

**Public Works and  
Government Services Canada**

Requisition No: \_\_\_\_\_

ISSUED FOR TENDER DRAWINGS & SPECIFICATIONS  
For

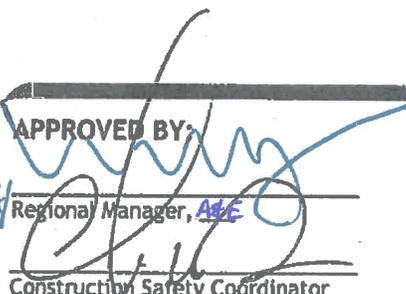
**30T Kone Crane Painting**  
Project No. R.090380.001

AND

**150T Krupp Crane Painting**  
Project No. R.090381.001

July 2017

APPROVED BY:

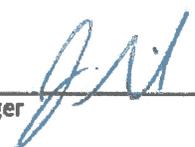
  
Regional Manager, **ASE**

2017-07-28  
Date

  
Construction Safety Coordinator

2017-07-27  
Date

TENDER:

  
Project Manager

2017-07-27  
Date



# Public Works and Government Services Canada

Requisition No: \_\_\_\_\_

ISSUED FOR TENDER DRAWINGS & SPECIFICATIONS  
For

**30T Kone Crane Painting**

Project No. R.090380.001

AND

**150T Krupp Crane Painting**

Project No. R.090381.001

July 2017

## APPROVED BY:

\_\_\_\_\_  
Regional Manager, \_\_\_\_

\_\_\_\_\_  
Date

\_\_\_\_\_  
Construction Safety Coordinator

\_\_\_\_\_  
Date

## TENDER:

\_\_\_\_\_  
Project Manager

\_\_\_\_\_  
Date

**SPECIFICATIONS**

**# of Pages**

**DIVISION 1 GENERAL REQUIREMENTS**

011155	General Instructions.....	11
013300	Submittal Procedures.....	2
013301	Shop Drawings, Product Data and Samples .....	4
013533	Health and Safety Requirements .....	15
013543	Environmental Procedures.....	6
015100	Temporary Facilities.....	2
015600	Temporary Barriers and Enclosures .....	2
017830	Closeout Submittals.....	3

**DIVISION 2 EXISTING CONDITIONS**

028311	Lead Coatings Abatement .....	5
--------	-------------------------------	---

**DIVISION 3 GROUTING**

036213	Non-Metallic, Non-Shrink Grout .....	5
--------	--------------------------------------	---

**DIVISION 9 FINISHES**

090190	Maintenance of Painting and Coating.....	10
--------	--	----



**APPENDICES**

Appendix A	Preliminary Hazard Assessment Form .....	3
Appendix B	Assessment of Lead in Paint – 30T Kone.....	47
Appendix C	Assessment of Lead in Paint – 150T Krupp .....	54
Appendix D	EGD Environmental Best Management Practices.....	51
Appendix E	Preparation and Treatment Recording Form .....	1

**DRAWINGS (BOUND SEPARATELY)**

01	Key Plan and Site Plan
02	30T Kone Elevations
03	150T Krupp Elevations

**END OF INDEX**

- 
- 1. Codes** .1 Perform work to CURRENT Codes, Construction Standards and Bylaws, including Amendments up to the TENDER closing date.
- 2. Description of Work** .1 Work under this Contract covers the preparation, cleaning, and re-painting of isolated areas of coating breakdown throughout the 30T Kone Crane; and the preparation, cleaning, and re-painting of the Gantry Legs, Portal, Handrail and associated components, and Walk-On Deck surfaces below the Main Boom of the 150T Krupp Crane at the Esquimalt Graving Dock, 825 Admirals Road, Victoria, B.C. This includes all rigging and access equipment, and environmental containment/protections.
- .2 Existing coatings on the 150T Krupp contain lead. Where the removal of these coatings is specified, lead abatement procedures are required. Where the existing coating is sound, no removal has been specified and the lead-containing-paints will be encapsulated by the new coating system.
- .3 Work to be performed under this Contract includes, but is not limited to, the following items covered further in the Contract documents:
- .1 30T Kone (areas of work are distributed across the exterior surface of the entire crane)
- .1 Removing isolated areas of corrosion and deteriorated coatings to bare metal,
- .2 Applying a protective coating to prepared areas as specified
- .2 150T Krupp (areas of work are restricted to the exterior below the slew ring, with the exception of the walk-on deck)
- .1 Cleaning and preparing all areas to be painted,
- .2 Removing isolated areas of corrosion and deteriorated coatings to bare metal (includes lead-containing-paint abatement),
- .3 Cleaning the entire walk-on deck to bare metal (includes lead-containing-paint abatement),
- .4 Building up and re-grading the walk-on deck for drainage,
- .3 Applying a complete overall coating as specified.
- .4 "Green" requirements:
- .1 Use materials/products containing highest percentage of recycled and recovered materials practicable - consistent with maintaining

---

cost effective satisfactory levels of competition.

- .2 Adhere to waste reduction requirement for reuse or recycling of waste materials, thus diverting materials from landfill.

**3. Contract Method** .1 Complete work under unit price contract.

**4. Contract Documents** .1 The Contract documents, drawings and specifications are intended to complement each other, and to provide for and include everything necessary for the completion of the work.

.2 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work.

**5. Other Contracts** .1 Other contracts are currently in progress at the site. Concurrent projects adjacent to the work area may include:

- .1 Ship Repair Operations within the Graving Dock
- .2 Facility Maintenance and Upgrades

.2 Further Contracts may be awarded while this contract is in progress.

.3 Cooperate with other Contractors on site in carrying out their respective works and carry out instructions from Departmental Representative.

.4 Coordinate work with that of other Contractors.

**6. Division of Specifications** .1 The specifications are subdivided in accordance with the current 6-digit National Master Specifications System.

.2 A division may consist of the work of more than one subcontractor. Responsibility for determining which subcontractor provides the labour, material, equipment and services required to complete the work rests solely with the Contractor.

.3 In the event of discrepancies or conflicts when interpreting the drawings and specifications, the specifications govern.

**7. Time of Completion** .1 Complete the project within **6** weeks after Contract Award.

**8. Hours of Work** .1 Restrictive as follows:

- .1 Schedule all work during normal weekday working hours of the

Esquimalt Graving Dock. Normal weekday working hours are 7:00 to 20:00 Monday through Friday, excluding statutory holidays.

- .2 Submit written request to Departmental Representative for authorization prior to working outside of normal working hours including weekends or holidays.

## **9. Work Schedule**

- .1 Carry on work as indicated and as follows:
  - .1 Work shall be done in phases such that no more than 1 crane shall be out of service at any given time.
    - .1 Phase 1: 30T Kone Crane
    - .2 Phase 2: 150T Krupp Crane
  - .2 Within 2 working days after Contract award, provide a Master Project Schedule, in the form of a bar chart, showing anticipated progress stages and final completion of the work within the time period required by the Contract documents. Schedule to indicate the following:
    - .1 Submission of shop drawings, product data, MSDS sheets and samples.
    - .2 Commencement and completion of work of each section of the specifications or trade for each stage of work as outlined.
    - .3 Final completion date within the time period required by the Contract documents.
  - .3 Do not change approved Schedule without notifying Departmental Representative.
  - .4 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to the approval of the Departmental Representative.

## **10. Measurement and Payment**

- .1 Mobilization, Demobilization, and Project Closeout:
  - .1 Mobilization, Demobilization, and Project Closeout will not be measured for payment.
  - .2 Mobilization will be paid for at its tendered Unit price. Payment shall include for all costs in connection with

- 
- mobilization. The Unit price tendered for Mobilization shall be paid on completion of all applicable items to the satisfaction of Departmental Representative, including, but not limited to:
1. Submission and acceptance of all pre-work documentation (Health & Safety Plan, Environmental Protection Plan, etc.),
  2. Installation and proof of certification of rigging.
- .3 Demobilization will be paid for at its tendered Unit price. Payment shall include for all costs in connection with demobilization. The Unit price tendered for Demobilization shall be paid on completion of all applicable items to the satisfaction of Departmental Representative, including, but not limited to:
1. Removal of all rigging and equipment from site,
  2. Removal of all waste material from site,
  3. Submission and Acceptance of NACE quality assurance inspection reports.
- .4 Project Closeout will be paid for at its tendered Unit price. Payment shall include for all costs in connection with Project Closeout. The Unit price tendered for Project Closeout shall be paid on completion of all applicable items to the satisfaction of Departmental Representative, including, but not limited to:
1. Submission and acceptance of As-Built Drawings
  2. Submission and acceptance of Disposal Certificates
- .2 Environmental Requirements and Hazardous Material Abatement:
- .1 Environmental Requirements and Hazardous Material Abatement will not be measured for payment.
  - .2 All environmental protections and containment, transportation and disposal of hazardous material, and other tasks or equipment required to meet the environmental specifications of this project will be considered incidental to the work.
  - .3 Other payment items are described in their associated specification sections.

