed deposits.

At the request of PWGSC, Golder (2010b) undertook an AOA of five Areas of Environmental Concern (AEC) within the EGD prior to soil remediation involving the removal of contaminated soils: AEC 10; AEC 14; AEC 18; AEC 22 and AEC 23 (Figure 3). In addition, PWGSC required an AIA be conducted at AEC 14 in advance of the proposed east end extension of the graving dock. During the AIA, Golder delineated the vertical and horizontal extent of relocated shell midden deposits from site DcRu-6, which had been used as fill along the top of the slopes east and south of the EGD. Golder recommended consultation between PWGSC and the Esquimalt and Songhees Nations regarding the final disposition of the cultural deposits prior to their removal. Golder also recommended monitoring of the North Parking Lot (AEC 22) in the area where subsurface cultural deposits were observed (Golder 2010a), and along the north end of the decommissioned rail spur line (AEC 23), adjacent to Maple Bank Road, where possible shell midden deposits were observed during monitoring of geo-environmental

drilling (Golder 2009b). Remediation of the two remaining AECs (10 and 18) was determined to have no impact on archaeological deposits due to the shallow depth of the soils to be removed. Golder recommended that a chance find management procedure be developed and implemented so that the appropriate steps could be taken in the event that archaeological materials are inadvertently impacted or exposed during remediation.

At the request of PWGSC, Golder (2010c) undertook an AIA for security upgrades to the Front Guardhouse located at the east end of the EGD (Figure 3). Project works involved machine excavation of soil and sediments within a 53 m by 10 m area along the north side of the main access road. Blasting of a bedrock outcrop at the west end of the project area was also required to accommodate road widening and sidewalk construction. Machine excavation of the sod layer (from the ground surface to approximately 40/50 centimetres below surface) within the majority of the project area had occurred prior to the assessment. During the subsequent construction monitoring, previously disturbed, low density shell midden mixed with clay fill was observed in approximately 75% of the project area, with a concentration in the eastern portion. These deposits likely represent redeposited shell midden from site DcRu-6 (Golder 2010c). Based on the results of this monitoring program, no further archaeological assessment is considered warranted at this location. Materials exhumed from construction, including midden deposits, were redeposited along the top of the slope immediately east of the graving dock.

During remediation of soils in AEC 14 at the head of the graving dock, a single human bone element was unearthed (Millennia 2010a). Subsequent monitoring of soil remediation on the south side of the staircase exposed several thin (10-15 cm) pockets of disturbed, redeposited shell midden. No intact cultural deposits were observed. In addition to the human remains, four artifacts were collected: one small core, two secondary-stage reduction flakes, and a large sandstone cobble with evidence of pecking (Millennia 2010a:5). As a result of the monitoring, the existing site boundary for DcRu-6 was expanded to the south to include the area of disturbed midden. Recommendations include a review by an archaeologist of any proposed ground altering work within or adjacent to site DcRu-6 (Millennia 2010a: 9).

During construction of the East End Extension Project at EGD, Golder (2011b) conducted archaeological monitoring of two areas containing cultural deposits previously identified by Millennia (2010a) associated with site DcRu-6, as well as a nearby shell exposure observed by workers following vegetation clearing (Figure 3). Disturbed, diffuse and highly fragmented shell midden was observed up to 30 cm dbfs at the top of the slope near the southeast corner of the graving dock, below which was sterile fill material (Golder 2011b). During removal of the concrete slab south of the staircase shell midden was observed over a 5 m by 1.5 m area. The deposit was 5-8 cm thick comprised of clam shell in a black matrix along with historical rubbish. The shell exposure observed by workers was in a 1.5 m by 0.5 m area and was 10 cm thick. No dark organic soil was associated and no artifacts were observed although the shell was fragmented and discoloured in a manner consistent with cultural processing (Golder 2010b: 4). All cultural deposits were relocated to the top of the slope at the head of the graving dock where other cultural materials from site DcRu-6 have been deposited. Golder recommended PWGSC consult with the Esquimalt and Songhees Nations regarding the disposition of any further cultural deposits removed from their current location during the project (Golder 2011b: 5).

Golder (2011a) conducted a post-impact assessment of a 75 m by 25 m area adjacent to site DcRu-790 within AECs 18 and 19 following ground disturbance associated with mechanical vegetation clearing (Figure 3). Pedestrian reconnaissance of the entire partially graded area identified four concentrations of crushed shell. Three of these were on berms formed along the east and south edges of the cleared area, and a fourth was located in a machine cut along the north edge of this project area. The remaining cleared area exhibited very sparse, scattered crushed shell. No artifacts or features, including charcoal or fire-altered rock, were observed during the surface reconnaissance or during screening of the four shell concentrations. Considering the absence of any cultural materials, including features, artifacts, faunal elements, fire-altered rock or charcoal, it was

concluded that the observed shell was naturally occurring, and not related to the cultural deposits observed at site DcRu-790 located to the east of this project area. No further archaeological work was recommended within the disturbed area.

During remediation of a bedrock knoll in the North Area Parking Lot (AEC 22), within the recorded boundary of site DcRu-12, thin pockets of shell midden were observed (Figure 3). Subsequent inspection by Millennia (2010c) confirmed the presence of 5 cm to 20 cm thick patches of shell midden containing butter and littleneck clam, along with fire-altered rock. All five of the shovel tests that were subsequently excavated in this project area contained medium density shell mixed with modern refuse. One of the tests also produced four mammalian bone fragments and one avian bone fragment. Soils containing shell midden were segregated and deposited adjacent to AEC 23, approximately 100 m to the east. The bedrock knoll has since been removed and paved over. No further archaeological work was recommended for this location.

Two discrete pockets of disturbed shell midden were observed during remediation of the abandoned rail spur (AEC 23) located along the southwest edge of the North Area Parking Lot (Figure 3). The pockets were located approximately 35 m apart and contain disturbed shell midden mixed with fill material, native clay and historical debris (Millennia 2011a). The southern deposit was left *in-situ*, while the northern deposit was removed with heavy machinery under the direction of an archaeologist. This latter cultural deposit, located adjacent to Maple Bank Road, measured approximately 12 m in diameter with a maximum thickness of approximately 20 cm. No intact cultural deposits, and no artifacts or faunal materials, were identified during removal. No further archaeological work was recommended at this location, but due to the presence of nearby cultural deposits (Golder 2010b), it was recommended that any future ground disturbing activities be monitored by a qualified archaeologist.

Following an AIA (Millennia 2011b) initiated after shell midden deposits were observed during remediation at AEC 10, Millennia (2011c) conducted archaeological monitoring and mitigative data recovery. Two layers of predominantly disturbed shell midden were observed at depths of approximately 40 cm and 100 cm dbfs across the project area and into adjacent locations to the north, west and south. The disturbed shell midden deposits varied in thickness from 1 cm to 40 cm and were mixed with fill material and modern refuse. An intact hearth feature in the northwest corner of AEC 10 was systematically excavated. Intact midden was also observed below fill at either end of a 24 m storm drain trench which extended from the northwest corner of AEC 10. Four distinct cultural strata were observed overlying a sterile clay layer. In total, 20 artifacts were recovered during monitoring and subsurface testing, and include the following: five basalt projectile points, seven pieces of debitage, seven worked bone and one worked antler fragment. Two of the worked bone pieces and three pieces of debitage were found *in-situ*. In addition, numerous faunal remains, dominated by harbour seal (*Phoca vitulina*), were recovered. Four fragments of human bone, representing at least two individuals (one adult, one child), were also recovered from disturbed matrices. Remediation of the soils within AEC 10 and the associated storm drain trench has removed all sediments containing archaeological deposits. No further archaeological work was recommended within these areas. For adjacent areas, it was recommended that an archaeologist be contacted prior to any ground disturbing work.

Four pockets of shell midden deposits associated with newly registered site DcRu-1255 were identified during archaeological monitoring of machine excavation associated with remediation efforts within AEC 18 (Millennia 2011d). All deposits were described as “heavily disturbed, mixed with modern refuse and overlying more modern fill materials” (Millennia 2011d: 4). The four pockets were observed in Parking Lot A and along the road which connects Parking Lot A to Parking Lot B. The largest deposit was observed in Parking Lot A and measured approximately 5 m by 1.5 m and varied in thickness from 2 cm to 15 cm; remaining deposits are described as, “small mottled midden lenses” (Millennia 2011d: 4). No archaeological materials or features were

observed. All contaminated soils have since been removed from AEC 18 and those containing cultural materials have been moved to the on-site storage location. No further archaeological work was recommended.

Several pockets of disturbed, discontinuous shell midden containing charcoal and fire-altered rock associated with site DcRu-1255 were observed during subsurface testing and monitoring for the 400 m long Security Fence Replacement Project (Millennia 2015). The project was located along the north security fence line from just east of Parking Lot A to approximately 80 m northwest of Parking Lot B (Figure 3). Disturbed shell midden deposits were observed in the machine excavated trench east of Parking Lot A and during monitoring of a 30 m length of trench line north and west of Parking Lot B. Two shovel tests and two auger tests northwest of Parking Lot B also contained disturbed shell midden deposits. The archaeological deposits were present from just below surface up to 30 cm dbfs and were mixed with historical refuse. An additional five shovel tests and eight auger tests conducted along the west half of the project area were negative for archaeological materials. Recommendations for future ground-disturbing work within the EGD consisted of an assessment by an archaeologist prior to ground disturbing work during the planning stage, with provisions for archaeological monitoring where appropriate.

Two pockets of shell midden associated with registered site DcRu-6 were observed during the South Side Electrical Services Upgrade Project (Millennia 2016a). The project included trenching for the installation of a new electrical duct bank from the north side of the main access road, south across the head of the graving dock, and west along the South Jetty. Portions of the project are located within the registered boundary of site DcRu-6. One pocket of midden was observed on the slope at the head of the graving dock, and consisted of a secondary deposit of low density shell midden overlying modern refuse. The second deposit was located on the steep slope above the retaining wall on the south side of the graving dock and consisted of intact shell midden. A possible post-hole, and a shell pit feature consisting of crushed shell, charcoal and ash was observed on the slope. A total of seven artifacts were recovered, including three deer ulna awls, one probable awl, one bone bipoint, a bone point fragment, and one unilaterally barbed antler point. Several faunal specimens were also collected, representing eight mammal species, thirteen bird species, and one fish species. Project specific recommendations include avoidance of the remaining intact midden deposits on the steep slope above the south side of the graving dock, or monitoring if avoidance is not possible. In addition, future development in or around DcRu-6 should be reviewed by a qualified archaeologist. Cultural deposits removed during the project were stockpiled within DcRu-1256.

Intact and disturbed archaeological deposits were observed within and adjacent to registered archaeological site DcRu-789 during a surface reconnaissance, and subsurface testing, in advance of construction of a new substation for the Replace Main Substation North Substation (RMSNS) project, which required removal of bedrock to create an extra 10-15 m of space to the northeast (Millennia 2016b). Thirteen of seventeen shovel and auger tests were positive for cultural material resulting in expansion of the archaeological site boundary to the north and east. Disturbed and intact shell midden deposits were observed from the surface up to 50 cm dbfs. A bone bipoint and a sandstone abrader were recovered from an EU, as was an historical clay pipe that was recovered from the upper 10 cm. A total of 689 faunal specimens were collected from the EU, 89% of which were fish. Recommendations include avoidance, or systematic data recovery along the southern, intact portion of the site including collection of organic material for radiocarbon dating, followed by monitoring during ground disturbing activities.

Disturbed shell midden deposits containing charcoal and fire-altered rock associated with registered archaeological site DcRu-1255, and both intact and disturbed shell midden deposits containing faunal material associated with registered site DcRu-6 were observed during construction of the Pumphouse Substation / Service Entrance Substation (PHS/SES) project (Millennia 2016c). The project consisted of the installation of an

electrical duct bank, and upgrades to the existing sewer and storm drains. The project extended from the main gate, along the north property boundary to the new Service entrance Substation (SES) near Parking Lot A, and from here, west and then south to the existing Pumphouse Substation, and on to the main substation 60 m to the west (Figure 3). Archaeological deposits associated with DcRu-1255 were observed on the grassy slope between the new SES, and Parking Lot A. Archaeological deposits associated with DcRu-6 were observed between 83 and 103 cm dbs in a trench near the top of the South Jetty Access Road. Twenty-three herring bones were recovered from a sample of intact midden. Excavated archaeological deposits were relocated to the new stockpile location between the North Parking Lot, and the Submarine Building within site DcRu-12. No further archaeological work was recommended with regard to the project.

Disturbed shell midden containing fire-altered rock and fauna associated with site DcRu-1255, and both intact and disturbed shell midden deposits associated with site DcRu-789, were recorded during archaeological monitoring of construction for the North Landing Wharf Electrical Supply and Storm Drain project (Millennia 2017a). DcRu-1255 deposits were identified in three positive shovel tests over a 2 m by 3 m area located at the south edge of the Garry oak stand west of Parking Lot B following observed surface deposits in this area. These cultural deposits extended to 30 cm dbs. A bone point and 13 faunal specimens representing mammal, bird, and fish were recovered from an evaluative unit. Archaeological deposits associated with site DcRu-789 were observed from 70-180 cm dbs within all, but the northern 7 m of a 52 m storm drain trench located along the western boundary of the site, and within a machine test located north of the trench. Six artifacts including a dentalia shell, four worked bone, and unmodified slate were recovered from the trench. Historical debris, including shards of a ceramic vessel manufactured between 1865 and 1877, were also recovered. Faunal material included both terrestrial and marine mammal, and fish. Recommendations included avoidance or archaeological monitoring with data recovery in areas where midden is present. Archaeological sediments removed during trenching were stockpiled in Lot 203 located northwest of the project area, with plans to use the material in landscaping the area adjacent to Parking Lot B, and then seeding.

Disturbed shell midden deposits attributed to registered archaeological site DcRu-12 were observed in two shovel tests during AIA for the new North Landing Wharf Substation Relocation Project (NLWSR) (Millennia 2017b). The project was located within and adjacent to the existing Electrical Shop footprint at the foot of the bedrock outcrop west of Parking Lot B. Two shovel tests on a treed bench approximately 35 m southeast of the North Parking Lot yielded shell midden deposits from 4-15 cm dbs, and 3-25 cm dbs respectively. Fire-altered rock and a bird bone were collected from the second shovel test. Disturbed shell midden was also observed on the surface and within a shovel test on top of the bedrock outcrop, adjacent to the recently installed electrical duct bank where shell midden associated with site DcRu-1255 had been used to backfill the duct trench. A concrete foundation was also observed on top of the outcrop. Recommendations included avoidance of the treed bench where the positive shovel tests were located or monitoring during ground altering activities, and monitoring in areas in proximity to sites DcRu-12 and DcRu-1255 where subsurface testing could not be undertaken due to the presence of existing infrastructure.

Disturbed shell midden deposits associated with registered archaeological site DcRu-12 were observed within one of several post holes excavated during construction of a fence line at the EGD North Security Gate (Millennia 2017c). Disturbed shell midden containing burnt shell, vertebrate faunal material and fire-altered rock was observed below asphalt within fill and concrete between 7 and 58 cm dbs. This was underlain by a thin layer of black midden to 68 cm dbs. Between 68 cm and 100 cm dbs, the maximum depth of the post hole, was an intact, fire-reddened, burnt shell feature with high concentrations of fire-altered rock. Faunal material included six pieces of calcined bone; four fish, and two mammal. No further archaeological work was recommended in advance of this development.

3.3.1.2 *Munroe Head and Canadian Forces Sailing Association Properties*

In 2003, Golder (2003b) undertook an AIA in advance of improvements proposed for the Canadian Forces Sailing Association (CFSA) property (Figure 3). The objective of the AIA was to assess whether the proposed developments would impact archaeological resources, including the previously recorded archaeological site DcRu-12. During the course of the assessment, 17 boreholes were machine augered. Disturbed shell midden was present in 13 of the 17 boreholes. Intact shell midden was observed immediately west of the existing CFSA Clubhouse in the west central portion of the CFSA property; probable intact shell midden was observed in a vegetated area near the northeast corner of the CFSA property. In general, disturbed midden was present from the surface to depths of up to 4.50 m; intact shell midden was present from 0.70 m to 2.10 m below surface.

Based on the results of the 2003 AIA, Golder concluded that remnants of archaeological shell midden associated with the previously recorded archaeological site DcRu-12 are situated on the CFSA property, primarily inland from the 1924 high water mark. The observed shell midden deposits exhibit variable degrees of previous disturbance, with the highest degree of apparent disturbance situated in the south portion of the CFSA property. Possible intact shell midden was observed at the north end of the CFSA property. Golder (2003b) recommended the following mitigative measures for the protection of the observed archaeological deposits, archaeological data recovery and archaeological monitoring of construction activities that have the potential to disturb surface soils and sediments. It was also recommended that, where possible, archaeological shell midden removed during construction should be re-used on site and re-deposited as near to the point of excavation as possible to limit the displacement of human remains (if present) or other archaeological remains. Furthermore, these re-deposited cultural materials should be mapped on base drawings and included in an updated BC Archaeological Site Inventory Form to avoid future confusion regarding the origin of these cultural deposits.

Millennia Research Limited (Millennia 2004b) conducted archaeological monitoring of water main and storm drain trenches between Buildings 2 and 14 on the Monroe Head property in 2004 (Figure 3). Discontinuous disturbed shell midden deposits were observed between 3 m and 28 m west of the water main valve chamber near Building 2 at a depth of approximately 0.40 m below road surface. Intact cultural deposits were identified from 0.53 m to at least 1.70 m below surface (the maximum depth of the shovel test) within both trenches. The cultural deposits were not uniformly distributed across the project area. Millennia recommended archaeological monitoring of construction within the "Area of Potential Archaeological Concern" as identified by Bailey (2003).

Golder (2008a) undertook additional archaeological assessment within the CFSA property to better delineate cultural deposits associated with archaeological site DcRu-12 along the eastern extent of the property in advance of future development of the area (Figure 3). Seven boreholes were machine augered within the area; no archaeological materials were observed. Systematic surface inspection of the shoreline and upland areas in the north (Munroe Head) and west sections of the CFSA property revealed deep and intact shell midden deposits. In addition, one hearth feature and six lithic artifacts were observed along the shoreline of Munroe Head. Golder recommended an AIA be conducted in areas where intact and previously disturbed archaeological deposits have been identified that might be impacted by any proposed development within the CFSA property. Because of the presence of human remains at other locations within DcRu-12, archaeological monitoring of any disturbances to intact or previously disturbed archaeological deposits during development was also recommended.

On behalf of Victoria Shipyards Company Ltd. and PWGSC, The Bastion Group Heritage Consultants (Bastion 2010) conducted archaeological monitoring associated with the construction of the Submarine Repair and Maintenance Facility (RMF) located on Munroe Head, adjacent to previously recorded archaeological site

DcRu-12 (Figure 3). Six areas were chosen for monitoring based on the results of an earlier geotechnical drilling program. During construction monitoring of these six areas, nine locations were identified containing both intact and disturbed shell midden (Bastion 2010). Subsequent testing at some of these locations resulted in the identification of an intact dog skeleton and a rock feature. Numerous lithic and bone artifacts were also recovered from four of the six monitored areas, including small triangular chipped stone projectile points and ground slate tools. These artifacts, along with the canine remains and collected soil samples were reburied at the request of the Esquimalt Nation in the green space to the east of the RMF without analysis (Figure 5). As a result of the monitoring program the site boundary for DcRu-12 was extended 70 m to the southeast. Bastion recommended monitoring by a professional archaeologist during the course of any future ground disturbing activities in the area (Bastion 2010).

On the east side of the Dry Dock Company building (Building 2), disturbed and possibly intact shell midden was observed in seven of 10 boreholes during archaeological monitoring of soil sampling for contaminants (Millennia 2010b) (Figure 3). Midden was observed on the surface and at 43 cm depth below surface (dbs) and varied in thickness from 5 cm to 70 cm. Millennia recommended avoidance of cultural deposits and consultation with an archaeologist prior to any subsurface work at his location (Millennia 2010b: 6).

Golder (2011a) undertook archaeological monitoring of a 30 m long trench associated with upgrades to the North Security Gate at Munroe Head (Figure 3). Intermittent, partially disturbed shell midden was observed in the trench between 35 cm and 60 cm below surface from approximately 10 m to 20 m southwest of Building 2. Cultural deposits were determined to be *in-situ*, but disturbed through compaction from overlying sand and gravel fill. No artifacts or features were observed. All sediments containing cultural deposits were screened for artifacts and redeposited in the green space at the head of the graving dock. Recommendations included monitoring by a professional archaeologist during activities that have the potential to disturb buried archaeological deposits.

3.3.1.3 Pilgrim Cove, CFSA, Munroe Head and EGD Waterlots

Golder (2011c) conducted an AOA for the EGD waterlot and adjacent areas in advance of sediment remediation (Figure 3). Background research indicates the area around the graving dock and Pilgrim Cove has been largely disturbed by dredging. A review of ship and aircraft wreck data indicated no heritage wrecks are located within the project area. Analysis of historical aerial photographs, hydrographic surveys and towed video indicated no wrecks or archaeological materials or features within the project area. Archaeological monitoring of 17 offshore machine excavated sediment samples at the CFSA and Pilgrim Cove and two in the intertidal at Munroe head did not identify any cultural deposits (Golder 2011c, 2011d). Previous disturbance to marine sediments was noted as deep as 8.5 m below surface at Munroe Head where a steel spike was recovered during drilling. One area of archaeological potential was identified along the subtidal zone adjacent to site DcRu-12 where evidence of down-slope migration of sediments was observed (Figure 5). If erosion and redeposition is occurring from DcRu-12, there is potential for the seabed in the sloped area adjacent to Munroe Head and the CFSA to include disturbed archaeological materials (Golder 2011c). It was recommended that either AIA with sub-tidal testing be conducted to determine if the boundaries of DcRu-12 extend off shore or that monitoring by a professional archaeologist occurs during dredging.

Golder (2014) conducted an AIA in the CFSA waterlot and at Munroe Head as part of the EGD Waterlot Remediation Project. No archaeological materials or features were observed at Munroe Head during archaeological monitoring of mechanical testing. However, two of the eleven offshore tests within the CFSA waterlot produced five small, non-diagnostic fragments of withe and worked cedar strips. Subsurface testing of

the seabed was conducted using a pipe “caisson” system and an air lift with a collection basket attached to capture excavated materials. Due to the nature of the sediments in the area, the recovered artifacts were determined to be a secondary deposit. The boundary for registered archaeological site DcRu-12 was revised to include these deposits. Due to the secondary nature of the deposits, and the low potential for additional material to be recovered, no further archaeological work was recommended.

Golder (2015) conducted an AIA as part of the EGD Waterlot Remediation Project beneath the west end of the EGD South Jetty (Figure 3). The same caisson system used above, was employed during the testing program. No precontact archaeological materials were observed. Historical materials, including wood and ferrous metal fragments, and a faunal element from a domesticate, were recovered from nine of the ten tests. None of these materials were considered historically significant. Analysis of the sediments and invertebrate faunal collected from the tests suggests the area has been largely disturbed by bioturbation, turbidity, and previous dredging associated with the construction of the EGD. Golder recommended that no further archaeological work be conducted in advance of the remediation works.

3.3.1.4 Lot 203, Songhees IR No. 1A

Golder (2011e) undertook an AIA, including archaeological monitoring of geo-environmental testing of the proposed lease site at Lot 203 Songhees IR No. 1A, Section 2A, Esquimalt District (Figure 2). Intact and partially disturbed shell midden was observed in 11 of 45 shovel tests and in 1 of 7 surface scrapes associated with monitoring of the Phase 1 Environmental Assessment. No cultural deposits were observed in the four boreholes located within the trailer park; the positive tests were all located in the south half of the lease lot. Shell midden deposits were generally confined to the upper 30 cm of sediment, with cultural deposits in one test extending to 70 cm db (the maximum depth of the test). Intact cultural deposits were only observed east of the E&N rail spur. In addition, shell midden deposits were observed in four surface exposures along the abandoned E&N rail spur, as well as within the trailer park and along the west facing slope north of the park. No artifacts or features were observed during the assessment. An on-site meeting with Grant Keddie (curator Royal BC Museum) indicated human remains recovered during a post-impact surface reconnaissance in the early 1980s may be buried within or adjacent to the south border of Lot 203 (Keddie, personal communication, September 2011). Recommendations included archaeological monitoring during ground disturbing activities within areas previously assessed, and AIA preceding development in areas not previously assessed.

3.3.2 Ethnographic Setting

The Project area lies within the asserted traditional territories of the Songhees Nation and Esquimalt Nation. These First Nations speak Northern Straits Salish, one of five language groups that form part of the Central Coast Salish culture area (Suttles 1990). Northern Straits Salish was spoken on the southeast corner of Vancouver Island, the San Juan Islands, and along the mainland from Point Roberts and Boundary Bay to Deception Pass (Duff 1969; Suttles 1987, 1990).

Prior to contact with Euro-Canadians, these groups lived in a relatively independent household groups, each of which had a main winter village, but who moved seasonally to undertake a variety of subsistence activities (Barnett 1955; Suttles 1990). After contact, these groups became collectively known as the Songhees (or Songish), although they were not politically joined as a single tribe (Duff 1969). The Northern Straits Salish term for all Songhees local groups was Lekwungen, which today is represented by the Songhees Nation and Esquimalt Nation.

In 1911, the Songhees Indian Reserve in Victoria was surrendered to the Government of the Province of British Columbia for the sum of \$10,000 among other credits and moved to its present location in Esquimalt at Songhees IR No. 1A (Section 2A, Esquimalt District) (Department of Justice Canada website).

Detailed information on Songhees and Esquimalt culture, including social structure, political organization, demographics, treaties, material culture, medicine, life cycle, effects of disease, subsistence, ethnobotany, language, beliefs and customs, secret societies, food preparation, pastimes and other aspects can be found in: Barnett (1955), Boas (1890), Duff (n.d., 1964, 1969), Galois and Harris (1994), Hill-Tout (1907), Kennedy and Bouchard (1995), Mitchell (1968), Suttles (1951, 1958, 1960, 1968, 1987, 1990), Turner (1991), and Turner and Bell (1971).

3.3.2.1 *First Nations Place Names and Esquimalt Harbour*

Duff (1969) interviewed local elders and recorded Lekwungen place names in the Victoria area. When discussing Esquimalt harbour, *swhaymaltheith* was used by the elders to refer to the harbour, the village, and the people (Duff 1969:32). However, after further thought the elders indicated that when properly applied the name refers only to Duntze Head, the site of the present-day dockyard. While the elders were not able to translate the name (Duff 1969:32), Suttles has suggested that the present form of the name may have been derived from a village named *Swhaymaltheith* and may be translated as “vicinity of the village of (the) Whyomilth” (Duff 1969:33). An early Admiralty chart refers to Constance Cove as “Village Bay” and tiny islets outside of Lang Cove as “Village Rocks” (Duff 1969:32). These map references combined with the place name suggests that a village was likely present on Duntze Head (Duff 1969:32-33).

3.3.3 *Historic Setting*

Europeans began to explore the shores of Vancouver Island in the 1790s. By the mid-19th century, the British had established a permanent presence on southern Vancouver Island. In 1843, the Hudson’s Bay Company (HBC) sent James Douglas to Victoria and Esquimalt Harbours to find a new site for their operations. A fort was built in Victoria Harbour, and the area adjacent to Esquimalt Harbour was acquired from the local First Nations for its promising agricultural farmland (see Duff 1969 and Harris 2002 for information regarding treaties); farms were subsequently started at Constance Cove and Plumper Bay. By 1858, HBC buildings were present along the north shore of Skinner Cove where the North Landing Wharf is located today (BC Archives).

The Royal Navy set up residence in the harbour in the 1840s, establishing a naval presence in Esquimalt that continues to this day. In 1848, Constance Cove became the operations base for the H.M.S. Constance naval ship and the Royal Navy constructed the first permanent naval base buildings on Duntze Head in 1855. The naval base included a landing and boathouse on Grant Knoll (the naval dockyard, Building 116), buildings for paint and oil, boat maintenance, ordnance, and various storage facilities. In 1860, a powder magazine was established on Cole Island, followed by the construction of two coal sheds on Thetis Island and a lighthouse on Figgard Island. The factory building, housing an engine shop, smelter and smith shop, was constructed during the 1860s.

The Royal Navy officially declared permanent residence in Esquimalt Harbour in 1865 with the property boundary extending north, south, and east halfway to old Esquimalt village. Tension between Britain and the United States spurred further development of the base, and the naval property expanded between Skinner and Lang Coves. By 1883 there were 58 buildings present on the naval base.

Discussion for construction of what would become the Esquimalt Graving Dock began as early as 1904, but didn't move forward until the First World War when the need to service a new class of war ships and commercial vessels arose (Golder 2010d). Lang Cove was originally chosen for the location of the graving dock, but during survey in 1917 it was decided to move it to Skinner's Cove. Construction began in 1921 under the Dominion Public Works Department and was completed in 1926 with the first ship entering the facility on 13 September. At the time it was the second largest dry dock in the world after Boston (Taylor 1986).

In 1946/47 the precursor to the CFSA, the Royal Canadian Naval Yacht Club (West Coast) was created during a boat building project by a group of sailors near the current location of the South Jetty (CFSA website). In 1953 the name changed to the Royal Canadian Sailing Association and in 1954 it was moved to its present location north of Munroe Head. In 1968, with the integration of the three military branches, it became the Canadian Forces Sailing Association. In 1998 the CFSA became the permanent host to the Victoria Chapter of the Disabled Sailing Association of BC. Today the association provides training, recreational and competitive sailing opportunities for serving military members and their families as well as recreation for civilian members of DND, their dependants and employees of Federal Government agencies.

4.0 METHODS

4.1 Introduction

One of the objectives of this AOA was the development of a geographic information systems (GIS) based model for predicting the location of precontact archaeological sites in the Project area. This model was developed to enable PWGSC to better understand archaeological site spatial distributions and to predict potential conflicts between proposed developments and archaeological sites in areas where little or no archaeological inventory data exist.

An archaeological predictive model involves observing patterns of where known archaeological sites are located across the landscape, and using that information to suggest where unrecorded sites are most likely to be found. Archaeological and environmental variables (e.g., slope, proximity to flowing water, etc.) are scored, and areas where the variables converge (i.e., where total scores are greatest), are assigned the highest site potential ratings. A variation on this form of analysis applies weighted scales to rank the variables of interest, under the assumption that some criteria are more important than others for predicting site locations.

4.2 Literature Review

A review of readily available data regarding local and regional prehistory, history, ethnography, and the environment of the Project area was undertaken. Included in this review were archaeological site records, archaeological overview and impact assessment reports on file with the Archaeology Branch and reports provided to Golder by PWGSC. The Provincial Heritage Register was also searched using the Remote Access to Archaeological Data (RAAD) application to establish whether any previously recorded archaeological sites are found in the Project area, and to determine the types of sites that may be located in the vicinity of the study area. Geotechnical and environmental studies, aerial photos, and historic maps specific to the study area were also reviewed.

4.3 Archaeological Modeling

The archaeological predictive model incorporates a variety of variables structured in distinct layers. Variations within these parameters are summed to arrive at graded evaluations of archaeological potential that can be accurately mapped. Variables relied upon in this study include slope, proximity to the ocean and proximity to previously recorded archaeological sites. Also factored into this model were the results from previous archaeological assessment and monitoring in the Project area, as well as relevant information gleaned from geotechnical and geo-environmental testing in the region.

The potential model used in this analysis incorporates five sets of variables into an overall map of potential:

- slope
- distance to the ocean
- distance to known archaeological sites
- archaeological assessment and monitoring results
- geotechnical and geo-environmental testing results

Each of the variables were ranked independently of one another and mapped in ArcInfo, a GIS-based program. Rankings of high, moderate and low were determined for each variable in terms of its potential relationship with the identification of archaeological sites. These rankings were established on the basis of generally recognised principals in relation to site location parameters. In areas where the potential ratings overlap, preference was given to the higher rating.

The model is based upon the assumption that the distribution of archaeological sites is dependent upon regional terrain characteristics and availability of local resources. It is realized that human factors such as population densities, seasonal movement cycles, and other culture-based variables will also affect the distribution of archaeological sites within the Project area. In addition, it is recognized that natural taphonomic processes have also affected what sites now exist in the archaeological record and provide a degree of bias. A large percentage of the activities carried out in the region in the past are not preserved in the present-day record. Furthermore, many activities, such as the gathering of plants, often do not leave materials behind in the archaeological record.

4.3.1 Category Rankings

4.3.1.1 Slope

Slope is the angle from which the topography deviates from a flat or horizontal plane. Based on examination of the previously recorded sites and their terrain associations, slope was determined to be a factor of significant importance in predicting the location of precontact archaeological sites. For instance, most habitation activities tend to be associated with relatively level terrain.

Slope was ranked in 10-degree intervals. Slopes between 0° and 10° were provided a high potential ranking. A moderate ranking was given to slopes between 11° and 20°, while slopes above 21° were ranked low. Considering the grade of the terrain, slope should be an important factor in this predictive model.

4.3.1.2 Proximity to the Ocean

Proximity to the ocean is considered to have considerable influence on locating archaeological resources. The ocean provides a consistent source of food, and serves as an important travel route through the rugged terrain. All areas below the 1939 high water shoreline were determined to have low potential for archaeological deposits unless recent data (archaeological, geotechnical) suggested otherwise.

4.3.1.3 Previously Recorded Archaeological Sites

Actual archaeological site locations were used in the creation of the potential model. During the production of this model, existing data on archaeological sites were used for two purposes. First, site specific information provided a basis for the identification of the types of sites to be expected in the region. Second, the location of each of the sites was utilized to assign archaeological potential.

A radius was placed around the recorded boundaries of each archaeological site of 20 m (creating a circle of at least 40 m in diameter). While this range was arbitrarily chosen, it is believed that it reflects the minimum area that cultural activities can be expected to have occurred at a site.

The location of all the previously recorded archaeological sites in the Project area was compared to the assigned potential rankings. Where a site overlapped two potential rankings, it was still given the ranking of high potential.

4.3.1.4 Archaeological Assessment Data

Areas where archaeological investigations had been previously undertaken were considered. Shovel tests, auger tests and in some cases borehole tests were entered into the archaeological potential model as they provided information on the presence or absence of archaeological deposits. Tests which were positive for archaeological deposits were given a high potential rating which was arbitrarily extended 20 m into the surrounding area to create a buffer for future development. Negative shovel, auger and borehole tests were given a low potential rating which was extended for 5 m into the surrounding area. A potential rating of moderate was given to areas where archaeological deposits were observed, but determined to have been previously disturbed. These locations were also provided with a 20 m buffer.

4.3.1.5 Geotechnical Data

Geotechnical data derived from boreholes and test pits was also used in determining archaeological potential. Boreholes containing evidence of intact shell midden deposits, as determined by a qualified archaeologist, were given a potential rating of high for archaeological deposits. All other boreholes were given a rating of moderate unless it was determined that the collected soils and sediments consisted of fill down to bedrock and did not contain any shell, in which case they were given a rating of low. A buffer of 20 m was extended to each borehole.

5.0 RESULTS

5.1 Previously Recorded Archaeological Sites within the Project Area

There are six registered archaeological sites located within the Project area: DcRu-6, DcRu-12, DcRu-789, DcRu-790, DcRu-1255 and DcRu-1256 (Figure 3). Each of these six archaeological sites contains precontact shell midden deposits. There are over 45 previously recorded archaeological sites located on Esquimalt Harbour, 19 of which are situated within 1 km of the development.