**11. Codes, Bylaws,  
Standards**

---

- .1 Perform work in accordance with the National Building Code of Canada (NBC) 2010 (as applicable), and other indicated Codes, Construction Standards and/or any other Code or Bylaw of local

---

application.

- .2 Comply with applicable local bylaws, and all Esquimalt Graving Dock rules and regulations enforced at the location concerned.
- .3 Meet or exceed requirements of Contract documents, specified standards, codes and referenced documents.
- .4 In any case of conflict or discrepancy, the most stringent requirements shall apply.

**12. Documents Required**

- .1 Maintain 1 copy each of the following at the job site:
  - .1 Contract drawings.
  - .2 Contract specifications.
  - .3 Addenda to Contract documents.
  - .4 Copy of approved work schedule.
  - .5 Reviewed/approved shop drawings.
  - .6 Change orders.
  - .7 Other modifications to Contract.
  - .8 Field test reports.
  - .9 One set of record drawings and specifications for "as-built" purposes.
  - .10 Health and Safety Plan and other Safety Related Documents.
  - .11 Contractor's Environmental Management Plan
  - .12 Other documents as specified.

**13. Regulatory Requirements**

- .1 Obtain and pay for - Building Permit, Certificates, Licenses and other permits required by regulatory municipal, provincial or federal authorities to complete the work.
- .2 Provide inspection authorities with plans and information required for issue of acceptance certificates.
- .3 Furnish inspection certificates in evidence that the work installed conforms with the requirements of the authority having jurisdiction.

**14. Owner Occupancy**

- .1 During the entire construction period, the owner and site tenants will occupy adjacent areas for execution of normal operations.
- .2 Co-operate with Departmental Representative in scheduling operations to minimize conflict and to facilitate Owner usage of adjacent areas. In the event of a conflict the contractor will accommodate changes to

---

their operations to minimize interference with owner operations.

**15. Contractor's Use  
of Site**

---

- .1 The Esquimalt Graving Dock shall be assumed to be fully operational for the duration of the contract.
  - .1 Not more than one (1) crane shall be out of service at any given time during the execution of the work.
- .2 Contractors work sites are indicated on the drawings.
  - .1 Location of the cranes shown on the drawings may be subject to change due to operations requirements. Final position of the cranes during the work on each phase will be determined prior to the start of the work.
- .3 The Contractor will assume the role of Prime Contractor as per Section 118 of the Workers Compensation Act
- .4 The use of Contractor's work site is exclusive and complete for the execution of contract work.
- .5 The Contractor shall:
  - .1 Assume responsibility for assigned premises for performance of the work.
  - .2 Coordinate all work activities on the Contractor's work site, including the work of other contractors engaged by Departmental Representative.
  - .3 Provide security of Contractor's work site and all Contractor's and Subcontractor's equipment and material. Secure Contractor's work site at the end of each work day.
  - .5 Ensure the site is not unreasonably encumbered with material or equipment.
  - .6 Comply with security restrictions, any area of the Esquimalt Graving Dock property to which access is restricted by sign is a secured or restricted area and shall not be entered.
  - .7 Avoid obstructing access to PWGSC property outside of the Contractor's work site. Maintain overhead clearances, keep roadways and walkways clear, and maintain routes for emergency response vehicles.

**16. Existing  
Services**

---

- .1 Notify Departmental Representative of intended interruption of services and obtain required permission. Where work involves connecting to existing services, contractor shall submit a request to the Departmental Representative a minimum of 48 hours prior to the event. The contractor will not proceed until approval has been granted.

---

The PWGSC Departmental Representative will make all reasonable efforts to accommodate the request; however PWGSC will not accept delay charges should the request not be accepted.

- .2 Minimize duration of interruptions.
- .3 Protect, relocate or maintain existing active services.

**17. Work by others**

- .1 Co-operate with other Contractors on site in carrying out their respective works and carry out instructions from the Departmental Representative.
- .2 Co-ordinate work with that of other Contractors. If any part of the Work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of work.

**18. Examination**

- .1 Examine site and be familiar and conversant with existing conditions likely to affect work.
- .2 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
- .3 At completion of operations the condition of existing work must be equal to or better than that which existed before new work started.
- .4 Protect existing work to prevent injury or damage to portions of existing work which remain.

**19. Cutting and Patching**

- .1 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval.
- .2 Making good is defined as matching construction and finishing materials and the adjacent surfaces such that there is no visible difference between existing and new surfaces when viewed from 1.5 meters in ambient light.

**20. Setting Out of Work**

- .1 Assume full responsibility for and execute complete layout of work to

---

locations, lines, angles, and elevations indicated.

- .2 Provide devices needed to lay out and construct work.
- .3 Supply such devices as rigging or scaffolding required to facilitate Departmental Representative's inspection of work.

**21. Acceptance of Substrates**

- .1 Each trade shall examine surfaces prepared by others and job conditions which may affect his work, and shall report defects to the Departmental Representative. Commencement of work shall imply acceptance of prepared work or substrate surfaces.

**22. Quality of Work**

- .1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.
- .2 In cases of dispute, decisions as to standard or quality of work rest solely with the Departmental Representative, whose decision is final.

**23. Works Coordination**

- .1 Coordinate work of subtrades:
  - .1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.
  - .2 Convene meetings between subcontractors whose work interfaces and ensure awareness of areas and extent of interface required.
    - .1 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.
- .3 Work cooperation:
  - .1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.
  - .2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, cutting, patching and removal or replacement of completed work.
- .4 Ensure disputes between subcontractors are resolved.
- .5 Departmental Representative is not responsible for, or accountable for

---

extra costs incurred as a result of Contractor's failure to coordinate Work.

- .6 Maintain efficient and continuous supervision.

**24. Approval of Shop Drawings, Product Data and Samples**

---

- .1 In accordance with Section 013300, submit the requested shop drawings, product data, MSDS sheets and samples indicated in each of the technical Sections.
- .2 Allow sufficient time for the following:
  - .1 Review of product data.
  - .2 Approval of shop drawings.
  - .3 Review of re-submission.
  - .4 Ordering of approved material and/or products - refer to technical Specifications.

**25. Security Clearances**

---

- .1 Personnel employed on this project will be subject to security check. Obtain requisite clearances, as instructed, for each individual required to enter the premises.

**26. Testing and Inspections**

---

- .1 Particular requirements for inspection and testing to be carried out by testing service or laboratory approved by the Departmental Representative and paid for by the Contractor.
- .2 The Contractor will appoint and pay for the services of testing agency or testing laboratory as specified, and where required for the following:
  - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
  - .2 Inspection and testing performed exclusively for Contractor's convenience.
- .3 Where tests or inspections by designated testing laboratory reveal work is not in accordance with the Contract requirements, Contractor shall pay costs for additional tests or inspections as the Departmental Representative may require to verify acceptability of corrected work.
- .4 Contractor shall notify Departmental Representative in advance of planned testing.

- .5 Contractor shall pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.
- .6 Provide Departmental Representative with 1 electronic copy of testing laboratory reports as soon as they are available.

**27. As-Built Documents**

- .1 The Departmental Representative will provide 2 sets of drawings, 2 sets of specifications, and 2 copies of the original AutoCAD files for "as-built" purposes.
- .2 As work progresses, record changes in red ink. Maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.
- .3 Refer to Section 01 78 30 Close Out Submittals.

**28. Cleaning**

- .1 Daily conduct cleaning and disposal operations. Comply with local ordinances and anti-pollution laws.
- .2 Ensure cleanup of the work areas each day after completion of work.

**29. Dust Control**

- .1 Provide dust control measures as described in the Specifications and as required to comply with all Local, Provincial, and Federal Requirements, Acts, Regulations, By-Laws and Site Requirements.

**30. Environmental Protection**

- .1 Do not dispose of waste into water courses, storm or sanitary sewers.
- .2 Ensure proper disposal procedures in accordance with all applicable regulations.
- .3 Refer to Section 013543 Environmental Procedures.
- .4 Refer to Section 028311 Lead Coatings Abatement.

- 31. Additional Drawings** .1 The Departmental Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with plans referred to in the Contract documents.
- .2 Upon request, Departmental Representative may furnish up to a maximum of 3 sets of Contract documents for use by the Contractor at no additional cost. Should more than 3 sets of documents be required the Departmental Representative will provide them at additional cost.
- 32. System of Measurement** .1 The metric system of measurement (SI) will be employed on this Contract.
- 33. Familiarization with Site** .1 Before submitting tender, visit site - as indicated in tender documents and become familiar with all conditions likely to affect the cost of the work.
- 34. Submission of Tender** .1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analyzed the Contract documents and inspected the site, and is fully conversant with all conditions.

**END OF SECTION 011155**

**1. Administrative**

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present information in SI Metric units.
- .4 Where items or information are not produced in SI Metric units, converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and will be considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .8 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's review.

- .9 Keep one reviewed copy of each submission on site.
- 2. Progress Photographs and Final Photographs**
- .1 Provide digital photos in “Joint Photographic Experts Group” (.jpg) format for Progress Photographs and Final Photographs
- .2 Digital photographs to have a minimum of 2,592 x 1,944 pixel (5 Megapixel) resolution.
- .3 Progress and Final Photographs to be submitted on a USB Digital Storage Device.
- .4 Quantity: Provide sufficient number of photographs to adequately describe the work activities carried out during the reporting period. A minimum of two photographs taken from two viewpoints are to be provided for each clean-up/construction activity.
- .5 Submit final photographs with as-built documents.

**END OF SECTION 01 33 00**

**1. Approvals**

- .1 Approval of shop drawings and samples: refer to Section 011155 – General Instructions.

**2. General**

- .1 This Section specifies general requirements and procedures for the Contractor's submissions of shop drawings, product data, samples and other requested submittals to Departmental Representative for review. Additional specific requirements for submissions are specified in individual technical sections.
- .2 Present shop drawings, product data and samples in SI Metric units.
- .3 Where items or information is not produced in SI Metric units, converted values are acceptable.
- .4 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submissions.
- .5 Notify Departmental Representative in writing at time of submission, identifying deviations from requirements of Contract documents and stating reasons for deviations.
- .6 Contractor's responsibility for deviations in submission from requirements of Contract documents is not relieved by Departmental Representative's review of submission unless Departmental Representative gives written acceptance of specific deviations.
- .7 Make any changes in submissions which Departmental Representative may require consistent with Contract documents and resubmit as directed by Departmental Representative
- .8 Notify Departmental Representative in writing, when resubmitting, of any revisions other than those requested by Departmental Representative.
- .9 Do not proceed with work until relevant submissions are

reviewed and approved by the Departmental Representative.

**3. Submission  
Requirements**

- .1 Coordinate each submission with the requirements of the work and the Contract documents. Individual submissions will not be reviewed until all related information is available.
- .2 Allow (3) three days for Departmental Representative's review of each submission, unless noted otherwise.
- .3 Accompany submissions with transmittal letter, in duplicate, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .4 Submissions shall include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative, certifying approval of submissions, verification of field measurements and compliance with Contract documents.
  - .5 Details of appropriate portions of work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions (including identified field dimensions) and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.

.5 After Departmental Representative's review, distribute copies.

**4. Shop Drawings**

.1 Shop drawings: original drawings or modified standard drawings provided by Contractor to illustrate details of portions of work which are specific to project requirements.

.2 Maximum sheet size: 850 x 1050 mm.

.3 Submit 1 digital file of shop drawings for each requirement requested in the specification sections and/or as requested by the Departmental Representative.

.4 Cross-reference shop drawing information to applicable portions of the Contract documents.

**5. Shop Drawings Review**

.1 Review of shop drawings by the Departmental Representative is for the sole purpose of ascertaining conformance with the general concept.

.2 This review shall not mean that the Departmental Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with Contractor submitting same.

.3 This review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and Contract documents.

.4 Without restricting the generality of the foregoing, the Contractor is responsible for:

.1 Dimensions to be confirmed and correlated at the job site.

.2 Information that pertains solely to fabrication processes or to techniques of construction and installation.

.3 Coordination of the work of all sub-trades.

**6. Product Data**

.1 Product data: manufacturers' catalogue sheets, MSDS sheets,

brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products or any other specified information.

- .2 Delete information not applicable to project.
- .3 Supplement standard information to provide details applicable to project.
- .4 Cross-reference product data information to applicable portions of Contract documents.
- .5 Submit 1 electronic copy of product data.

**END OF SECTION 01 33 01**

**PSPC Update on Asbestos Use**

**Effective April 1, 2016, all Public Services and Procurement Canada (PSPC) contracts for new construction and major rehabilitation will prohibit the use of asbestos-containing materials.**

**Further information can be found at <http://www.tpsgc-pwgsc.gc.ca/comm/vedette-features/2016-04-19-00-eng.html>**

**1. References**

- .1 Government of Canada.
  - .1 Canada Labour Code - Part II
  - .2 Canada Occupational Health and Safety Regulations.
- .2 National Building Code of Canada (NBC):
  - .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .3 Canadian Standards Association (CSA) as amended:
  - .1 CSA Z797-2009 Code of Practice for Access Scaffold
  - .2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes
  - .3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structure
  - .4 CSA Z1006-10 – Management of Work In Confined Space
- .4 National Fire Code of Canada 2010 (as amended)
  - .1 Part 5 – Hazardous Processes and Operations and Division B as applicable and required.
  - .2
- .5 American National Standards Institute (ANSI):
  - .1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.
- .6 Province of British Columbia:
  - .1 Workers Compensation Act Part 3-Occupational Health and Safety.
  - .2 Occupational Health and Safety Regulation
- .7 NMS Section 00 10 10 Specification Index (Appendix A thru Appendix E)

**2. Related Sections**

- .1 01 33 00 – Submittal Procedures
- .2 01 35 43 – Environmental Procedures
- .3 08 83 11 – Lead Coatings Abatement

**3. Workers'**  
**Compensation Board**  
**Coverage**

- .1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.
- .2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

**4. Compliance with**  
**Regulations**

- .1 PSPC may terminate the Contract without liability to PSPC where the Contractor, in the opinion of PSPC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.
- .2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

**5. Submittals**

- .1 Submit to Departmental Representative submittals listed for review in accordance with Section 013300.
- .2 Work effected by submittal shall not proceed until review is complete.
- .3 Submit the following:
  - .1 Site Specific Health and Safety Plan.
  - .2 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.
  - .3 Copies of incident and accident reports.
  - .4 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
  - .5 Copy of Contractors' Construction Safety Manual
- .5 Emergency Procedures.
- .4 The Departmental Representative will review the Contractor's Site Specific Project Health and Safety Plan and Emergency Procedures, and provide comments to the Contractor within 5 (five) days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.
- .5 Medical surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for

- site personnel prior to commencement of work, and submit additional certifications for any new site personnel to Departmental Representative.
- .6 Submission of the Site Specific Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:
- .1 Be construed to imply approval by the Departmental Representative.
  - .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.
  - .3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

## **6. Responsibility**

- .1 Assume responsibility as the Prime Contractor for work under this contract.
- .2 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract documents, applicable Federal, Provincial, Territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

## **7. Health and Safety Coordinator**

- .1 The contractor shall appoint a Health and Safety Coordinator who shall:
  - .1 Be responsible for completing all health and safety training, and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.
  - .2 Be responsible for implementing, daily enforcing, and monitoring the site-specific Health and Safety Plan.
  - .3 Be on site during execution of work.

## **8. General Conditions**

- .1 Provide safety barricades and lights around the Contractor's Work Site (as required) and the Contractor Off-Site Offload Facility (as required) to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.
- .2 Ensure that non-authorized persons are not allowed to circulate

in designated construction areas of the work sites.

- .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.
- .2 Secure site at night time or provide security guard as deemed necessary to protect work sites against entr

## **9. Utility Clearances**

- .1 The Contractor is solely responsible for all utility detection and clearances prior to starting the work
- .2 The Contractor will not rely solely upon the Reference Drawings or other information provided for utility locations.