5.1.1 DcRu-6

DcRu-6 is located within and adjacent to the EGD Project area. The site is situated on the shore of Pilgrim Cove and consists of a habitation feature and shell midden associated with precontact burials. Initially recorded in 1959, DcRu-6 measures approximately 190 m by 40 m. Nine archaeological investigations have been undertaken since the site was initially recorded (Golder 1999, 2009b, 2010b, 2010c, 2011b; Hall and Hutchcroft 2008; Millennia 2003c, 2005, 2010a), resulting in the recovery of intact cultural deposits, including house floors, postholes, bone, antler, and lithic artifacts (Millennia 2005, 2010a). Following the 2003 excavations by Millennia, excavated soils containing shell midden deposits from DcRu-6 were screened for artifacts and then spread over adjacent lands to the north and northeast, including at the head (east end) of the graving dock, and north of the Front Guard House (Figure 5). In recent years it has become common practice to redeposit excavated soils from around the EGD containing cultural materials to these two areas (Golder 2010c, 2011a, Millennia 2011b, 2011c, 2011d, 2016a). According to the Provincial Heritage Register, the site is considered to be less than 50% intact.

5.1.2 DcRu-12

DcRu-12 is located in the north and west portions of Munroe Head and extends north through the CFSA and the New Songhees Indian Reserve No. 1A to Ashe Head. The site measures 670 m by 200 m. It was first recorded in 1959 and has since been revisited by several archaeologists conducting both research and assessment investigations. Large scale research excavations were conducted by the University of Victoria in the 1970s (McMurdo and Styles 1974; McMurdo 1975; Keddie 1976). Observed in these archaeological investigations were intact stratified shell midden deposits, artifacts, faunal remains, possible living floors, and human remains. Radiocarbon dates suggest occupation from 3000 to 250 years ago (Grant Keddie, personal communication August 2011). Since 2002, several archaeological impact assessments and monitoring programs have been conducted at DcRu-12 (Bastion 2010; Golder 2003a, 2003b, 2008a, 2009b, 2010a, 2011a, 2011e; Millennia 2002, 2003a, 2003b, 2004a, 2004b, 2004c, 2010b, 2010c, 2011a, 2011b, 2011c, 2017b, 2017c). Wet site and intact archaeological deposits were observed during these assessments, including the articulated remains of a dog.

5.1.3 DcRu-789

DcRu-789 is a shell midden site that was recorded within the property boundaries of the EGD by Millennia Research Ltd. in 2004. The site is situated on sloping terrain overlooking the Esquimalt Harbour to the west. Prior to construction of the Graving Dock, DcRu-789 was likely situated immediately adjacent to the east shore of Esquimalt Harbour. Shovel tests and examination of natural exposures revealed midden deposits ranging between 25 and 30 cm thick directly over bedrock. Faunal remains, fire-altered rock, and a rare carved siltstone artifact shaped in the form of a phallus, have been collected from this site (Millennia 2004a, 2017a).

5.1.4 DcRu-790

DcRu-790, a shell midden site, was recorded within the property boundaries of the EGD by Millennia Research Ltd. (2004a). The site measures 8 m by 5 m and is reported to be intact and unstratified. Prior to construction of the Graving Dock, DcRu-790 was likely situated immediately adjacent to the east shore of Esquimalt Harbour. It is not known if the archaeological deposits originally extended beneath a demolished building foundation located immediately adjacent to the site (Millennia 2004a).

5.1.5 DcRu-1255

DcRu-1255 consists of intermittent pockets of redeposited shell midden and faunal material observed over a 355 m by 30 m area along the north side of the EGD property. The site was recorded during remediation of AEC 18 (Millennia 2011d), during replacement of the EGD security fence along the E&N rail line to the north (Millennia 2015), and during an AIA for the North Landing Wharf Substation Relocation project (Millennia 2017b). All sediments containing archaeological deposits were stockpiled within DcRu-1256, the designated area for archaeological material displaced from other sites within the EGD near the east end of the property.

5.1.6 DcRu-1256

DcRu-1256 is the EGD designated stockpile location for archaeological material displaced from other sites within the EGD as a result of development. The stockpile is located within the green-space at the head of the Graving Dock, and overlies a portion of site DcRu-6. The site measures 30 m by 25 m.

5.2 Previous Geotechnical Studies within the Study Area

Previous environmental and geotechnical reports supplied to Golder by PWGSC were reviewed for information relating to the condition of subsurface soils and sediments. As well, borehole log summaries were examined for evidence of shell, organics, and/or intact soils, as these can be indicators of archaeological sites.

Twelve geotechnical studies and two archaeological impact assessments which utilized auger testing were reviewed for the purposes of this report. Combined, they represent data from 415 boreholes, 63 test pits and 36 shovel tests/auger tests (Figure 4). The testing results reviewed for this AOA were found in the following documents:

- Environmental Investigation of Signal Hill and Munroe Head, Esquimalt Harbour (SRK-Robinson 1993).
- Phase III Contaminated Site Investigation of DND Munroe Head Land Parcel, Esquimalt Harbour, BC (GeoViro 1996).
- Phase 2 and 3 Environmental Site Assessments Esquimalt Graving Dock (Seacor 2002a).
- Subsurface Environmental Investigation and Remedial Options Assessment Munroe Head Property Esquimalt, BC (Seacor 2002b).
- Supplemental Site Investigation Esquimalt Graving Dock Esquimalt, BC (Seacor 2003).
- Archaeological Impact Assessment Proposed Site Redevelopment Canadian Forces Sailing Association, Esquimalt, BC (Golder 2003b).

- Supplemental Site Investigation and Quantitative Risk Assessment at Munroe Head Esquimalt Harbour, BC (Golder 2003c).
- Victoria Shipyards South Jetty Redevelopment Esquimalt Graving Dock (Golder 2007).
- Archaeological Impact Assessment of The Canadian Forces Sailing Association Site in Esquimalt, BC (Golder 2008a).
- Geotechnical Site Investigation North Landing Wharf Esquimalt Graving Dock, BC (Golder 2008b).
- Esquimalt Graving Dock Uplands Phase 1 Environmental Site Assessment Report (SLR 2009a).
- Esquimalt Graving Dock Uplands Phase 2/3 Environmental Site Assessment Report (SLR 2009b).
- Esquimalt Graving Dock Waterlot Detailed Site Investigation Update (Golder 2011d).
- Victoria Shipyards – Training Centre Maplebank Road Preliminary Geotechnical Investigation (Thurber 2011).

A review of orthophotos from 2007 (Capital Regional District Regional Community Atlas, website accessed 19 March 2009), an 1858 Admiralty Chart (RAAD 2009), maps documenting the 1924 shoreline (Golder 2008b) and photos documenting the construction of the EGD (SLR 2009a) reveal that large areas of the shoreline within the Project area have been covered in fill. Borehole logs indicate that intact native soils have been encountered below fill from 0.25 m to 2.9 m below the present surface at EGD, and from 0.3 m to 1.5 m below the present surface in the CFSA (SLR 2009b, Seacor 2002a, Golder 2003c). If intact soils are present below fill, there is the possibility that intact archaeological deposits may be present in these same soils within the Project area.

5.3 Archaeological Potential Model

The PWGSC property is located along the north shore of Constance Cove in the Esquimalt Harbour. Figure 5 presents the results of the archaeological potential model developed for the Project area. The model was developed using the five variables summarized in Section 4.0:

- slope
- distance to the ocean
- distance to known archaeological sites
- archaeological assessment and monitoring results
- geotechnical and geo-environmental testing results

The archaeological potential model provides information on the location of all previously registered archaeological resources. This model also predicts the location where archaeological sites might be situated based on environmental and cultural parameters, as well as from an analysis of where buried soils and sediments may be located from previous archaeological, geotechnical and geo-environmental assessments in the Project area. Areas of high, moderate and low potential to contain buried archaeological sites and features were identified and mapped (Figure 5).

It must be recognized that an archaeological potential model is only as accurate as the information that contributes to its formulation. Knowledge of the archaeological resource distributions in any region depends on the intensity and distribution of prior investigation. Information available in the Provincial Heritage Register also varies with respect to its quality, accuracy and detail.

Other limitations that need to be considered include the potential changes that may have taken place in the past in vegetation types and ecological zones. For example, vegetation types in early post glacial times are believed to have differed substantially from modern communities and in mid Holocene times vegetation zones are thought to have had markedly different distributions. There have also been sometimes dramatic differences in sea level across the Holocene resulting in significant differences from the current shoreline.

6.0 RECOMMENDATIONS

6.1 Introduction

An archaeological potential model has been developed for PWGSC that predicts the location of previously unidentified precontact archaeological sites within the Project area along Esquimalt Harbour in Esquimalt, BC. Archaeological potential was defined by the presence of archaeological sites in the vicinity of the Project area and consideration of terrain where archaeological sites have been previously identified in other localities, particularly locations near the shoreline. Information on previous archaeological, geotechnical and geo-environmental assessment in the Project area was also incorporated into the model.

The results of the AOA indicate that the Project area has areas of high, moderate and low potential to contain buried archaeological sites and features.

6.2 Management Concerns

The RMSNS project is currently underway and the NLWSR project is scheduled for the 2019 fiscal year. Anticipated impacts for these and future potential projects will vary depending on the degree of surface disturbance, as influenced by local topography, weather conditions and the types of equipment used. Information on the level of these impacts can be used in conjunction with the mapped predictions of landscape sensitivity to determine appropriate management responses to archaeological concerns. This planning would be completed in advance of proposed developments in any specific location within the Project area.

Golder Associates has developed a matrix specifically for PWGSC that balances archaeological potential against potential impacts to significant archaeological sites (Table 1). Proposed developments have been ranked as high, moderate, and low depending upon the degree of impact to significant archaeological sites. As discussed in Section 3.2, high impact operations would include, but not limited to, excavation, grading, levelling, landscaping, dredging and demolition. Developments considered to have a moderate impact to archaeological sites include augering of boreholes for geotechnical and geo-environmental investigations and paving of roads and parking lots. Low impact activities include on-going operational activities such as vehicle use that will not disturb surface soils and sediments.

Table 1: Archaeological Management Matrix

Location	Percent of Project Area	Type of Predicted Archaeological Site Impact		
		High Impact	Moderate Impact	Low Impact
Known Archaeological Site	14.8	high sensitivity	high sensitivity	low sensitivity
High Potential	43.4	high sensitivity	moderate sensitivity	low sensitivity
Moderate Potential	6.0	moderate sensitivity	moderate sensitivity	low sensitivity
Low Potential	50.6	low sensitivity	low sensitivity	low sensitivity

Table 1 compares archaeological site potential with the degree of impact. It provides for three different levels of archaeological sensitivity, high, moderate, and low. Where substantial impacts are to occur in an area of high archaeological site potential, the location would be considered to have a high sensitivity; moderate to low impacts in a location of low archaeological site potential would be considered to be of low sensitivity. A professional archaeologist would work with PWGSC to review plans for future developments within the Project area against this Archaeological Management Matrix.

Sensitivity evaluations are used to develop appropriate levels of program management to address archaeological concerns and the following AOA implementation is suggested:

- Where **sensitivity is high**, a professional archaeologist should be contacted to discuss the proposed impacts. Where archaeological resources are unknown but of high potential, an AIA would likely be recommended. Where archaeological resources have been previously assessed, it may be possible to proceed directly to an impact management measure such as site avoidance by relocating the development, site protection, or systematic data recovery (i.e., archaeological excavations) by a professional archaeologist.
- For areas of **moderate sensitivity**, a professional archaeologist should be contacted to discuss the proposed impacts and determine if impact management actions are necessary. Suggested actions might include archaeological monitoring or avoidance. Archaeological monitoring would need to be conducted by a professional archaeologist. Monitoring would be used to identify any significant archaeological sites that might warrant further archaeological assessment and/or mitigation.
- For Areas of **low sensitivity**, a chance find management procedure should be developed prior to development and implemented so that the appropriate steps are taken in the unlikely event that archaeological materials are inadvertently impacted or exposed during development.

6.3 Future Investigations

An important objective of any assessment procedures undertaken in the Project area would be to test the validity of the archaeological predictive model. The results of future investigations should be used to verify or modify the results of the model to improve its accuracy. As a test of these archaeological potential rankings, future assessment activities should also sample areas of low archaeological potential prior to development.

6.4 Conclusion

An archaeological predictive model has been developed for the Project area. These preliminary findings provide baseline data that will serve as the basis for continued efforts to improve and refine modelling approaches in the Project area. The model can be utilized for development and operational planning and for archaeological management purposes. For example, developments can be ranked on the basis of the anticipated impacts to archaeological sites. Using these rankings, a matrix has been proposed where planners can identify locations where particular developments have the potential to impact archaeological sites. This tool can be used to minimize high impact activities in areas of high heritage sensitivity.

It is recommended that a professional archaeologist work with PWGSC to review plans for future developments within the Project area. Recommendations would then be formulated for the management of archaeological resources within the proposed development area. It is anticipated that the screening process can be completed well in advance of development activities allowing planners to avoid areas of archaeological concern if they wish.

It is expected that PWGSC will undertake developments that will require formal archaeological assessment before construction is allowed to proceed. Where significant archaeological deposits are identified, further measures may be required to protect the resource. Mitigative options can include the following: avoidance, further assessment, data recovery (archaeological excavation) and/or monitoring. PWGSC should be aware that serious delays have been experienced by other proponents when assessment and mitigation activities were not completed in a timely fashion. PWGSC is advised that if unanticipated archaeological materials or features (including but not limited to, culturally modified trees, rock art, stone artifacts, human remains, or unusual objects or features of a possible ceremonial nature) are encountered during any further construction or related activities, all work in the immediate area should cease, and an archaeological consultant should be contacted.

7.0 LIMITATIONS AND USE OF REPORT

This report was prepared for the exclusive use of PWGSC. Any use, reliance or decisions made by third parties on the basis of the report are the sole responsibility of such third parties.

8.0 CLOSURE

We trust the information in this report is satisfactory for your present needs. Should you require additional information or clarification, please do not hesitate to contact the undersigned at your earliest convenience.

Golder Associates Ltd.



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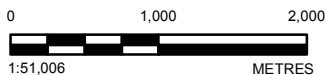
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- LEGEND**
- PROJECT AREA
 - RESIDENTIAL AREA



REFERENCE(S)

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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
PWGSC

PROJECT
ARCHAEOLOGICAL OVERVIEW ASSESSMENT OF ESQUIMALT GRAVING DOCK, ESQUIMALT B.C.

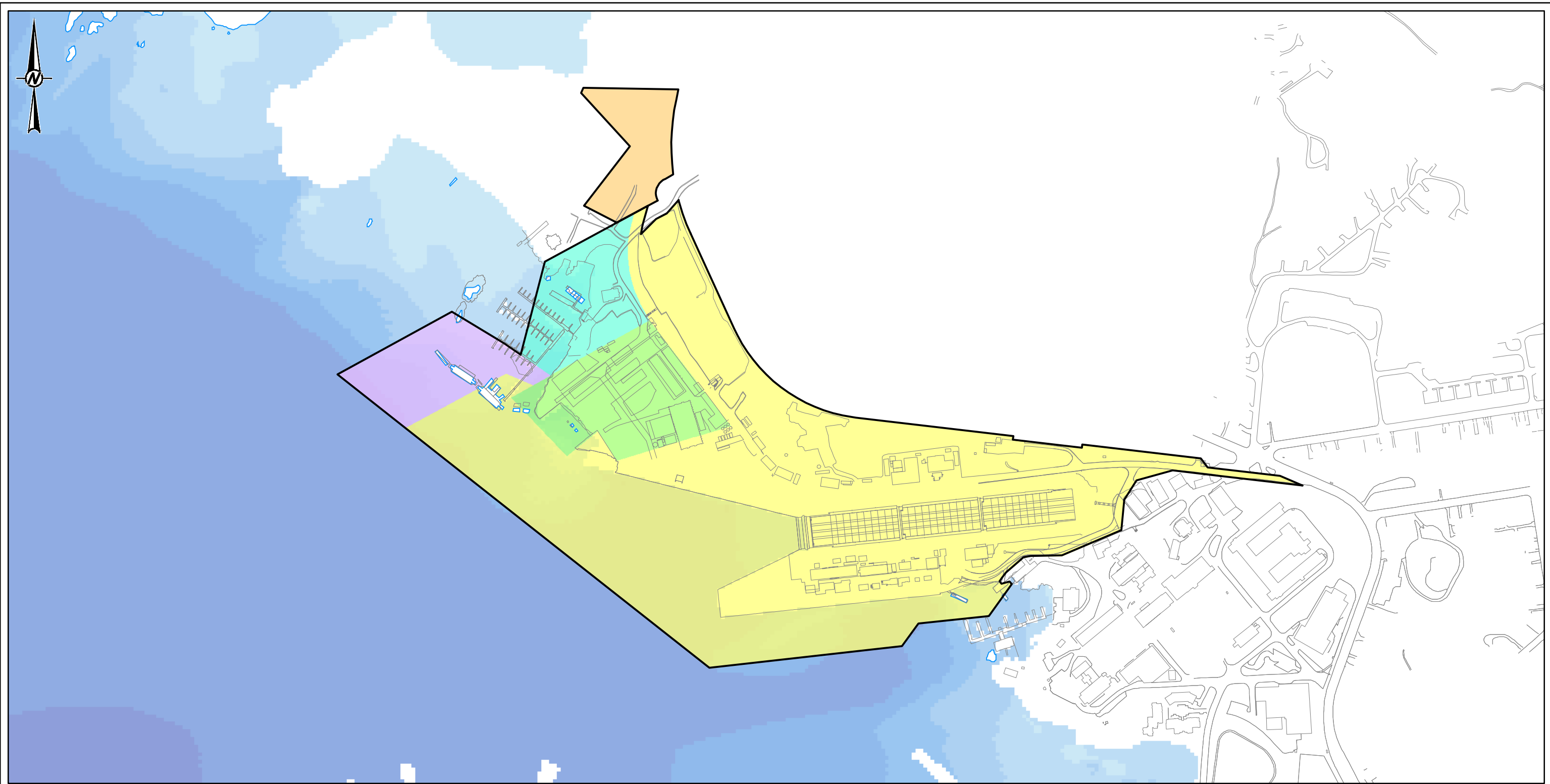
TITLE
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CONSULTANT	YYYY-MM-DD	2018-04-27
GOLDER	DESIGNED	DD
	PREPARED	JP
	REVIEWED	DD
	APPROVED	BH

PROJECT NO.	PHASE	REV.	FIGURE
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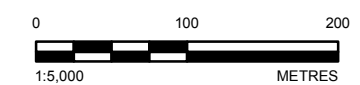
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- LEGEND**
- PROJECT AREA
- PROPERTIES**
- CANADIAN FORCES SAILING ASSOCIATION
 - LEASE SITE LOT 203 (IR NO. 1A, SEC. 2A)
 - MUNROE HEAD
 - ESQUIMALT GRAVING DOCK UPLANDS AND WATERLOT
 - CANADIAN FORCES SAILING ASSOCIATION WATERLOT

REFERENCE(S)
 1. BASE LINEWORK PROVIDED BY THE PWGSC, 16 APRIL 2018.
 COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N



CLIENT
 PWGSC

CONSULTANT



YYYY-MM-DD	2018-04-27
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PREPARED	JP
REVIEWED	DD
APPROVED	BH

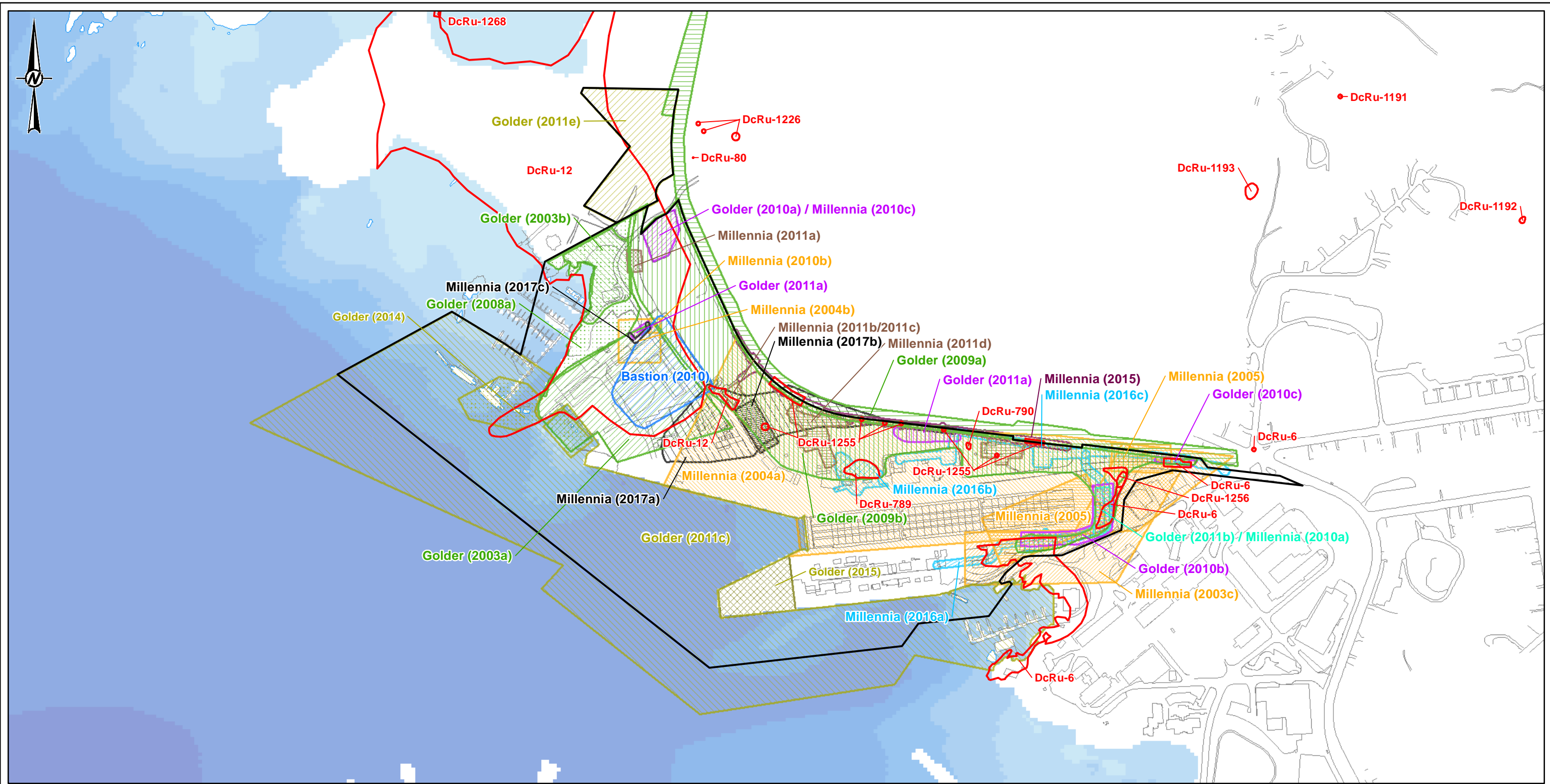
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 ARCHAEOLOGICAL OVERVIEW ASSESSMENT OF ESQUIMALT GRAVING DOCK, ESQUIMALT B.C.

TITLE
PROJECT PROPERTIES

PROJECT NO.	PHASE	REV.	FIGURE
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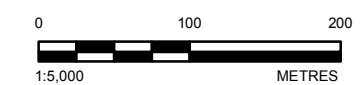
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LEGEND

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ARCHAEOLOGICAL SITE	GOLDER (2011A)	MILLENNIA (2011A)
PREVIOUS PROJECT AREAS	GOLDER (2011B) / MILLENNIA (2010A)	MILLENNIA (2011B/2011C)
BASTION (2010)	GOLDER (2011C)	MILLENNIA (2011D)
GOLDER (2003A)	GOLDER (2011E)	MILLENNIA (2015)
GOLDER (2003B)	GOLDER (2014)	MILLENNIA (2016A)
GOLDER (2008A)	GOLDER (2015)	MILLENNIA (2016B)
GOLDER (2009A)	MILLENNIA (2003C)	MILLENNIA (2016C)
GOLDER (2009B)	MILLENNIA (2004A)	MILLENNIA (2017A)
GOLDER (2010A) / MILLENNIA (2010C)	MILLENNIA (2004B)	MILLENNIA (2017B)
GOLDER (2010B)	MILLENNIA (2005)	MILLENNIA (2017C)

REFERENCE(S)
 1. BASE LINWORK PROVIDED BY THE CLIENT.
 COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N



CLIENT
 PWGSC

CONSULTANT



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APPROVED	BH

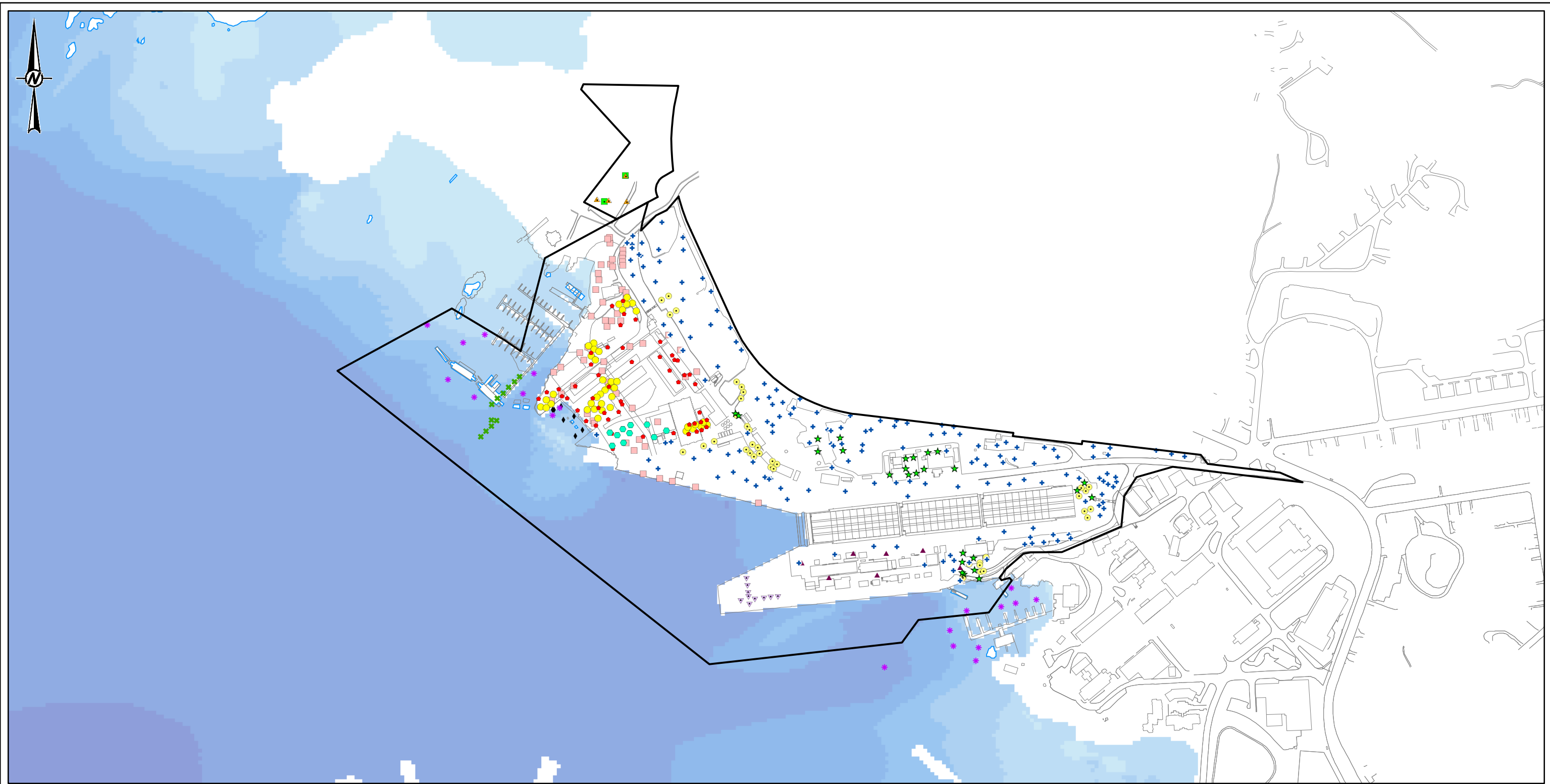
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 ARCHAEOLOGICAL OVERVIEW ASSESSMENT OF ESQUIMALT
 GRAVING DOCK, ESQUIMALT B.C.

TITLE
 LOCATION OF KNOWN ARCHAEOLOGICAL SITES AND
 PREVIOUS ARCHAEOLOGICAL STUDIES

PROJECT NO.	PHASE	REV.	FIGURE
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- LEGEND**
- PROJECT AREA
 - GEOVIRO, 1996
 - GOLDER, (2003b, 2003c, 2008a, 2008b)
 - ▲ GOLDER, 2007
 - ◆ GOLDER, 2010
 - ✱ GOLDER, 2011a
 - ▲ GOLDER, 2011e
 - ✕ GOLDER, 2014
 - ▼ GOLDER, 2015
 - SEACOR, 2002a
 - ◆ SEACOR, 2002b
 - ★ SEACOR, 2003
 - + SLR, 2009
 - SRK, 1993
 - THURBER, 2011

REFERENCE(S)
 1. BASE LINEWORK PROVIDED BY THE CLIENT.
 COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N



CLIENT
 PWGSC

CONSULTANT



YYYY-MM-DD	2018-04-27
DESIGNED	DD
PREPARED	JP
REVIEWED	DD
APPROVED	BH

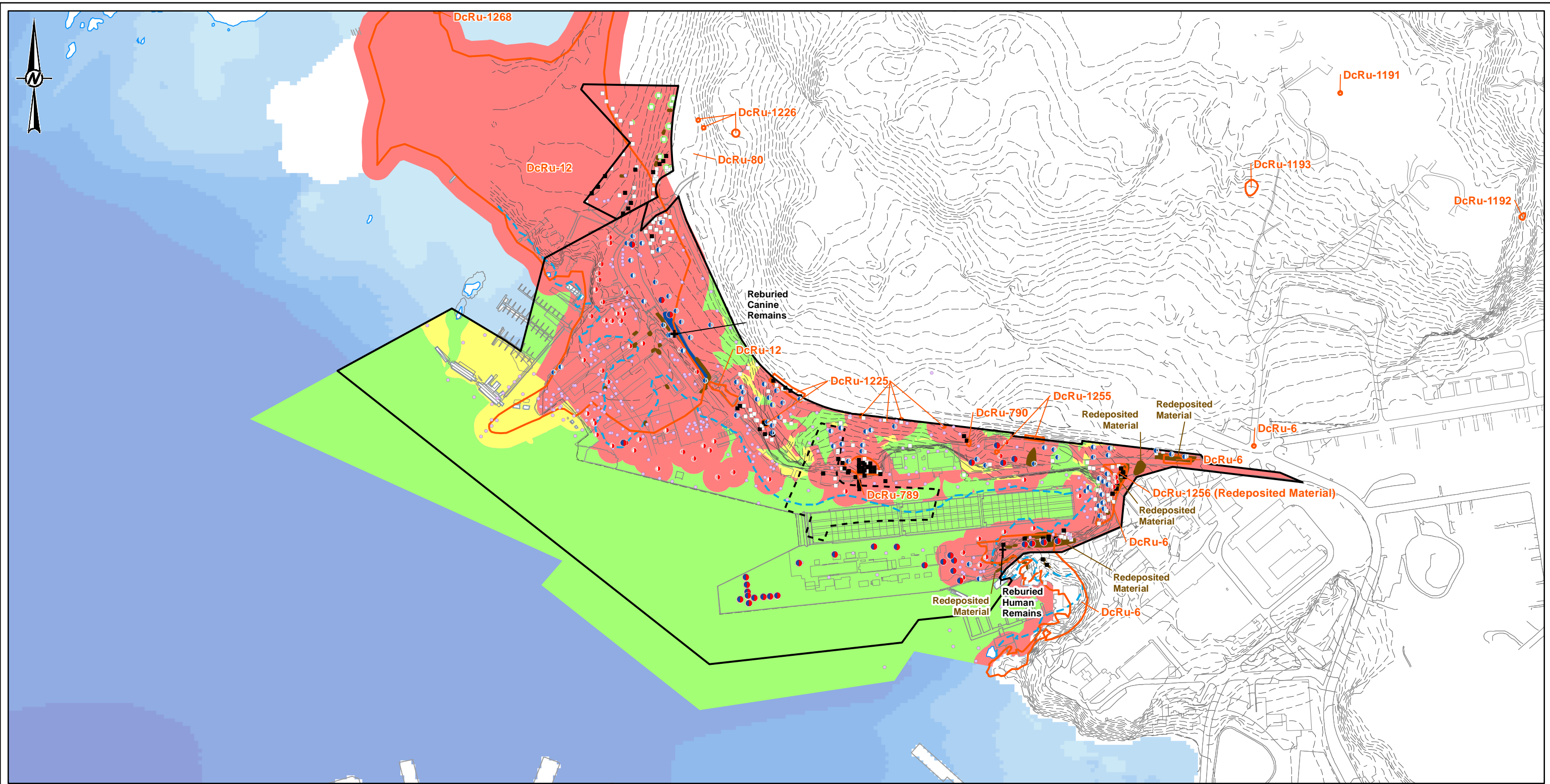
PROJECT
 ARCHAEOLOGICAL OVERVIEW ASSESSMENT OF ESQUIMALT
 GRAVING DOCK, ESQUIMALT B.C.

TITLE
BOREHOLE LOCATIONS

PROJECT NO.	PHASE	REV.	FIGURE
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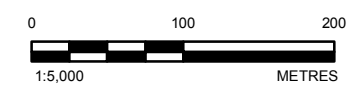
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- LEGEND**
- PROJECT AREA
 - ARCHAEOLOGICAL SITE
 - ERODING SHELL
 - SHELL MIDDEN
 - HBC BUILDINGS FROM 1858 NAUTICAL MAP (APPROXIMATE)
 - 1939 SHORELINE
 - CONTOUR LINE
 - EXISTING BOREHOLES
 - BOREHOLES CONTAINING SHELL
 - BOREHOLES CONTAINING NATIVE SOIL
 - BOREHOLES CONTAINING SHELL AND NATIVE SOIL

- † REBURIED HUMAN REMAINS (Millennia 2003c)
 - POSITIVE SHOVEL TEST LOCATION
 - NEGATIVE SHOVEL TEST LOCATION
 - + REBURIED CANINE REMAINS (BASTION 2010)
- ARCHAEOLOGICAL POTENTIAL MODEL**
- HIGH POTENTIAL
 - MODERATE POTENTIAL
 - LOW POTENTIAL

REFERENCE(S)
 1. BASE LINENWORK PROVIDED BY THE CLIENT.
 COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N



CLIENT
 PWGSC

CONSULTANT



YYYY-MM-DD	2018-04-27
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PREPARED	JP
REVIEWED	DD
APPROVED	BH

PROJECT
 ARCHAEOLOGICAL OVERVIEW ASSESSMENT OF ESQUIMALT
 GRAVING DOCK, ESQUIMALT B.C.

TITLE
ARCHAEOLOGICAL POTENTIAL MODEL

PROJECT NO.	PHASE	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

APPENDIX A

Compilation of Archaeological
Reports Referenced in
Archaeological Overview
Assessment of the Esquimalt
Graving Dock, Public Works and
Government Services Canada,
Esquimalt, BC



golder.com

**ESQUIMALT GRAVING DOCK
REPLACE MAIN DISTRIBUTION LINE (RMDL)
BC HYDRO (BCH) POINT OF DELIVERY (POD) SWITCHGEAR
ESQUIMALT, BRITISH COLUMBIA**

**APPENDIX C
SAMPLE CONTRACTOR'S HEALTH
& SAFETY PLAN**

CHECKLIST OF HEALTH & SAFETY PLAN REQUIREMENTS

- Prepare and comply with a site-specific project Health and Safety Plan (see sample below) based on hazard assessment, including, but not limited to, the following:
- Reference to Contractor's health & safety policy.
- Indication Health & Safety has been fully considered in the bid.
- General safety rules for the project.
- Commitment to comply with all applicable regulations and applicable policies and procedures of PWGSC and Pacific Forestry Centre.
- Confirmation that PWGSC will be informed of any sub-contractors before they enter the site and that PWGSC has the right to remove any sub it deems unsatisfactory.
- Commitment to completion of a Job Hazard Analysis and ensuring workers are made aware of the hazards and comply with specific requirements.
- Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations.
- Commitment to the documentation of job-specific safe work procedures and ensuring workers are trained in those procedures before starting work.
- Define regular communication channels to ensure information is transferred between the Construction team and the Departmental Representative/ operations and record keeping procedures.
- Commitment to provision of plans by Qualified Persons when required by regulation (e.g. fall arrest program, etc.), ensuring workers are trained in the plan, have approved equipment and follow the agreed plan.
- Commitment to ensuring no worker (including sub-trades) enters the job site without proper training. Ensuring Workers are made aware of their right to refuse work they consider too hazardous. Acknowledgement that the PWGSC orientation is not to be considered complete training.
- Commitment to using only "Qualified Persons" on the project and provision of proof of qualification as required.

- Definition of roles & responsibilities for project safety/organization for project specifically the Construction Superintendent, OH&S Representative and Worker
- Safety Representative. Identify any alternates and the qualifications of all individuals.
- A commitment to holding Occupational Health and Safety Meetings at a frequency agreed with the Departmental Representative and provision of minutes within 2 days of the meeting.
- Define Inspection Policy & Procedures. A commitment to holding formal site inspections at a frequency agreed with the Departmental Representative and provision of a report within 2 days of the inspection. The Worker Safety Representative will participate whenever possible.
- A commitment to conform to all environmental requirements and safe work procedures for hazardous materials. This includes provision of MSD Sheets and training of workers in correct use, handling, disposal and personal protective measures to be used.
- Definition of how First Aid will be provided and how medical emergencies will be treated.
- Incident reporting and investigation policy and procedures. Commitment to reporting all incidents, accidents, near-miss and WORKSAFEBBC inspections/orders to the Departmental Representative immediately followed by copies of relevant reports etc. within 2 days.
- Occupational Health and Safety Committee/Representative procedures.
- Occupational Health & Safety communications and record keeping procedures.
- List hazardous materials to be brought on site as required by work.
- Indicate engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
- Identify personal protective equipment (PPE) to be used by workers.
- Identify personnel and alternates responsible for site safety and health.
- Identify personnel training requirements and training plan, including site orientation for new workers.

**ESQUIMALT GRAVING DOCK
REPLACE MAIN DISTRIBUTION LINE (RMDL)
BC HYDRO (BCH) POINT OF DELIVERY (POD) SWITCHGEAR
ESQUIMALT, BRITISH COLUMBIA**

**APPENDIX D
PRELIMINARY JOB HAZARD ANALYSIS CHECKLIST**



Project Title: Master.

Project No.

Inspection Date:

Inspection/Job Hazard Analysis Conducted By:

Note:

1. This form is also intended for use as a checklist when making daily inspections of the worksite. Therefore some questions will not apply to the initial inspection/ job hazard analysis.
2. This form is intended as a guide only and does not necessarily cover every situation regulated by WORKSAFEBC or other jurisdictions. It is imperative that the Contractor be familiar with safety requirements and add anything that is relevant but not listed below. New items should be noted to the attention of the Project Manager for inclusion in future revisions. Contractors must finalize the JHA to reflect the methods/equipment etc. they will use to do the work.
3. Project Managers must review all items as part of creating preliminary JHA. Do not simply reuse this form from a previous project. Delete or add to "Hazard/action required" items as appropriate for your project and enter checkmarks or NA (not applicable) or TBD (to be determined with Contractor) under "Existing" column as appropriate.
4. **CODES:**
 - "*" indicates covered in Basic Site Orientation for Contractors presentation by PWGSC.
 - "S" indicates item covered in startup meeting with Contractor and up to Contractor to carry out appropriate action. Not covered in EGD orientation session.
 - "O" indicates item covered in EGD project specific orientation session. This does not relieve the contractor of responsibility for training workers with regards to this item.

5. Column "WORKSAFEBC Ref." May also contain Canadian Occupational Safety & Health (COSH) regulation references.

Add brief description of work to be done:

Significant Risks include but are not limited to:



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

Cond No.	Condition	Existing √	CODE	WORKS AFEBC Ref. #	Hazard/ Action Required
GENERAL	1.1 Notice of Project (NOP) given to WORKSAFEBC? Check regulations for conditions requiring notice: <ul style="list-style-type: none"> - Over \$100,000. - All or part of works are required to be designed by P.Eng. - Asbestos removal - Disturb Lead coatings - Significant Risk of Occupational Disease - New construction, major alteration, structural repair or demolition of : <ul style="list-style-type: none"> - Bldg over 2 stories (or 20ft.) - Bridge - Earth/water retaining structure over 10' - Silo/chimney over 20' - Work in compressed air environment - Work in a caisson - Work in a tunnel (see 22.2) - Work on underground working (22.6) - Trenches 4' deep and 100' long or other type of excavation over 4' a worker must enter. - Diving Operations check 24.9 - Aircraft involved? check 29.8 	√	S	20.2 24.9 22.6 29.8	Contractor to provide NOP to WORKSAFEBC and provide copy to Project Manager before pre-startup safety orientation meeting. Note that WORKSAFEBC NOP Form 52E49 is used for general construction work and when asbestos or lead is involved. Use WORKSAFEBC Form 52E48 for NOP when diving, underground workings or aircraft are involved. NOP should go to WORKSAFEBC 4-5 days before starting work if possible and MUST be submitted no less than 24 hrs before commencing work. The white copy is for the site and the canary and pink copies go to the WORKSAFEBC. Photocopies should be posted on the safety notice board, placed on the project file, contract file and sent to the Regional Safety Coordinator. Note also the requirement to provide written notice to WORKSAFEBC before commencing (under Part 19) if workers, equipment, machinery or materials could come in contact with energized high voltage conductors or other exposed electrical equipment. Note application to underground workings in WORKSAFEBC section 22.2
	1.2 Multiple Contractor Coordination. <ul style="list-style-type: none"> - 2 or more employers? - Overlapping work areas - Appoint qualified safety coordinator - Post construction procedures and JHA 	√	S	Review WORK SAFEBC 20.3	Contractor to appoint Worker Safety Representative and Construction Superintendent. Coordination with EGD personnel and others on site will be through Project Manager. Post Final JHA and procedures.
	1.3 Building and other permits obtained?	√	S		Building permit required for new construction.
	1.4 Notice of Project Posted?	√	S		Contractor will post on safety notice board.



Project Title: Master.

Project No.

1.5	Post emergency response plan and site plan? Workers trained in emergency response? Conduct risk assessment for: Work at high-angles Special needs individuals Others as required by 4.13 or identified in other sections below	√	*	4.13-4.18 20.3	Site plan and emergency response to be posted on safety notice board. Contractor to ensure all workers trained in emergency response for fire, earthquake, medical, bomb threats and hazardous materials accidents before starting work. Note the special rescue requirements for high-angle work and the need for written agreements to provide service.
1.6	Regular Safety Meeting Minutes Posted?	√	*	3.2	Weekly safety meeting to be held. Contractor to provide minutes to Project Manager for posting.
1.7	WORKSAFEB Orders, Inspections or "Notice to Workers" Posted? Notification of compliance posted?	√	S	Div. 10 183	Contractor to provide any WORKSAFEB inspections and/or orders to Project Manager and post any inspections and compliance reports.
1.8	Regular Inspections carried out with Safety Rep and Posted? Conduct special inspection if required due to malfunction or accident.	√	S	3.5 3.7 3.8	Provide inspection reports to P.M. and post.
1.9	Contractor's workers safety representative identified for each employer? Alternatively, a Joint Committee set up if required by WORKSAFEB Div. 4?	√	S	20.3 Div4 125-140	Worker Safety representative if 9 or more workers.
1.10	Insufficient lighting?	√	S	4.65	Contractor to ensure lighting levels are sufficient for work to be performed. Provide portable lighting where necessary.
1.11	Workers informed of the hazards of the job and that they have the right to refuse work they consider too hazardous without discriminatory action?	√	*	Review 3.12	To be covered in orientation session and reinforced by Contractor
1.12	Workers with physical or mental impairment that could affect work must inform their supervisor.	√	*	4.19	To be covered in orientation session and reinforced by Contractor. Do not work at heights if subject to dizziness or if worker has a fear of heights
1.13	Workers informed no alcohol, drugs or other substance so as to endanger self or others?	√	*	4.20	To be covered in orientation session and reinforced by Contractor. Inform First Aid attendant of any medications being taken as they may be important in case of accident.
1.14	Firearms of any kind are prohibited on site.	√	*		To be covered in orientation session and reinforced by Contractor
1.15	Duties of Employers, Workers, Supervisors and Owners	√	*	Div.3 115-119	Review duties/responsibilities of parties involved. To be covered in orientation session.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

1.16	General Duty: In the absence of a specific requirement, all work must be carried out without undo risk of injury or disease to anyone.	√	*	2.2	To be covered in orientation session and reinforced by Contractor
1.17	Do not remove or render inoperative any safeguard and ensure safeguards are in place before operating equipment.	√	*	4.11 4.12	To be covered in orientation session and reinforced by Contractor
1.17a	All workers must be given adequate instruction in the fire prevention and emergency evacuation procedures applicable to their workplace	√	O	4.16	To be covered in orientation session and reinforced by Contractor
1.18	Do not operate any EGD equipment. Only those trained and authorized by the contractor are to operate contractor's equipment.	√	*	4.10	To be covered in orientation session and reinforced by Contractor
1.19	Ensure equipment inspection & maintenance record (s) are readily available to equipment operators or inspectors.	√	*	4.9	To be covered in orientation session and reinforced by Contractor
1.20	Workers must not engage in improper activity that could constitute a hazard to themselves or others including horseplay threats or physical force. Improper activity must be investigated.	√	*	4.24-4.31	To be covered in orientation session and reinforced by Contractor. Violence or harassment will not be tolerated. Contractor carry out risk assessment of injury from violence if there is potential for violence. Inform workers and prepare plans to minimize risk as required by 4.30
1.21	Workers to restrict activity to designated areas of the site.	√	*		Restrictions to be discussed at pre-start-up safety orientation meeting.
1.22	Workers informed of location of copy of WORKSAFEBC Regulations and Worker's Compensation Act.	√	*		Cover at orientation meeting. Contractor to ensure current copy of Regulations and the Act is available on site.
1.23	Written work procedures developed? Provided to P.M. and workers?	√	S & O		Contractor to document work procedures and sequence of activities and provide to Project Manager and workers before starting work.
1.24	Do not work on site outside of agreed working hours.	√	*		EGD must ensure an employee is on site anytime contractors are on site. Therefore notice is required.
1.25	If work damages a utility it must be reported.	√	O	4.18	Immediately inform the Utility and then the Project Manager
1.26	Wildlife, rodents may be encountered on the site.	√	O		Be aware of potential for encounters with wildlife on the site. Rodents may leave droppings in crawl spaces that could present a hazard if dust is breathed. Also, raccoons may be aggressive if cornered and deer may protect their young.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: **Master.**

Project No.

2.1	Has the Contractor carried out an assessment and identified the numbers of workers who may require first aid at any time; the types of injuries that might occur; barriers to first aid being provided to an injured worker; and time required to transport an injured worker to medical attention?	√	*	3.16 & 3.17	Contractor to provide <u>written</u> first aid assessment and written procedures for providing first aid to comply with first aid amendments effective 1 Feb/08				
2.2	Workers instructed to report ALL injuries or near misses, hazardous conditions?	√	*	3.10	To be covered at the pre-startup safety orientation meeting.				
2.3	Workers know where first aid is located and how to call for first aid? Communication between first aid attendant and ambulance service defined?	√	*	3.17 & 3.18	Contractor MUST have own F.A. Before starting work. Identify location & adequacy of Contractor's F.A. equipment. Cover procedures in orientation.				
2.4	First Aid qualified person(s) on contractor's crew? ORIGINAL Certificate(s) must be with person(s) on site. Provide photocopy to Project Manager.	√	S	Part 3	Required. Provide certificate(s) to Project Manager before orientation session.				
2.5	F.A. equipment on site where required? Must comply with "High" Hazard class 20 min or less travel to hospital.	√	S	3.16	Provide location and type.				
2.6	Provide immediate investigation & notice to WORKSAFEBEC for: - serious injury/death - major structural failure of bldg., bridge, tower, crane, hoist, excavation, temp. construction support system. - major release of a hazardous substance - incident required to be reported.	√	S	Div. 10 172	To be covered in project startup meeting with Contractor. Do not disturb the accident site except to attend injured persons, prevent further injuries or protect property. Assist investigators every way possible.				
2.7	Provide emergency transport to hospital as required by WORKSAFEBEC and written procedures for transport	√	S	3.17	Contractor to define procedures for provision of first aid, calling ambulance service etc. as required by regulation. Post them and ensure workers are informed.				
2.8	Is the first aid attendant available to render prompt service?	√	S	3.18	Do not assign activities that will interfere with the attendant's ability to receive and respond to call for first aid. Ensure coverage during lunch and other breaks. Provide backup first aid immediately for planned absences. About 1/2 shift absence is permissible for unplanned absence until replacement attendant is in place.				

FIRST AID & INVESTIGATIONS



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

2.9	Has the general contractor included all subs in determining the numbers or workers and first aid requirements	√	S	3.20	General Contractor's first aid assessment and procedures to include sub-contractors.
2.91	Has the contractor assigned a person to manage first aid service?	√	S	3.17	Assign someone to ensure attendants, supplies, facilities and equipment are always available.
2.92	Does the Contractor have New or Young Workers as defined by WorkSafeBC regulations?	√	S	3.22-3.25	Ensure New or Young workers receive special orientation and training as required by regulations and documentation is provided to the Project Manager. Ensure follow up observation and provide reinforcement training if required or requested by the worker.
2.91	Has the contractor assigned a person to manage first aid service?	√	S	3.17	Assign someone to ensure attendants, supplies, facilities and equipment are always available.

CHEMICAL/BIOLOGICAL - WHMIS					
3.1a	Hazardous Substances Used? Provide details.	TBD	O	PART 5	Contractor to provide Material Safety Data (MSD) Sheets for all hazardous substances to be used including welding materials and gases. Sheets must be provided by the contractor at first meeting with the engineer in order to complete the Job Hazard Analysis and define safe work practices. Ensure effective written procedures are prepared and implemented to prevent exposure by any route that could cause an adverse health effect, and to address emergency and cleanup procedures in the event of a spill or release of the substance. Ensure the supervisor and the workers are trained in and follow the established procedures. Environmental Assessment to be provided to Contractor.
3.1b	Environmental Assessment completed? Check identified hazards and measures to be taken.	TBD	S		Contractor to follow Best Management Practices provided by Environmental Services.
3.1c	EGD Environmental Best Management Practices applicable?	TBD	O		Contractor to follow Implementation plan checklist for hazardous substances. See WORKSAFEBC section 5.7
3.2	Implementation Plan Checklist completed?	TBD	S	5.7	Contractor to provide MSD Sheets and make available at worksite to all workers.
3.3	Material Safety Data Sheets Available?	TBD	O	5.16	Contractor to define emergency response as appropriate for hazardous substances.
3.5	Emergency Response Defined?	TBD	O		Contractor to follow education & training checklist for hazardous substances provided by WORKSAFEBC. See 5.7
3.6	Training Checklist Completed?	TBD	S	5.7	
3.7	Flammable/Combustible Substances?	TBD	O	5.27-5.35	



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

3.8	Substances under pressure?	TBD		5.36-5.47	
3.9	Controlling Worker Exposure	TBD	O	5.48-5.59	
3.10	Ventilation controls?	TBD	O	5.60-5.71	
3.11	Internal Combustion Engines operated in poorly ventilated areas?	TBD		5.72-5.75	
3.12	Hazardous Wastes & Emissions	TBD	O	5.76-5.81	
3.13	Personal Hygiene	√	O	5.82-5.84	Wash hands before eating or smoking or at breaks as required by regulation.
3.14	Emergency Washing Facilities, eyewash required?	TBD	O	5.85-5.96	Contractor to provide emergency washing facilities where required due to hazardous substances.
3.15	Emergency Procedures defined? Review First Aid, Fire, Spill Control.	TBD	O	5.97-5.102	Contractor to review emergency procedures with workers
3.16	First Aid and Fire depts. aware of substance and quantities used and locations stored?	TBD	S	4.17	Contractor provide notice if required by regulations.
3.17	Supervisor & Workers trained? General WHMIS instruction as well as substance specific training?	TBD	S		Contractor to ensure Workers and Supervisors have WHMIS training and training in dealing with specific substances.
3.18	Substance specific requirements?	TBD	S	PART 6	Review Part 6 and ensure compliance as per MSD sheets. See also sections 25, 28 and 29 below.
3.19	Evaluate worker understanding of substance specific requirements and emergency/spill procedures during inspections.	TBD	S		Inspection item.
3.20	Ensure containers for hazardous substances are maintained to ensure secure containment. Keep covered when not in use.	TBD	S	5.20-5.22	Inspection item.
3.21	Keep only enough for one shift, store balance of quantity in designated separate area. Ensure workplace/supplier labels are on EVERY container.	TBD	S	5.23	To reduce the risk of a major spill, fire etc. minimize quantities on site. Ensure workers can easily tell what is in every container. Inspection item.
3.22	Store incompatible substances so that they can not mix in event of leakage, breakage etc.	TBD	S	5.24	Serious consequences can result from mixing certain substances. Ensure they cannot mix. Inspection item.
3.23	Store hazardous substances so they can't fall, be damaged or exposed to extreme temperatures.	TBD	S	5.25	Inspection item.
3.24	Ensure the designated storage area meets design requirements.	TBD	S	5.26	Inspection item.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

	3.25	Protective and spill equipment available?	TBD	O		Contractor to ensure all personal protective equipment and spill response equipment is readily available and workers are trained in spill response plan.
	3.26	Follow proper procedures in disposing of hazardous substances.	TBD	S		Follow MSD Sheet instructions.
	3.27	Other	TBD			
		Note: Refer to WHMIS Implementation Plan checklist when doing inspections for hazardous substances	TBD	S		Create inspection checklist where required.

WORKING ALONE	4.1	Working alone process defined for workers assigned to work alone? Note new guidelines Nov./08 for determining if working alone regs apply. Amongst other things a "person check" system alone is unlikely to meet the "readily available" test.	No working alone	*	4.21-4.23	There will generally be no working alone. Document special procedures and agree with Project Manager if working alone is necessary. Note regulation changes 1 Feb/08
	4.2	Working alone process followed?	√		4.21-4.23	Inspection item.
	4.3	Restricted Access area?	√	O		Contractor to ensure workers follow procedures for restricted access.

CONFINED SPACE	5.0	Confined Space Entry Control required?	NA	S		Considerable danger may exist if personnel enter designated confined spaces without proper ventilation and other controls/procedures being in place. No confined space identified on this project.
	5.1	Confined Space Entry Controlled and/or hazard identified?	√	S	9.3, 9.12	Project Manager to identify confined space and inform Contractor.
	5.2	Hazard Assessment Completed by Qualified Person?	√	S	9.9-9.11	Ensure space has been assessed by a Qualified Person. All known spaces have been assessed at EGD.
	5.3	Entry permits completed, signed and posted per regulations? Keep permit for 1 year.	√	S	9.13- 9.16	Inspection item.
	5.4	Confined Space Entry Program Defined?	√	S	9.5	Follow WORKSAFABC regulations. Contractor will use own policy and forms. EGD CSE policy and forms to be used for EGD workers. Ensure emergency/rescue plans are coordinated and compatible.
	5.5	Person assigned to administer confined space program?	√	S	9.6	EGD confined space program coordinator is Kim Wilson



Project Title: Master.

Project No.

5.6	Confined Space Entry Program followed?	√	S		EGD workers will Follow the program outlined in the binder in the Pump House. Contactor will follow own program. Inspection item.
5.7	Workers & Supervisors Trained?	√	O		Ensure workers are trained in written procedures for entry, monitoring air quality and rescue. Only trained workers may participate in the work, rescue, monitoring etc.
5.8	Ventilation adequate?	√	O	9.31 9.33	Check ventilation considering work to be done and airborne contaminants etc. Each job must be separately assessed.
5.9	Lockouts Performed when required?	√	O	9.17-9.20	Lockout may be required as part of the confined space entry procedure. Follow EGD lockout policy.
5.10	Rescue Equipment condition checked.	√	S		Check equipment maintenance log.
5.11	Standby worker requirements being followed?	√	O	9.34-9.36	Inspection item.
5.12	Rescuer's trained and drills conducted?	√	O	9.37-9.38	Standby Rescuers to have performed drills in this area, otherwise conduct drill before starting work.
5.13	Notify Rescue personnel before workers enter and again when workers complete work unless agreement is for 24 hour service. Ensure rescuers monitor the signalling system.	√	O	9.39 9.40	Follow agreed protocol with rescuers. Generally must have rescuers on standby at entrance with Fire Dept. considered backup.
5.14	No cylinders of compressed gas inside confined space.	√	S	9.48	Inspection item.
5.15	Welding/Cutting torches and hoses must be removed when not in use.	√	S	9.49	Inspection item.
5.16	Ensure electrical tools & equipment meets WORKSAFIBC 9.50	√	S	9.50	Inspection item.
5.17	Use only non-sparking tools if flammable/explosive gases, vapors or liquids are present.	√	S	9.51	Inspection item.
5.18	Provide means of communication – radio for workers inside confined space.	√	O		Inspection item.
5.19	Ensure rescue equipment is inspected by Qualified Person before each use. Note: Follow Confined Space Entry program details as inspection guideline. These must be agreed with Rescuer personnel.	√	S		Contractor to ensure inspection and document.
		√	O		



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

		LOCK-OUT & ELECTRICAL								
6.1	Has the EGD Lockout policy been reviewed and relevant sections complied with?	✓		S						Policy to be reviewed by Contractor with workers as part of training.
6.2	Each worker has own lock, no combination locks? Means of identifying lock owner?	✓		O		PART 10				Every worker must have own lock and tag identifying worker and company.
6.3	Lockout procedures documented for project?	✓		O		PART 10				To be documented and agreed with J. Lezetc and permit issued before initiating lockout.
6.4	Workers and Supervisors trained in lockout? Only certified electricians to do electrical work.	✓		O		PART 10				Contractor to ensure all Workers and Supervisors are trained in the lockout procedure. Contractor to provide proof of certification to Project Manager before start of work.
6.5	All isolation points identified?	✓		S		PART 10				To be done in conjunction with J. Lezetc and documented in lockout procedure.
6.6	Electrical ground hazard?	✓		S						To be done in conjunction with J. Lezetc and documented in lockout procedure.
6.7	Pneumatic Devices hazard?	✓		S						Document if this type of hazard exists and controls required.
6.8	Potential Energy hazards? All parts secured against inadvertent movement?	✓		S						Document if this type of hazard exists and controls required.
6.9	Kinetic Energy hazards? All parts secured against inadvertent movement?	✓		S						Document if this type of hazard exists and controls required.
6.10	Hydraulic Energy hazards?	✓		S						Document if this type of hazard exists and controls required.
6.11	Chemical Energy hazards (eg. Flammable, Combustible, corrosive) ?	✓		S						Document if this type of hazard exists and controls required.
6.12	Radiation hazards (eg microwave, lasers, Ultraviolet, infrared)	✓		S						Document if this type of hazard exists and controls required.
6.13	Thermal Energy hazards (eg, steam, hot water or other substances, refrigeration lines)	✓		S						Document if this type of hazard exists and controls required.
6.14	If over 750V follow H.V. guidelines in lockout policy.	✓		O						Document if this type of hazard exists and controls required.
6.15	No working NEAR energized H.V. equipment or conductors.	Not permitted		S		Lockout Policy				Not permitted.
6.16	No working on energized lighting circuits.	Not permitted		S		Lockout Policy				Not permitted.
6.17	Control the use of metal ladders, wire reinforced ladders,, metal scaffolds or work platforms.	✓		S		19.10				Planned use of ladders, scaffolds etc. to be determined with Contractor and electrical risks assessed.
6.18	No Qualified workers within 1 m. of uninsulated, energized parts.	Not permitted		S		Lockout Policy				Not permitted. Keep unqualified personnel at least 3 m. from energized parts.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

6.19	If using an insulated aerial device has it been tested as required by WORKSAFEBC Reg. 19.9	√	S	19.9	Check plans to use aerial device & insure compliance.
6.20	Is all portable electrical equipment either double insulated and so marked or effectively grounded? Workers trained to inspect?	√	S	19.14	Contractor to check any portable electrical equipment and ensure workers trained in inspecting electrical equipment for safe operation.
6.21	Is all portable electrical equipment used outdoors or in wet/damp conditions protected by Class A Type ground fault circuit interrupters?	√	S	19.15	Contractor to check any portable electrical equipment and ensure workers trained in inspecting electrical equipment for safe operation.
6.22	Ensure good access to electrical equipment and that no flammable materials are stored or placed close to electrical equipment.	√	O	19.7	Practice good housekeeping. Keep areas clear in front of electrical panels, fire alarms & extinguishers. No flammables inside work areas unless agree by Project Manager.
6.23	Other, specify:				
6.24	Are lockout points easily identifiable (e.g. By number) to prevent lockout errors and identify the equipment it serves?	√	S	19.13	All lockout points are labelled.
6.25	Note that lockout of a panel door preventing access to other live breakers is unacceptable.	√	S		Generally there should be no other users of panels while the project work is underway. Confirm.
6.26	Note lockout of Control Circuits is not sufficient for total isolation.	√	S		Reminder item
6.27	Be SURE to understand what will happen if an energy source is activated.	√	S		Reminder item
6.28	Consider severity of injury, frequency of doing the job and probability of injury in assessing tasks.	√	S		Reminder item
6.29	Before the conclusion of the job and after energizing, have conspicuous signs been placed near the equipment stating "Danger – Energized Equipment"?	√	O	19.11 19.17	Place signs when finished.
6.30	Ensure electrical instrumentation is functioning properly and has not been the subject of recall by the manufacturer.	√			Note that some Fluke Model 179 Multimeters have exhibited faulty readings and need to be replaced.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

7.0	Fall Protection required?	✓	S	11.2	1. Work over 7.5 ft. (CLC requirement) or shorter distance if risk of injury greater than fall to flat surface 2. Use guardrails or similar restraint if practicable. 3. Use other fall restraint if 2 not practicable. 4. If 3 not practicable use fall arrest system 5. If 4 not practicable ensure work procedures acceptable to WORKSAFEBC are used. Note changes to WORKSAFEBC regulations 1 Jan/05
7.1	Fall Protection System defined in writing?	✓	S&O	11.3	Contractor to define fall protection plan for any work over 7.5 ft. (CLC requirement) above ground on unguarded surfaces from which fall greater than 7.5m.(25ft) can occur or 11.2(5) applies.
7.2	Workers & Supervisors Trained?	✓	S&O	11.2(6)	Contractor to ensure all workers & supervisors trained in fall protection procedures before work starting and provide documentation to Project Manager.
7.3	Workers trained & Fall Protection Procedures followed?	✓		11.2(6)	Inspection item.
7.4	Inspection of fall arresting equipment before each use by a qualified person being done?	✓	S	11.9-	Qualified Person to perform inspection before use on each shift. Keep free from foreign substances & conditions that can contribute to deterioration & keep in good working order.
7.5	Fall Protection System used?	✓	S	11.2(7)	Ensure workers use system
7.6	Safety Belts used for fall restraint only? Otherwise use body harness.	✓	S	11.4	Follow written fall protection plan.
7.7	Ensure equipment meets standards	✓	S	11.5	Ensure components are suitable and compatible, sufficient to support the forces and meet and are used in accordance with standards.
7.8	Ensure anchors meet standards	✓	S	11.6	Check anchors meet WORKSAFEBC requirements. Changed 17 May/06
7.9	Temporary horizontal lifeline system used?	✓		11.7	Acceptable if 1) manufactured for commercial use and installed and used per written instructions and drawings (available on site) 2) designed, installed & used per written instruction and drawings (available on site) certified by P.Eng. 3) other acceptable to WORKSAFEBC Changed 17 May/06
7.10	Need to remove from service?	✓	s	11.10	If fall protection system has arrested fall of a worker remove from service until inspected and recertified safe by manufacturer or P.Eng.

FALL PROTECTION



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

		FIRE RELATED							
8.1	Workers aware they generally do not fight fires? First priority is to raise the alarm and get selves and others to safety.	✓	*					Workers to fight fires only if small (2'x2') and they have been trained in fire extinguisher use and they are confident they can extinguish the fire. To be reinforced at orientation meeting and reinforced by Contractor.	
8.2	Fire Extinguishers Available and accessible?	✓	O					Contractor to ensure proper type and number of extinguishers available. Check monthly inspection and tags.	
8.3	Electrostatic Discharge	✓	O					Contractor to determine risk of ignition due to discharge and take preventive measures.	
8.4	Ignition Sources eliminated or controlled if flammable gas or liquid used or stored?	✓	O		5.27			No smoking on this project except in designated areas defined by Project Manager. Define any other ignition sources and controls required.	
8.5	Flammable gas concentrations	✓	S&O					Ensure adequate ventilation to comply with WORKSAFEBC regulations. Monitor flammable gas concentrations and use forced ventilation if required.	
8.6	Combustible materials	✓	O					Keep area clear of combustibles. Practice good housekeeping. Store oily rags in approved metal containers with tight fitting lids and empty daily. Burning of waste is prohibited.	
8.7	No smoking in buildings, on cranes, in caissons or tunnels. Define other restrictions. Rules being followed?	✓	O		4.81			Contractor to enforce no smoking except in areas designated by the Project Manager.	
8.11	Do not use flammable liquids as a manual cleaning solvent.	✓	S		5.32			Flammable fumes can collect on clothes and result in the worker being engulfed in flames should ignition occur. Also, these substances are often hazardous to health and can be absorbed through the skin. Contractor to reinforce with workers and monitor for compliance.	
8.12	Hot Work Permits issued and posted?	✓	*					Obtain permit from Project Manager before starting any cutting, welding, brazing, soldering, grinding, heat-treating or other hot work like roof tarring, thawing pipe, hot riveting or using powder-driven fasteners.	
8.13	Fire Alarms explained?	✓	*					To be covered at pre-startup meeting and worker orientation session.	



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

		LADDERS/SCAFFOLDS & TEMP WORK PLATFORMS				
	9.0	Is work off ladders/scaffolds etc planned? Note new guidelines Nov/08 re suitable ladders, work platforms, and scaffolding, and to specify that the top plate of interior or exterior walls, the top plate/top walers used in concrete formwork, or other elevated surfaces narrower than 50 cm (20 in) are not considered suitable work platforms or acceptable as elevated walkways.	NA	S	No work off ladders/scaffolds foreseen.	
	9.1a	Workers trained and authorized to use temporary work platform?	✓	S	COSH 3.5 Ensure all workers trained before authorizing use.	
	9.1b	Weather conditions likely to be hazardous to use of temporary structure?	✓	S	COSH 3.3 No work in rain, snow, hail or electrical/wind storm likely to be hazardous to worker safety	
	9.2	Has Qualified Person inspected temporary structure before use each shift?	✓	S	COSH 3.6 If defect found, do not use until remedied.	
	9.3	Could temporary structure be contacted by person or vehicle?	✓	S	COSH 3.7 Install hi-viz barricade around base or post a person.	
	9.4	Ladder type and condition? Meet specifications per WORKSAFEBC?	✓	S	PART 13 Contractor to ensure all ladders are in good condition and meet WORKSAFEBC requirements for the application. Ensure portable ladders are marked with grade of material and use for which ladder constructed.	
	9.5	Ladder Inclination, Footing and Support and use according to WORKSAFEBC regulations	✓	S	PART 13 COSH 3.11 Check for minimum 1/4 maximum 1/3 inclination, solid footing and support. Projects at least 1m(3ft.) above upper landing to which it supplies access. Check extension overlap. Tie off if possible for stability during use.	
	9.6	Contractor to ensure work off ladders meets regulations. If work cannot be done safely from a ladder provide work platform.	✓	O	13.6 Follow safe ladder work practices	
	9.7	Heavy/bulky objects or others that may make ascent or descent unsafe not to be carried up ladders	✓	O	13.6 Use an assist to raise & lower tools.	
	9.8	Scaffold or other work platforms to be designed and approved by a P.Eng.?	✓	S	Check WORKS AFEBC PART 13 13.11 Contractor to provide P.Eng. certified scaffolding plan where required by regulation 13.11. Follow instructions including fall protection during erection/ dismantling and use of the system. Signed copy to be available on site.	