## **10. Project/Site Conditions**

- .1 The Esquimalt Graving Dock is a dry dock and ship repair facility. It is an industrial site wherein industrial, manufacturing, fabrication, heavy construction, and like works are conducted by a variety of contractors and sub-trades for a variety of owners and sub-trades for a variety of owners and/or PWGSC.
- .2 Work at site will involve a number of hazards known to PWGSC as noted in the Preliminary Hazard Assessment Form. This site may involve contact with hazardous and/or toxic materials and substances such as, but not limited to:
  - .1 Waste sandblast grit.
  - .2 Paint spray, including solvents and mineral spirits.
  - .3 Waste water.
  - .4 Contaminated soils and debris.
  - .5 Polychlorinated biphenyl (PCB).
  - .6 Creosote and creosote materials.
  - .7 Asbestos.
  - .8 Lead paints and other paints containing toxic substances such as arsenic and carcinogens.
- .3 Other safety hazards or risks which may be encountered include, but are not limited to:

- .1 Contact with traveling and mobile cranes, forklifts, manlifts and other motorized vehicles.
- .2 Overhead hazards such as that created by material transported by cranes.
- .3 Fall hazards.
- .4 Drowning hazards.
- .5 Confined space hazards.
- .6 Electrical hazards.
- .7 Contact with operating mechanical, electrical, electronic, pneumatic, thermal, and hydraulic machinery and equipment.
- .8 Fire hazards.

**11. Regulatory Requirements**

- .1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.
- .2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

**12. Work Permits**

- .1 Obtain specialty permits related to project before start of work.

**13. Filing of Notice**

- .1 The Prime Contractor is to complete and submit a Notice of Project as required by Provincial authorities.
- .2 Provide copies of all notices to the Departmental Representative.

**14. Health and Safety Plan**

- .1 Conduct a site-specific hazard assessment for the Contractor's Work Site and the Contractors' Off-Site Offload Facility (as required), based on a review of Contract documents, required work, and both project work sites. Identify any known and potential health risks and safety hazards.
- .2 Develop, implement, and enforce a Site Specific Project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:
  - .1 Primary requirements:

- .1 Contractor's safety policy.
  - .2 Identification of applicable compliance obligations.
  - .3 Definition of responsibilities for project safety/organization chart for project.
  - .4 General safety rules for project.
  - .5 Job-specific safe work, procedures.
  - .6 Inspection policy and procedures.
  - .7 Incident reporting and investigation policy and procedures
  - .8 Occupational Health and Safety Committee/Representative procedures.
  - .9 Occupational Health and Safety meetings.
  - .10 Occupational Health and Safety communication and record keeping procedures.
- 
- .2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.
  - .3 List hazardous materials to be brought on site as required by work.
  - .4 Indicate Engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
  - .5 Identify personal protective equipment (PPE) to be used by workers.
  - .6 Identify personnel and alternates responsible for site safety and health.
  - .7 Identify personnel training requirements and training plan, including site orientation for new workers.

**14. Health and Safety**  
**Plan cont'd**

- .3 Develop the Site Specific project health and Safety Plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.
- .4 Revise and update Site Specific Project Health and Safety Plan as required, and re-submit to the Departmental Representative.
- .5 Departmental Representative's review: the review of the contractors' Site Specific Safety Project Health and

Safety Plan by Public Services and Procurement Canada (PSPC) shall not relieve the Contractor of responsibility for errors or omissions in final Site Specific Project Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

**15. Emergency Procedures**

- .1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:
  - .1 Designated personnel from own company.
  - .2 Regulatory agencies applicable to work and as per legislated regulations.
  - .3 Local emergency resources.
  - .4 Departmental Representative and other PSPC staff as required.
- .2 Include the following provisions in the emergency procedures:
  - .1 Notify workers and the first-aid attendant, of the nature and location of the emergency.
  - .2 Evacuate all workers safely.
  - .3 Check and confirm the safe evacuation of all workers.
  - .4 Notify the fire department or other emergency responders.
  - .5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.
  - .6 Notify Departmental Representative and PSPC site staff.
- .3 Provide written rescue/evacuation procedures as required for, but not limited to:
  - .1 Work at high angles.
  - .2 Work in confined spaces or where there is a risk of entrapment.
  - .3 Work with hazardous substances.
  - .4 Underground work.
  - .5 Work on, over, under and adjacent to water.
  - .6 Workplaces where there are persons who require physical assistance to be moved.
- .4 Design and mark emergency exit routes to provide quick and unimpeded exit.

**15. Emergency Procedures cont'd**

- 5 At least once each year, emergency drills must be held to ensure awareness and effectiveness of emergency exit routes and procedures, and a record of the drills must be kept.

- .6 Revise and update emergency procedures as required, and re-submit to the Departmental Representative.

**16. Hazardous Products**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.
- .2 Where use of hazardous and toxic products cannot be avoided:
  - .1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per [Section 013300].
  - .2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when tenants have left the building.
  - .3 Provide adequate means of ventilation in accordance with NMS Sections as indicated in Section 000110 Specification Index.

**17. Off Site Contingency and Emergency Response Plan**

- .1 Prior to commencing Work involving handling of hazardous materials, develop off site Contingency and Emergency Response Plan.
- 2. Plan must provide immediate response to serious site occurrence such as explosion, fire, or migration of significant quantities of toxic or hazardous material from Site.
- 3. Notification of fire departments [4.17 – Worksafe BC Regulations Part 4 Buildings, Structures, Equipment, and Site Conditions]
  - (1) An employer having at a workplace hazardous products covered by WHMIS, explosives, pesticides, radioactive material, consumer products or hazardous wastes in quantities which may endanger firefighters, must ensure the local fire department is notified of the nature and location of the hazardous materials or substances and methods to be used in their safe handling.
  - (2) Subsection (1) does not apply to a workplace

(a) where materials are kept on site for less than 15 days if the employer ensures an alternative effective means for notification of fire departments is in place in the event of fire or other emergency, or

(b) which is not within the service area of a fire department.

[Amended by B.C. Reg. 30/2015, effective August 4, 2015.]

### **18. Personnel Health, Safety, and Hygiene**

1. Training: ensure personnel entering Site are trained in accordance with specified personnel training requirements. Training session must be completed by Health and Safety Officer.
2. Levels of Protection: establish levels of protection for each Work area based on planned activity and location of activity.
3. Personal Protective Equipment
4. Furnish site personnel with appropriate PPE as specified above. Ensure that safety equipment and protective clothing is kept clean and maintained.
5. Develop protective equipment usage procedures and ensure that procedures are strictly followed by site personnel; include following procedures as minimum:
  6. Ensure prescription eyeglasses worn are safety glasses and do not permit contact lenses on site within work zones.
  7. Ensure footwear is steel-toed safety shoes or boots and is covered by rubber overshoes when entering or working in potentially contaminated work areas.
  8. Dispose of or decontaminate PPE worn on site at end of each workday.
  9. Decontaminate reusable PPE before reissuing.
  10. Ensure site personnel have passed respirator fit test prior to entering potentially contaminated work areas.
  11. Ensure facial hair does not interfere with proper respirator fit.

#### **Respiratory Protection:**

1. Provide site personnel with extensive training in usage and limitations of, and qualitative fit testing for, air purifying and supplied-air respirators in accordance with specified regulations.

2. Develop, implement, and maintain respirator program.
3. Monitor, evaluate, and provide respiratory protection for site personnel.
4. Ensure levels of protection as listed have been chosen consistent with site-specific potential airborne hazards associated with major contaminants identified on site.
5. In absence of additional air monitoring information or substance identification, retain an industrial hygiene specialist to determine minimum levels of respiratory protection required.
6. Immediately notify Departmental Representative when level of respiratory protection required increases.
7. Ensure appropriate respiratory protection during Work activities. As minimum requirement, ensure that persons entering potentially contaminated work areas are supplied with and use appropriate respiratory protection.

**18. Personnel Health,  
Safety and Hygiene cont'd**

**Heat Stress/Cold Stress:**

Implement heat stress or cold stress monitoring program as applicable and include in site-specific Health and Safety Plan.

**Personnel Hygiene and Personnel Decontamination Procedures.**

Provide minimum as follows:

1. Suitable containers for storage and disposal of used disposable PPE.
2. Potable water and suitable sanitation facility.

**Emergency and First-Aid Equipment:**

1. Locate and maintain emergency and first-aid equipment in appropriate location on site including first-aid kit to accommodate number of site personnel; portable emergency eye wash; 9 kg ABC type dry chemical fire extinguishers as required.