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

9.9	Employer must ensure scaffold is in a safe condition regardless of who erected it. Ensure scaffold manufacturer's technical data & instructions for erection available on site.	✓	O	13.13, 13.15 COSH 3.10	Ensure manufacturer's documentation is on site or follow P.Eng. instructions. Contractor ensure compatibility if different manufacturers of components used. Ensure qualified Person supervises erection, use and dismantling and scaffold capable of holding 4 times load likely to be imposed. (COSH)
9.10	Guardrails and toe boards installed at every open edge of platform?	✓	S	4.55-4.60 COSH 3.8	Ensure guardrails and toeboards installed
9.11	Tools/equipment/materials arranged to prevent being accidentally knocked off platform?	✓	S	COSH 3.4	Ensure safe arrangement on platform
9.12	Check Scaffold Stability, Bracing, Access and all connections secure.	✓	S	13.17 13.18	Ensure scaffold is stable, plumb and level and WORKSAFEBC requirements are met. If height 3 times min. base dimension or other circumstance requiring stability- bldg ties/guys required. Inspection item.
9.13	Plank type & condition inspection. Planks secured?	✓	S	13.14 13.16	Contractor Inspect planks regularly and secure to scaffold frame. Dimensions and guardrails meet requirements?
9.14	Scaffold grounded if near high voltage or hazardous level of voltage likely to be induced in scaffold?	✓	S	13.19	Ensure grounding. Inspection item
9.15	Safe access provided to work platform?	✓	S	13.7 COSH 3.9	Provide safe access. Temporary stairs have uniform steps, slope not exceeding 1.2 in 1; hand-rail between 90 and 110cm above stair level. Ensure temporary ramps securely fastened; safe footing, braced if necessary; slope 1 in 3 except in stairwells check COSH Inspection item
9.16	Work platform strength sufficient for load and secured against separation form supporting equipment, structure or surface?	✓	S	13.8	Ensure scaffold can support 4 times load likely to be imposed on it (COSH 3.10)
9.17	Work platform subjected to sudden drop, contact with electrical conductors or showing signs of mechanical damage/wear?	✓	S	13.12	Remove from service until certified safe by manufacturer or P.Eng.
9.18	Ensure movable work platforms are clearly marked with rated capacity	✓	S	13.20	Also check for marking on components (e.g. rigging capacity, counterweight, etc.) as required by regulations
9.19	For elevating work platforms ensure operation manual, maintenance instructions, replacement parts information are reasonably available to workers.	✓	S	13.21	If information is not available, equipment must not be used until obtained or written instructions provided by P.Eng.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

9.20	Employer must keep records regarding inspection, maintenance, repair or modification for each elevating work platform, swing stage, and permanent powered platform	√	S	13.22	If inspection and maintenance records other than pre-shift inspections not available, do not use until certified safe by manufacturer or P.Eng.
9.21	Vehicle-mounted and self-propelled boom-supported elevating work platforms tested?	√	S	13.23	Inspect and certified by manufacturer or P.Eng. every 12 months. In 10 th year after manufacture & every 5 years thereafter include structural inspection to verify integrity and stability. Dielectric test insulated units at least annually- certified by testing agency.
9.22	If a movable work platform is not designed to be moved while a worker is on it, ensure it is secured before being accessed by the worker. Move platforms designed to be moved while occupied only as specified by the manufacturer.	√	S	13.24	Exceptions: If the height of the work platform of a rolling scaffold is: (a) not more than 1 1/2 times the least base dimension of the scaffold, the scaffold may be moved by the effort of the person occupying the platform or a person on the floor or other supporting surface, (b) more than 1 1/2 times the least base dimension of the scaffold, the scaffold must be moved only by the effort of a person on the floor. (c) more than 2 times the least base dimension of the scaffold, the scaffold must not be moved while the person is occupying the platform
9.23	Elevating work platform meets requirements for warning devices and controls?			13.25 13.26	Ensure intermittent horn or flashing light and warning system for deviation from level are provided as required by regulation. Ensure controls including STOP are clearly marked. Clearly mark overriding lowering control to be used in emergency.
9.24	Guardrails installed? Ensure temporary guardrails meet specs.	√	S	4.58	Contractor to ensure guardrails are installed and meet regulations. Inspection item.
9.25	Forklift mounted work platform not to be used except as defined by WorkSafeBC regulation.	√	S	13.30	Check revised regulations 1 Feb/08. Inform Project Manager before using a forklift mounted platform.
9.26	Work platforms suspended from a crane or hoist must be certified and loaded weight including rigging not over 50% of crane/hoist rated capacity at the working radius or configuration.	√	S	13.27-	Boom must be powered or fixed. No platform suspended from articulating boom crane unless approved by manufacturer. Secondary hoisting line must not be used when workers are on platform suspended from a crane.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

9.28	Hoisting and lowering work platforms done according to safe practices?					13.29	Operate as slowly as practicable. Lower under power if device powered. May not be controlled only by brakes. Ensure lower travel limit device is used where required. Carry out a trial lift before platform is occupied.		
9.29	Portable powered platform capable of raising/lowering by 2 or more separately controlled hoists?					13.31	Ensure controls located so one person can operate all hoists simultaneously.		
9.30	Ensure fall protection meeting WORKSAFEBEC requirements is in place for suspended or elevating work platforms	✓		S		13.33	Include in fall protection plan. Each person on a work platform attached to a crane boom must use a personal fall arrest system secured to an anchor on the boom or on the platform that is designated by the manufacturer, or a professional engineer.		
9.31	WORKSAFEBEC approval obtained for high risk situations?	✓		S		13.32	A swing stage, boatswain's chair and portable powered platform must not be used without prior permission of the Board if (a) one work platform will be used above or below any portion of another work platform, (b) a deck or planking will be used to span a gap between two independent work platforms, (c) the work platform will exceed 10 m (32 ft) in length, or (d) the suspension height will exceed 91 m (300 ft).		
10.1	Hard Hats Worn at all times. Chinstraps available for high wind/ bending over?	✓		*		8.11-8.13	Contractor to monitor and enforce hardhat and chinstrap usage.		
10.2	High Visibility Clothes, correct type for the job.	✓		O		8.24-8.25	Wear high viz vests when required. Traffic Control Persons will have special requirements.		
10.3	Approved Buoyancy Equipment (note change in acceptable standards G8.27-2)	NA		O		8.26-8.30	Required if working within 5 feet of water.		
10.4	Safety Footwear	✓		*		8.22-8.33	Approved steel-toed footwear in good repair, required at all times meeting WORKSAFEBEC requirements for the work to be performed.		
10.5	Approved Safety Eyewear/ Face Shields. Note new guidelines re acceptable standards Nov/08	✓		O		8.14-8.18	Eye protection required when energizing and de-energizing breakers. Also when doing any other work where flying objects may be encountered. Also may be required when using hazardous substances (TBD).		
10.6	Wear Hearing Protection when required by WORKSAFEBEC regulations.	✓		O		7.1-7.9	Hearing protection required when in high noise situations exceeding WORKSAFEBEC noise exposure limits. Implement and provide evidence of noise control and hearing conservation program where required by regulation. Post warning signs in high noise areas.		
PROTECTIVE EQUIPMENT									



Project Title: **Master.**

Project No.

10.7	Respiratory Protection & Fit	√	O	8.32-8.37	Wear approved respiratory protection considering the respirator protection factor and maximum use concentration, MSD Sheets, exposure to oxygen deficient atmosphere when selecting respirators for workers that may be exposed to dusts or hazardous fumes/mists above exposure limits.
10.71	Respirator fit tests conducted?	√	O	8.38-8.41 8.44	Ensure proper fit tests per regulations and keep records. Workers must perform a positive or negative pressure user seal check in accordance with <i>CSA Standard before each use.</i>
10.72	Worker's ability to use a respirator in doubt for medical reasons?	√	O	8.42	Ensure worker examined by a physician, and advice obtained re the ability of the worker to wear a respirator.
10.73	Self Contained Breathing Apparatus (SCBA) used?	√	O	8.35 8.37 8.45	Ensure air quality complies with regulation 8.37. Ensure inspection and testing of compressed air cylinders must be done in accordance with <i>CSA Standard</i> and SCBA, including regulators, are serviced and repaired by qualified persons.
10.8	Gloves, Aprons, leg protection	√	O	8.19-8.21	Wear protective clothing when performing work that could result in cuts, slivers, abrasions, etc. Check added requirements from MSD Sheets.
10.9	Flame resistant clothing	√	O	8.31	Wear when welding or cutting or other hot work hazards
10.10	Welding Goggles	√	O		Wear when welding or cutting
10.11	Welding Clothes (e.g. leather aprons, face shields, leather gauntlet gloves etc.)	√	O		Wear when welding or cutting. Also those working nearby may need to wear protective clothing.
10.12	Vibration Reduction	√	O	7.10-7.16; 5.54	Provide written exposure control plan where required by regulation and inform worker of hazards. Employer ensure equipment is labelled to identify hazard. Ensure hands and arms not exposed to cold if also exposed to vibration.
10.13	Radiation Exposure Control	√	O	7.17-7.25	Provide written exposure control plan where required by regulation and inform worker of hazards.
10.14	Personal clothing, rings, hair etc. OK	√	O	8.10	Ensure workers do not have loose clothing, long hair or rings which could become entangled if operating rotating power tools.
10.15	Apply Sunscreen, to protect against sunburn on exposed skin.	√	O		Wear sunscreen when working outdoors.
10.16	Safety belts, harnesses, lanyards & shock absorbers	√	O		Follow fall protection plan and use prescribed equipment.
10.17	Employees must wear suitable personal clothing for the work they are doing to reduce risk of injury.	√	S		Contractor to ensure workers wear suitable clothing.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

		Note: Check all protective equipment for proper fit and condition.	✓	S		Contractor responsible for ensuring proper fit and care of all protective equipment and documentation thereof.
HEAT STRESS	11.1	Heat Stress Control Required? Followed?	✓	S	7.27	To be determined by Contractor's Superintendent based on section 7 WORKSAFEBC regulations (Jan/05), weather conditions, and worker proximity to heat sources and clothing worn.
	11.2	Check for heat stress if temp warrants.	✓	S	7.28- 7.30	Contractor to monitor environmental conditions and take action accordingly if ACGIH standard requires. If required, conduct assessment and develop exposure control plan. Provide engineering controls if practicable, otherwise reduce exposure or provide admin controls or PPE.
	11.3	Potable drinking water nearby?	✓	O	7.31	Contractor to supply adequate drinking water for Workers
	11.4	Workers & Supervisors trained to recognize?	✓	O	7.32	Contractor to ensure Workers and Supervisor recognize symptoms and know proper response. Contractor's F.A. attendant to be instructed to monitor workers for signs. Remove workers exhibiting stress from exposure and provide First Aid or physician treatment.
COLD STRESS	12.1	Cold Stress Control Required? Followed?	✓	S	7.33	Cold stress not likely to be a factor during summer months. Contractor to be aware of conditions under which cold stress could be a concern based on ACGIH standard (Jan /05)
	12.2	Check Table 7-4 for conditions	✓	S	7.34- 7.37	Contractor to monitor for cold stress risk conditions and take appropriate action. if ACGIH standard requires. If required, conduct assessment and develop exposure control plan. Provide engineering controls if practicable, otherwise reduce exposure or provide admin controls or PPE.
	12.3	Workers & Supervisors trained to recognize?	✓	O	7.38	Ensure workers trained. First Aid attendant may be asked to monitor for cold stress. Remove workers exhibiting stress from exposure and provide First Aid or physician treatment



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

		√	S		Changes effective 1 Feb./08 to add clarity.
13.1	Note WorkSafeBC definitions for “critical lift” “duty cycle work”, “load bearing component”, “sign truck” and “tandem lift”	√	S		
13.1a	Only EGD Operators operate EGD Cranes/hoists or other equipment.	√	*		No plans to use any EGD equipment. Contractor to reinforce that only EGD workers are to operate EGD equipment.
13.1b	Contractor supplied crane meets specifications and has required labelling etc per WORKSAFEBC regulation?			14.2-14.8	Ensure crane is marked with: a) Manufacturer, model, sr# b) rated capacity or load chart. c) boom angle, boom extension and load measure (where applicable) d) any modifications to the crane or components
13.1c	Crane Hoist documentation available?			14.12	Ensure manufacturer’s crane/hoist manual, including instructions for assembly/disassembly, maintenance, and safe operation are readily available on site.
13.1d	Inspection and maintenance carried out and documented including any modifications? Operator to carry out start of shift inspection and document.	√	S	14.13 to 14.16 14.35	(1) Each crane and hoist must be inspected and maintained at a frequency and to the extent required to ensure that every component is capable of carrying out its original design function with an adequate margin of safety. (2) A crane or hoist must not be used until any condition that could endanger workers is remedied. (3) Any repair to load bearing components of a crane or hoist must be certified by a professional engineer or the original equipment manufacturer.
13.1e	Crane properly equipped?			14.17 to 14.33	Ensure crane/hoist meets all WORKSAFEBC requirements for stops, audible warnings, guards, controls, operator protection, etc. as per WORKSAFEBC regulations
13.2	Weight lifted determined and communicated to operator and all others involved in lift?	√	O	14.36 14.38	Contractor to ensure that load weights are accurately determined and communicated to the crane operator and others involved. Crane operators must not lift if there is any doubt about the safety of the lift.
13.3	Ensure crane operators meet the trade qualification specified by WORKSAFEBC	√	S	14.34	Provide proof of qualification to Project Manager before starting work.
13.4	Ensure workers stay clear of swinging loads and equipment when swinging creates a hazard	√	O	14.40 14.41	Position equipment to ensure 2 ft. clearance or more between crane parts etc. and obstructions in any area accessible to workers.
13.5	Multiple Crane lift? Follow WORKSAFEBC regs	NA	S	14.42	No multiple crane lifts planned.
13.6	Travel with load? Follow WORKSAFEBC regs.	√	S	14.43	Follow safe practices.

CRANES, HOISTS & RIGGING



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: **Master.**

Project No.

13.7	Prevent passing over workers with load	✓	O	14.44	Contractor to ensure loads do not pass over workers.
13.8	Load left suspended and unattended?	✓	O	14.45	Do not leave loads suspended & unattended.
13.9	Hook position over load to prevent side loading?	✓	O	14.46	Ensure straight lifts are used. If lifts on an angle are necessary observe working load limit (WLL) reduction.
13.10	Designated signalman? Use std signals? Use radio if possible.	✓	O	14.47 to 14.49	Ensure trained workers use standard signals when communicating with crane operator. Use dedicated 2-way radio communication on UHF at power assigned and coordinated by the WORKSAFEBC whenever possible.
13.11	High voltage in vicinity? Risk of induced charge? Review and follow WORKSAFEBC requirements.	✓	O	14.51-14.52	No lifts planned near high voltage.
13.12	Up-travel limit tested for bridge, gantry & OH traveling cranes? (crane operator daily check)	✓	O	14.55	If crane/hoist is not EGD operated equipment, Contractor to ensure operator has tested limits.
13.13	Ensure mobile cranes are on surface capable of supporting the load	✓	S	14.69	Contractor to check before lift.
13.13 a	Mobile cranes or boom trucks inspected at least annually?	✓	S	14.71	Ensure mobile cranes or boom trucks are inspected at least annually. Provide proof to Project Manager.
13.14	Rigging/slinging work done by or under direct supervision of qualified workers familiar with the rigging to be used.	✓	S	15.2	Contractor to use trained riggers following accepted good practices when performing lifts and provide a list of trained individuals to the Project Manager.
13.15	Ensure rigging is identified with the manufacturer and Working Load Limit (WLL) as well as any other information required by WORKSAFEBC and meets the WORKSAFEBC requirements for the work to be performed.	✓	O	15.5 15.42 15.46 15.55 15.59	Do not use rigging without proper permanent identification. DO NOT EXCEED the designated WLL; also applies to below-the-hook lifting devices.
13.16	Use only rigging permanently marked with an adequate working load limit considering the angle of lift, termination efficiencies, numbers of legs used, conditions for the lift, temperature restrictions and good rigging practices.	✓	S	15.9	Follow good rigging practices. Ensure design factors comply with changes Jan/05.
13.17	Ensure any attachments (rings, shackles, couplings etc) are designed for use with the rigging to which they are fastened.	✓	S		Contractor to ensure compatibility in design.
13.18	Slings & attachments must conform with specifications and be visually inspected before use on each shift.	✓	S	15.30 15.31	Remove defective equipment from service immediately.
13.19	Do not subject the rigging to dynamic loading.	✓	S		Apply the load slowly & smoothly



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: **Master.**

Project No.

13.20	Do not use rope/slings with evidence of wear or distortion, broken strands, kinking, bird-caging, corrosion, heat or arc damage that meets the rejection criteria specified by WORKSAFEBC.	√	S	15.25-15.27 15.48-49	Remove equipment from service immediately if it meets rejection criteria.
13.21	Do not use worn or damaged hooks that fail to meet WORKSAFEBC regulations.	√	S	15.29	Remove rejected hooks from service immediately.
13.22	Protect slings from damage if passing over a sharp edge and store properly.	√	S	15.37 15.39	
13.23	Follow WORKSAFEBC rules for slinging to prevent slipping or overstressing the sling and when lifting multiple piece lifts.	√	S	15.40 15.41	
13.24	Hooks must have safety latches unless meeting the exemption of WORKSAFEBC 15.10(2)	√	S	15.10	
13.25	Consider effect of wind on loads	√	S		Crane operator to use judgement and consider wind velocity in determining if lift can be safely made. Crane operator has final decision on making any lift.

MOBILE EQUIPMENT & TRANSPORT OF WORKERS					
14.1	Does the contractor intend to use any mobile equipment on site other than trucks for transporting workers?	TBD	S	PART 16	To be determined. Define equipment to be used and any special requirements.
14.2	Are contractor's vehicles safe for transport of worker's?	√	S	16.3	Contractor to ensure vehicles are properly equipped and maintained.
14.3	Are workers obeying speed limits? Max speed 20kph	√	*	PART 16	Cover at start up orientation meeting.
14.4	Are vehicles properly parked?	√	*	PART 16	Workers will be shown the designated parking areas. Do not park in areas where crane travels, Fire Lanes, blocking fire hydrants, fire/emergency alarm pull stations or fire extinguishers.
14.5	Elevating work platform(s) operations manual and inspection certificate on site? Daily inspection log available?	√	S	PART 16	Requirements depend on contractor use of this type of equipment. TBD in final JHA
14.6	Ensure seat belts used and roll over protection provided if required. Note guidelines Nov./08	√	O	PART 16	Requirements depend on contractor use of this type of equipment. TBD in final JHA
14.7	Suspended work platforms/chairs used? Conform to specifications? Verify engineering design. Support structures in place?	NA	S	PART 16	Generally, not planned to be used. Check WORKSAFEBC regulations if suspended platforms to be used.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

14.8	Do not leave delivery vehicles unattended for extended periods.	√	*			Contractor to enforce.
14.9	Do not hitch a ride on forklifts unless proper seats exist for this purpose.	√	*			Contractor to ensure vehicles meet WORKSAFEBC requirements.
14.10	Ensure volatile, flammable, or hazardous materials transported in isolated compartment accessible only from outside & properly ventilated & drained	√	S	17.6		Contractor to ensure workers cannot be injured by unsecured items in the vehicle.
14.11	Ensure tools/materials/ equipment are carried in separate designated area for that purpose.	√	S	17.5		Ensure workers do not leave equipment parts unattended in an elevated condition or work under equipment unless properly secured.
14.12	Equipment properly secured if elevated? No use of hydraulic or pneumatic lifts as blocks unless collapse not possible.	√	S	16.37		Contractor to ensure loads are properly secured.
14.13	Loads secured according to regulations? Loads do not interfere with lift truck operation?	√	S	16.44-16.46		Contractor to ensure workers have training & equipment if they will change tires.
14.14	Workers have procedures, equipment and training for tire repairs?	√	S	16.47-16.48		

TRAFFIC CONTROL						
15.1	Is there any blocking of roadways, or aisles during the project? If so install signs, barricades etc.	√	S&O			Define road blocking and traffic control requirements. Contractor to ensure proper traffic control if temporary road blocking is required to deliver materials etc. Contractor to ensure non-project personnel are kept out of the work area as agreed with the P.M. before starting work.
15.2	Will gantry crane travel through the work area? Coordinate with the crane supervisor.	√	*			Workers to be instructed regarding crane travel and alarms during pre-startup meeting as they may encounter them enroute to work location. Ensure work is planned and communicated to crane supervisor before start.
15.3	Is there operations activity near the project site? Ensure coordination and minimize impact.	√	S&O			The Engineer will ensure all supervisors and contractors on site are aware of the work and schedule.
15.4	Control boat traffic and ensure flags and markers are in place.	√	S&O			Provide controls if working near water.
15.5	Is there a need to protect Public Roadways? Review WORKSAFEBC PART 18.	√	S&O	PART 18		Define need and document special traffic control measures. Ensure traffic control plan prepared by a qualified person is in place meeting MoTH requirements and WORKSAFEBC regulations. NOTE changes effective 1 Jan/07



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: **Master.**

Project No.

15.4	Is there a defined inspection program for traffic control devices to ensure they are well maintained and effective under all weather and light conditions? Documentation of inspections & repairs made kept?	√	S&O	Contractor to define an inspection program including repair/replacement procedures, inventory of devices, Contractor to ensure documentation is maintained including follow-up to ensure work has been done.
15.5	Are pavement markings clear and old markings removed?	√	S&O	Ensure markings are clear and not confusing. Remove old markings.
15.6	Are markings removed/covered when not in use?	√	S&O	Contractor to ensure markings are removed/covered when not required.
15.7	Is there an individual assigned supervisory responsibility for traffic control?	√	S&O	Contractor to assign an individual. Ensure all workers and supervisors are trained in safe work requirements and supervisors ensure workers follow prescribed procedures.
15.8	Are Traffic Control Persons trained?	√	S&O	Contractor to ensure only trained individuals engage in traffic control and that they have written instructions. Provide proof of completion of MoTH approved course.
15.9	Has the Contractor kept records of changes in traffic control?	√	S&O	Contractor to maintain records to assist investigation in event of an accident.
15.10	Are there risks to workers due to vehicles/equipment operating on the construction work site?	√	S&O	Contractor to define risks to workers on the construction site due to vehicles and measures to minimize risks of injury. Risks to employees of other companies to be acknowledged, minimized and communicated to appropriate supervisors.

16.1	Written procedures developed?	√	S&O	4.13	Contractor to ensure need for emergency rescue assessed and procedures for rescue documented. Call 911. Rescue will be by DND/Esquimalt Fire Dept. Ensure all workers understand process to call for assistance and have emergency numbers. Review emergency procedures at orientation session.
16.2	Simulations/ Training completed?	NA		32.2	Fire Dept. Rescuers are trained.
16.3	Equipment warranted or P.Eng. certified?	NA		32.3	Fire Dept. responsibility
16.4	Rope suitable per std.?	NA		32.4	Fire Dept. responsibility
16.5	Visual & physical inspection by qualified workers after use or training?	NA		32.5	Fire Dept. responsibility
16.6	Maintenance per manufacturer & records kept?	NA		32.6	Fire Dept. responsibility
16.7	At least 1 on rescue team Level 1 F.A. Certificate?	NA		32.7	Fire Dept. responsibility
16.8	Communications between rescuers & support?	NA		32.8	Fire Dept. responsibility

EVACUATION & RESCUE



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

16.9	Rescue boat available? Buoy & rope? Sufficient rescuers?	NA		32.9	
17.0	Diving /Marine Operations?	NA	S		No diving or marine related work on this project.
17.1	Wharf ladders & condition?	✓	O	24.2	Ladders are available every 100 feet.
17.2	Marine lifesaving equipment available & condition?	✓	S	24.3	Contractor will supply own PFD's and other rescue equipment per Part 24 WORKSAFEBEC regulations.
17.3	Handrails, bullrails, & markings?	✓	S	24.4-24.5	
17.4	Notice of Project submitted for diving projects?	✓	S	24.9	Required.
17.5	Rescue boat available if required for rescue or evacuation?	✓	S	24.6 24.31	Contractor will supply rescue boat and sufficient rescuers.
17.7	Medical Certification for each diver available at dive site?	✓	S	24.10	Required.
17.8	Diving supervisor approves diver as being physically capable of diving?	✓	S	24.11	Required.
17.9	Divers, standby divers and tenders not fatigued or have consumed drugs/alcohol which could impair their ability to work safely?	✓	O	24.11	Sufficient divers available to prevent fatigue and ensure ability to work safely?
17.10	All divers, diving supervisors and diving tenders trained in CPR, oxygen therapy and diving accident management?	✓	S	24.12	Entire crew trained and certified?
17.11	Certified competency documents available for each diver at the site?	✓	S	24.13	Included in divers logs?
17.12	Current chronological dive logs available on site for each diver?	✓	S	24.14	Available for each diver?
17.13	Dive site has list of hyperbaric chambers?	✓	O	24.15	Available? Nearest is still at DND across the bay?
17.14	Dive site has location of nearest hospital and phone#?	✓	O	24.15	Record on dive plan document.
17.15	Dive site has Level 1 F.A. kit and an oxygen therapy unit of sufficient capacity to reach emergency services?	✓	O	24.15	Required.
17.16	Dive site has complete set of approved dive tables (not sport type)? Diving computers must not be used instead of tables.	✓	O	24.15 24.21	Required

DIVING/ MARINE OPERATIONS



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

17.17	Dive site has copy of WORKSAFEBEC reg. PART 24?	✓	O	24.15	Required
17.18	Is there an appropriate way of entering and leaving the water, including rescuing an incapacitated diver?	✓	O	24.15	Contractor to document in rescue plans.
17.19	Dive site has equipment for voice communication with emergency services personnel?	✓	O	24.15	Radio supplied by EGD to supervisor for continuous contact to pumphouse for fast 911 call if required. Work will be 7a.m to 4 p.m. only unless agreed ahead of time with Doug Ferrier.
17.20	Divers on a lifeline wear suitable harness? Lifelines not attached to weight belt, free of knots & splices.	✓	S	24.16	Contractor has proper equipment and will ensure safe usage.
17.21	Diver tender must tend lines at all times.	✓	S	24.16	Agreed by contractor.
17.22	Diving contractor has safety procedures documented and available at dive site?	✓	S&O	24.17	Contractor's safety manual will be on site at all times.
17.23	Diving supervisor's detailed plan presented in writing to EGD before work starting?	✓	S	24.18	Dive plan to be presented to Doug Ferrier and posted.
17.24	Diving supervisor must not leave the area during diving operations.	✓	S	24.19	Entire crew qualified to act as supervisor. Sufficient divers and supervisors will always be in the area during diving operations or no divers will be in the water.
17.25	Before each dive has the crew briefing been carried out? This will include discussion of hazards, planned duration and maximum depth, decompression procedures, location of other divers, work to be done, recall signals and emergency procedures.	✓	O	24.19	A briefing will be carried out ahead of the dives.
17.26	Divers made aware of their responsibilities under 24.20?	✓	O	24.20	Divers responsibilities to be reviewed with them by contractor as part of pre-start meeting. Diving will be one day only.
17.27	If decompression is required check compliance with WORKSAFEBEC regs 24.22- 24.25	✓	S		No decompression planned as part of dives. Depth less than 50 ft.
17.28	Ensure breathing mediums and equipment comply with WORKSAFEBEC reg 24.26 to 24.29	✓	S		Contractor will ensure compliance.
17.29	Ensure control of boat traffic and proper warning devices, flags etc.	✓	O	24.30	Project manager to ensure ship engines will not be started during this project.
17.30	If a hoisting device is used to raise or lower the diver dedicated for dive duration?	✓	S	24.32	Needs to be defined.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

17.31	Hoist operator takes directions from diver, supervisor or tender only.	√	O	24.32	Needs to be defined.
17.32	Standby diver required? If so, meets requirements and able to enter water in 1 min.?	√	O	24.33	Required.
17.33	In event of an accident or incident comply with WORKSAFEBC regs for information and not tampering with equipment.	√	O	24.34	Contractor will comply.
17.34	Are all hazardous mechanisms secured against inadvertent movement and locked out?	√	S	24.63	Project Manager will ensure no docking/undocking work will take place during this project and that any nearby ship will not start engines.
17.35	If working near or in an intake /pipe/tunnel/duct comply with WORKSAFEBC reg 24.64	√	S	24.64	Project Manager will ensure no docking/undocking work will take place during this project.
17.36	If there are exceptional hazards, additional dive team members with independent equipment and capable of effecting rescue must be on site.	NA	S	24.65	No exceptional hazards identified.
17.37	If diving in contaminated environments comply with WORKSAFEBC reg 24.66	NA	S	24.66	

DEMOLITION EXCAVATION & CONSTRUCTION					
18.1	Protection from falling materials	√	S	20.9	Requirements to be determined in final JHA based on detailed construction plans.
18.2	Safe access/ egress to worksite? Ramps at least 20" wide with guardrails & cleats.	√	S		Requirements to be determined in final JHA based on detailed construction plans.
18.3	Temporary Floors	√	S	20.5-20.6	No temporary floors foreseen. Permanent floor will be built first.
18.4	Fall prevention / protection required? See also group 7 checklist items.	√	O	20.9	Required for all work over 7.5ft on unguarded surfaces (CLC requirement). Fall protection plan required.
18.5	Chutes	√	S	20.10	Requirements to be determined in final JHA based on detailed construction plans.
18.6	Glass Panels	√	S	20.12	Requirements to be determined in final JHA based on detailed construction plans.



Project Title: Master.

Project No.

18.7	Thrust out Crane landing platforms used?	√	S	20.13	P.Eng. must certify each thrust-out crane landing platform and certify that the building structure can adequately support loads to be imposed by use of the platform. Drawings and certification must be available on site, rated capacity clearly marked on platform and not be exceeded. Control measures acceptable to the Board must be implemented to ensure all loads placed on a thrust-out crane landing platform are safely supported, and can be safely attached to and detached from the rigging. Requirements to be determined in final JHA based on detailed construction plans.
18.8	Temporary support of partially assembled components adequate?	√	S	20.14	Requirements to be determined in final JHA based on detailed construction plans. Ensure partially assembled components are properly supported and braced including for possible wind loading.
18.9	All construction details available on site including drawings, erection procedures, temp. bracing, falsework	√	O	20.15	All drawings and specifications will be available on site at the project office. Contractor will also ensure his Superintendent has latest copies on site.
18.10	Walkways /runways provided on structural members to prevent tripping?	√	S	20.16	Requirements to be determined in final JHA based on detailed construction plans.
18.11	Plans & specs for Concrete Formwork & Falsework approved by P. Eng.?	√	S	20.17	Requirements to be determined in final JHA based on detailed construction plans.
18.12	Qualified Supervisor for erection/use of formwork/ falsework? Workers trained in hazards & proper methods?	√	S	20.18	Contractor to ensure Superintendent qualified to install formwork and workers are trained in the hazards and proper methods.
18.13	Erection drawings, design responsibility, continuity of engineering complies?	√	S	20.19-20.21	PWGSC will ensure continuity of design services.
18.14	Protruding reinforcing steel removed or guarded?	√	O	20.23	Guard or remove during construction.
18.15	Worker access restricted under formwork when steel or concrete has just been placed?	√	O	20.23	Requirements to be determined in final JHA based on detailed construction plans.
18.16	Formwork inspected before pour?	√	O		No pouring until Qualified Supervisor has performed final inspection and OK given.
18.17	Formwork exhibits any weakness, excess distortion, or undue settlement?	√	O	20.23	Superintendent to monitor and take appropriate action.
18.18	No loads on uncured concrete except as per dwgs or specs.	√	S	20.23	Superintendent to ensure drawings/specifications followed regarding loading.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

18.19	Erection and temporary bracing of pre-manufactured open web joists and trusses or laminated beams must be according to written instructions from a P.Eng. or the manufacturer detailing safe erection procedures.	✓	O	20.72	Contractor to ensure documentation is on site and that all workers have been trained in the prescribed erection procedures before work starting.
18.20	Ensure crawl boards/ladders used for roof work are securely fastened	✓	O	20.74	
18.21	Work on roofs having slope 8 vertical to 12 horizontal or greater require nailed toeboards in conjunction with personal fall protection or safety nets.	✓	S	20.75	Toe-holds must be used if the roofing material allows for it. Note: Exposed horizontal roof strapping may be used as toe-holds as long as it provides safe footing.
18.21a	Roof edge guarded?	✓	S	20.76	The roof edge about a chute, bitumen spout and material hoist must have guardrails meeting the requirements of Part 4 (General Conditions) or barriers of at least equivalent strength to at least 2 m (6.5 ft) on each side of such a work area.
18.22	Mechanical or powered equipment that has the potential to push or pull a worker over an unguarded roof edge, must not be used unless operated according to procedures acceptable to the Board.	✓	S	20.77	Secure WORKSAFEBC approval of procedures if using this equipment.
18.23	Loose insulation, polyethylene, roofs with smooth surfaces, asphalt and surfaces with water, snow, ice or frost increase the risk of losing footing.	✓	S		Work under severe weather conditions will be under the control and advisement of their supervisor
18.24	Avoid walking backwards on roofs.	✓	S		Contractor's Supervisor will advise all workers of safe working practices

EXCAVATION /DEMOLITION					
19.0	Excavation work to be carried out?	NA		S	No excavation on this project.
19.1	Written instructions/ drawings by P.Eng. available for excavation work ?	✓	O	20.78	Keep all instructions/ drawings readily available at the site. Train workers to follow instructions.
19.2	All utilities accurately located & danger determined?	✓	S&O	20.79	Contractor to get details on utility location and necessary approvals before digging.
19.3	Utilities instructions followed regarding excavation?	✓	S	20.79	Obtain necessary approvals and instructions.
19.4	Nearby objects secured or removed if hazardous?	✓	S&O	20.80	Ensure any objects are removed as required to meet regulations depending on depth of excavation etc.
19.5	Sloping/shoring requirements met as defined by P.Eng. or Geoscientist ?	✓	O	20.81-	Follow requirements of P.Eng. or Geoscientist



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

		Control of water addressed?	√	O		Ensure water in excavation is controlled to prevent possible trench wall collapse.
	19.6	Ladder provided in immediate work area extending min. 3' above ground?	√	S		Requirements to be determined in final JHA based on detailed construction plans.
	19.7	Barricades in place to prevent fall into trench if over 7.5' deep? If excavation is a hazard to workers, cover or guard it.	NA	O	20.88	No trenching over 7.5ft deep foreseen. Barricade work area and position flashing warning signs to prevent accidental falling into trench.
	19.8	End shoring in place equal to depth of excavation?	√	S		
	19.9	Loose excavated materials well back from slopes/trenches in use?	√	O	20.90	Keep at least 2' from excavation and 4' from any other excavation
	19.10	Are there soil contaminants expected or chance of encountering archeological materials?	√	O		Workers to be shown sample of archeological materials and instructed to stop excavating if they encounter possible archeological materials. Also provide workers with details of soil contaminants and potential risks. Stop work and immediately report to P.M. if anything is encountered including suspected soil contaminants.
DEMOLITION/EXCAVATION	19.11	All Workers must be aware that soils on the site may contain hydrocarbons and metals such as arsenic, zinc, copper, lead.	√	O		All excavation and management of soils must be in compliance with the Interim Soil Management Plan for Munroe Head, Esquimalt Graving Dock and North Naden - stored fully contained, sampled, and disposed off-site if above federal industrial criteria. Project Manager to provide guidance for specific project.
	19.12	Ensure structure and adjoining structure are properly supported during demolition to the extent and manner prescribed by a P. Engineer IF Workers could be endangered by the demolition or adjoining structures could have their stability compromised.	√	S&O	20.111	Follow demolition/ temporary support procedures and detailed schedule as defined by an Engineer in writing. Copy of the plan must be available on site.
	19.13	Ensure hazardous materials are identified before beginning demolition or salvage of machinery, equipment, buildings or structures.	√	S	20.112	Hazardous substances will be defined in the Environmental Assessment as well as by inspection with the Contractor. Details will be available at the site and procedures identified for safe containment and removal.
	19.14	Stop all work if hazardous materials are discovered during demolition and not previously identified.	√	O		Report to Project Manager immediately.
	19.15					



Project Title: Master.

Project No.

19.16	Ensure all electric, gas, water and other services are disconnected	√	O	20.113	Contractor to ensure all services are properly disconnected before starting work.
19.17	Glass must be removed from top to bottom and before other work commences.	√	S	20.114	
19.18	Ensure floors are not overloaded by materials and equipment.	√	O	4.2	
19.19	Protect workers from falling materials including covering floor or roof openings and barricading areas where materials will be dropped.	√	O	20.116 20.117	
19.20	Dangerous or unstable walls must be adequately braced.	√	O		Follow Engineer's demolition plan.
19.21	Do not let debris accumulate if it will in any way endanger workers	√	O	20.120	Follow Engineer's demolition plan.
19.22	Stairways and handrails must be left intact until access to the level they serve is no longer required.	√	O	20.121	Follow Engineer's demolition plan.
19.30	Restrict access to pile driver when hoisting piles	√	O	20.103	Only workers engaged in the operation to remain on superstructure or any area where pile could fall. Control general access to site with barricades and signs. Contractor to ensure suitable roof or shelter.
19.31	Operator protected from falling objects, rigging failures & weather?	√	S	20.104	Contractor to control discharge.
19.32	Any air or steam discharge controlled to prevent injury to workers or impair ability to see operation?	√	O	20.105	Operator to ensure.
19.33	Chock suspended hammer securely when not in use.	√	O	20.106	Operator to ensure.
19.34	Do not raise hammer with swinging/suspended leads until necessary.	√	O	20.106	Operator to ensure.
19.35	Wooden piles properly prepared?	√	O	20.107	Cut wooden pile square, clean of debris, bark & slivers before driving. Trim pile to fit the follower or pile driving cap. Ensure suitability for type of piling being driven.
19.36	Follower or pile driving cap being used correct size & type?	√	O	20.107	Remove defective hammer from service immediately. Contractor to ensure.
19.37	Do not use a cracked drop hammer.	√	O	20.108	
19.38	Do not use spliced ropes to support a pile driver hammer.	√	O	20.109	



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: **Master.**

Project No.

HOUSEKEEPING; MATERIALS STORAGE								
20.1	Refuse spills and waste materials not allowed to accumulate and create a hazard	√	O	4.41		Cover at start up orientation meeting.		
20.2	No use of compressed air to clean clothing of any potentially hazardous dusts etc.	√	O	4.42		Compressed air can penetrate skin, enter bloodstream and result in death. Do not use compressed air to clean work surfaces. Cover at start up orientation meeting.		
20.3	Check state of repair of floors, ramps, stairs and free of tripping and slipping hazards	√	O	4.39		Cover at start up orientation meeting.		
20.4	Material stacked securely and stable?	√	S	4.43		Check plans for stacking materials. Also Inspection item.		
20.5	Are areas free of risk of entrapment or falling materials? If not take appropriate measures per 4.44 and 4.45	√	S	4.44-4.45		Evaluate risks. Also Inspection item.		
20.6	Use metal containers with tight fitting lids for oily or painting rags & empty daily.	√	O			Oily or paint soaked rags can ignite through spontaneous combustion. Store properly. Also Inspection item		
20.7	Use proper containers for refuse.	√	O			Inspection item		
20.8	Are work areas free of protruding nails?	√	O			Ensure nails are either removed or bent over to eliminate the hazard of stepping on them.		
20.9	Are nuts/bolts etc. stored in containers to reduce tripping hazards?	√	O			Clean up components frequently to reduce risks.		
20.10	Returned tools to proper place after use.	√	O			Ensure tools are properly stored.		

EQUIPMENT MAINTENANCE & USE								
21.1	Equipment operator's manuals at site?	√	S			Keep manuals on site with equipment. Includes equipment like concrete pumping trucks		
21.2	Equipment operated by qualified persons?	√	S			Contractor to provide proof of qualification of equipment operators.		
21.3	Equipment maintained according to manufacturer's instructions?	√	S			Maintain equipment as specified by manufacturer and maintain a record of maintenance.		
21.4	Equipment inspection before use carried out?	√	S	16.34		Operators inspect equipment before use, record results (where required by WORKSAFEBEC) and report any defects to Supervisor. Do not use defective equipment until defect is remedied.		
21.5	Explosive operated tools maintained, and used properly? Operator's trained? Equipment & shots stored in restricted area?	√	S			Provide proof of training to Project Manager for users of this equipment before starting work. Check with P.M. for Hot Work permit requirement also.		
21.6	Air operated nailing guns trigger mechanism working properly?	√	S			Ensure safety mechanisms working properly.		



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

	22.0	Follow safe lifting practices. Use mechanical lifting assist wherever feasible or get assistance.	✓	S		Contractor to train all workers in safe lifting practices and monitor for compliance.
CONCRETE PUMPING	23.1	Placing boom certified safe within last 12 months?	✓	S	20.47	Serious injury could result due to failure of components, couplings etc. if pressures or other loads are exceeded. Contractor provide certificate copy to P.M.
	23.2	Permanent equipment labels on pump, boom and mast per WORKSAFEBC requirements?	✓	S	20.27	Inspection item.
	23.3	Outriggers used properly and within maximum extension and load?	✓	S	20.40	Inspection item
	23.4	Ensure concrete delivery pipe meets boom manufacturer's specs and is rated at greater than maximum pressure pump can generate. Ensure pipe clamps are of proper rating and properly installed per regulations.	✓	S	20.42 20.43 20.44	Inspection item.
	23.5	Ensure agitator guards meet WORKSAFEBC specifications & are properly used and maintained. Do not stand on the grill when agitator is running.	✓	S	20.37	Inspection item
	23.6	Ensure discharge line couplings are guarded and attachments to placing boom restrained	✓	S	20.45 20.46	Inadvertent disconnection could cause injury from flying concrete. Inspection item
	23.7	Weight of each removable section of placing boom marked?	✓	S	20.49	Inspection item.
	23.8	Placement boom not to be used for hoisting loads	✓	S	20.50	Contractor to instruct workers in proper use. Inspection item.
	23.9	Clean out operations are to be done off site	✓	S	20.51	Excess concrete to be properly disposed of by Contractor off site unless agreed with Project Manager.
	23.10	Pumper operator must have full control and no other duties while operating or placing boom or mast.	✓	S	20.52	If cleanout on site is agreed follow WORKSAFEBC restrictions Contractor to ensure control.
	23.11	If operating near H.V. lines or exposed energized conductors, comply with WORKSAFEBC PART 19	✓	S	20.53 PART 19	No operation near electrical conductors foreseen.
	23.12	Operator must see hopper on concrete pump at all times or means of signalling a problem must be provided.	✓	O	20.54	Contractor to enforce.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

23.13	Wear eye protection at all times when pumping concrete. Wear gloves to protect against concrete.	✓	O		Contractor to ensure protective equipment is used.
23.14	Controls have functions identified and emergency shutoff to stop pumping?	✓	S	20.31 20.36	Inspection item.
23.15	Hydraulic valves have pressure relief and holding valves?	✓	S	20.32	Inspection item.

24.0	Blasting operations are not usually permitted at EGD.	✓	S	PART 21	Use drilling and hoe-ram methods to break up rock.
24.1	Ensure only competent workers trained in the proper methods of blasting, hazards of fire and mishandling and procedures to follow in event of fire or explosion are to be involved in blasting operations.			21.2, 21.7	Provide proof of formal training program and documentation of training session signed by workers trained and authorized to assist the Blaster of Record.
24.2	Provide a qualified "Blaster of Record" who will exercise authority and visual supervision over all assistants or others involved during explosive loading, priming, fixing or firing.			21.5	Provide copy of blaster's certificate for anyone planned to conduct or direct blasting operations as the Blaster of Record. Ensure scope of the certificate is valid for the planned work. Keep ORIGINAL certificate at job site.
24.3	Maintain records of blasting operation as required by regulations.			21.4	Blaster of Record maintain personal log of pre-blast loading details and results of post-blast inspection and log available for inspection at the site.
24.4	Any dangerous incident, including unexpected result or problem with explosive products, or Blaster has failed to comply with regulations or safe practices, must be reported and all blasting operations and duties of the Blaster of Record will be suspended until agreed with Project Manager/WORKSAFEBC to continue.			21.3 21.13	Notify Project Manager and WORKSAFEBC immediately and complete required reports.
24.5	Comply with all other legislation besides WORKSAFEBC regulations including Explosives Act (Canada), Transportation of Dangerous Goods Act, 1992 (Canada) governing storage, handling and use of explosives.			21.6	Contractor to ensure understanding of regulations and comply with them.

BLASTING



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

24.6	Keep explosives and detonation materials separated until the last practical moment before bringing them together.				21.16-21.17, 21.20, 21.21	Contractor to ensure safe and secure storage of explosives and detonation materials.
24.7	Ensure signage is in place to identify magazines, day boxes, vehicles containing explosives and that all workers are aware of the location of storage and restrictions on access and activities around explosives and detonators.				21.18	Contractor to provide signage meeting regulations and ensure effective communication.
24.8	No passengers in explosive vehicles other than those assigned to assist in handling explosives.				21.22	
24.9	Ensure vehicles meet the transport requirements with proper separation of flammables and detonation devices from explosives. Ensure exposed ferrous metal in a conveyance is prevented from contacting packages containing explosive				21.23 21.24 21.25 21.27 21.32	If transporting on a mobile drill rig, ensure special restrictions are met including attending by the Blaster of Record at all times. No trailers. If a semi-trailer is used, ensure power brakes can be operated from inside cab.
24.10	Provide written procedures to address emergencies while transporting or working with explosives and ensure all workers are adequately instructed.				21.28	Provide documentation to Project Manager
24.11	Operate vehicle transporting explosives according to regulations but not exceeding 90 km/h; do not exceed 80% of manufacturer's load rating; follow special railway crossing requirements; ensure vehicles have been serviced before loading.				21.29 21.30 21.33 21.34	
24.12	Ensure vehicles containing explosives are parked away from habitation and bldgs containing flammables; premises are used for a purpose unlikely to cause an explosion or fire; vehicle is at all times attended by a qualified person.				21.35	Define overnight parking location(s) and ensure vehicles are attended.
24.13	Follow manufacturer's recommended practices for storage, transport, handling and use of explosive materials. Do not use materials believed to be defective.				21.36 21.37	



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

24.14	No smoking or open flame ignition sources on this project work site. Dispose of empty containers as recommended by manufacturer.				21.40 21.41 21.42	Project manager will define designated smoking areas well away (min. 15m.) from where explosives are stored, handled or loaded into holes. Hot work permit required from Project Manager for this kind of work.
24.15	Follow safe drilling procedures including location of utilities, stabilizing slopes to prevent slides and checking blasted areas for misfires before continuing.				21.42 21.43 21.44	Ensure hole sizes are adequate and don't drill within 6m. of a hole containing explosives or within 15cm of a bootleg
24.16	Follow proper loading practices including making up primers just before use, no carrying explosive material in clothes, no removal of wrappers,				21.45- 21.48 21.67 21.68	Ensure tools are non-spark generating materials. Don't attach blasting circuit until just before being ready to fire and ensure logical sequence of detonation is used.
24.17	If there is a sign of thunderstorm, suspend blasting				21.49	Lightning can result in an unplanned explosion. Suspend all blasting, clear the danger area and guard it.
24.18	Loaded holes present a hazard in that someone could drive over them or tamper with them.				21.50	Do not leave loaded holes unattended overnight. Post a worker whose sole responsibility is the security of explosives.
24.19	No driving vehicles over loaded holes an explosion could accidentally result.				21.51	
24.20	Holes are hot after being "sprung" and could result in accidental explosion if loaded too soon.				21.52	Allow ample time for cool down.
24.21	Accidental explosion could result if detonators are attached sooner than necessary				21.53 21.54	Don't interconnect detonating cords or attach detonators or detonator connectors until everything is in readiness for the blast.
24.22	Static electricity or hazards from stray currents could result in accidental explosion if loading explosives pneumatically.				21.55 21.56	Define procedures and ensure equipment used will prevent this hazard. Use only safety fuse assemblies with antistatic protection.
24.23	Inadequate or damaged fuse assemblies can result in faster than planned ignition.				21.56 21.57	Follow safe practices when lighting safety fuses.
24.24	Stray currents or static electricity may cause unexpected detonation resulting in injury or death.				21.58 21.59 21.60	Follow safe practices to prevent unplanned detonation. Do not use electric detonators if extraneous current exceeds 50 milliamps.
24.25	Radio frequency transmitters, including mobile units, can cause unplanned detonations.				21.61 to 21.65	Contractor to provide details demonstrating that all regulations are being met and get prior approval from Project Manager if electrical blasting circuits are to be used.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

24.26	Accessing the blasting area during a detonation could result in serious injury or death.			21.66	The Blaster of Record will ensure proper covers are used to control flying materials and that workers are posted at all necessary points to ensure no one enters the area and that a warning system is in place. Provide written warning procedures and blasting signals and post conspicuously. Ensure workers are trained in procedures and provide documentation to Project Manager. Project Manager will ensure all EGD occupants are made aware of the procedures and signals.
24.27	Misfires or other hazards could injure workers if they enter the area after a blast. The Blaster may be hurt if entering the area as a result of electrical detonation of unexploded loads.			21.71 21.81	Ensure the area is inspected by the Blaster before allowing anyone to enter. Blasters must disconnect all circuits and short circuit leads, and ensure the blasting machine switch is locked open. In the event of misfire, follow standard practice including waiting at least 10 minutes before anyone enters the blast area. Contractor to provide written procedures for the standard handling of misfires and ensure all workers understand the process.
24.28	Ensure procedures are well defined and regulations reviewed if blasting is to involve underwater blasting, or seismic blasting			21.82- 21.85	

ASBESTOS	25.1	Workers possibly exposed to potentially hazardous levels of asbestos? E.g. - workplace has asbestos-containing materials present or used - operation involves abatement of asbestos-containing materials - exposure to asbestos fibre in excess of 50% of exposure limits may occur	√	O	PART 6 6.2	Should the Contractor encounter any questionable situation involving asbestos, lead paints or other potentially hazardous substance, immediately stop work and report to Project Manager for direction.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

		Workers possibly exposed to potentially hazardous levels of asbestos? E.g. - workplace has asbestos-containing materials present or used - operation involves abatement of asbestos-containing materials - exposure to asbestos fibre in excess of 50% of exposure limits may occur	NA	O	PART 6 6.2	No exposure to asbestos is foreseen under this JOB ORDER. Should the Contractor encounter any questionable situation, immediately stop work and report to PWGSC Representative for direction.
25.0	Workplace exposure monitoring done and results provided to workers	✓	O	5.53		
25.2	Contractor exposure control plan developed meeting WORKSAFEBEC 5.54?	✓	O	6.3		Plan to include: - Purpose & Responsibilities - Risk identification; assessment & control - Education & training - Written work procedures - Hygiene facilities & decontamination procedures, when required - Health monitoring, when required - Documentation, when required
25.4	Qualified person prepare and keep current an inventory of all asbestos-containing materials; identify all such materials by signs, labels etc.	✓	O	6.4 6.5		
25.5	Qualified Risk assessment conducted by qualified person before any demolition, repair, etc work where asbestos-containing materials may be disturbed.	✓	O	6.6		
25.6	Procedures documented providing task-specific work direction addressing both hazards & controls and eliminating or minimizing the airborne release of asbestos fibres	✓	O	6.7 6.8		WORKSAFEBEC publication "Safe Work Procedures for Handling Asbestos" provides procedures acceptable to the Board.
25.7	No use of pressure spraying to remove asbestos-containing materials from buildings/structures	✓	O	6.9		
25.8	No use of compressed air to clean up or remove asbestos-containing materials, dusts, fibres. Also no dry sweeping or dry mopping.	✓	O	6.9		
25.9	Employer must substitute material less hazardous than asbestos where practicable	✓	O	6.10		If not practicable, document why and make available to workers and health & safety representative

ASBESTOS



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

25.22	Proper respiratory protection used? Fit checked?	✓	O	6.29	No single-use respirators permitted. Ensure adequate protection and enforce usage.
25.23	Proper protective clothing supplied and worn & maintained?			6.30	Ensure asbestos resistant clothing with proper coverage and fit is used. Repair/replace damaged clothing immediately. Clean clothing using HEPA filter vacuum before removal. Remove protective clothing/equipment before leaving designated work area. Protective clothing being sent to an acceptable laundry must be HEPA vacuum cleaned, placed in a soluble plastic bag, sealed and labelled before being sent.
25.24	Workers to launder own clothing?			6.31	Ensure workers informed of hazards of asbestos and precautions required.
25.25	Documentation maintained?			6.32	Employer to keep records of inventories, risk-assessments, inspections and air monitoring results at least 10 yrs. Keep records of corrective actions to control release, training/instruction to workers, work procedures and notification to WORKSAFEBC for at least 3 years.

TREE REMOVAL					
26.1	Risk of injury due to tree falling practices	✓			The hazards associated with removing large trees exist. To ensure workers and passers-by are not injured: <ul style="list-style-type: none"> - Coordinate with all concerned and barricade off all potential fall areas. - Document the tree falling plan Employ only qualified / experienced fallers to do this work - Define tree falling plan and agree with P.M. Drop in sections not entire tree. - Check trees for internal rot that could put persons at risk if scaling tree. - Clean up and remove trees from site immediately after falling and cutting up.
26.2	Are workers trained to carry out tree removal?	✓		26.3	Ensure workers meet WBC training requirements and provide documentation to the Project Manager.
26.3	Are workers using all required PPE for tree removal operations?	✓		26.7	Ensure workers using chainsaws use leg protective devices in addition to other PPE. Also ensure all PPE is checked for wear, fits the users and is in serviceable condition



Project Title: Master.

Project No.

26.4	Have workers been trained in the hazards of operating chain saws?						Contractor to ensure workers are aware of hazards, safe working practices and protective equipment to be used.
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WELDING & CUTTING							
27.1	Are workers qualified to perform welding/cutting work and work performed according to standard?	✓			12.112		Contractor to provide proof of qualification. Perform work according to CSA Standard W117.2-94 Safety in Welding, Cutting and Allied Processes or other standard acceptable to WORKSAFEBC and manufacturer's instructions for equipment being used.
27.2	Workers must be aware of the health effects of exposure to welding smoke. The combination of base materials, coatings, shielding gases and other factors can create many different substances that can potentially have an adverse effect on almost any part of the body.	✓			12.124		Contractor to identify the specific hazards associated with a particular welding operation and the environmental conditions and ensure workers understand the short-term and long-term health effects of exposure to welding smoke and how to protect him or herself. Undertake appropriate engineering controls or work practices to control/remove welding fumes. Ensure respirators are the correct type and fit-tested.
27.3	Coatings must be removed from base metal before welding/cutting.	✓	S		12.115 12.129		Coatings could emit harmful contaminants during welding or cutting. Remove coatings and wear protective equipment. Do not apply paint to materials about to be welded.
27.4	Workers must be aware of the risk of burning due to contact with hot slag, metal chips, sparks and hot electrodes.	✓			12.125		Contractors to ensure workers protect themselves and others against the risk of burns. Wear suitable protective clothing. Ensure recently welded or flame cut work is marked "HOT" or guarded to prevent accidental contact.
27.5	Workers must be aware of the risks associated with exposure to ultraviolet or infrared light from welding which can damage the eye and result in skin burns.	✓			12.122		Contractors to ensure workers understand the hazards of exposure to the welding arc and how to protect themselves. Be sure the lens shade number is adequate for the type of welding/cutting being performed. Hand-held screens are not acceptable. Use barriers of flame resistant non-reflective material to protect other people from exposure to the arc, heat, and hot spatter. Also use signs to warn of the dangers of looking at the arc.
27.6	Workers must be aware that exposure to the noise of welding can permanently damage hearing, cause stress leading to increased blood pressure.	✓					Contractor to ensure workers have regular hearing test and that wearing protective equipment is enforced.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

27.7	Workers must be aware of the risks of electrical shock especially in wet or cramped conditions. Even a small shock can lead to a fall or other accident. Brain damage or death can result from a large shock.	√			Ensure workers use dry gloves, rubber-soled shoes or an insulating layer. Ensure work piece and frame of electrically powered machines are grounded. Keep electrode holders and cables dry and in good condition. Electrodes should not be changed with bare hands, with wet gloves or if standing on grounded surfaces or wet floors.
27.8	Workers must be aware of dangers of welding on containers, pipes or structures or in any place that has held flammable or combustible materials unless thoroughly cleaned.	√		12.116	Fires, explosions or release of toxic vapours can result. Containers with unknown contents should be assumed flammable or combustible. Ensure a qualified person has tested
27.9	Beware of backfires and flashbacks when using compressed gases.	√		12.120	Do not ignore these warnings. Undertake immediate corrective action. Ensure safety devices are used to prevent reverse flow and arrest flashbacks on oxyfuel systems
27.10	Ensure fire prevention and fighting capabilities before welding/cutting.	√		12.121	Suitable fire extinguishing equipment must be available close to the work. Use a firewatcher if work is being done where other than a minor fore might develop. Maintain the fire watch at least ½ hour after welding or cutting work is completed to detect smouldering fires. Keep areas clear of combustibles and cover those that cannot be removed with flame-resistant materials, Cover doorways, windows and cracks. Provide and use receptacles for electrode stubs.
27.11	Welders must wear required personal protective equipment including flame resistant clothing, gauntlet gloves, etc.	√		12.123	Ensure welders wear all required special PPE
27.12	Check Gas Cylinder Condition & Securing/Upright storage, & protection from sparks, flames, heat, physical damage or corrosion. Ensure pressure relief valves are present.	√	S	5.36	Cylinders of compressed gas can explode or become projectiles if exposed to excessive heat, or if the valve stem were to break should the tank be knocked over from a vertical position. Inspection item
27.13	Ensure empty gas cylinders have regulator removed, capped & are tagged as empty.	√	S		Identify empty tanks. Inspection item
27.14	Ensure Cylinders are identified re type of gas and valid testing.	√	S	5.37-5.39	Cylinders must be pressure tested to ensure ability to perform safely and the test date recorded. The cylinder must be identified regarding the type of gas in the cylinder to prevent confusion and potential accidents. Inspection item Do not use cylinders or contents for other than intended purpose.



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

	27.15 Ensure Cylinder valves are closed when not used.	√	S		Do not rely on the welding torch or other device to control the release of gas other than when manned by an operator. Dangerous leakage could occur with gas building up inside buildings, vessels etc. with potential for explosion or other hazards. Inspection item
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LEAD					
28.1	Worker exposure to lead?	√	S	6.60 6.67	Develop and implement an exposure control plan meeting the requirements of section 5.54 if workers are or may be exposed to lead in excess of 50% of the exposure limits, or if exposure through any route of entry could result in elevated lead body-burdens. Develop and maintain a health protection program.
28.2	Airborne exposure possible?	√	S	6.61	Provide monitoring per regulation.
28.3	Warning signs	√	S	6.62	Post signs at the boundary of any work area where hazardous lead exposures could occur
28.4	Contamination of exposed skin and/or clothing possible?	√	S	6.63 PART 5	Follow personal hygiene requirements
28.5	Work surfaces protected?	√	S	6.64 6.65	Protect work surfaces from finely divided lead; prevent dispersal of finely divided lead into work area
28.6	Workers trained?	√	S	6.66	Provide training in hazards of lead, written work procedures, correct operation and use of any required engineering controls and personal protective equipment, personal hygiene and decontamination procedures, and purpose and significance of any health monitoring.
28.7	Records maintained?	√	S	6.68	Maintain records of risk assessments, worker exposures and worker training. Produce for Project Manager if requested.

NON-IONIZING RADIATION					
29.0	Is there exposure to microwave radiation?	TBD	S		
					Get safety procedures from Rogers
					No approach within 3 meters



Preliminary JOB HAZARD ANALYSIS CHECK LIST

August 2011

APPENDIX D

Project Title: Master.

Project No.

ROCK DUST	29.1	Rock crushing, drilling, mucking, excavation, loading, transportation, road grading, road construction or conveying of rock or similar operations?	√	S	6.110 6.111	Ensure that dust concentrations to which a worker may be exposed are maintained at or below the established exposure limits, by one or a combination of (a) mechanical ventilation, (b) the use of water spray, (c) other equally effective methods.
	29.2	Access restricted?	√	S	6.112	Restrict access to area of exposure
	29.3	A rock drill, other than a manually-powered rock drill used?	√	S	6.113	Must be equipped with a dust suppression system, that uses water jet, spray, or other equally effective means to suppress drilling dust.
MUSCULOSKELETAL INJURY	30.1	Is there a risk of musculoskeletal injury?	TBD	S	4.47	Contractor to eliminate or control risk
	30.2	Are controls required?	TBD	S	4.50-4.52	Contractor to define control measures and train workers in risks and safe work procedures, use of PPE etc. Contractor to monitor for compliance and effectiveness.

Contractor's Superintendent: _____ Date: _____

Distribution:

- EGD Operations Manager
- EGD Supervisors
- Engineer-of Record
- Resident Engineer/Construction Coordinator
- Project File

**ESQUIMALT GRAVING DOCK
REPLACE MAIN DISTRIBUTION LINE (RMDL)
BC HYDRO (BCH) POINT OF DELIVERY (POD) SWITCHGEAR
ESQUIMALT, BRITISH COLUMBIA**

**APPENDIX F
EGD STANDARDS FOR SURVEY**

Esquimalt Graving Dock (EGD) STANDARDS FOR SURVEYS

Revised 2012-02-28

1. INTRODUCTION

This standard is written to provide the British Columbia Land Surveyor (BCLS) a guideline for producing acceptable topographic survey for all EGD projects.

2. APPLICATION OF THE STANDARD

This standard applies to surveys that are intended to show new installation of structures, utilities and underground conduits including the existing structures, utilities and underground conduits in the vicinity of the project and as requested by EGD Representative.

The Surveyor in making topographic surveys uses accepted terrestrial and/or GPS surveying methods. Topographic surveys that additionally depict the location of property lines must also be in compliance with the current standard for property surveys and show all legal boundary evidence found.

3. DEFINITIONS

- 1) Benchmark (control point) is a relatively permanent material object, natural or artificial, bearing a marked point whose elevation above or below an adopted datum is known and whose horizontal coordinates are known in an accepted coordinate system (UTM NAD 83 CSRS Zone 10).
- 2) A Contour is an imaginary line on the ground, all points of which are of the same elevation above or below a specified datum.
- 3) The Parcel is the area designated by an EGD Representative and is usually, but not necessarily, given by a legal description of the property.
- 4) Utilities are services provided by governmental and private entities that provide the following: electric power, telephone, water, sanitary and storm sewer, gas, etc.
- 5) Acronyms and Definitions:
 - BCLS: British Columbia Land Surveyor
 - EGD: Esquimalt Graving Dock
 - NEZ: Northing, Easting, Elevation – Coordinates
 - PBM: Permanent Benchmark (Control point)
 - TBM: Temporary Benchmark (Control point)
 - Headwall: concrete wall structure on top of or on each side of culvert.

Esquimalt Graving Dock (EGD) STANDARDS FOR SURVEYS

Revised 2012-02-28

4. RESEARCH AND INVESTIGATION

- 1) The Surveyor shall acquire the elevation and datum of all benchmarks to be used in the survey. The elevation used shall be based on a nationally accepted datum whenever practical or unless otherwise instructed by an EGD Representative. The EGD Representative shall specifically describe the parcel to be surveyed.
- 2) At least four (4) benchmarks shall be established using Global Positioning System and electronic survey total stations, in which the position of all survey works and detected objects shall relate.
- 3) The benchmarks shall be established on stable ground within 6 m (20 ft) adjacent to the project site or as directed by EGD Representative. The benchmarks shall have reference numbers, coordinates and heights above the established datum (geodetic and/or chart datum).

5. THE SURVEY

The survey shall be performed on the ground to obtain the information required in this standard and any additional information requested by EGD. The Surveyor shall select the equipment and procedures necessary to obtain the horizontal and vertical positional accuracy required by these standards.

6. DATA

The surveyor shall locate and show on the survey map the following information:

- 1) The location of permanent structures including retaining walls and culverts.
- 2) The location of street or road paving, entrances, driveway openings and sidewalks.
- 3) Elevations on the top of curbs, gutters and sidewalks.
- 4) EGD building numbers assigned to the parcel.
- 5) North arrow and scale of drawing.
- 6) Legend depicting the symbols and abbreviations used on the drawing.
- 7) Provide buildings footing corners, exterior corners, roof line corners and main floor elevations of all required building listed in Appendix A.
- 8) Location and elevation of existing structures, utilities, underground conduits or drainage courses on or near the surveyed parcel.

Esquimalt Graving Dock (EGD) STANDARDS FOR SURVEYS

Revised 2012-02-28

- 9) Schedule of all benchmarks with the reference numbers coordinates (UTM NAD83 CSRS Zone 10) and heights above the established datum (geodetic and/or chart). Description and location of the benchmarks shall also be submitted.
- 10) Original copy of the survey field logbooks or electronic logbook printouts data duly endorsed by the British Columbia Land Surveyor. All survey data from field logbooks or electronic notebooks shall include and clearly indicate corrections or errors done during surveying work.
- 11) Certificates showing that the surveying equipment used have been calibrated in the last twelve (12) months shall also be attached. These certificates shall also be submitted prior to start of work.
- 12) The surveyor map grid coordinate system shall be based on NAD 83 (North American Datum) UTM Zone 10.
- 13) Levels related to established datum (geodetic and/or chart).
- 14) All other items listed in **Appendix A**.

7. POSITIONAL ACCURACY

The following relative positional accuracies are provided as a guide for surveys.

	Vertical Positional Accuracy Feet	Horizontal Positional Accuracy Feet
Contour line 300 mm (1') interval	± 200 mm (0.65 ft)	± 300 mm (1 ft)
Contour line 600 mm (2') interval	± 400 mm (1.30 ft)	± 600 mm (2 ft)
Contour line 1.2 m (4') interval	± 800 mm (2.60 ft)	± 1.200 m (4 ft)
Contour line 1.5 m (5') interval	± 1.000 m (3.20 ft)	± 1.200 m (4 ft)
Contour line 3.0 m (10') interval	± 2.000 m (6.50 ft)	± 2.400 m (8 ft)
Floor elevations	± 10 mm (0.05 ft)	± 300 mm (1 ft)
Spot paving elevations	± 10 mm (0.05 ft)	± 300 mm (1 ft)
Spot ground elevations	± 50 mm (0.20 ft)	± 600 mm (2 ft)
Sewer invert elevations	± 10 mm (0.05ft)	± 300 mm (1 ft)
Underground utilities/conduits	± 10 mm (0.05ft)	± 300 mm (1 ft)
All underground services/structure	± 10 mm (0.05ft)	± 300 mm (1 ft)

Positional Accuracy is given at the 95 percent confidence level.

Esquimalt Graving Dock (EGD) STANDARDS FOR SURVEYS

Revised 2012-02-28

8. ELECTRONIC DATA DISTRIBUTION

Surveyor to provide the survey data in an AutoCAD 2012 or 2010 .dwg drawing file. The surveyor shall also provide a signed and sealed hard copy drawing. This drawing shall be the official map and shall be deemed to be correct and superior to the electronic data.

The electronic data file shall also contain a statement that the file is not a certified document and that the official document was issued and sealed by *(name and commission number of the BCLS)* on *(date)*. Surveyor to also provide a table of the survey points data (NEZ) in electronic format (MS Excel, MS Word or PDF).

Esquimalt Graving Dock (EGD) STANDARDS FOR SURVEYS

Appendix A - ITEMS TO BE INCLUDED IN SURVEY

Revised 2012-02-28

The following items marked with an **(X)** are to be included in the survey:

- () Boundary survey of the parcel.
- () Plot the location of easements and rights-of-way as shown on the recorded subdivision subdivision plan and all easements evidenced by a recorded document provided by EGD. The plan or document number of each shall be shown.
- () Vicinity map with subject property highlighted.
- () Observable evidence of recent earth moving work, borrow or fill.
- () Cross-section of offsite drainage courses for engineering studies.
- () Spot elevations covering the entire survey limits showing high points, low points, grade changes, and at sufficient intervals to represent the general character of the terrain. Existing contours shall be drawn with major contour lines at 10m (25') intervals and minor contour lines at 2m (5') intervals unless otherwise noted.
- () Elevations at the inside of walk, top of curb, and gutter at approximately one inch 3 cm (1") intervals at the final map scale.
- () Dimensions of curb, sidewalk, and gutter lines or ditch lines and centerline of all streets, alleys or roads adjoining the parcel. Indicate type of paving surface and condition.
- (X)** Location, width and elevation at both ends of all existing sidewalks. Include a description of the kind and general condition of the sidewalk.
- (X)** Location, diameter, and species of all trees over 10 cm diameter.
- (X)** Perimeter outline only of thickly wooded areas unless otherwise directed.

Esquimalt Graving Dock (EGD) STANDARDS FOR SURVEYS

Appendix A - ITEMS TO BE INCLUDED IN SURVEY

Revised 2012-02-28

- (x) Electric utilities – the location of:
 - (x) power poles – 1 point at ground elevation
 - () power poles – 1 point at top of pole elevation
 - () guy wires – 1 points
 - () anchors – 1 points
 - (x) Rectangular junction/pull boxes – 4 corners
 - (x) Round junction/pull boxes – cover center
 - (x) Underground conduits – all tie-ins (existing or new) and change of directions
 - (x) vaults – 4 corners

- (x) Storm, sanitary or combined sewers – the location of:
 - (x) manholes – cover center
 - (X) culverts – 2 centreline measurements to show direction of flow
 - (X) headwalls – 4 corners
 - (x) catch basins – 4 corners + 1 centre measurement at gutter line
 - (x) clean-outs – center point
 - (x) Include elevations of the top and bottom of manholes, culverts, headwall and catch basins.
 - (x) Show type, size, and direction of flow and invert elevation of all pipes or culverts.

 - (x) Trench drain – center point of trench and start and end of drains.

- (x) Water – the location of:
 - (x) all water valves – center point
 - () standpipes – center point
 - () regulators – center point
 - () fire hydrants – 1 point at ground elevation
 - () fire hydrants – 1 point at top of hydrant elevation

- () Gas – the location of:
 - () all valves – center point
 - () meters – center point
 - () gas line markers – center point

Esquimalt Graving Dock (EGD) STANDARDS FOR SURVEYS

Appendix A - ITEMS TO BE INCLUDED IN SURVEY

Revised 2012-02-28

- Show elevation on top of any valves.
- Telephone – the location of:
 - all poles – 1 point at ground elevation
 - all poles – 1 point at top of pole elevation
 - manholes – center point
 - Rectangular junction/pull boxes – 2 opposite corners
 - Round junction/pull boxes – cover center
- Street/Roads – the location of:
 - all lamp poles – 1 point at ground elevation
 - all lamp poles – 1 point at top of pole elevation
 - Rectangular junction/pull boxes – 4 corners
 - Round junction/pull boxes – cover center
 - road cross-section: Survey spot levels along cross-sections at maximum 5m (15') intervals up to 30m (100') beyond the edges of the road shoulder. The interval of the spot levels shall be varied based on the condition at site. If required, closer spacing shall be surveyed where the terrain is not uniform such as deep gullies and creek areas.
- Heating – the location of:
 - steam manholes – center point
 - vaults – 4 corners
- Location and dimensions of:
 - tanks – 2 opposite corners minimum
 - fences – corners/gates + changes of direction
 - fences cross-section: Survey spot levels along cross-sections at maximum 5m (15') intervals up to 30m (100') beyond the edges of the fences lines. The interval of the spot levels shall be varied based on the condition at site. If required, closer spacing shall be surveyed where the terrain is not uniform such as deep gullies and creek areas.
 - obstructions – 2 opposite corners minimum

Esquimalt Graving Dock (EGD) STANDARDS FOR SURVEYS

Appendix A - ITEMS TO BE INCLUDED IN SURVEY

Revised 2012-02-28

- (x) Existing buildings – the location of:
 - (x) __PWGSC Project Trailer_____
 - (x) __Tenant Building_____
 - (X) __Vic Ships Building _____
 - (X) __PWGSC Washroom_____
 - () _____
 - () _____

- () Location and description of any building or major structure on adjoining land that is not more than ____ feet outside the parcel being surveyed.