**19. Asbestos Hazard**

- .1 Modifications to spray- or trowel-applied asbestos surfaces can be hazardous to health.
- .2 Removal and handling of asbestos will be performed as per Worksafe B.C. Regulations Part 6 Substance Specific Requirements Asbestos and all applicable regulations.

**20. PCB Removals**

- .1 Mercury-containing fluorescent tubes and ballasts which contain polychlorinated biphenyls (PCBs) are classified as hazardous waste.

**21. Removal of Lead-Containing Paints**

- .2 Remove, handle, transport and dispose of in accordance with all federal, provincial, and local laws and regulations
- .1 All paints and coatings containing lead concentrations above 90 mg/kg (0.009%) dry weight of lead are considered lead-containing as per Health Canada definition.
- .2 Paint debris is classified as hazardous waste under the BC Hazardous Waste Regulation (Environmental Management Act) with respect to disposal, due to the characteristic of toxicity, if after testing by Toxicity Characteristic Leaching Procedure (TCLP), the leachate contains any of the elements in the concentrations listed below (or greater):

Arsenic	2.5 mg/l
Barium	100 mg/l
Cadmium	0.5 mg/l
Chromium	5 mg/l
Copper	100 mg/l
Lead	5 mg/l
Mercury	0.1 mg/l
Selenium	1 mg/l
Silver	5 mg/l

Note: Other elements and characteristics can cause a material to be hazardous as defined in Hazardous Products Act (Canada) and must be taken into consideration.
- .3 Carry out demolition activities involving lead-containing paints in accordance with Worksafe B.C. Regulations Part 6 Substance Specific Requirements Lead and all applicable regulations.
- .4 Inspection and Air monitoring shall be conducted by a 3<sup>rd</sup> party environmental consultant retained and paid for by the Contractor
  - .1 All inspection reports shall be provided to the Departmental Representative.
  - .2 3<sup>rd</sup> party environmental consultant shall inspect and approve in writing (sign-off) enclosure prior to any work proceeding.
  - .3 All waste manifests shall be provided to the Departmental Representative.
- .5 Remove, handle, transport and dispose of as indicated in Section 02 83 11.

**22. Electrical Safety Requirements**

- .1 Comply with authorities and ensure that, when installing new

facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.

- .1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative.
- .2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.
- .3 Develop, implement and enforce a communication plan with Departmental representative and EGD maintenance staff for all electrical work and lockout procedures.

- 23. Electrical Lockout** .1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.
- .2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental Representative.
  - .3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

- 24. Overloading** .1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.

- 25. Falsework** .1 Design and construct falsework in accordance with CSA S269.1-1975 (R2003).

- 26. Scaffolding** .1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 and B.C. Occupational Health and Safety Regulations.

- 27. Confined Spaces** .1 Carry out work in confined spaces in compliance with Worksafe B.C. Part 9 Confined Spaces and CSA Z1006-10 Management of Work in Confined Space.

**28. Restricted Access**

- 
- .1 Contractor shall perform a hazard assessment and develop an appropriate restricted access entry plan in accordance with Worksafe B.C. regulations.

**29. Confined Space and Restricted Space Outside of Defined Work Site**

- .1 Carry out work in confined spaces in compliance with Worksafe B.C. Part 9 Confined Spaces and CSA Z1006-10 Management of Work in Confined Space. Coordinate all confined space entry work with PSPC Departmental Representative through the contractor's confined space entry permit system.
- .2 Contractor shall perform a hazard assessment and develop an appropriate restricted access entry plan in accordance with Worksafe B.C. regulations. Coordinate all restricted access space entry work with the PSPC Departmental Representative prior to entry.
- .3 The Contractor is required to provide a reasonable amount of time to the Departmental Representative for making arrangements for entry and/or access to Confined Space or Restricted Access spaces located outside the designated work site.

**30. Powder-Actuated Devices**

- .1 Use powder-actuated devices in accordance with ANSI A10.3 only after receipt of written permission from the Departmental Representative.

**31. Fire Safety and Hot Work**

- .1 Coordinate all hot work with PSPC Departmental Representative through the contractors' hot work permit system.
- .2 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.
- .3 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.

**32. Fire Safety**

**Requirements**

- .1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
- .2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

**33. Fire Protection and**

**Alarm System**

- .1 Fire protection and alarm systems shall not be:
  - .1 Obstructed.
  - .2 Shut off.
  - .3 Left inactive at the end of a working day or shift.
- .2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.
- .3 Be responsible/liable for costs incurred from the fire department, the building owner and the tenants, resulting from false alarms.

**34. Unforeseen Hazards**

- .1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of the work, immediately stop work and advise the Departmental Representative verbally and in writing.

**35. Posted Documents**

- .1 Post legible versions of the following documents on site:
  - .1 Site Specific Health and Safety Plan.
  - .2 Sequence of work.
  - .3 Emergency procedures.
  - .4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.
  - .5 Notice of Project.
  - .6 Floor plans or site plans.
  - .7 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.
  - .8 Workplace Hazardous Materials Information System (WHMIS) documents.
  - .9 Material Safety Data Sheets (MSDS).
  - .10 List of names of Health and Safety Coordinator, Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.

- .2 Post all Material Safety Data Sheets (MSDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.
- .3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

**36. Meetings**

- .1 Attend health and safety pre-construction meeting and all subsequent meetings called by the Departmental Representative.
- 2. All personnel employed by the contractor and its subcontractors shall attend the mandatory EGD Safety Orientation presentation prior to performing Work at the EGD Work Site.

**37. Correction of Non-Compliance**

- .1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance with health and safety issues identified.
- .3 The Departmental Representative may issue a "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. The Contractor will be responsible for any costs arising from such a "stop work order".

**END OF SECTION**

**1. Definitions**

- .1 **Environmental Pollution and Damage:** presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
- .2 **Environmental Protection:** prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

**2. Submittals**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.
- .3 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .4 Environmental protection plan to include:
  - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
  - .2 Names and qualifications of persons responsible for manifesting contaminated

- materials and hazardous waste to be removed from site.
- .3 Names and qualifications of persons responsible for training site personnel.
  - .4 Descriptions of environmental protection personnel training program.
  - .5 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
  - .6 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
  - .7 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
  - .8 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
  - .9 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

**3. Fires**

- .1 Fires and burning of rubbish on site is not permitted.

**4. Waste Management and Disposal**

- .1 Accomplish maximum control of construction waste to preserve environment and prevent pollution and environmental damage
  - .1 All disposal, recycling and waste manifests shall be provided to the Departmental Representative.
  - .2 Leachate quality criteria testing and analysis must be conducted and paid for by the Contractor for all dust and debris to be disposed of, to assess if material levels meet the criteria of Hazardous Waste as per BC Ministry of Environment regulations.
    - .1 Provide Test Results to the Departmental Representative.
- .2 Identify opportunities for waste reduction, reuse, and recycling of materials.
- .3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide containers to deposit reusable and recyclable materials
- .5 Collect, handle, store on-site, and transport off-site, salvaged materials in separated condition.
- .6 Store materials to be reused, salvaged, and recycled in locations as directed by the Departmental Representative.
- .7 Unless otherwise specified, materials for removal become Contractor's property.
- .8 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to

licensed disposal facility.

- .9 Do not bury rubbish and waste materials on site.
- .10 Do not dispose of wastes into water courses, storm, or sanitary sewers.
- .11 Washout of concrete trucks is prohibited on site

**5. Work Adjacent to Waterway**

---

- .1 Do not dump waste material or debris in waterways.

**6. Pollution Control**

---

- .1 Maintain pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authorities' emission requirements.
- .3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
  - .1 Ambient Air Quality –Visible Emissions: The criteria for assessing the adequacy of the controls over Visible Emissions shall be as follows:
    - .1 Visible emissions shall be controlled as described below. Unacceptable emissions shall be cause for the project shut down until corrections to the containment are made. Visible emissions shall be determined in accordance with SSPC Guide 6 – Guide for Containing Debris Generated during Paint Removal Operations (Reference 2.3) Section 5.5.1.1 and shall not exceed Level 0 Emissions.
    - .2 Visible emissions shall be determined in accordance with SSPC Guide 6 – Guide for Containing Debris Generated during Paint Removal Operations (Reference 2.3) Section 5.5.1.1 General Surveillance.
    - .3 Air Monitoring and Inspections shall be the responsibility of the Contractor and must be

- conducted by a third party consultant.
- .2 Ambient Air Quality for Lead – Personal Monitoring to Establish Regulated Areas:
    - .1 The contractor shall establish a regulated area surrounding activities where lead exposures may exceed the PEL. This includes the paint removal area, dust collection equipment, equipment, and any locations where lead containing debris is handled or transferred to storage containers.
    - .2 The regulated area shall be demarcated by ropes, tape, walls, or other similar means, and the contractor shall control access to only those persons properly trained and protected as required.