- (x) Other – the location of:
 - (x) EGD Benchmark _____
 - (x) EGD CM 1– Site Monuments_____
 - (x) EGD CM 3 – Site Monuments _____
 - (x) 150 Tonne & 44 Tonne Crane Rails on 3m intervals_
 - (x) Existing Bollards adjacent to work area_____
 - () _____
 - () _____
 - () _____
 - () _____
 - () _____
 - () _____
 - () _____

**ESQUIMALT GRAVING DOCK
REPLACE MAIN DISTRIBUTION LINE (RMDL)
BC HYDRO (BCH) POINT OF DELIVERY (POD) SWITCHGEAR
ESQUIMALT, BRITISH COLUMBIA**

**APPENDIX G
DOCK BOOKING SUMMARY**

Calendar of All Bookings Date Range: 16-Nov-2018 to 31-Dec-2025 Drydock & NLW & SJ								
Company	V.Length (m)	Vessel	Status	Sections	Date in	Date out	Booking date	Booking time
Drydock								
VSL	63.40 m	OFSV1	Confirmed	3	09-Oct-18	27-Nov-18	01-Aug-18	15:41:00
VSL	114.60 m	Alaska Ocean	Tentative		08-Nov-18	30-Nov-18	29-Jun-15	13:03:33
BCF	130.00 m	Queen of New Westminster	Tentative		13-Nov-18	19-Nov-18	26-Jan-17	09:19:00
VSL	118.00 m	Te Kaha	Confirmed	2 and 3	17-Nov-18	31-Dec-18	29-Aug-16	08:52:00
BCF	96.00 m	Queen of Cumberland	Tentative		18-Nov-18	27-Nov-18	08-Dec-16	12:14:00
BCF	160.00 m	Coastal Inspiration	Tentative		19-Nov-18	27-Nov-18	07-Aug-18	09:46:09
BCF	140.00 m	Queen of Cowichan	Tentative		21-Nov-18	17-Dec-18	14-Oct-16	08:08:21
VSL	290.00 m	Ruby Princess	Tentative		28-Nov-18	21-Dec-18	18-Jul-16	10:53:05
VSL	63.40 m	OFSV1	Tentative		28-Nov-18	17-Dec-18	20-Sep-18	06:17:07
VSL	87.00 m	American Triumph	Tentative		03-Dec-18	30-Dec-18	22-Oct-18	09:46:34
VSL	70.40 m	Corner Brook	Tentative		02-Jan-19	27-Feb-19	11-Sep-18	12:45:45
VSL	87.00 m	American Triumph	Tentative		02-Jan-19	15-Jan-19	22-Oct-18	09:49:30
EDC	79.00 m	Eclipse 110	Confirmed	3	03-Jan-19	25-Jan-19	04-Oct-18	15:07:25
EDC	33.00 m	Odyssey 102	Confirmed	2 and 3	03-Jan-19	25-Jan-19	04-Oct-18	15:08:13
BCF	107.00 m	Salish Eagle	Tentative		07-Jan-19	16-Jan-19	17-Mar-17	14:25:12
VSL	70.10 m	HMS 2000 Barge	Tentative		10-Jan-19	28-Jan-19	29-Oct-18	11:41:20
VSL	255.73 m	Midnight Sun	Tentative		17-Jan-19	25-Feb-19	21-Feb-17	10:54:00
BCF	140.00 m	Queen of Surrey	Tentative		25-Jan-19	11-Feb-19	14-Oct-16	08:23:23
BCF	107.00 m	Salish Raven	Tentative		13-Feb-19	20-Feb-19	17-Mar-17	14:29:33
VSL	289.52 m	Grand Princess	Tentative		25-Feb-19	22-Mar-19	23-Dec-16	10:11:02
EDC	124.00 m	FRPD 309	Confirmed	2 and 3	28-Feb-19	26-Mar-19	07-Dec-16	16:23:00
EDC	60.96 m	Peter D. Anderson	Confirmed	2 and 3	28-Feb-19	26-Mar-19	18-Apr-18	09:19:12
EDC	70.30 m	Columbia	Confirmed	2 and 3	28-Feb-19	26-Mar-19	18-Apr-18	09:20:28
VSL	288.61 m	Emerald Princess	Confirmed	1	21-Mar-19	26-Mar-19	16-Aug-18	12:34:00
VSL	288.61 m	Emerald Princess	Confirmed	1, 2, and 3	27-Mar-19	07-Apr-19	06-Jun-17	14:15:00
EGD	42.50 m	EGD Caisson #1	Confirmed	1	08-Apr-19	30-Aug-19	24-Jul-17	08:39:00
VSL	83.00 m	American Dynasty	Tentative		08-Apr-19	10-May-19	30-Nov-16	09:21:00
VSL	288.61 m	Emerald Princess	Tentative		08-Apr-19	21-Apr-19	06-Jun-17	15:20:00
VSL	70.40 m	Chicoutimi	Tentative		08-Apr-19	30-Aug-19	15-Nov-18	14:55:11
DND	135.00 m	HMCS Vancouver	Confirmed	2 and 3	08-Apr-19	30-Aug-19	01-Nov-13	09:16:00
VSL	112.00 m	Exellence	Tentative		17-Apr-19	10-May-19	07-Apr-17	10:11:45
VSL	70.40 m	Corner Brook	Tentative		07-Jul-19	21-Jul-19	12-Mar-18	10:55:59
VSL	134.20 m	Vancouver	Tentative		31-Aug-19	08-Sep-19	22-Oct-18	09:22:14
VSL	294.00 m	Disney Wonder	Confirmed	1, 2, and 3	02-Sep-19	02-Oct-19	14-Jul-16	15:30:00
VSL	290.00 m	Ruby Princess	Tentative		24-Sep-19	16-Oct-19	23-Dec-16	10:08:18
VSL	294.00 m	Disney Wonder	Tentative		26-Sep-19	20-Oct-19	14-Jul-16	15:59:00
VSL	285.24 m	Noordam	Confirmed	1, 2, and 3	01-Oct-19	14-Oct-19	04-Oct-17	14:44:25
VSL	70.40 m	Corner Brook	Tentative		01-Oct-19	14-Oct-19	12-Mar-18	10:57:52
BCF	160.00 m	Coastal Renaissance	Tentative		15-Oct-19	31-Oct-19	14-Oct-16	10:02:00

BCF	139.35 m	Queen of Alberni	Tentative		15-Oct-19	23-Oct-19	16-Oct-18	10:27:58
BCF	84.97 m	Bowen Queen	Tentative		16-Oct-19	25-Oct-19	24-Jul-18	10:58:04
BCF	110.00 m	Skeena Queen	Confirmed	3	24-Oct-19	16-Nov-19	24-Oct-16	14:38:00
VSL	70.40 m	Corner Brook	Confirmed	1	26-Oct-19	10-Nov-19	18-Jun-18	07:21:00
CCG	69.00 m	John P Tully	Tentative		05-Nov-19	17-Dec-19	07-Aug-15	13:37:08
VSL	118.00 m	Te Mana	Confirmed	2 and 3	11-Nov-19	24-Dec-19	24-Jan-18	09:59:36
BCF	139.35 m	Queen of Alberni	Tentative		14-Nov-19	29-Nov-19	06-Dec-16	15:22:00
CCG	83.00 m	Sir Wilfrid Laurier	Tentative		15-Nov-19	28-Apr-20	18-Oct-18	14:25:22
VSL	102.48 m	Northern Jaeger	Tentative		17-Nov-19	24-Dec-19	30-Nov-16	14:00:00
BCF	139.35 m	Queen of Alberni	Tentative		06-Dec-19	14-Dec-19	16-Oct-18	10:38:04
BCF	140.00 m	Queen of Oak Bay	Confirmed	2 and 3	06-Jan-20	30-Jan-20	16-May-16	15:38:31
BCF	96.00 m	Queen of Capilano	Confirmed	1	06-Jan-20	29-Jan-20	16-May-16	15:39:56
VSL	255.73 m	North Star	Tentative		20-Jan-20	24-Feb-20	21-Feb-17	10:58:00
VSL	255.73 m	Midnight Sun	Confirmed	1, 2, and 3	31-Jan-20	28-Feb-20	19-Dec-16	15:44:00
EDC	124.00 m	FRPD 309	Tentative		01-Mar-20	29-Mar-20	28-Jul-17	18:59:32
VSL	198.00 m	Seabourn Sojourn	Tentative		25-Mar-20	17-Apr-20	06-Apr-18	13:38:40
DND	135.00 m	HMCS Ottawa	Confirmed	2 and 3	30-Mar-20	06-Jul-20	10-May-17	11:22:00
VSL	289.51 m	Star Princess	Tentative		08-Apr-20	01-May-20	20-Jun-18	09:22:33
VSL	87.00 m	American Triumph	Confirmed	1	15-Apr-20	13-May-20	30-Nov-16	14:00:00
VSL	103.94 m	Northern Hawk	Tentative		15-Apr-20	13-May-20	21-Feb-18	08:58:36
VSL	103.94 m	Northern Hawk	Tentative		14-May-20	09-Jun-20	16-Apr-18	07:45:57
BCF	160.00 m	Coastal Inspiration	Tentative		19-May-20	05-Jun-20	16-May-16	15:54:01
DND	134.20 m	Ottawa	Confirmed	2 and 3	07-Jul-20	18-Sep-20	13-Feb-18	10:26:00
BCF	85.00 m	Powell River Queen	Tentative		08-Oct-20	16-Oct-20	17-Mar-15	16:09:33
BCF	140.00 m	Queen of Coquitlam	Tentative		08-Oct-20	23-Oct-20	03-Oct-16	14:01:22
BCF	75.00 m	Quinitsa	Tentative		13-Oct-20	04-Nov-20	16-May-16	16:05:00
BCF	107.00 m	Salish Orca	Confirmed	3	19-Oct-20	10-Nov-20	17-Mar-17	13:50:42
BCF	168.00 m	Spirit of British Columbia	Confirmed	2 and 3	05-Jan-21	19-Jan-21	02-Dec-16	17:23:00
BCF	96.00 m	Queen of Cumberland	Tentative		05-Jan-21	19-Jan-21	13-Jun-17	11:53:52
VSL	255.73 m	North Star	Tentative		18-Jan-21	26-Feb-21	21-Feb-17	11:01:00
EGD	114.00 m	EGD 1 Section Maintenance	Confirmed	3	20-Jan-21	15-Sep-21	13-Sep-18	15:38:54
VSL	255.73 m	North Star	Tentative		29-Jan-21	28-Feb-21	19-Dec-16	15:45:00
BCF	140.00 m	Queen of Surrey	Confirmed	1 and 2	29-Jan-21	26-Feb-21	16-May-16	16:26:00
EDC	124.00 m	FRPD 309	Tentative		01-Mar-21	31-Mar-21	28-Jul-17	19:02:47
BCF	150.75 m	Northern Expedition	Confirmed	1 and 2	02-Apr-21	21-Apr-21	10-Nov-16	09:56:00
BCF	160.00 m	Coastal Celebration	Tentative		05-Apr-21	23-Apr-21	03-Oct-16	16:27:24
VSL	220.00 m	Maasdam	Tentative		20-Apr-21	05-May-21	06-Apr-18	13:33:36
DND	135.00 m	HMCS Regina	Confirmed	1 and 2	21-Apr-21	02-Aug-21	10-May-17	11:22:00
VSL	285.24 m	Oosterdam	Tentative		22-Apr-21	07-May-21	29-Aug-17	10:43:50
VSL	89.92 m	Katie Ann	Tentative		27-May-21	30-Jun-21	30-Nov-16	09:43:31
DND	134.20 m	Regina	Confirmed	1 and 2	03-Aug-21	15-Sep-21	13-Feb-18	11:24:00
VSL	294.00 m	Disney Wonder	Tentative		06-Sep-21	03-Oct-21	18-Feb-18	10:39:47
VSL	203.82 m	Ocean Phoenix	Tentative		16-Sep-21	15-Oct-21	07-Apr-17	10:10:09

VSL	294.00 m	Coral Princess	Tentative		16-Sep-21	11-Oct-21	11-Apr-18	10:38:00
VSL	285.24 m	Oosterdam	Tentative		23-Sep-21	11-Oct-21	29-Oct-18	11:43:27
VSL	289.52 m	Grand Princess	Tentative		30-Sep-21	19-Oct-21	20-Jun-18	09:26:18
BCF	160.00 m	Coastal Renaissance	Confirmed	2 and 3	12-Oct-21	08-Nov-21	16-May-16	15:49:00
BCF	130.00 m	Queen of New Westminster	Tentative		12-Oct-21	30-Oct-21	06-Dec-16	15:22:00
BCF	140.00 m	Queen of Cowichan	Tentative		15-Oct-21	04-Nov-21	04-Oct-16	13:21:48
BCF	89.84 m	Quinsam	Tentative		25-Oct-21	16-Nov-21	16-May-16	16:19:37
BCF	139.29 m	Queen of Cowichan	Tentative		08-Nov-21	14-Nov-21	02-Apr-18	17:06:08
BCF	139.35 m	Queen of Alberni	Tentative		14-Nov-21	09-Dec-21	06-Dec-16	15:22:00
VSL	112.00 m	Exellence	Tentative		15-Nov-21	10-Dec-21	07-Apr-17	10:14:09
BCF	117.00 m	Northern Adventure	Tentative		02-Jan-22	20-Jan-22	04-Oct-16	14:11:53
BCF	107.00 m	Salish Eagle	Tentative		05-Jan-22	28-Jan-22	17-Mar-17	14:26:24
VSL	255.73 m	Midnight Sun	Tentative		28-Jan-22	28-Feb-22	18-Jun-18	09:35:23
BCF	168.00 m	Spirit of Vancouver Island	Tentative		08-Feb-22	24-Feb-22	30-Nov-16	17:53:00
BCF	107.00 m	Salish Raven	Tentative		16-Feb-22	10-Mar-22	17-Mar-17	14:30:56
EDC	124.00 m	FRPD 309	Tentative		28-Feb-22	29-Apr-22	28-Jul-17	19:06:54
CCG	83.00 m	Sir Wilfrid Laurier	Tentative		22-Mar-22	19-Apr-22	07-Aug-15	13:30:27
VSL	288.61 m	Emerald Princess	Tentative		01-Apr-22	25-Apr-22	26-Sep-18	11:17:54
BCF	160.00 m	Coastal Inspiration	Confirmed	2 and 3	18-Apr-22	16-May-22	04-Oct-16	13:44:53
VSL	285.30 m	Westerdam	Tentative		21-Apr-22	10-May-22	28-Jun-18	14:18:39
VSL	181.00 m	Pacific Princess	Tentative		25-Apr-22	14-May-22	20-Jun-18	09:29:17
VSL	112.00 m	Exellence	Tentative		11-May-22	07-Jun-22	07-Apr-17	10:15:29
DND	135.00 m	HMCS Calgary	Confirmed	2 and 3	16-May-22	05-Sep-22	12-Jan-18	09:36:00
BCF	140.00 m	Queen of Coquitlam	Confirmed	2 and 3	05-Sep-22	29-Sep-22	03-Oct-16	14:30:00
BCF	52.21 m	Kuper	Tentative		11-Oct-22	08-Nov-22	28-Dec-16	16:24:51
CCG	69.00 m	John P Tully	Tentative		01-Nov-22	13-Dec-22	07-Aug-15	13:38:13
BCF	168.00 m	Spirit of British Columbia	Tentative		03-Jan-23	28-Jan-23	02-Dec-16	17:19:46
BCF	102.45 m	Island Sky	Tentative		17-Jan-23	17-Feb-23	16-Jan-18	15:07:34
BCF	160.00 m	Coastal Celebration	Tentative		17-Mar-23	25-Apr-23	03-Oct-16	16:38:52
VSL	288.63 m	Crown Princess	Tentative		20-Mar-23	04-Apr-23	20-Jun-18	09:37:43
VSL	289.51 m	Golden Princess	Tentative		24-Mar-23	14-Apr-23	20-Jun-18	09:40:15
VSL	114.60 m	Alaska Ocean	Tentative		29-Mar-23	28-Apr-23	30-Apr-18	10:00:59
BCF	150.75 m	Northern Expedition	Tentative		02-Apr-23	01-May-23	07-Dec-16	17:12:00
BCF	48.62 m	Quadra Queen II	Tentative		16-Apr-23	20-May-23	03-Nov-16	14:34:57
BCF	47.55 m	Klitsa	Tentative		16-Apr-23	16-May-23	23-Dec-16	15:17:16
BCF	50.00 m	Tachek	Tentative		20-Jun-23	15-Jul-23	14-Oct-16	08:34:02
VSL	294.06 m	Disney Magic	Tentative		06-Sep-23	14-Oct-23	18-Feb-18	10:59:12
BCF	117.00 m	Northern Adventure	Tentative		29-Sep-23	30-Oct-23	04-Oct-16	14:50:05
BCF	140.00 m	Queen of Cowichan	Tentative		06-Nov-23	01-Dec-23	14-Oct-16	08:09:34
VSL	289.51 m	Star Princess	Tentative		28-Nov-23	18-Dec-23	20-Jun-18	09:35:03
BCF	96.00 m	Queen of Cumberland	Tentative		08-Jan-24	16-Jan-24	08-Dec-16	11:45:58
BCF	140.00 m	Queen of Surrey	Tentative		29-Jan-24	16-Feb-24	14-Oct-16	08:24:24
BCF	168.00 m	Spirit of Vancouver Island	Tentative		01-Feb-24	25-Feb-24	30-Nov-16	17:53:00

VSL	288.61 m	Emerald Princess	Tentative		23-Mar-24	16-Apr-24	26-Sep-18	11:20:16
BCF	54.72 m	Kahloke	Tentative		07-Apr-24	07-May-24	23-Dec-16	15:27:21
VSL	297.00 m	Koningsdam	Tentative		08-Apr-24	01-May-24	26-Sep-18	12:01:18
VSL	285.30 m	Westerdam	Tentative		15-Apr-24	09-May-24	26-Sep-18	11:23:34
VSL	294.00 m	Disney Wonder	Tentative		06-Sep-24	14-Oct-24	18-Feb-18	10:53:35
BCF	75.00 m	Quinita	Tentative		14-Oct-24	05-Nov-24	23-Dec-16	15:28:47
BCF	160.00 m	Coastal Renaissance	Tentative		15-Oct-24	01-Nov-24	14-Oct-16	08:13:13
BCF	160.00 m	Coastal Inspiration	Tentative		20-May-25	09-Jun-25	04-Oct-16	14:00:41
BCF	71.63 m	Kwuna	Tentative		30-Sep-25	25-Oct-25	23-Dec-16	15:25:07
BCF	107.00 m	Salish Orca	Tentative		21-Oct-25	12-Nov-25	17-Mar-17	13:49:26
BCF	89.84 m	Quinsam	Tentative		23-Oct-25	14-Nov-25	22-Dec-16	11:30:26

North Landing Wharf								
VSL	118.00 m	Te Kaha	Confirmed		01-May-18	26-Nov-18	01-Aug-17	10:55:00
VSL	134.20 m	Winnipeg	Confirmed		13-Nov-18	31-Dec-18	21-Aug-18	12:17:36
VSL	190.00 m	JSS194	Tentative		20-Nov-18	21-Jun-19	19-Jan-15	09:29:55
VSL	290.00 m	Ruby Princess	Tentative		03-Dec-18	18-Dec-18	18-Jul-16	10:54:56
VSL	118.00 m	Te Kaha	Confirmed		21-Dec-18	01-Mar-19	01-Aug-17	10:55:00
VSL	134.20 m	Winnipeg	Tentative		01-Jan-19	07-Jan-19	02-Nov-18	12:00:00
EDC	79.00 m	Eclipse 110	Confirmed		01-Jan-19	07-Jan-19	02-Nov-18	08:59:37
EDC	33.00 m	Odyssey 102	Confirmed		01-Jan-19	07-Jan-19	02-Nov-18	09:00:58
VSL	70.40 m	Corner Brook	Tentative		07-Jan-19	24-Mar-19	12-Mar-18	10:50:06
VSL	70.40 m	Corner Brook	Confirmed		07-Jan-19	26-Oct-19	18-Jun-18	09:00:00
VSL	134.20 m	Winnipeg	Confirmed		08-Jan-19	31-Jan-19	06-Nov-18	16:07:11
EGD	42.50 m	EGD Caisson #1	Confirmed		31-Jan-19	28-Feb-19	05-Oct-17	08:53:00
VSL	250.00 m	Seaspan Barge	Tentative		14-Feb-19	09-Mar-19	22-Oct-18	10:11:00
VSL	118.00 m	Te Kaha	P.Confirmed		02-Mar-19	30-Apr-19	11-Nov-18	09:03:39
VSL	70.40 m	Corner Brook	Tentative		25-Mar-19	30-Apr-20	12-Mar-18	10:53:51
EGD	42.50 m	EGD Caisson #1	Confirmed		27-Mar-19	07-Apr-19	05-Oct-17	08:54:00
VSL	50.00 m	Emerald Princess Lifeboats	Confirmed		30-Mar-19	19-Apr-19	06-Jun-17	14:16:49
DND	135.00 m	HMCS Vancouver	Confirmed		01-Apr-19	16-Apr-19	23-Jan-18	14:19:39
VSL	118.00 m	Te Mana	Confirmed		01-May-19	31-Jan-20	24-Jan-18	09:20:39
VSL	63.40 m	OFSV3	Tentative		15-May-19	25-Aug-19	31-May-18	15:32:15
DND	135.00 m	HMCS Vancouver	Tentative		03-Aug-19	18-Oct-19	08-Feb-17	08:58:00
DND	135.00 m	HMCS Vancouver	Confirmed		26-Aug-19	12-Dec-19	23-Jan-18	14:20:00
EGD	42.50 m	EGD Caisson #2	Confirmed		02-Sep-19	14-Oct-19	23-May-18	11:18:08
VSL	60.00 m	Disney Wonder Lifeboats	Confirmed		03-Sep-19	29-Sep-19	06-Oct-17	11:41:00
VSL	255.73 m	Midnight Sun	Tentative		01-Oct-19	28-Feb-20	18-Jun-18	09:27:10
VSL	60.00 m	Noordam Lifeboats	Confirmed		02-Oct-19	13-Oct-19	04-Oct-17	15:53:00
VSL	70.40 m	Corner Brook	Confirmed		10-Nov-19	09-Dec-19	18-Jun-18	07:28:00
VSL	190.00 m	JSS195	Tentative		28-Nov-19	15-May-20	19-Jan-15	09:30:59
VSL	255.73 m	North Star	Confirmed		13-Dec-19	01-Feb-20	21-Feb-17	10:58:00
DND	135.00 m	HMCS Ottawa	Confirmed		16-Mar-20	05-Apr-20	23-Jan-18	14:21:00
VSL	50.00 m	Star Princess Lifeboats	Tentative		14-Apr-20	30-Apr-20	20-Jun-18	09:46:07
DND	135.00 m	HMCS Ottawa	Confirmed		12-Sep-20	11-Dec-20	23-Jan-18	14:21:00
VSL	255.73 m	North Star	Tentative		01-Nov-20	28-Feb-21	18-Jun-18	09:29:56
DND	135.00 m	HMCS Regina	Confirmed		29-Mar-21	27-Apr-21	10-May-17	11:22:00
VSL	149.30 m	POLAR	Tentative		07-Apr-21	12-Nov-21	19-Jan-15	09:32:15
VSL	297.00 m	Koningsdam	Tentative		25-Apr-21	01-May-21	22-Oct-18	09:54:06
DND	135.00 m	HMCS Regina	Confirmed		09-Sep-21	17-Dec-21	23-Jan-18	14:22:00
VSL	60.00 m	Disney Wonder Lifeboats	Tentative		12-Sep-21	10-Oct-21	18-Feb-18	10:50:53
VSL	50.00 m	Grand Princess Lifeboats	Tentative		03-Oct-21	17-Oct-21	20-Jun-18	09:50:56
VSL	255.73 m	Midnight Sun	Tentative		15-Dec-21	01-Feb-22	18-Jun-18	09:33:52
DND	135.00 m	HMCS Calgary	Confirmed		14-Mar-22	21-May-22	12-Jan-18	09:31:00
VSL	50.00 m	Pacific Princess Lifeboats	Tentative		28-Apr-22	12-May-22	20-Jun-18	09:53:58

DND	135.00 m	HMCS Calgary	Confirmed		31-Aug-22	16-Dec-22	12-Jan-18	15:13:00
VSL	50.00 m	Crown Princess Lifeboats	Tentative		23-Mar-23	02-Apr-23	20-Jun-18	09:58:33
VSL	50.00 m	Golden Princess Lifeboats	Tentative		29-Mar-23	12-Apr-23	20-Jun-18	10:00:45
VSL	60.00 m	disney magic life boats	Tentative		14-Sep-23	10-Oct-23	18-Feb-18	11:06:02
VSL	50.00 m	Star Princess Lifeboats	Tentative		01-Dec-23	15-Dec-23	20-Jun-18	09:55:59
VSL	60.00 m	Disney Wonder Lifeboats	Tentative		15-Sep-24	08-Oct-24	18-Feb-18	10:55:29
South Jetty								
VSL	70.40 m	Corner Brook	P.Confirmed		09-Dec-19	30-May-20	04-Jun-18	07:32:08

**ESQUIMALT GRAVING DOCK
REPLACE MAIN DISTRIBUTION LINE (RMDL)
BC HYDRO (BCH) POINT OF DELIVERY (POD) SWITCHGEAR
ESQUIMALT, BRITISH COLUMBIA**

**APPENDIX H
ENVIRONMENTAL
BEST MANAGEMENT PRACTICES**



Environmental Best Management Practices



Prepared by:
Public Services and Procurement Canada
Environmental Services

October 2016
Version: 05

INDEX

Overview

Risk Management Policy

EGD Site Map

EBMP #1: Pressure Washing (*High and Ultra High*)

EBMP #2: Abrasive Blasting

EBMP #3: Painting and Coating

EBMP #4: Dry Dock Floor Management and Clean Up

EBMP #5: Hazardous Materials Handling and Storage

EBMP #6: Waste Management and Recycling

EBMP #7: Fuelling and Oil Transfer

EBMP #8: Invasive Species

EBMP #9: Fish and Wildlife Management

EBMP #10: Water Use

EBMP #11: Energy Conservation

EBMP #12: Nuisance Pollution (*Noise/Odour/Light*)

EBMP #13: Sanitary Waste Management and Sewer Use

EBMP #14: Spill Preparedness and Response

EBMP #15: In-Water Hull Cleaning and Maintenance

EBMP #16: Housekeeping

EBMP #17: Stormwater Management

EBMP #18: Property and Infrastructure Maintenance, Modifications and Construction

OVERVIEW

The **Esquimalt Graving Dock (EGD)** is a federal government owned and operated, multi-user ship repair and maintenance facility located in Esquimalt, British Columbia. The facility has been in operation since 1925, and provides service to local, Federal, and international vessels. The vessel repair and maintenance work at the EGD is carried out by privately owned shipyard repair contractors that rent the required sections of the drydock, lease upland work space from the government, and pay a fee for services such as cranes, compressed air, water, sewer and power.

The EGD is committed to managing the actual and potential health and safety, environmental, security, financial and public relations risks, while ensuring quality operations and services. In order to identify and manage these risks, the EGD has implemented an **Environmental Management System (EMS)** and a Risk Management Framework (*in conformance with the internationally recognized standards ISO 14001 and ISO 31000*). The EMS provides the framework for identifying environmental impacts, and ensures adequate controls are in place to effectively manage them.

This manual contains a series of **Environmental Best Management Practices (EBMPs)** developed to reduce impact to the environment related to common activities and operations at the Esquimalt Graving Dock. The manual contains guidance and recommendations for those operating at the EGD, and is intended to complement existing environmental legislation. It does not remove the responsibility of all contractors and companies operating at the EGD to abide by all applicable regulatory requirements and industry standards. All users of the facility are expected to follow the EBMPs.



For additional information contact the EGD Environmental Services Department.



Esquimalt Graving Dock Risk Management Policy

It is the goal of the Esquimalt Graving Dock, in partnership with the ship repair industry, to be the premier ship repair, construction and maintenance facility on the west coast of North America.

The Esquimalt Graving Dock acknowledges that risk management is an integral part of attaining this goal. We recognize that risk is the effect of uncertainty on our operations and is inherent within the ship repair industry. Our objective is to identify, monitor and manage risk in order to prevent the harm of our employees, site users, contractors, neighbours, other stakeholders, the environment and our facility, while ensuring and maintaining quality operations and services.

We are committed to managing the actual and potential **health & safety, environmental, security, financial and public relation risks** pertaining to strategies, policies and practices at the Esquimalt Graving Dock.

To meet our commitment we will:

- > Implement systems and processes to consistently identify, measure, mitigate, minimize and report on risks, while continuing to uphold and adapt the established Environmental Management System and other relevant Management Frameworks.*
- > Meet or exceed applicable federal, provincial and municipal legislation and regulations, departmental policies, industry standards, practices and other requirements.*
- > Communicate openly with our employees to ensure they are aware of and understand our Risk Management Framework, the nature of our operations and their roles and responsibilities in managing risk.*
- > Monitor and review our Risk Management Framework to ensure we are meeting our goals. Ongoing oversight of the effectiveness of our Risk Management Framework is the responsibility of the Esquimalt Graving Dock Risk Management Team.*
- > Provide the necessary resources to effectively implement our Risk Management Framework, while continuing to improve our programs, procedures and operations.*



Public Works and
Government Services
Canada

Travaux publics et
Services gouvernementaux
Canada

Jim Milne
Director
Esquimalt Graving Dock
Engineering Assets
Strategy Sector

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Strategy Sector

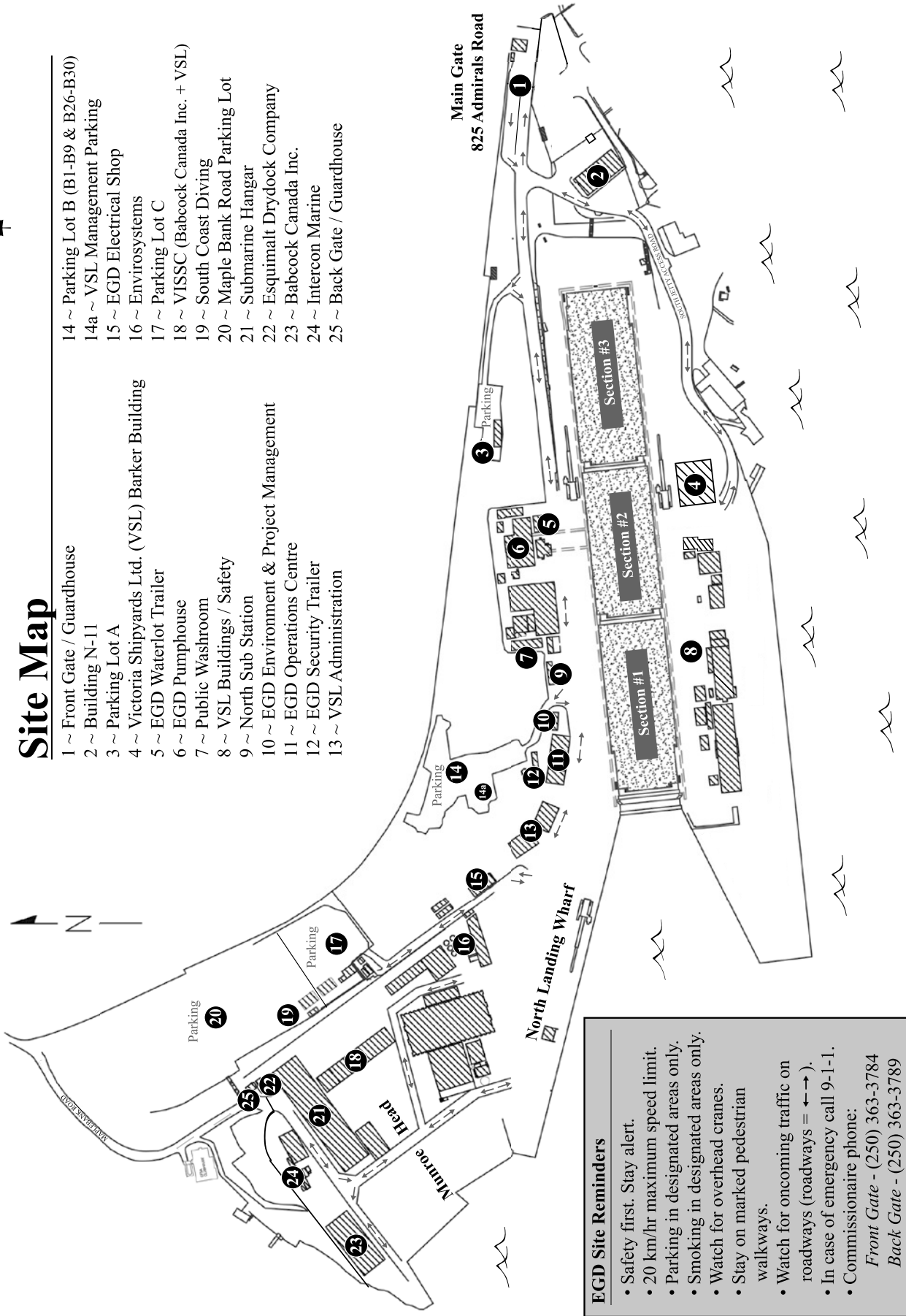
Canada

August 2015



Site Map

- 1 ~ Front Gate / Guardhouse
- 2 ~ Building N-11
- 3 ~ Parking Lot A
- 4 ~ Victoria Shipyards Ltd. (VSL) Barker Building
- 5 ~ EGD Waterlot Trailer
- 6 ~ EGD Pumphouse
- 7 ~ Public Washroom
- 8 ~ VSL Buildings / Safety
- 9 ~ North Sub Station
- 10 ~ EGD Environment & Project Management
- 11 ~ EGD Operations Centre
- 12 ~ EGD Security Trailer
- 13 ~ VSL Administration
- 14 ~ Parking Lot B (B1-B9 & B26-B30)
- 14a ~ VSL Management Parking
- 15 ~ EGD Electrical Shop
- 16 ~ EnviroSystems
- 17 ~ Parking Lot C
- 18 ~ VISSC (Babcock Canada Inc. + VSL)
- 19 ~ South Coast Diving
- 20 ~ Maple Bank Road Parking Lot
- 21 ~ Submarine Hangar
- 22 ~ Esquimalt Drydock Company
- 23 ~ Babcock Canada Inc.
- 24 ~ Intercon Marine
- 25 ~ Back Gate / Guardhouse



EGD Site Reminders

- Safety first. Stay alert.
- 20 km/hr maximum speed limit.
- Parking in designated areas only.
- Smoking in designated areas only.
- Watch for overhead cranes.
- Stay on marked pedestrian walkways.
- Watch for oncoming traffic on roadways (roadways = ↔).
- In case of emergency call 9-1-1.
- Commissionaire phone:
Front Gate - (250) 363-3784
Back Gate - (250) 363-3789



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 3
Approved by:	Stafford Bingham
EBMP #1: Pressure Washing	

EBMP #1: Pressure Washing (High and Ultra High)

One of the first activities to occur on a drydocked vessel is pressure washing of the hull to remove salts, marine growth and residual paint, prior to surface preparation or painting. This typically involves pressure washing the underwater hull and/or super structure with water at 2,000 – 3,500 psi. This activity produces large volumes of paint contaminated wastewater (e.g. washwater). Ship repair contractors may also use an Ultra High Pressure (UHP) washing process (from 40,000 – 55,000 psi) to completely remove all paints, often eliminating the need for further surface preparation (e.g. sandblasting) prior to painting. UHP generates even larger volumes of wastewater and slurry solids. All wastewater created from pressure washing and UHP requires management (i.e. assessment, collection, handling, treatment and disposal).

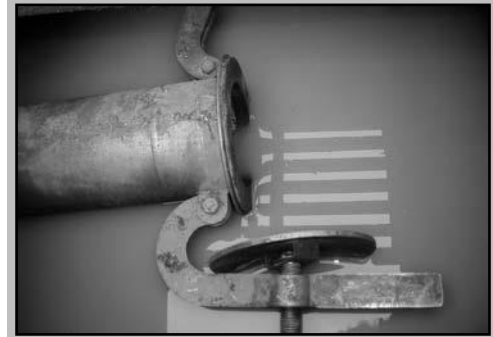
Management of Wastewater on the Graving Dock Floor

- Ensure all wastes and wastewater discharges, resulting from hull and anchor chain washing, as well as dock bottom clean-up activities, are collected and disposed of properly.
- Close all sump well valves in the drydock floor collection system prior to and during pressure washing operations.
- Manage pumps to ensure they are handling the volume of washwater sufficiently.
- Manage washwater storage containers to ensure they are not overfilled.
- Divert contaminated wastewater, that falls outside of the drydock floor collection system, away from the tunnel drains.
- Direct non-contaminated water (e.g. ballast water, cooling water, dock wall/moon pool leakage water) away from contaminants on the drydock floor.
- Collect and dispose of stormwater that comes into contact with contaminants.
- Do not use detergents or additives in washwater.

Opening Sump Well Valves

Sump well valves in the drydock floor can be opened to manage rainwater under the following conditions ONLY:

- Dock floor has been pre-cleaned, prior to the completion of the work period.
- A filter cloth has been installed to reduce the migration of debris.



All wastewater containing paint contaminants must be directed to the collection trench drains and sump wells on the drydock floor, collected, and sent for proper treatment.



Antifoulant contaminated washwater entering the collection system (trench drains and sump wells) on the drydock floor.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 3
Approved by:	Stafford Bingham
EBMP #1: Pressure Washing	



The sill diversion pump removes clean seawater from the pool at the front of Section 1 (moon pool) and discharges into the tunnel drains through a hard pipe on the graving dock wall.



Sediment from the harbour often settles on dock bottom after dewatering. If this becomes contaminated with paint, etc., it must be disposed of.



The hull of a cruise ship being ultra high pressure washed.

Section 1 Considerations:

Caisson and Dock Wall Leakage & Drydock Floor Sediment **Managing Caisson and Dock Wall Leakage:**

- Divert caisson leakage water away from pressure washing areas.
- Water leakage from the caisson can be diverted by using a sump pump connected to the PVC diversion pipe installed on the north wall of the drydock Section 1.
- Divert water leakage from the graving dock walls, during high tide, directly into the drainage tunnel.

Managing Entrained Sediment:

Harbour sediment may accumulate in the corners, trenches, keel blocks and sumps of the drydock Section 1 during normal docking procedure. Users of the section will need to consider management of this sediment and are responsible for removal and proper disposal if it becomes contaminated from their operations and activities on dock floor (e.g. *pressure washing wastewater, sandblast grit, paint chips, paint overspray, and other contaminants*).