**7. Notification**

- .1 Departmental Representative will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

**8. Spills or Release of Deleterious Substances**

- .1 Measures to be implemented to prevent, control or mitigate spills or release of deleterious substances:

- .1 Contractor shall take due care to ensure no deleterious materials enter watercourses or any surface drainage pathways located in the project area.
- .2 Emergency response procedure for spills of deleterious substances must be in place. In the event of a spill, the contractor will immediately implement their Spill Response Protocol.
- .3 The Contractor is responsible for all costs associated with a spill or release as a result of their actions. This will include but not limited costs of spill response equipment and materials, associated sampling, analysis and any required restoration of the impacted area.
- .4 Response equipment to be on site at all times (i.e. spill kits) and workers trained in their location and use. The resources on hand must be sufficient to respond effectively and expediently to any spill that could occur on site.
- .5 All construction equipment brought onto the site will be clean and properly maintained.
- .6 Any equipment maintenance must occur in a designated area and must be conducted away from any surface water drains or collection points.
- .7 Any equipment remaining on site overnight shall have appropriately placed drip pans.
- .8 Waste generated will be prevented from entering the environment.
- .9 Prevent discharges containing paint and coatings, asphalt, grout, concrete or other waste materials from reaching storm drains or the marine environment.

**END OF SECTION 01 35 43**

**1. Access and Delivery**

- .1 Only the designated entrance may be used for access to the site. The designated entry and exit will be via the Main Esquimalt Graving Dock gate on Admirals Road, along the Main Access Road, and along the south side of the dry dock.
- .2 Vehicular movement in and out of the Esquimalt Graving Dock will pass through check points and be monitored by EGD security. All Contractor's and Subcontractor's staff must carry current photo identification and an EGD Contractor security pass.
- .3 Contractor is required to use only the designated entrance to access the work site, for deliveries to site, and as the exit for offsite disposal.
  - .1 Maintain for duration of contract.
  - .2 Make good damage resulting from Contractor's use.
- .4 Use of the Esquimalt Graving Dock facility will be granted to the Contractor through the Departmental Representative.
  - .1 Parking for Contractor shall be confined within the Contractor's Work Area as shown on the drawings. Unauthorized parking outside of the Contractor's Work Area is prohibited unless authorized in writing by the Departmental Representative. Security will be instructed to have unauthorized vehicles towed at the Contractor's Expense.
- .5 Provide and maintain access roads, sidewalk crossing ramps and construction runways as may be required for access to the work. All roadways and walkways outside of the Contractor's work site must be kept clear of materials and equipment at all times.
- .6 Provide and maintain competent flag operators, traffic signals, barricades and flares, lights or lanterns as may be required to perform work and protect other users of the Esquimalt Graving Dock.

**2. Storage Facilities**

- .1 Storage space will be limited to the contractor's Work Area as identified on the drawings.

**3. Power**

- .1 Electrical power may be obtained at site for use during duration of the work free of charge.
  - .1 Contractor shall provide 48 hours written notice to the Departmental Representative requesting use of electrical power at site

**4. Air**

- .1 Compressed air may be obtained at site for use during duration of the work free of charge.
  - .1 Contractor shall provide 48 hours written notice to the Departmental Representative requesting use of compressed air at site.

**5. Water Supply**

- .1 Water supply may be obtained at site for use during duration of the work free of charge.
  - .1 Contractor shall provide 48 hours written notice to the Departmental Representative requesting use of water at site.

**6. Crane Services**

- .1 Crane services may be obtained at site for use during duration of the work free of charge.
- .2 Contractor shall provide 48 hours written notice to the Department Representative requesting use of crane services at site.
- .3 Contractor is responsible to provide qualified rigger(s) and spotter(s), all required rigging and associated equipment required below the hook necessary to perform lifts.

**7. Removal of Temporary Facilities**

- .1 Remove temporary facilities from site when directed by the Departmental Representative.

**8. Signs and Notices**

- .1 Signs and notices for safety and instruction shall be in both official languages or graphic symbols conforming to CAN/CSA-Z321.
- .2. Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or when directed by Departmental Representative.

**END OF SECTION 01 51 00**

**1. References**

- .1 Section 013533 – Health and Safety Requirements.
- .2 Section 013543 – Environmental Procedures.
- .3 WorkSafe BC Regulations – Part 6 – Substance Specific Requirements.
- .4 Canadian Standards Association (CSA International)
  - .1 CSA-O121-[M1978(R2003)], Douglas Fir Plywood.

**2. Installation and Removal**

- .1 Provide temporary enclosures (lead and cleaning/removal products) as required in order to execute work.
- .2 Remove from site all such work after use.

**3. Access to Site**

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

**4. Public Traffic Flow**

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

**5. Fire Routes**

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

**6. Protection for Off-Site and Public Property**

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

**7. Protection of Existing  
Property**

- .1 Provide protection for finished and partially finished property and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

**END OF SECTION 01 56 00**

- 1. Submission**
- .1 Prepare instructions and data by personnel experienced in maintenance of described products.
  - .2 Revise content of documents as required before final submittal.
  - .3 If requested, furnish evidence as to type, source and quality of products provided.
  - .4 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- 2. Format**
- .1 Organize data in the form of an instructional manual.
  - .2 Binders: vinyl, hard covered, 3 "D" ring, loose leaf 219 x 279 mm with spine and face pockets.
  - .3 Cover: identify each binder with type or printed title "Project Record Documents"; list title of project and identify subject matter of contents.
  - .4 Arrange content by product under section numbers and sequence of Table of Contents.
  - .5 Provide tabbed fly leaf for each separate product, with typed description of product and major component parts of equipment.
  - .6 Text: manufacturer's printed data, or typewritten data.
  - .7 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- 3. Contents, Each Volume**
- .1 Table of Contents – provide the following:
    - .1 Title of project.  
Date of submission.
    - .2 Names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
    - .3 Schedule of products, indexed to content of volume.
  - .2 For each product, list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

- 
- .3 Product data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
  - .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- 4. As-built Documents**
- .1 **Contract drawings and shop drawings:** legibly mark each item to record actual construction, including:
    - .1 Field changes of dimension and detail.
    - .2 Changes made by change orders.
    - .3 Details not on original Contract drawings.
    - .4 References to related shop drawings and modifications.
  - .2 **Contract Specifications:** legibly mark each item to record actual "Workmanship of Construction", including:
    - .1 Manufacturer, trade name, and catalogue number of each "Product/Material" actually installed, particularly optional items and substitute items.
    - .2 Changes made by addenda and change orders.
  - .3 **As-built information:**
    - .1 Record changes in red ink.
    - .2 On site "Red Line" As-Built documents to be reviewed with Departmental Representative at project meetings to ensure up-to-date and accurate As-Built documents at the end of the project.
    - .3 Mark on 1 set of drawings, specifications and shop drawings at completion of project and, before final inspection.
    - .4 Provide electronic as-built information in PDF and AutoCAD 2013 formats on 1 USB Digital Storage Device.
    - .5 Submit to the Departmental Representative.
- 5. Warranties, Bonds, Test Reports, Inspection Reports**
- .1 Separate each Document with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier and manufacturer with name, address, and telephone number of responsible principal.

- .3 Obtain Warranties, Bonds, Test Results, Inspection Reports executed in duplicate by subcontractors, suppliers, manufacturers, and inspection agencies within 10 days after completion of the applicable item of work.
- .4 Except for items put into use with the Departmental Representative's permission, leave date of beginning of time of warranty until the date of substantial performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

**6. Completion**

- .1 Submit a written certificate that the following have been performed:
  - .1 Work has been completed and inspected for compliance with the Contract documents.
  - .2 Defects have been corrected and deficiencies have been completed.
  - .3 Equipment and systems have been tested, adjusted and balanced as required.
  - .4 Work is complete and ready for final inspection.