Ultra High Pressure (UHP) Washing

Ultra high-pressure washing generates significant volumes of wastewater and sludge that may pose a challenge for collection and disposal.

- Prepare in advance for the management of UHP waste.
- Remove all water, sludge and debris, generated from UHP washing, from the drydock.
- Ensure the washwater and sludge is disposed of at an appropriately permitted facility.
- Disposal certificates may be requested, by EGD Management, to ensure washwater is being properly managed.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 3 of 3
Approved by:	Stafford Bingham
EBMP #1: Pressure Washing	

Management of Pressure Wastewater in Upland Areas/Dockside

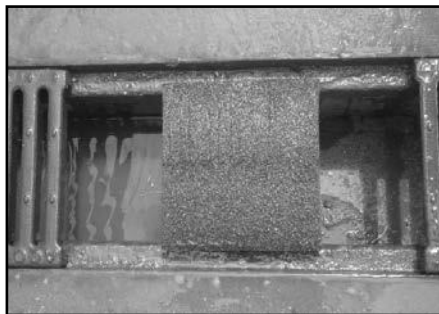
- Perform pressure washing of small vessels and parts, in designated areas only, where wastewater management can be effectively achieved.
- Approval for pressure washing in upland areas (*including the use of a stormwater trench for water collection*) is required from EGD Management
- Wash vessel parts in a suitable contained area (*e.g. enclosed skip*).
- Completely block all drains in the area where pressure washing will occur (*e.g. cover nearby trench drains with filter cloth, place a foam bung in the trench drain to prevent migration of wash water should an incident occur*).
- Ensure sufficient equipment (*e.g. pumps, totes, tanks, foam blocks and sandbags*) is available for the timely collection, control and removal of washwater.
- Contaminated washwater requires proper treatment for disposal. Label containers.



A small vessel is power washed on the North Landing Wharf (NLW).



The trench drain is blocked and a sump pump is installed to collect wash water into a tote.



Example of high density styrofoam blocks used as a drain blocker on the NLW.



Large tank dockside with an attendant.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 3
Approved by:	Stafford Bingham
EBMP #2: Abrasive Blasting	

EBMP #2: Abrasive Blasting

Abrasive blasting is a common operation performed at the Esquimalt Graving Dock (EGD) to prepare vessel surfaces for painting. However, this operation creates challenges with respect to controlling air emissions and the waste materials generated.

The dust emissions generated from abrasive blasting operations can contain harmful environmental pollutants and have the potential to negatively effect employees, facility users, neighbours, equipment and infrastructure if it is not properly managed. Fugitive dust may also impact the local marine environment by entering the Esquimalt Harbour directly, or via stormwater runoff, and through direct deposit to uplands soil.

Waste grit may be highly contaminated with antifouling paint and other metals, which also poses a risk to the environment if not handled and disposed of properly.

Dust Control

- Establish dust suppression controls in advance of starting any work.
- Do not abrasive blast during conditions that render containment ineffective (*e.g. during windy conditions*).
- No abrasive blasting of vessels shall be performed while vessels are docked alongside the North Landing Wharf or South Jetty.
- Minimize dust emissions by ensuring blast nozzles are angled perpendicular to the vessel and aimed slightly downward during blasting.
- Properly manage (*contained, covered and secure*) all sandblast product and wastes during transport.

Hoarding (Physical Containment)

- Use containment such as tarps, shrouds or portable structures to prevent airborne particles from entering the atmosphere and surface waters.
- Containment should be large enough to adequately enclose or segregate the working area and reach the dock floor or walls.
- Ensure containment is properly installed (*connected and overlapped*) so there are no gaps.
- Used tarps with tears and holes should be replaced, repaired or doubled with additional layers.



ADEQUATE containment.



INADEQUATE containment.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 3
Approved by:	Stafford Bingham
EBMP #2: Abrasive Blasting	

Water Use (*Fugitive Dust Suppression*)

- Where physical containment techniques are not sufficient to prevent fugitive dust emissions, water may be used to mitigate dust.
- Users may requisition use of Dust Suppression Units (e.g. *Dust Boss*) from the EGD. The units are highly effective at mitigating dust.
- Monitor areas where dust escapes physical containment and adjust dust suppression unit water spray accordingly.
- Do not allow water from the dust suppression units to enter other sections of the dock, especially in the case where another user occupies it.
- Do not allow water from the dust suppression units to come in contact with contaminants on the drydock floor or other work areas. Adjust water spray and relocate contaminants to mitigate impacts.
- Fire nozzle “water curtains” may only be used to control dust emissions when approved by EGD Management in advance. The dust suppression units generates a more effective water mist and uses significantly less fresh water during operation.

Waste Grit Management

- Cover trench drains and tunnel grates in work areas with filter cloth. Replace the cloth as required.
- Manage waste grit by sweeping it into central areas, away from trenches, tunnel grates and dock floor traffic.
- Remove waste grit from work areas as soon as possible.
- Store all waste grit in appropriate containers to prevent leakage.
- Cover all skips, storage bins, tanks, and hoppers to prevent dust emissions and spills.
- Characterize and dispose of waste grit in accordance with applicable provincial regulations.



Dust suppression unit in operation.

Store all waste grit away from drains, to prevent contaminants migrating into the marine environment.



INADEQUATE waste grit storage.



ADEQUATE waste grit storage.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 3 of 3
Approved by:	Stafford Bingham
EBMP #2: Abrasive Blasting	



Clean up waste grit to prevent it from being washed into the drainage system by clean water (e.g. cooling water discharge, stormwater, dust suppression unit spray).



Store waste grit in appropriate containers.



Remove waste grit from work areas as soon as possible to prevent migration of contaminants throughout the drydock floor.

Keel / Bilge Blocks

Keel and bilge blocks on dock bottom present a challenge for the clean up of spent waste grit.

Waste grit must be removed from areas around excess blocks stored in the dock bottom. To prevent grit from collecting between the blocks, they can be relocated or covered prior to sandblasting.

Power washing at the base of the blocks can be effective in removing contaminants.





Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 3
Approved by:	Stafford Bingham
EBMP #3: Painting and Coating	

EBMP #3: Painting and Coating

Ship repair and maintenance often requires the painting and coating of vessel surfaces to protect them from corrosion or to inhibit the growth of marine life. The industrial nature of marine paints and solvents, in particular antifouling paints, may result in negative impacts to the environment and surrounding infrastructure, if not properly managed.

Spray Painting

Paint overspray has the potential to impact the marine environment, soils, neighbouring residences, and nearby equipment and infrastructure.

- Use containment such as tarps, shrouds or portable structures to prevent airborne particles from entering the atmosphere and surface waters.
 - Containment should be large enough to adequately enclose or segregate the working area.
 - Ensure containment is secured so there are no gaps.
 - Ensure that containment reaches the dock floor or walls.
 - Do not use keel blocks, dock floor or dock walls to test paint sprayers.
- Do not spray paint during conditions that render containment ineffective (e.g. windy).
- Place containment beneath and around structures being painted on dock floor and in work areas to ensure overspray does not reach the surrounding area (e.g. during painting of anchor chains, or grates).
- Manage overspray on the drydock floor to prevent safety hazards (e.g. slippage).
- When spray painting materials inside the stabilizer pockets, ensure the area is sealed and that the walls and floors are covered.
- For vessels docked in Section 1, ensure that overspray does not reach the caisson sill/moon pool water. Avoid docking vessels so they extend over sill area.

Spray Painting



ADEQUATE containment.



INADEQUATE containment.



INADEQUATE containment.

Ensure tarps are in place to prevent overspray impacting the surrounding work area.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 3
Approved by:	Stafford Bingham
EBMP #3: Painting and Coating	



ADEQUATE containment on stabilizer pocket doors.



Paint overspray due to INADEQUATE containment stabilizer pocket doors.

Manual Painting

Painting by hand (*roller, brush*) can be conducted without shrouding the work area; however, the potential remains for product to migrate into the environment. Work spaces and product handling must be managed with care, similar to dockside painting.

- Containment should be large enough to adequately cover the work area and provide a barrier between the work and the environment (*e.g. dock floor, ocean and soil*).
- Ensure containment is secured so there are no gaps.
- Product container lids are to be secured.

Painting Dockside

- Do not spray paint vessels docked alongside the wharves or jetties (*e.g. North Landing Wharf*).
- Use rollers and brushes to paint vessels dockside.
- Ensure tarps are in place below work areas, as well as in between the vessel and the dock, to prevent spills and drips from entering the water.
- Ensure paint cans are stored securely when working alongside vessel edges.
- Ensure floor grates of manlifts are covered to prevent spills from going into the marine environment.
- Waste generated from painting and other activities such as grinding, hand tooling and welding, must be prevented from entering the marine environment.



ADEQUATE containment.



While painting vessels docked alongside the wharves or jetties, do not spray paint. Take sufficient measures to prevent paint from entering the marine environment.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 3 of 3
Approved by:	Stafford Bingham
EBMP #3: Painting and Coating	



Empty paint cans must be properly stored on dock bottom and dock side.



Temporary Paint Storage/Mixing Areas

- Must be under cover to protect from inclement weather.
- Only in designated areas.
- Must be on secondary containment (*a tarp at minimum*).
- Ensure empty paint cans and other associated wastes from painting are stored properly, protected from the weather, and removed from dock bottom as soon as possible.
- Ensure empty paint containers being dried for disposal are protected from rain.
- Do not dispose of used paint containers that still contain wet paint.

IMPORTANT!

In rare situations (*e.g. shape of the vessel, combined with ideal weather conditions*) containment may not be necessary to prevent overspray from escaping the area.

In this situation, the User must notify EGD Management prior to beginning the work, and obtain approval (*in writing*) to paint without completely enclosing the vessel.

Restrictions and monitoring requirements will be applied.

To this date this has only been allowed in three situations:

- Painting underneath a flat bottom barge.
- Painting the underwater hull portion of the midsection of a cruise ship.
- Painting of a C-class ferry underwater hull area, during calm wind conditions.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 4
Approved by:	Stafford Bingham
EBMP #4: Dry Dock Floor	

EBMP #4: Dry Dock Floor Management and Clean Up

Drain Management

- All sump well valves must be closed prior to and during power washing operations.
- Cover all tunnel drains and net cages during sandblasting, painting and power washing to prevent contaminants from entering the marine environment.
- In the case of a spill or release on dock bottom all sump well valves must be closed and all contaminated material contained and removed from dock bottom.
- Direct all contaminated water to the trench drain system, to avoid entering the tunnel drains.
- Collect and properly dispose of all contaminated water. Ensure sufficient equipment is available for contaminated water collection.
- Ensure all non-contaminated water is directed away from work areas and into the tunnel drain system (e.g. ballast water, cooling water, caisson sill water).

Hazardous Materials Management

- Store hazardous materials (e.g. fuel, paint, waste oils) away from the drains on dock bottom.
- Store hazardous materials to the inside of the trench drains so that any spills or releases can be captured.
- Store hazardous materials in areas protected from the weather, water curtains and other water sources.
- Ensure adequate spill response equipment is in close proximity to hazardous material transfer operations. At a minimum one spill kit is required per section of the graving dock.



Collect and properly dispose of all contaminated water.

Sediment Management

- Segregate any marine sediment, that may enter the dock during vessel transfer, from the waste generated during vessel repair. This is to reduce the amount of wastes requiring disposal.
- Collect and properly dispose of marine sediment that becomes contaminated with waste generated from vessel repair.
- Remove all contaminants and residues from the trench drains and sump wells prior to flooding at the end of work period.





Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 4
Approved by:	Stafford Bingham
EBMP #4: Dry Dock Floor	

Housekeeping

- Remove waste sandblast grit from the work area as soon as possible to prevent migration of grit contaminants into tunnel drain system.
- Store wastes collected from the dock floor in appropriate secondary containment and remove from dock bottom as soon as possible.



Residual paint in the cans may drip out of the skip and enter the marine environment through the drain systems.



Leaving garbage around the work site attracts wildlife such as seagulls, racoons and rats.



When cleaning dock bottom, skips of waste sandblast grit may leak contaminated water and should be removed as soon as possible.



All hazardous materials must be stored in appropriate containment and away from tunnel drain system.

Inspection and Cleanliness

- Prior to flooding, the drydock must be cleaned to meet the Esquimalt Graving Dock (EGD) Standard of Cleanliness (see below), as determined by the EGD undocking supervisor.
- Users must ensure that the dock floor is free of deleterious substances prior to flooding.
- Water may be used to clean the dock floor; however, any wastewater generated must be collected and disposed of properly.
- If a vessel occupies a shared portion of a dock section each User must clean the trench drains up to and including the section sump well.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 3 of 4
Approved by:	Stafford Bingham
EBMP #4: Dry Dock Floor	



ADEQUATE:
Example of a dock floor that would pass inspection.



INADEQUATE:
Example of a dock floor that would not pass inspection.

EGD Standards of Cleanliness

Due to the importance of drydock cleanliness prior to flooding, and since quantitative testing is impractical due to time and cost restrictions, the following guidelines will be used to assess cleanliness of drydock surfaces.

- All drydock surfaces, including stairwells and sills must meet the standard for “**residue free**” prior to flooding of the drydock. “**Residue free**” is considered met when a person of normal visual acuity, while standing, is unable to detect visible accumulations of potential pollutants.
- This includes, but is not restricted to:
 - the removal of abrasive grit,
 - paint residues or paint chips,
 - cutting and grinding wastes,
 - oil and grease,
 - food and drink containers,
 - ear plugs,
 - dust masks,
 - rope,
 - cigarette butts, or
 - any other refuse that may have been deposited during the work period.
- Debris of natural origin that may have been deposited during the previous flooding of the drydock, such as wood, sand, silt, seaweed, or marine life may be exempt from these requirements, as long as it will not contaminate the environment upon reintroduction.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 4 of 4
Approved by:	Stafford Bingham
EBMP #4: Dry Dock Floor	

AREAS IN NEED OF SPECIAL ATTENTION

ACCEPTABLE



RAMPS



SILLS



KEEL BLOCKS



TRENCH DRAINS



SUMP WELLS

NOT ACCEPTABLE





Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 3
Approved by:	Stafford Bingham
EBMP #5: Hazardous Materials	

EBMP #5: Hazardous Materials Handling and Storage

A variety of hazardous materials are used, stored and transported by Users at the Esquimalt Graving Dock (EGD). If not handled appropriately, these materials have the potential to negatively impact worker health and safety, infrastructure and the environment. Hazardous materials commonly used at the EGD include: antifoulant paint, fuels and oils, antifreeze.

Storage

Users must have designated storage areas suitable for the materials they use on site. Where applicable, these areas must:

- Have appropriate secondary containment suitable to the quantity and nature of the material in that area.
- Ensure materials are stored in accordance with compatibility requirements.
- Be protected from the weather (*covered, lids secured, valves closed*).
- Have placards and proper ventilation.
- Have controlled access.
- Be located away from pathways to the marine environment.
- Be located on impervious surfaces (*e.g. concrete*).

Handling

All hazardous materials must be:

- Labelled appropriately with the owner name, product name, first aid information, and PPE requirements.
- Secured appropriately during transport.
- Transported by equipment that can sufficiently handle its weight and size.
- Transported in containers that are stable and not in need of repair (*e.g. totes with broken feet, excessive rust, faulty valves*).



ADEQUATE storage.



ADEQUATE storage.



INADEQUATE storage.



Any container holding hazardous materials must be clearly and properly labelled.



Environmental Best Management Practices

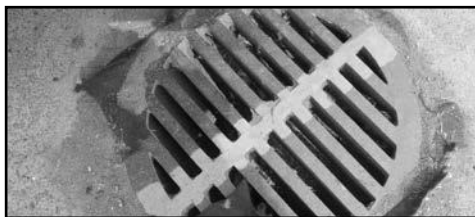
Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 3
Approved by:	Stafford Bingham
EBMP #5: Hazardous Materials	

Areas to Avoid Storing Hazardous Materials



Trench Storm Drains

Any containers placed directly over top or beside a trench drain have the potential to spill to the drain leading directly to the ocean.



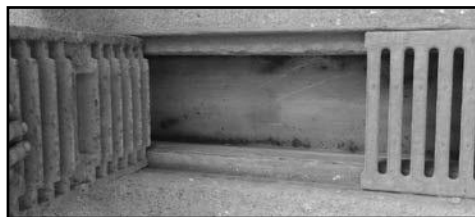
Storm Drains

Any containers placed directly over top or beside a storm drain have the potential to spill to the drain leading directly to the ocean.



Alongside Wharves and Jetties

Any containers placed alongside the edge of the wharves and jetties at the EGD have the potential to spill directly to the ocean, as there are no berms or secondary containment available.



Dock Floor Trench Drains

If a tote or drum is placed directly over or beside a trench drain, hazardous materials have the potential to flow down the drain and into the marine environment. Although the drains are designed for rapid containment and recovery, there is no guarantee that workers will be present to close drain valves during an incident.



Dock Floor Sump Wells

When the sump well valve is open the sump drains directly into the marine environment. Any containers placed on top of or adjacent to the sump well have the potential to enter the ocean if a spill were to occur.



Dock Floor Tunnel Grate Drains

Tunnel grate drains lead directly to the marine environment. Any containers placed directly over top of or beside a tunnel grate have the potential to impact the marine environment, should a spill occur.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 3 of 3
Approved by:	Stafford Bingham
EBMP #5: Hazardous Materials	

Safety Data Sheet (formerly Material Data Safety Sheet)

A Safety Data Sheet (SDS) is a document that contains information on the potential hazards (*health, fire, reactivity and environmental*) and how to work safely with the product. SDSs also contains information on the use, storage, handling and emergency procedures all related to the hazards of the material. SDSs must be available (*electronically or hardcopy*) for all products stored on site and be readily available to all employees.



Storage Tanks and Totes

Storage tanks and totes are used for a variety of materials at the EGD, including: washwater, fuel products, bilge water, waste oil/fuel and other waste liquids. Storage tanks and totes may be considered portable/mobile, temporary or permanent. The regulatory requirements for proper use of these tanks vary and is dependent on a variety of factors.

Federal Regulation for Fuel Storage Tanks

The EGD is a Federal facility; therefore, storage tanks onsite need to comply with the Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations. Users may be required to register their tanks with Environment Canada. **Contact EGD Environmental Services for information.**



National Fire Code
The National Fire Code outlines the requirements for containment, labelling and location of flammable liquid storage.

There are four different fuel tanks at the Esquimalt Graving Dock.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 3
Approved by:	Stafford Bingham
EBMP #6: Waste Management	

EBMP #6: Waste Management and Recycling

Operations at the Esquimalt Graving Dock (EGD) generate a variety of waste streams including hazardous waste, controlled waste, biological waste, international waste, and general refuse and recyclables.

Hazardous Waste

Hazardous wastes generated at the EGD may include waste oil and oil filters, antifreeze, batteries, paint and solvents, oily rags and absorbent materials, spent grit, solids generated during power washing, mercury, PCB containing equipment and asbestos. Appropriate management of hazardous waste will reduce environmental liability associated with inappropriate disposal and storage as well as reduce the risk of human injury and environmental impact.

Hazardous waste storage should be segregated from new product storage.

- Ensure designated storage areas are away from active work areas.
- Ensure areas are covered to reduce exposure to environment and wildlife.
- Ensure that waste accumulation areas are organized.

Hazardous waste should be segregated into separate containers.

- Ensure containers used are appropriate for the type of waste (e.g. separate drums for waste oil, oil filters, antifreeze, batteries, paint and solvents, oily rags and absorbent material, spent grit).
- Store batteries in a manner that prevents leakage of acid to the environment.
- Properly dispose of contaminated clean-up materials (e.g. absorbents, rags, etc.).
- Do not dilute or mix hazardous waste, other hazardous or non-hazardous wastes.
- Cover waste containers to prevent exposure to weather (e.g. rain).

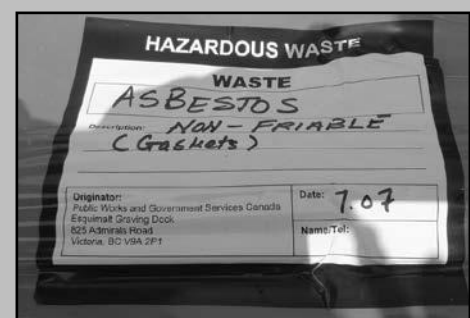


All hazardous waste must be carefully stored and disposed of.

Asbestos

All asbestos containers and asbestos-containing materials must be identified by signage and labelling in accordance with applicable legislation.

Companies that engage in asbestos related work at the EGD must be qualified to do so.





Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 3
Approved by:	Stafford Bingham
EBMP #6: Waste Management	

Clearly label all hazardous waste containers.

- Labels should include: type of waste, generator/company name, and contact information.

Controlled Waste

Controlled waste such as animal feces, sewage, contaminated grit, stormwater catch basin waste, creosote wood and dead animals can be disposed of at the **Capital Regional District (CRD) Hartland Landfill**.

Controlled waste disposal at requires a permit.

For more information about Controlled Waste disposal contact the CRD Hotline at (250) 360-3030.



Large scale food waste bin.

Food Waste

During normal activity at the EGD, food waste is collected in conveniently located and accessible receptacles onsite and disposed of at the landfill. During larger projects, however, alternative measures are taken to account for the increase in generated wastes.



An example of a Waste Management Area at the EGD.

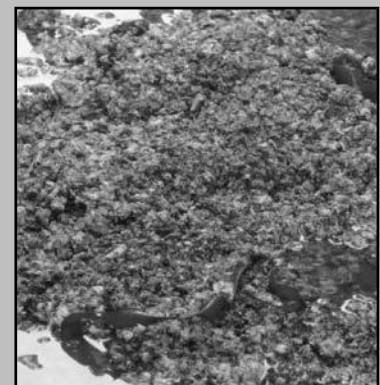
General Refuse

General refuse should be separated into categories to enable easy disposal. Users are responsible for properly disposing of refuse and recyclable materials. There are many containers throughout the site for disposal of common refuse materials (e.g. steel, wood, glass, cardboard etc.).

Biological Waste

Marine life removed from vessel hulls and sea chests may contain paint contaminants. This waste may be considered a controlled or hazardous waste and would need to be handled and disposed of accordingly.

Biological waste should be stored out of the sun, covered and removed from the facility quickly to prevent any odours from emanating.





Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 3 of 3
Approved by:	Stafford Bingham
EBMP #6: Waste Management	

Recycling

All Users of the EGD are responsible for collecting and disposing of the solid waste they generate from their activities, properties and vessels they are responsible for.

- Recycle solid waste such as plastic, glass, aluminum, mixed paper and cardboard. Recycling areas should be conveniently located and easily identifiable.
- Segregate other solid waste, such as scrap metal, wood, electronics, polystyrene foam and soft plastics for recycling at an approved facility.
- Leaf and yard waste collected on property should be composted or disposed of appropriately.
- Construction and demolition waste should be reused or recycled wherever cost effective and technically feasible.
- Encourage the use of recyclable products to reduce the solid waste impact on the environment.

International Waste

Like hazardous waste, International Wastes may pose a threat to human health and the environment.

Dunnage from vessels has been known to carry invasive species to local areas. Foreign dunnage must be identified, stored, and disposed of at an approved facility without delay.

Food wastes may carry pathogenic organisms that could cause illness to those handling it. Food wastes shall be kept in separate, closed containers. The **Canadian Food Inspection Agency (CFIA)** will inspect foreign vessels and issue directions on disposal.



 Environmental Best Management Practices	Revision Number:	05
	Revision Date:	October 2016
	Page:	Page 1 of 3
	Approved by:	Stafford Bingham
	EBMP #7: Fuelling & Oil Transfer	

**EBMP #7:
Fuelling and Oil Transfer**

The transfer of fuel and oil is a common activity at the Esquimalt Graving Dock (EGD). Transfer may be from ship to shore (e.g. removal of waste fuel/oil), from shore to ship (e.g. refuelling a vessel from a truck) or land based.

An accidental release during these operations has the potential to negatively impact the environment and health and safety of those at the facility.

- Prior to any fuelling or oil transfer operations:
 - o the **EGD Oil Transfer Checklist** must be complete;
 - o an emergency plan must be in place and readily available;
 - o adequate spill response equipment must be available; and
 - o personnel must be aware of spill response procedures.
- All transfer and storage equipment must be in good condition, tested, and properly connected.
- Do not place storage and transfer equipment near pathways to the marine environment (e.g. storm drains, trench drains, edge of the dock) without effective mitigation measures in place.

Vessel Fuelling and Bulk Oil Transfer
Definition of Oil: as described in the Canada Shipping Act **oil** is considered petroleum in any form, including: crude oil, fuel oil, sludge, oil refuse, gasoline, lube oil and refined products.

Berthed Vessels

- ALL berthed vessels receiving fuel from a truck or a barge require a containment boom.
- Transfers of fuel and oil to and from ALL berthed vessels require a containment boom.
- An **EGD Oil Transfer Checklist** must be filled out and signed by representatives from the truck and the vessel and submitted to EGD representatives in the Pumphouse prior to fuelling or oil transfer operations.
- Transfer operations must comply with the *Canada Shipping Act, Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals Subdivision 5*.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 3
Approved by:	Stafford Bingham
EBMP #7: Fuelling & Oil Transfer	

Vessels in Drydock

- ALL fuel and oil transfers occurring in the drydock require spill kits to be placed nearby and are not to be completed next to drainage pathways to the marine environment (e.g. trench drains, sump wells, tunnel grate drains).

On Land Transfers

- ALL fuel and oil transfers occurring on land require spill kits to be placed nearby and are not to be completed next to drainage pathways to the marine environment (e.g. storm drains, edge of dock).

Containment Boom Requisition

The Esquimalt Graving Dock has containment boom and deployment equipment available for requisition. To arrange for booking or rental, contact the EGD Operations Manager.



An orange inshore containment boom fully surrounds the vessel while being fuelled.



The hydraulic powered deployment reel with inshore containment boom available for requisition.

EXAMPLE SCENARIO REQUIREMENTS

Scenario 1: FUELLING A BERTHED VESSEL



- Completed and signed **EGD Oil Transfer Checklist** submitted to EGD Pumphouse.
- Containment boom deployed and effectively secured at both ends.
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 3 of 3
Approved by:	Stafford Bingham
EBMP #7: Fuelling & Oil Transfer	

EXAMPLE SCENARIO REQUIREMENTS (*Continued*)

Scenario 2: BULK OIL TRANSFER FROM A BERTHED VESSEL



- Completed and signed **EGD Oil Transfer Checklist** submitted to EGD Pumphouse.
- Containment boom deployed and adequately secured at both ends.
- Receiving containers located away from pathways to the harbour (*e.g. storm drains, edge of dock*).
- Receiving containers in secondary containment and in good condition.
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.

Scenario 3: FUELLING A VESSEL OR BULK OIL TRANSFER IN THE DRYDOCK



- Pumphouse operation on site prepared to shut down auxiliary pumps in case of an emergency.
- Receiving containers located away from pathways to the harbour (*e.g. trench drains, sump wells, tunnel grate drains*).
- Receiving containers in secondary containment and in good condition.
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.

Scenario 4: ONSHORE OIL TRANSFER BETWEEN CONTAINERS



- All containers located away from pathways to the harbour (*e.g. storm drains, edge of dock*).
- Receiving containers in secondary containment and in good condition.
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 1
Approved by:	Stafford Bingham
EBMP #8: Invasive Species	

EBMP #8: Invasive Species

Invasive species are a significant threat to the marine ecosystems of British Columbia. The Esquimalt Harbour is known to have a disproportionately high number of non-indigenous species. It has been widely recognized that the primary source of non indigenous marine species in local waters are the ballast tanks and hull surfaces of transoceanic vessels. Ship repair contractors are encouraged to report unusual species observed during hull cleaning activities.

Ballast Water

- Vessels must follow *Transport Canada Ballast Water Control and Management Regulations*

Ballast Tank Sediment

- Shipyards must follow *Transport Canada Ballast Water Control and Management Regulations*
- Sediments removed from the ballast tanks at the EGD must be contained, collected and disposed of at an authorized facility.
- Sediments must not be allowed to enter the harbour.

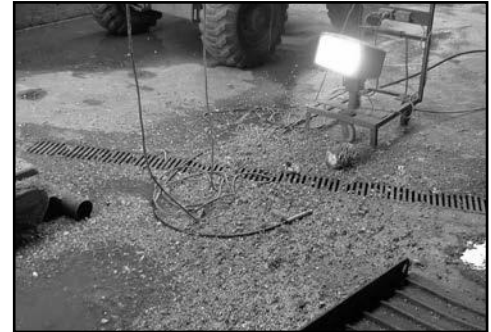
Anchor chain-growth

- All biological material removed from anchor chains must be contained, collected and disposed of appropriately.

Sea chests

- All biological material removed from sea chests must be contained, covered and disposed of appropriately.
- Material must be stored away from direct sunlight/heat and disposed of as soon as possible, to avoid nuisance odour pollution.

Marine growth removed from vessel hulls must not be allowed to enter the harbour through the drydock drainage system.



*INADEQUATE containment:
Biological waste on drydock floor near drains.*



*INADEQUATE containment:
Biological growth mixed with paint waste
on drydock floor.*



Sea chests, such as this one from a cruise ship docked at the EGD, often contain a significant amount of marine life.

If not managed appropriately, this marine life has the potential to negatively impact the local ecosystem of the harbour.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 2
Approved by:	Stafford Bingham
EBMP #9: Fish & Wildlife Management	

EBMP #9: Fish and Wildlife Management

The daily operations and activities of the Esquimalt Graving Dock (EGD) have the potential to negatively impact wildlife that frequents the property. The *EGD Wildlife Management Plan* has been developed to assist EGD employees and Users to properly manage interaction with fish and wildlife that are common to the facility.

Fish

Fish and other marine life have the potential to become stranded in the drydock during normal vessel docking/undocking operations. This may include, but is not limited to: salmon and other fish species, seals and octopus.

- The bubble curtain must be employed during vessel transfer into and out of the drydock.
- EGD employees must monitor the drydock for stranded fish and/or other marine life during dewatering and report cases to EGD Environmental Services.
- Whenever possible, EGD employees must retrieve fish and marine life and safely return them to the Esquimalt Harbour.
- Users are prohibited from removing fish and marine life from the drydock.

Report all cases of fish and marine life interaction with the drydock to EGD Environmental Services.

Wildlife

A variety of wildlife is known to occupy areas of the EGD property. In some cases wildlife may use the facility as a nesting/breeding ground, while others are present for short periods of time during migration or to feed. Activities and operations at the EGD have the potential to impact the well being of wildlife at the facility.

Such wildlife includes: deer, raccoon, mink, river otter, great blue heron, osprey, raven, Canada goose and a variety of other common waterfowl, nesting and songbirds and pollinators (e.g. bats, native bees).



Bubble curtain employed during vessel transfer.



Stranded marine life must be carefully returned back to the Harbour.

Fisheries Act - Destruction of Fish

The EGD has received authorization for the destruction of fish associated with normal operation of the drydock from the Department of Fisheries and Oceans (DFO).

Conditions of the Authorization:

- Take all reasonable precautions to prevent the trapping and mortality of fish.
- Monitor the success of preventative measures and retrieval success.
- Report to the DFO annually.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 2
Approved by:	Stafford Bingham
EBMP #9: Fish & Wildlife Management	

- ALL wildlife must be left alone. Do not approach or handle newborn or juvenile wildlife.
- Injured or orphaned wildlife must not be handled without proper experience and equipment.
- Dispose of dead wildlife appropriately.
- Report observations of injured or deceased animals to EGD Environmental Services.
- Prior approval from EGD Environmental Services is required for the relocation or removal of nesting wildlife; a Migratory Bird Damage or Danger Permit is required to remove nests and retrieve eggs of migratory birds (e.g. seagulls).
- Never mistreat, remove or destroy any areas that could provide habitat for wildlife without prior approval and receipt of appropriate permits from the relevant authority.

**Contact EGD Environmental Services for wildlife related information, incidents and interactions.
Contact the Front Gate Commissionaires for afterhours assistance.**



A variety of wildlife is known to occupy areas of the Esquimalt Graving Dock property.

**Incidents with wildlife are managed on a case by case basis.
Direction and/or assistance must be taken from the appropriate authority when required.**



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 2
Approved by:	Stafford Bingham
EBMP #10: Water Use	

EBMP #10: Water Use

The Esquimalt Graving Dock (EGD) is considered a major consumer of fresh water. Water is provided to the facility by the Capital Regional District (CRD) distribution system, on a fee for use basis. Inefficient use of water may result in a negative economic and environmental impact. Water consumption and the quality of water are both considerations of the environmental management systems at the EGD.

Water Consumption

Large volumes of water are used during normal operations at the facility; because of this, the EGD is considered a high volume user of fresh water in the CRD. Users must be conscious of activities that consume high volumes of water and work to mitigate any water waste.

In order to reduce the amount of water consumed onsite:

- Mitigate dust in problem areas using high efficiency Dust Suppression Units, when physical containment techniques are not sufficient to prevent fugitive dust emissions.
- Use fire nozzle water curtains only when all other attempts to contain particulate emissions from sandblasting have failed. Water curtain use must be approved by EGD Management in advance.
- Avoid use of freshwater to clean work areas, where possible.
- Maintain fittings in buildings and on equipment to prevent leakages.

Water Consuming Activities

Activities associated with vessel surface preparation and dust control use significant amounts of water.



Conventional pressure washing and ultra high pressure (UHP) washing use large amounts of water at high pressure to scour paint and biological material from the hulls of ships.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 2
Approved by:	Stafford Bingham
EBMP #10: Water Use	

Dust Suppression Units



Dust Suppression Units are used to mitigate the escape of dust from sandblasting operations in the drydock.

Water Quality

The water distribution system at the EGD was originally designed as a fire suppression system; therefore, the water in certain areas of the system may not be considered potable.

- Potable water is not available throughout the facility (*this includes intake to vessels moored alongside or in the drydock*).
- Users of the facility are responsible for ensuring that the water they use meets the guidelines for the purpose intended.
- Users must use backflow prevention when accessing the water distribution system.

The EGD maintains the fresh water distribution system.

- Flushing of the entire system is conducted on an annual basis.
- Collection and analysis of water, in comparison to drinking water quality guidelines, is conducted on an annual basis.



Metered Water Use at the Esquimalt Graving Dock

- Users of the facility must ensure that water is accessed from a metered line when connecting to the water distribution system.
- Portable meters are to be used when required.
- The EGD Pumphouse must be contacted for proper access to the water distribution system.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 2
Approved by:	Stafford Bingham
EBMP #11: Energy Conservation	

EBMP #11: Energy Conservation

The Esquimalt Graving Dock (EGD), as an industrial facility, is a major consumer of energy. Inefficient energy use may result in negative economic and environmental impacts. Economic impacts are associated with inefficient electrical usage (e.g. cost), while environmental impacts include those associated with the consumption of fuel (e.g. *air emissions*).

Energy consumption also results in the production and release of greenhouse gas emissions through the combustion of fossil fuels. Every aspect of work at the EGD results in the release of greenhouse gases, whether it is operating the cranes or printing a report. It is important to minimize energy consumption wherever possible to reduce the release of harmful greenhouse gases and conserve energy.

Electrical Consumption

There are a number of opportunities to increase the efficiency of electrical usage at the EGD:

- Turn off lights and equipment when not in use (e.g. *flood lights, office buildings*).
- Install energy efficient devices in buildings (e.g. *sensor switches, efficient light bulbs*).
- Use energy efficient equipment whenever possible and consider energy efficient options when purchasing new equipment.
- Stagger equipment start-up to decrease load on electrical system.





Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 2
Approved by:	Stafford Bingham
EBMP #11: Energy Conservation	

Fuel Consumption and Emissions

Opportunities to decrease the amount of fuel consumed by day to day activities include:

- Using energy efficient vehicles.
- Using alternative fuels where possible (e.g. Biofuels).
- Using alternative energy sources where possible (e.g. LED, solar, rechargeable).
- Avoid idling vehicles (e.g. delivery vehicles).
- Use shore power where possible.
- Encourage staff to try alternative means for commuting to work (e.g. carpool, public transit, cycling).

Idling Vehicles

- Do not idle vehicles near building doorways or air intakes
- Vehicles must be turned off if idling for more than 3 minutes in a 60-minute period.



Be aware of the potential impacts of emissions on neighbours near the EGD.



Idling vehicles produce unnecessary air emissions and noise.

Shore Power

For vessels moored alongside at the North Landing Wharf and in the drydock it is important that they utilize shore power when possible. With shore power, the auxiliary generator can be turned off, thereby saving fuel and preventing the release of harmful air pollutants.



Did You Know?

Shore Power may be accessed at the EGD:

- 208V and 480V available on the North Landing Wharf and drydock.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 2
Approved by:	Stafford Bingham
EBMP #12: Nuisance Pollution	

EBMP #12: Nuisance Pollution (Noise/Odour/Light)

The daily operations of the Esquimalt Graving Dock (EGD) Users have the potential to negatively impact neighbouring residents and businesses, as well as the immediate work area. Nuisance pollution is often created by noise, odour and light.

Noise

- Noise pollution can be generated and recognized in decibel levels, pitch, oscillation and duration.
- The main sources of noise at the EGD include sandblasting, drilling, hammering, compressors, generators and the crane warning bell. Even general shop repair activities generate large amounts of noise.
- Sound carries. Operational noise, vehicle noise and loud voices can be heard in nearby areas. Site Users must be aware of the potential impacts of all activities taking place at EGD and be respectful of neighbours.
- Schedule noisy activities for daytime hours 0700 hrs to 2300 hrs on weekdays, weekends and holidays. Through worker education and good practice the generation of high-level intermittent or non-continuous noises can be minimized.
- Personal vehicles, including motorcycles, can disturb neighbouring residents. Your vigilance is appreciated especially during quiet hours. Warning signs are posted at parking areas to remind personnel to be respectful of neighbours when arriving and departing the EGD.
- The EGD recognizes applicable municipal laws and regulations. Operations will consider the requirements of the *Municipality of Esquimalt Bylaw 2826 Maintenance of Property, Unsightly Properties and Nuisance Bylaw Part III Nuisances Noise Control*.



The EGD is located in close proximity to residential areas.



Personal vehicles with loud engines can disturb neighbouring residents.



Warning signs in parking areas act as a reminder to minimize noise at EGD.

Responses to nuisance pollution complaints will be taken on a concern-by-concern basis.

**To submit a nuisance complaint contact the
Esquimalt Graving Dock Information Line at (250) 363-0227.**



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 2
Approved by:	Stafford Bingham
EBMP #12: Nuisance Pollution	

Odour

- Daily dock operations often create strong and unpleasant odours whether from the release of VOCs, H₂S, organic materials, or chemicals. An offensive smell can reduce the quality of the work environment for neighbouring tenants and residents. Biological material removed from bilges, sea chests and hulls must be contained, covered and disposed of appropriately. Be proactive in planning for timely transport and proper disposal of material; a permit may be required for disposal.
- Material must be stored away from direct sunlight/heat and disposed of in a timely manner, to avoid nuisance odour pollution.
- Odour mitigating measures may be required, if odours are negatively affecting neighbouring properties or onsite personnel.
- The EGD recognizes applicable municipal laws and regulations. Operations will consider the requirements of the *Municipality of Esquimalt Bylaw 2826 Maintenance of Property, Unightly Properties and Nuisance Bylaw Part III Odour and Disturbances*.

Light

- Night time dock operations require spotlights to provide a safe work environment. Be aware that strong spotlights can be a significant intrusion for residential neighbours.
- Only utilize spotlights when absolutely necessary. This will help prevent disturbing the neighbours, as well as to ensure a more energy efficient work environment.
- Changing the direction of stationary and portable lights in the workplace may reduce the effect they have on the neighbours.
- Turn off any unnecessary lights.
- The EGD recognizes applicable municipal laws and regulations. Operations will consider the requirements of the *Municipality of Esquimalt Bylaw 2826 Maintenance of Property, Unightly Properties and Nuisance Bylaw Part III Odour and Disturbances*.



ADEQUATE containment of odorous waste.



INADEQUATE containment of odorous waste.



Only utilize spotlights when necessary.



Changing the direction of spotlights can reduce light impact on neighbours.



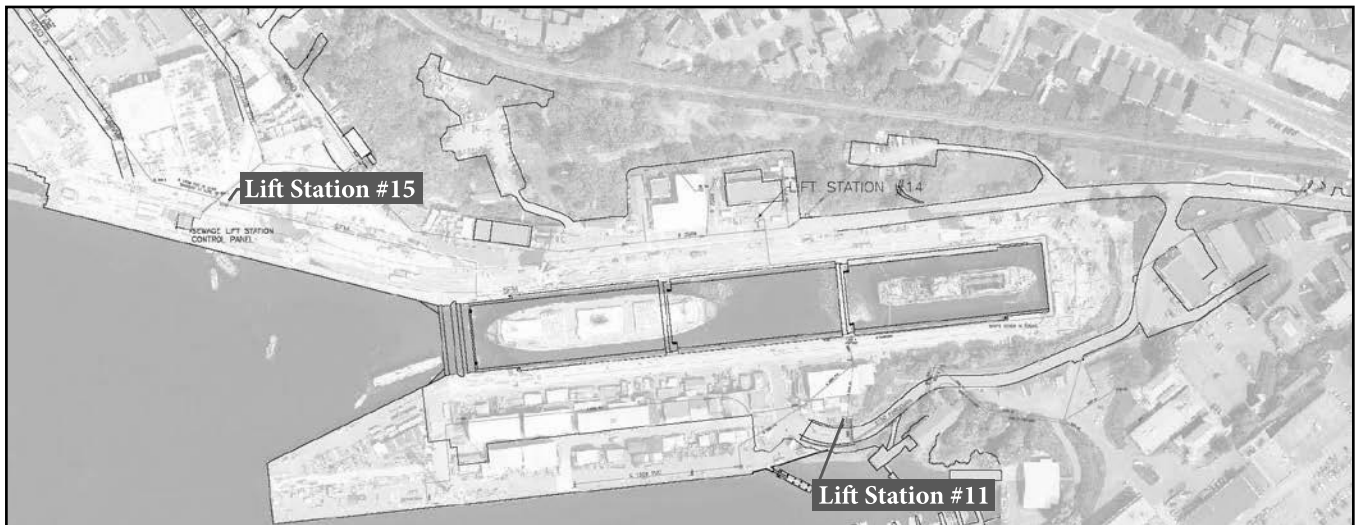
Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 3
Approved by:	Stafford Bingham
EBMP #13: Sanitary Waste & Sewer	

EBMP #13: Sanitary Waste Management and Sewer Use

The Esquimalt Graving Dock (EGD) is authorized by the Capital Regional District (CRD) as a ship and boat waste disposal facility. The authorization allows for the proper discharge of sanitary waste, grey water and superchlorinated water at designated locations at the EGD, and stipulates the requirements that must be met prior to discharge.

Discharge to the sanitary sewer at any location other than at LS#15, LS#11 or at vessel connections located in the services tunnels of the drydock is prohibited.



Lift Station #11.



Lift Station Maintenance.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 3
Approved by:	Stafford Bingham
EBMP #13: Sanitary Waste & Sewer	

The EGD is authorized to discharge to the sanitary sewer at:

- Lift Station #15 (LS#15),
- Lift Station #11 (LS#11), and
- Vessel connections in the drydock.

Permitted wastes include:

- Sanitary waste, *
- Grey water, and
- Treated superchlorinated water.**

***Sanitary Waste:** must contain <50,000 ppm total solids.

****Superchlorinated Water:** must not be discharged to the sanitary sewer unless it has been de-chlorinated to less than 5 ppm chlorine.

Prohibited wastes include:

- Bilge and ballast water,
- Wastewater sludge, and
- Fuel and oil, paint, paint thinner, solvents, and products containing toxic chemicals.

Other Wastes

Other wastes may be considered for discharge to the sanitary sewer on a case-by-case basis; approval *must be* requested from EGD Management prior to discharge.

Discharge to the sanitary sewer at locations other than those authorized may be considered on a case-by-case basis; approval *must be* requested from EGD Management prior to discharge.

Waste Discharge Notification

EnviroSystems Inc. will, as a standard operating procedure, notify the EGD Pumphouse prior to large volume discharges to the sewer system (e.g. any "batch discharge" in excess of 20,000 litres).

Coordination of discharge may be required depending on usage of the sanitary sewer system at the time.

EnviroSystems Inc. will contact the Pumphouse on a regular work day if EnviroSystems Inc. is planning to discharge large volumes during times other than Monday to Friday, day shift (0730 hrs to 1600 hrs) or on statutory holidays.

EnviroSystems Inc. must contact EGD Management if there is a change in normal discharge operations (e.g. increase in daily volume).



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 3 of 3
Approved by:	Stafford Bingham
EBMP #13: Sanitary Waste & Sewer	

Access to the Sanitary Sewer

- Users must notify the Pumphouse before conducting any discharges to the sanitary sewer. Typical methods of discharge include: large (*direct connection and discharge from a vessel*), and small (*portable discharges from totes and tanks*).
- Users must complete a **Sanitary Sewage Discharge Form** and provide it to the Pumphouse prior to discharging to the sanitary sewer.
 - Pumphouse Operators will ensure that sanitary sewer discharges are in accordance with applicable regulations and authorizations.
 - Pumphouse Operators will provide all completed **Sanitary Sewer Discharge Forms** to EGD Environmental Services.
- Users must ensure a sample collection point is accessible at the point of discharge.
- Users must request approval from EGD Management to connect directly to the sanitary sewer for regular domestic waste (*e.g. washrooms, sinks, toilets*). Any other waste is prohibited from being discharged of through these lines.

Lift Station Maintenance

- Commissionaires will contact the Pumphouse on radio Channel 4 when DND sewer maintenance personnel enter the facility.
- Pumphouse staff will supervise DND personnel work on the lift stations where required.



AUTHORIZED Sanitary Sewer Discharge point, Lift Station #11.



AUTHORIZED Sanitary Sewer Discharge point, Lift Station #15.



UNAUTHORIZED Sanitary Sewer Discharge point (i.e. storm drain).



UNAUTHORIZED Sanitary Sewer Discharge point (i.e. trench drains).



UNAUTHORIZED Sanitary Sewer Discharge point (i.e. sewer manhole).



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 3
Approved by:	Stafford Bingham
EBMP #14: Spill Preparedness	

EBMP #14: Spill Preparedness and Response

The Esquimalt Graving Dock (EGD) is committed to the protection of human health and the environment. Safety and environmental management programs have been implemented at the EGD to reduce the potential for accidents and spills. Emphasis is placed on the prevention of spills, and although the potential for spills can be reduced through these programs, spills do still happen.

All Users operating at the EGD must have the capability to effectively manage spills resulting from their activities and operations.

- User employees must have adequate training in spill response.
- User employees must have access to spill response equipment and materials appropriate to the work they are performing.
- Users must have plans and procedures in place to respond to spills.

For spills which are beyond the capability of the User or are not being effectively responded to by the User, the EGD will provide assistance. The EGD has additional resources available, including:

- Spill kits and response materials for land and water based spills.
- Containment boom, deployment reels and boat.
- Pneumatic skimmer with drum and brush recovery modules, deployment and retrieval services.
- Staff trained to deal with land and water based spills.

For spills beyond the capability of the facility to manage, contact *Emergency Management (EMBC)*. Additional resources will be coordinated for response to land and water based spills.

**ALL Spills at the Facility
MUST BE REPORTED to EGD Management.
Details are to be provided in an *Incident or Spill Report*.**



Spill response training at EGD.



Spill response training at EGD.



Spill response equipment: Skimmer.



Spill response equipment: Spill Kit.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 3
Approved by:	Stafford Bingham
EBMP #14: Spill Preparedness	



Assess the situation.



Stop product flow.



Secure the area.

Steps to Spill Response

Assess the Situation

- Never rush in. Warn others in the immediate area.
- Stay upwind of the spill and avoid low lying areas.
- Quickly and accurately gather details that may need to be communicated to spill response personnel and the authorities including:
 - What equipment or work activity is involved?
 - What hazards are associated with the spilled product?
 - How large is the spill?
 - Is the situation under control or is it escalating?
 - What areas are or could be affected?
 - Proposed strategy to contain/control the spill.
 - Notify others in the area of the spill.

Stop Product Flow

- Act quickly to stop product flow, **ONLY IF SAFE TO DO SO**.
- Activate emergency shutdowns (*if applicable*).
- Close delivery truck manifold valves, etc. (*if applicable*).

Secure the Area

- Clear the area of public and untrained personnel.
- Ensure those onsite are wearing appropriate PPE.
- If spill is indoors, ensure the building is evacuated.
- Isolate large spills in all directions.
- Limit or prevent access to the site.
- Enforce safety procedures.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 3 of 3
Approved by:	Stafford Bingham
EBMP #14: Spill Preparedness	

Contain the Spill

- Approach the spill from an upwind direction and avoid low lying areas.
- Use appropriate PPE (e.g. gloves, eye protection, respirator).
- Follow safe work procedures.
- Block drains, culverts, and ditches to prevent entry into waterways, sewers or confined areas.
- Contain spill with absorbent materials (from spill kits), earth, sand, or other non-combustible materials.

Notify the Authorities

- Contact your Supervisor immediately.
- Report the spill to EGD Management.
- For spills greater than 100L on land, or any spill of any size that enters the marine environment, contact: Emergency Management (EMBC) Reporting Line: 1-800-663-3456.
- Additional reporting requirements may be required depending on the spilled material.

Recovery and Clean Up

- Use appropriate materials to recover spilled product (e.g. loose absorbent, pads, booms, socks).
- Place waste in labelled 6mm plastic bags or leak proof containers.
- Store waste in secure, dry, well-ventilated location, away from heat and ignition sources.
- Consult with authorities before removing waste from site.
- Arrange for waste disposal at an approved facility by a qualified contractor.

Investigation & Reporting

- Investigate the spill or incident and complete and submit required reports to the authority having jurisdiction.



Contain the spill.

Environmental Emergency Contacts (24 Hours):

EGD Commissionaires

250-363-3784

Emergency Management (BC) Reporting Line

1-800-663-3456

DND QHM

250-363-2160

or

VHF Channel 10



Recovery and clean up.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 1
Approved by:	Stafford Bingham
EBMP #15: In-Water Hull Cleaning	

EBMP #15: In-Water Hull Cleaning and Maintenance

The cleaning, maintenance and repair of the underwater hull and associated appendages in water has the potential to release harmful contaminants into the marine environment.

In-water Hull Cleaning

- In-water hull cleaning of vessel hulls, that are coated with antifouling paint, is **prohibited** at the Esquimalt Graving Dock.
- In-water hull cleaning of vessels coated in non-biocide containing paints (*such as silicone based*), **may be considered** on a case-by-case basis and must be approved by EGD Management prior to the commencement of work. This applies to in-water hull cleaning to remove organic growth only, NOT to coating removal.

In-water Maintenance

- In-water maintenance may be considered on a case by case basis and must be approved by EGD Management prior to the commencement of work. In-water maintenance may include but is not limited to:
 - o Cleaning of anodes, inlets, props, and transducers for operational and inspection purposes only.



All vessels approved for in-water hull cleaning or maintenance must have a containment boom in place prior to work starting.

Additional requirements may be required on a case by case basis depending on the scope of work involved.

NOTE: Cleaning of the above water hull while berthed alongside the dock is PROHIBITED.

Did You Know?

Antifouling paints and their residues contain heavy metals, such as copper, which are toxic to aquatic organisms, including salmon and shellfish.

Wash water and solid residues from the washing, scraping, sanding and blasting of antifouling paints from boat hulls are considered "*deleterious substances*" under the *Fisheries Act*. Releasing these wastes to fish bearing waters is a violation of the Act.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 1
Approved by:	Stafford Bingham
EBMP #16: Housekeeping	

EBMP #16: Housekeeping

An organized, clean facility provides an environment that reduces the potential for pollutants to enter surface and ground water through spills and accidents. General cleanliness will lead to more organized and consistent handling of hazardous materials and waste products. Good housekeeping programs will identify and assign responsibilities for shift clean up, day-to-day cleanup, proper waste disposal, removal of unused material, and regular inspection.

Clean-Up

- Clean debris from work areas immediately after any maintenance activity. Dispose of collected material appropriately.
- Ensure garbage and recycling containers are available in all leased areas and are emptied regularly.
- Do not use running water to clean the work areas where potentially contaminated water could enter the stormwater system.
- Ensure trench and storm drains within designated leased areas are kept clean and free of debris.
- Sweep and/or clean active working areas on a regular basis.

Storage

- Do not store materials or equipment outside of leased areas.
- Regularly inspect lease areas for unidentified or improperly stored materials.
- Ensure all stored products and wastes are clearly labelled and identifiable.
- Place a drip pan underneath vehicles and equipment when performing maintenance. Promptly transfer used fluids to the proper waste or recycling drums.
- Ensure all containers (e.g. drums, totes, pails) are in good condition and have a clean exterior at all times. Ensure containers are not left open; secure lids or cover containers when not in use.



INADEQUATE: Keep work areas neat & orderly.



*INADEQUATE:
Keep trench and storm drains free of debris.*



*INADEQUATE:
Ensure storage containers are not left open.*



ADEQUATE: Keep work spaces organized and clear of debris to prevent accidents.



Environmental Best Management Practices

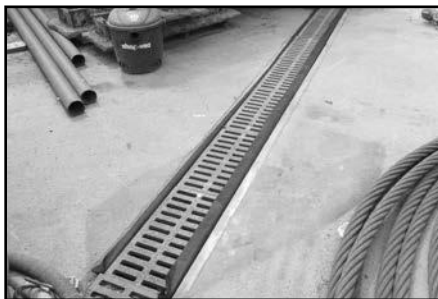
Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 2
Approved by:	Stafford Bingham
EBMP #17: Stormwater Management	

EBMP #17: Stormwater Management

Stormwater has been identified as one of the primary pathways of contaminant loading to the local harbour associated with Esquimalt Graving Dock (EGD) operations. Common contaminants found in stormwater samples include metals, extractable petroleum hydrocarbons (LEPH/HEPH), and total suspended solids (TSS). Five upland stormwater catchment areas terminate into the Esquimalt Harbour from the EGD property. The drydock floor tunnel drainage system leads directly to the Esquimalt Harbour. Any material entering the tunnel drainage system, either through tunnel grate drains or open sump well valves, will end up in the harbour. Deleterious materials must not be allowed to enter the storm or tunnel drain system.

Uplands Stormwater Management

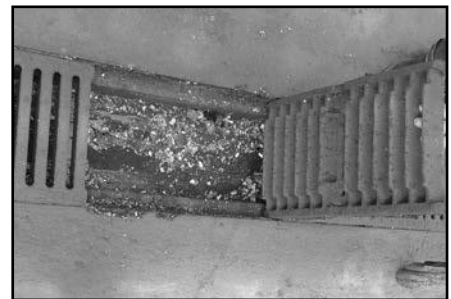
- Store hazardous materials away from storm drains and trenches on the dock floor and in upland areas.
- Ensure totes, drums, pails and skips containing hazardous materials are protected from the weather (e.g. lids secure, tarps in place).
- Place filter cloth over storm and trench drains when working with deleterious substances that are in close proximity to, and that could pose a hazard to the marine environment.
- Divert and contain stormwater runoff containing contaminants and sediment with proper materials and filtration, prior to entering the drains (e.g. use filter cloth, hay bales, sand bags).
- During heavy stormwater events, ensure storm drains and trenches are kept clear of debris to prevent flooding.
- Conduct regular inspections of storm and trench drains in lease areas to ensure they are kept clear of debris.
- When using trench drains for secondary containment, ensure the containment system is monitored and removed in a stormwater event. A blocked trench drain may cause flooding of the area.



Prevent deleterious substances entering marine environment by placing filter cloth in the trench drains.



Sand bags used on dock bottom to divert and filter excess water.



Do not allow trench drains to build up with debris. This helps to prevent flooding during heavy stormwater events.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 2
Approved by:	Stafford Bingham
EBMP #17: Stormwater Management	

Drydock Floor Stormwater Management

- Stormwater has the potential to mix with washwater and other contaminants on the drydock floor during normal operations. Users of the drydock must plan in advance for stormwater management during their work period.
- To reduce the amount of washwater requiring treatment, stop power washing operations until stormwater can be controlled.
- To prevent contamination of stormwater with washwater, waste sandblast grit and other hazardous materials and wastes, cleanup work areas as soon as possible.
- Sump well valves may be opened to allow stormwater to drain into the tunnel drains when the trench drains, sump wells and dock floor area is clear of contaminants and debris. In the case where washwater collection is completed, but the trench drains, sump wells and dock floor have not been cleaned, a filter cloth may be secured over an open sump well valve to allow stormwater flow. This procedure prevents contaminants and debris from entering the drainage system. This method requires dedicated personnel management of the process and regular filter cloth replacement. Do not poke holes in the filter cloth.
- Tunnel grate drains on the drydock floor in Section 2 and 3 may be uncovered enough to allow stormwater to flow into the drains. Ensure the area is clear of contaminants and debris.
- Sump well valves must be closed in sumps containing visibly contaminated material. Sump wells must be pumped out and cleaned prior to opening the valves.
- Ensure there is capacity in the trench drain/sump well collection system to manage expected stormwater volume. This will allow for continued collection and will prevent flooding of the dock floor.
- Prior to flooding and dewatering of the drydock, ensure all sump well valves are open.



Uplands storm drain with filter cloth. Avoid storing hazardous materials near storm drains, which are directly linked to the marine environment.



Filter cloth secured over sump well valve to allow stormwater flow.

 Environmental Best Management Practices	Revision Number:	05
	Revision Date:	October 2016
	Page:	Page 1 of 5
	Approved by:	Stafford Bingham
	EBMP #18: Property & Infrastructure	

EBMP #18:

Property and Infrastructure Maintenance, Modifications and Construction

Significant environmental issues and potential impacts are known to be related to the management of Esquimalt Graving Dock (EGD) property and infrastructure. Any new property and infrastructure construction or modification projects at the EGD must consider environmental issues in project planning and implementation. Common environmental aspects that require consideration and management when planning and implementing projects include: dust emissions, hazardous materials and wastes, storm water runoff, noise, and prevention and response to accidental spills and releases. Requirements for the operational aspects are identified in specific sections of the EGD EBMPs.

Infrastructure Maintenance & Repair

Maintenance and repair of existing facility property and infrastructure often results in waste generation and other environmental aspect considerations to be addressed.

Minor Concrete Work

- Contain dust emissions from cutting and drilling.
- Prevent concrete slurry runoff from entering storm drains.
- Prevent debris from mixing concrete from entering storm drains or the marine environment.
- Prevent concrete slurry runoff from entering the trench and tunnel drains and the “moonpool” on the drydock floor.

Use of Preserved Wood

- Avoid use of creosote preserved wood products where possible.
- Follow applicable guideline for use of preserved wood products.
- Creosote wood waste may be considered a hazardous, restricted or controlled waste, and must be handled and disposed of accordingly.

Demolition/Renovation

- Ensure structures are assessed for the presence of hazardous materials prior to demolition or renovation (e.g. asbestos, lead based paint, PCB and mercury containing ballasts, mould).
- Hazardous materials and waste must be handled and disposed of according to applicable regulatory requirements.
- Halocarbon containing equipment must be managed in accordance with the Federal Halocarbon Regulations.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 5
Approved by:	Stafford Bingham
EBMP #18: Property & Infrastructure	

Land Use Application

The EGD Land Use Application (EGD LUA) contains sections specific to potential environmental aspects related to the project. These sections must be completed with all relevant information.

EGD Management will respond with additional environmental protection and mitigation measures if required.



Infrastructure Modification & Construction

All modification and construction projects at the EGD must be assessed for environmental impacts, and plans put in place to mitigate the identified impacts. Projects managed by the EGD will be completed in accordance with the national project management system and site specific requirements.

For projects managed by Users:

- Any changes to infrastructure, changes to an existing lease or application for a new lease, must be approved by EGD Management.
- Prior to the approval of a property or infrastructure project, the EGD Land Use Application must be completed in full and submitted to EGD Management for review.

Green Space and Vegetation

The EGD property includes areas of vegetation that provides many benefits, including important habitat for wildlife and sensitive native plant species, and act as a buffer between the industrial operations of the facility and the neighbouring residential area.

All projects which have the potential to impact green space, vegetation and wildlife habitat must be reviewed and approved by EGD Management.

Tree and Vegetation Compensation Policy

To facilitate the EGD wildlife management plan and reduce the likelihood of habitat loss at the facility, property and infrastructure projects that require the removal of vegetation must provide compensation in the form of appropriate vegetation replacement. Additional supplies are also required when compensation vegetation is purchased to ensure that new plantings will be successful (*e.g. soil, mulch, tree protection, and water bags*). Consult with EGD Management prior to work to determine what compensation is required.

 Environmental Best Management Practices	Revision Number:	05
	Revision Date:	October 2016
	Page:	Page 3 of 5
	Approved by:	Stafford Bingham
	EBMP #18: Property & Infrastructure	

Soil Management

The EGD has undergone significant capital and operation and maintenance projects in recent years. Extensive investigations into the soil conditions (*e.g. contamination and structure*), utility mapping and identification of archaeological conditions have taken place. The industrial history of the facility has resulted in known contamination of the soil and in-fill material used on site. The primary contaminants commonly found at levels exceeding industrial soil standards include: arsenic, cadmium, copper, lead, mercury, zinc, and polycyclic aromatic hydrocarbons (*PAH*).

Requirements for Excavation

Planning Excavation

1. Consult with EGD Management prior to excavation to identify:

- Project area and excavation boundaries.
- Known utilities, structures, and historical information regarding the proposed excavation area.
- Known contaminated soil locations and the nature and level of contaminants potentially in the soils to be excavated.
- Archaeologically significant areas, requirements for mitigation of archaeological impacts, and dealing with unanticipated archaeological finds.

2. Prepare a plan for soil management: stockpiling and sampling of soils to be excavated. Key issues to be considered include:

- Turnaround times for sample results may take up to 2 weeks.
- Parameters to be sampled may vary depending on the area of excavation. Common parameters include total metals, leachable metals, PAHs, and hydrocarbons (*LEPH, HEPH*).
- EGD Management must approve stockpile areas.
- Soils which exceed the CCME Industrial Levels or BC CSR Industrial Levels: must be disposed of off site at an approved disposal facility.
- Soils which are below industrial standards: may remain on site if geotechnically suitable, if there is an identified use for the soil, and when approved by EGD Management.

3. Ensure contractors and employees are aware of the health and environmental risks associated with the suspected contaminated soils and have procedures in place to mitigate the risks. This includes adequate Personal Protective Equipment (*PPE*) and hygiene practices (*e.g. no smoking, wear gloves*).



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 4 of 5
Approved by:	Stafford Bingham
EBMP #18: Property & Infrastructure	



*ADEQUATE soil stockpile management.
Soils placed on poly and covered.*



*INADEQUATE stockpile of contaminated soil.
Soil should be covered to prevent exposure to
elements, runoff and people.*

Conducting Excavation

- Ensure appropriate PPE and hygienic precautions are in place to prevent exposure to contaminants in the soils.
- Monitor all excavations for visible soil contamination or archaeologically significant material.
- Ensure soil is stockpiled, sampled and analyzed in accordance with the Environmental Management Act and Contaminated Sites Regulation, and BC Ministry of Environment Technical Guidance Document 1, Site Characterization BC Government Technical Guidance on Contaminated Sites (January 2009).
- Ensure soils suspected of contamination are stockpiled on an impervious surface (e.g. 6 mil PVC or plastic poly liner) and adequately covered to prevent exposure to wind, storm water runoff or people. Stockpiles must not exceed 50m³ in size.
- Imported fill material used for surfacing, backfilling or any other use must meet CCME Residential/Parkland (RL/PL) Land Usage Soil Quality Guidelines. Fill material information must be provided to and approved by EGD Management before being used on site.

After Excavation

- Ensure all soil is disposed of at a facility that is permitted to accept that material.
- Obtain all disposal records, including: waste manifests, weigh bills and disposal certificates from the receiver.
- Report the volume, analysis results, excavation details and dimensions and disposal records to EGD Management.
- Provide all as-builts and project drawings to EGD Management in the format compatible with the EGD drawing standards.



Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 5 of 5
Approved by:	Stafford Bingham
EBMP #18: Property & Infrastructure	

Archaeological Considerations

The EGD property and surrounding area has a rich First Nations history. There are Provincially Registered Archaeological Sites listed within the property boundaries of the EGD.

- All excavation projects must be reviewed and approved by EGD Management prior to work beginning.
- Depending on the scope of the project a detailed Archaeological Impact Assessment may be required.
- All Users, including contractors and employees working on excavation projects, must be made aware of the potential for archaeological chance finds. In the case where suspect archaeological material is discovered during excavation, work must stop in that area and EGD Management must be notified immediately.

Archaeological Overview Assessment

An Archaeological Overview Assessment was conducted for the EGD which outlines the archaeologically sensitive areas on the property and identifies areas of high archaeological potential.

Archaeological significant materials found during excavation projects at the facility include shell midden, artifacts, faunal and human remains.



Many archaeologically sensitive areas exist on the EGD Property.

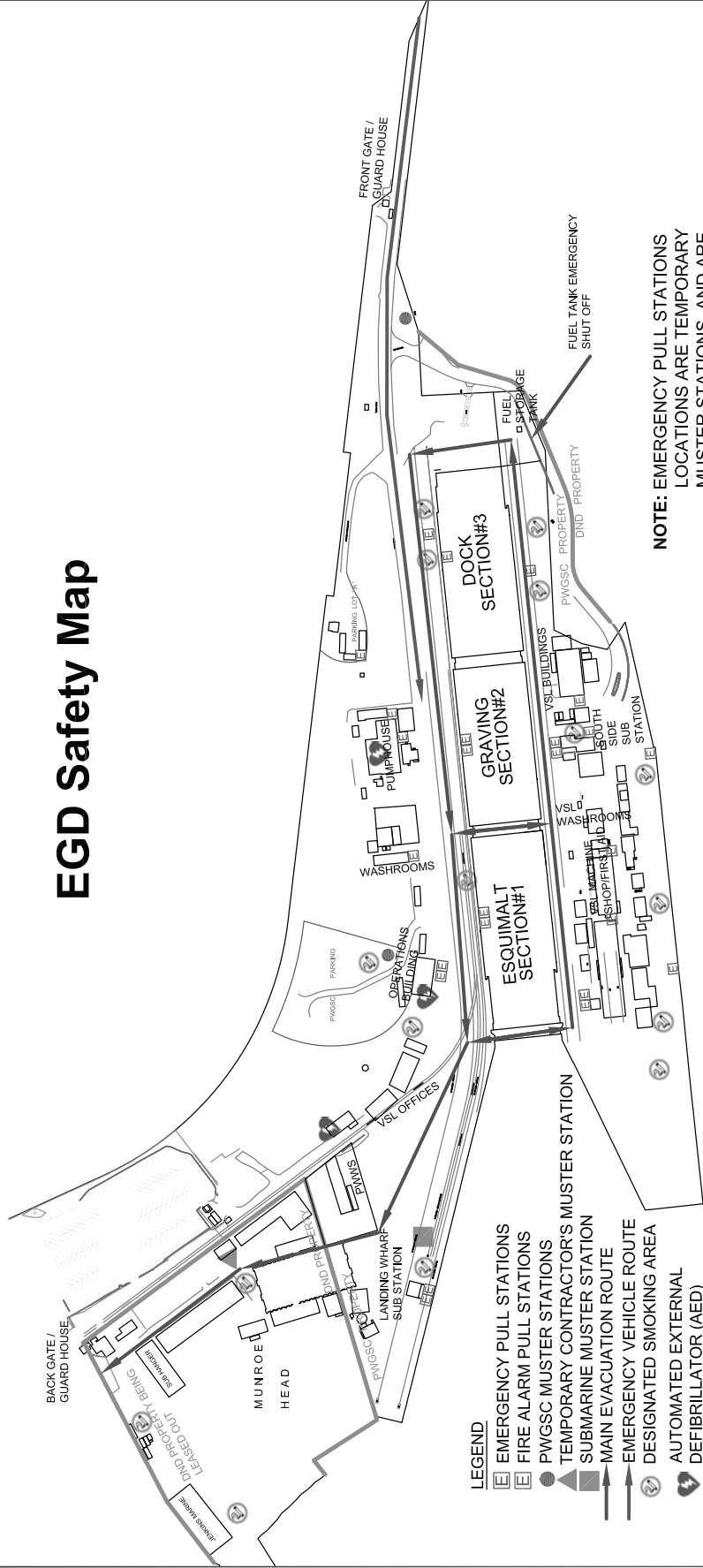


First Nations archaeologists examine materials unearthed during excavations at EGD.

**ESQUIMALT GRAVING DOCK
REPLACE MAIN DISTRIBUTION LINE (RMDL)
BC HYDRO (BCH) POINT OF DELIVERY (POD) SWITCHGEAR
ESQUIMALT, BRITISH COLUMBIA**

**APPENDIX J
FIRE SAFETY MAP**

EGD Safety Map



NOTE: EMERGENCY PULL STATIONS LOCATIONS ARE TEMPORARY MUSTER STATIONS, AND ARE SUBJECT TO CHANGE.

- LEGEND**
- [Square Box] EMERGENCY PULL STATIONS
 - [Circle] FIRE ALARM PULL STATIONS
 - [Triangle] PWGSC MUSTER STATIONS
 - [Arrow] TEMPORARY CONTRACTOR'S MUSTER STATION
 - [Star] SUBMARINE MUSTER STATION
 - [Thick Arrow] MAIN EVACUATION ROUTE
 - [Thin Arrow] DESIGNATED SMOKING AREA
 - [Circle with AED] AUTOMATED EXTERNAL DEFIBRILLATOR (AED)

Revisions/	Description/Description	Date/Date
2	Revisions by J.M. Brown	200605
1	Revisions by D. Ferrier	200611
0	Design/Consultation	200609

**ESQUIMALT
GRAVING DOCK**

825 ADMIRALS ROAD
ESQUIMALT, B.C. V9A 2P1

Project title/Titre de projet
ESQUIMALT GRAVING DOCK
825 ADMIRALS ROAD, ESQUIMALT, B.C.
BLDG_NAME

Contractor Signature Only

Designed by/Concept par
D Ferrier 200605

Drawn by/Dessiné par
D Ferrier 200605

PWGSC Project Manager/Administrateur de Projets 1950C

PWGSC, Regional Manager, Architectural and Engineering Services/
Gestionnaire régional, Services d'architecture et de génie, 1950C

Drawing title/Titre de dessin
Esquimalt, BC.
Graving Dock
Site Plan

Project No./No. de projet	Sheet/Feuille	Revision No./ No. de Révision
	1	2
	OF 1	



**ESQUIMALT GRAVING DOCK
REPLACE MAIN DISTRIBUTION LINE (RMDL)
BC HYDRO (BCH) POINT OF DELIVERY (POD) SWITCHGEAR
ESQUIMALT, BRITISH COLUMBIA**

**APPENDIX L
SAMPLE CONTRACTOR SUBMITTALS**

XYZ CONSTRUCTION

CONTRACTOR'S EVENT NOTIFICATION – sample only

EVENT NOTIFICATION

PROJECT:	
EVENT:	
DATE:	
TIME:	
DURATION:	
LOCATION:	
DESCRIPTION:	
SITE IMPACTS:	<input type="checkbox"/> Traffic: <input type="checkbox"/> Crane: <input type="checkbox"/> After-hours: <input type="checkbox"/> Other:
ATTACHMENTS:	