**END OF SECTION 01 78 30**

**1. Scope**

- .1 This specification covers the requirements for worker protection and the handling of dust and debris generated during the removal of damaged paint and corrosion and re-coating of the Boom, Jib, Rams, Backstays, Associated Structure and Appendages of the 30T Kone and 150T Krupp cranes located at the Esquimalt Graving Dock. The work requires cleaning random areas of corrosion and deteriorated coatings to bare metal in preparation for application of new paint, and the performance criteria for the containment system. Environmental and Safety practices and regulations not specifically related to lead paint/coatings removal are included as a part of this specification and are covered elsewhere in the specifications package. Where conflict between sections occurs, the most stringent requirements will apply
- .2 All attachments to crane surfaces in area of work, but not to be prepared and painted, shall be protected from the work prior to commencement of work and any protective materials used are to be completely removed upon completion of work. No components shall be removed unless authorized in writing by the Departmental Representative. Protect all adjacent surfaces and structures from the work, including occupied spaces.
  1. Where paint requiring removal contains lead, complete the work under Moderate Risk "Lead" Procedures as defined by WorkSafeBC – Lead Containing Paints and Coatings (Prevention Exposure in The Construction Industry), including:
  2. Work area to be surrounded by barrier or enclosure.
- .3 See paint analysis reports in Appendices B and C;
  1. Assessment of Lead in Paint, 150 Ton Krupp Crane, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC, PSPC Project # R.090381.001," dated June 29, 2017, SNC-Lavalin Project No. 647910, and
  2. Assessment of Lead in Paint, 30 Ton Kone Crane, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC, PSPC Project # R.090380.001," dated July 3, 2017, SNC-Lavalin Project No. 647911.
- .4 Leachate quality criteria testing and analysis must be conducted for all dust and debris to be disposed of, to assess if material levels meet the criteria of Hazardous Waste as per BC Ministry of Environment regulations.
- .5 The Contractor shall implement programs and procedures which comply with the requirements of this specification and all applicable Federal, Provincial and local safety and environmental standards and regulations.
- .6 Inspections and air monitoring to be conducted by a third party environmental consultant (the Environmental Consultant).

**2. Applicable Sections**

.1 01 35 43 Environmental Procedures

.2 01 35 33 Health and Safety Requirements

**3. Products**

.1 PAINT REMOVAL PRODUCTS: Submit applicable Safety Data Sheets for paint removal products used in paint removal work. Use the least toxic product, suitable for the job and acceptable to the Departmental Representative.

**4. Reference Documents**

.1 Safety - WorkSafeBC:  
1. The Occupational Health and Safety (OHS) Regulation of BC  
2. The Canadian Occupational Health and Safety Regulations  
3. Hazardous Products Act (Canada)

.2 Environmental  
1. Environmental Management Act of BC  
2. Hazardous Waste Regulation  
3. Waste Discharge Regulation  
4. Contaminated Sites Regulation  
5. Transportation of Dangerous Goods Act, Canada 1992

.3 Standards & Specifications  
1. WorkSafeBC – Lead – Containing Paints and Coatings (Preventing Exposure in the Construction Industry)  
2. Canadian Standards Association – protective equipment (respirators, steel toed boots, hard hats, safety glasses, gloves as applicable)  
3. The Society for Protective Coatings (SSPC)  
4. SSPC Guide 6 – Guide for Containing Debris Generated During Paint Removal Operations  
5. SSPC Guide 7 – Guide for the Disposal of Lead Contaminated Surface Preparation Debris

**5. Definitions**

.1 Lead Containing Paint: Paint is classified as lead containing if it contains 90 ppm lead or greater. This can be determined from prior knowledge of the coating or through laboratory testing in accordance with ASTM D3335.

.2 Hazardous Waste: Paint debris is classified as hazardous due to the characteristic of toxicity, if after testing by Toxicity Characteristic Leaching Procedure (TCLP), the leachate contains any of the elements in the concentrations listed below (or greater):

Arsenic	2.5 mg/l
Barium	100 mg/l
Cadmium	0.5 mg/l
Chromium	5 mg/l
Copper	100 mg/l
Lead	5 mg/l
Mercury	0.1 mg/l

Selenium 1 mg/l

Silver 5 mg/l

Note: Other elements and characteristics can cause a material to be hazardous as defined in **Hazardous Products Act (Canada)** and must be taken into consideration.

.3 Generator: The Departmental Representative is considered to be the generator of the waste for this project.

.4 Containment and Ventilation Systems: Includes the air tight containment structure (i.e., containment walls, floor, supporting structure, entryways); HEPA ventilation system (i.e., air input and exhaust) certified on the premises; and dust collection.

**6. Qualifications**

.1 Firm must have a minimum of five years documented experience in lead abatement projects and retain on site for the duration of the project a person who has completed and is current in all aspects of the WorkSafeBC Occupational Health & Safety Regulations for “Moderate Risk - Lead Abatement”.

.1 See Section 01 35 43 Environmental Procedures.

**7. Criteria for Controls Over Environmental Emissions**

**8. Execution**

.1 Notify the Departmental Representative 3 days prior to the start of any paint removal work.

.2 Lead Control Area Requirements.

1. Contain removal operations by the use of HEPA filtered power tools or liquid paint removal products.
2. Boundary Requirements: Provide physical boundaries around the lead control area by roping off the area or providing curtains, portable partitions or other enclosures to ensure that airborne concentrations of lead will not exceed 0.05 milligrams per cubic meter of air outside of the lead control area.

.3 Drop sheets must be used below the lead coating removal area. Perform paint removal work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition. Dust and waste must be cleaned up and removed by vacuuming with a HEPA filter-equipped vacuum certified within the last six months.

.4 Provide clean change rooms and a worker decontamination facility within the physical boundary around the designated lead control area in accordance with BC OHS Regulatory Requirements.

.5 Personnel shall wear and use protective clothing and equipment. Eating, smoking, or drinking is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been given appropriate training

**9. Criteria for  
Controls Over Worker  
Protection**

- and protective equipment.
- .6 Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area.
  - .7 Waste shall be stored in a sealed, lockable container on site pending results of leachate testing and prior to disposal.
  - .1 The contractor is advised that stabilization of the waste to reduce its leachability, or the dilution of the waste is NOT permitted.
  - .2 In the event that the waste has been sampled and reported as Hazardous Waste, the following requirements shall apply.
    - 1. Site Storage and Handling
      - 1. Special attention shall be given to the time of storage, amount of material stored at any one time, use of proper containers, and personnel training
      - 2. Contaminated debris shall not be placed on the unprotected ground and shall be shielded to prevent dispersion of the debris by wind or rain water
  - .3 Transportation and Disposal of Debris
    - 1. The Contractor shall arrange to have the debris transported from the site in accordance with the requirements of The Environmental Management Act of BC, Transportation of Dangerous Goods Act.
    - 2. Only licensed transporters and disposal facilities shall be used
    - 3. Signed manifests shall be returned to the departmental representative or his representative to verify that all steps of the handling and disposal process have been completed properly.
  - .4 The Contractor shall thoroughly HEPA vacuum, wash, or otherwise decontaminate reusable items prior to removal from the project site. Items include, but are not limited to, equipment, containment materials, ground covers, scaffolding, and change and decontamination facilities. If adequate cleaning is not possible, the materials shall be treated as hazardous waste and tested and disposed of in accordance with applicable legislation.
  - .5 The disposal location must be submitted for approval by the Departmental Representative minimum one week prior to disposal.

**END OF SECTION 02 83 11**

**1. Purpose**

1. The purpose of this specification is to describe the requirements for the application of grout material to re-grade the walk-on deck of the 150T Krupp Crane located at the Esquimalt Graving Dock Facility.

**2. References:**

1. Section 09 01 90
2. ASTM D695
3. ASTM D638
4. ASTM D790
5. ASTM D732
6. ASTM D648
7. ASTM C882
8. ASTM C109
9. CAN A23.2-6B
10. ASTM C157
11. ASTM C496
12. ASTM C469-02
13. Appendix D: EGD Environmental Best Management Practices

**3. Scope**

1. The intent of this specification is to describe the work required to regrade the walk-on deck on the 150T Krupp Crane to provide a consistent and even 2% cross fall away from the portal, allowing for runoff of water.
2. All material is Contractor Furnished.
3. For cleaning and preparation requirements, see Section 09 01 90.

**4. Precautions**

1. Mortars, grouts, and bonding agents shall be applied in accordance with all manufacturer's written instructions.
2. Precautions shall be taken to prevent damage and contamination of the interior area and exterior areas of the cranes from items such as, but not limited to, lead-containing-dust, other dust or debris, cleaning materials, wash water, etc. Close all access doors and hatches, temporarily blank and seal all other openings, inlets, and outlets, protect (wrapped and sealed) all equipment, fittings, windows,

sidelights, tally plates, electrical lighting etc subject to damage and not currently painted. Protect all non-painted surfaces and equipment from damage, i.e. plastic laminates, rubber products (hoses, shock mounts, expansion pieces, door/hatch/flap gaskets). Any spatter or drips on areas not specified to be painted shall be removed by the Contractor.

## **5. Cleaning And Preparation**

1. Any cleaning or preparation recommended by the manufacturer beyond that already specified in Section 09 01 90 shall be completed.
2. The Contractor shall certify and record that the areas have been prepared and cleaned to the specified standard.

## **6. Treatment**

1. The order of application of grout or mortar products specified in this section shall be coordinated with all products specified in Section 09 01 90.
2. Prior to application of the primary grout or mortar product, a manufacturer-approved bonding agent shall be applied.
3. The primary grout or mortar product shall be placed over the bonding agent in sufficient layers to achieve a consistent 2% slope away from the crane structure.

## **7. Products**

1. Bonding Agent shall meet the following criteria:
  - .1 Shall be a high-modulus, high-strength, epoxy-based protective coating and bonding adhesive.
  - .2 Shall be compatible for application over bare metal and/or all coatings applied to the walk-on deck during the course of this project,
  - .3 Shall be compatible for top-coating with Primary Grout or Mortar and products specified in Section 09 01 90.
  - .4 Shall be insensitive to moisture before, during, and after cure,
  - .5 Shall be free of polysulfides,
  - .6 Shall achieve a minimum 28-day compressive strength of 60MPa

- .7 Shall achieve a minimum 28-day modulus of elasticity of 3 GPa
- .8 Shall have the following Tensile Properties:
  - i. Minimum Tensile Strength: 30MPa
  - ii. Minimum Elongation at Break: 1.9%
  - iii. Minimum Modulus of Elasticity: 2GPa
- .9 Shall have the following Flexural Properties
  - i. Minimum Modulus of Rupture: 50 MPa
  - ii. Minimum Tangent Modulus of Elasticity in Bending: 3.0 GPa
- .10 Minimum Shear Strength: 40 MPa
- .11 Maximum Water Absorption: 2 hrs boil - 0.7%
- .12 Minimum Bond Strength, plastic concrete to steel: 13 MPa
- 2. Primary Grout or Mortar
  - .1 Shall be a one-component, polymer-modified repair and reprofiling grout or mortar with integral corrosion inhibitor.,
  - .2 Shall be compatible for application over selected bonding agent,
  - .3 Shall be manufacturer-recommended for exterior applications
  - .4 Shall be designed for high-build application up to minimum 40mm.
  - .5 Shall achieve a minimum 28-day compressive strength of 40MPa
  - .6 Minimum Bond Strength: 10 MPa
  - .7 Maximum 28-day shrinkage: 0.7%
  - .8 Minimum Modulus of Elasticity: 20 GPa

## **8. Application Requirements**

- 1. All products shall be applied in accordance with the Manufacturer's Product Data Sheets
- 2. The Contractor shall meet application and environmental requirements of the Manufacturer's Product Data Sheets.
- 3. The final surface of the mortar or grout shall be textured to provide a non-slip walking surface, either by the addition of granular material or by textured troweling, in accordance with the manufacturer's written recommendations.

4. The Contractor shall supply all materials, and provide manufacturer's names, product names, material technical data sheets, material batch numbers and any other pertinent information for all materials supplied. Materials shall not exceed manufacturer's stated shelf life.
5. Materials shall be delivered to the work site in the manufacturer's sealed containers, bearing the manufacturer's labels identifying product name, type, color, batch numbers, etc. Materials shall be stored in accordance with the manufacturer's written instructions.
6. The Contractor shall determine material quantities, and quantities shall be sufficient to comply with this specification and inform the Departmental Representative of their requirements.
7. The Contractor shall keep records during the application process as detailed in Appendix E including: details concerning the quantities of product used, manufacturer's name and date of manufacture. The thickness for each coat, temperature and humidity readings. Records of dry bulbs, relative humidity and temperature of surfaces being painted shall be recorded before application commences and every four hours thereafter or when ambient conditions change.

## **9. Measurement and Payment**

1. On the 150T Krupp:
  - .1 Mortar or Grout application will be measured in square metres of walk-on deck coated to the appropriate thickness, providing a consistent 2% cross fall away from the crane structure.
  - .2 Payment for each square metre of mortar or grout shall be made at the unit price rate tendered for "Apply Deck Re-Grading System"
2. Work completed and paid for under this section shall include all access, rigging, material, equipment and other associated costs required to install the final products as specified.

## **10. Safety**

1. Attention is drawn to the highly inflammable nature of the specified coatings and their solvents. Care must be exercised to ensure adequate ventilation is provided to prevent explosive concentrations of vapours

and that sources of ignition are eliminated from areas where such concentrations could occur.

2. The Contractor shall comply with all safety regulations and the requirements of all Material Safety Data Sheets.

**11. Environmental Regulations And Requirements**

1. Environmental protection requirements described in Section 01 35 43 – Environmental Procedures shall be adhered to at all times.

**12. Quality Assurance**

1. Products shall be applied by personnel trained and familiar with the specific product selected for use.
2. Application shall be completed in strict accordance with the manufacturer's written instructions
3. Application shall be completed in a manner to ensure the manufacturer's warranty is intact and valid.

**END OF SECTION**

**1. Purpose**

1. The purpose of this specification is to describe the requirements for re-coating work on the 30T Kone Crane and the 150T Krupp Crane located at the Esquimalt Graving Dock Facility.

**2. References:**

1. Steel Structures Painting Manual, Volume 2, Eighth Edition
2. SSPC-SP-1, Solvent Cleaning
3. SSPC-SP-11, Power Tool Cleaning To Bare Metal
4. SSPC-SP-12/NACE 5, High Pressure Water Jet Cleaning
5. SSPC-VIS-3, Visual Standard For Power And Hand Tool Cleaned Steel
6. SSPC-VIS-4, Visual Reference For Steel Surfaces Cleaned by Waterjetting
7. Appendix D: EGD Environmental Best Management Practices

**3. Scope**

1. The intent of this specification is to describe the work required to: clean, prepare and treat the specified areas of the cranes.
  - .1 On the 30T Kone, the work requires cleaning random areas of corrosion and deteriorated coatings to bare metal and treating as specified. Random areas of corrosion are further defined as localized, widely scattered paint damage and chips typically not more than 2.5cm x 2.5cm. These random areas of corrosion shall be re-painted directly.
  - .2 On the 150T Krupp, the work requires cleaning random areas of corrosion and deteriorated coatings to bare metal. This will involve the removal of lead-containing-paints. Random areas of corrosion are further defined as localized, widely scattered paint damage and chips typically not more than 2.5cm x 2.5cm. Additionally, the full walk-on deck area shown on the drawings shall be cleaned to bare metal. All portions of the crane included in this project and as shown on the drawings, including those cleaned to bare metal shall be cleaned, prepared, and receive a new painted coating. Work at the walk-on deck also includes the application of deck-thickeners for re-grading as described in Section 03 62 13 which shall be coordinated as specified.

2. All material is Contractor Furnished.

#### **4. Precautions**

1. Coatings shall be applied by brush or roller. Spray systems are not to be used.
2. Precautions shall be taken to prevent damage and contamination of the interior area and exterior areas of the cranes from items such as, but not limited to, lead-containing-dust, other dust or debris, cleaning materials, wash water, etc. Close all access doors and hatches, temporarily blank and seal all other openings, inlets, and outlets, protect (wrapped and sealed) all equipment, fittings, windows, sidelights, tally plates, electrical lighting etc subject to damage and not currently painted. Protect all non-painted surfaces and equipment from damage, i.e. plastic laminates, rubber products (hoses, shock mounts, expansion pieces, door/hatch/flap gaskets). Any paint spatter or drips on areas not specified to be painted shall be removed by the Contractor.

#### **5. Cleaning And Preparation**

1. The cranes shall be cleaned prior to the treatment of corroded areas as follows:
  - .1 Treat all surfaces through the application of a chemical cleaner such as Devprep 88 or equivalent. Equivalent products are to be submitted to the Departmental Representative for review after contract award and prior to use on site per Section 013300 and Section 013301.
  - .2 Clean all surfaces with low pressure water (LP WC) at a minimum pressure of 3000 psi, using hot water and biodegradable cleaner/degreaser to remove all surface contaminates, loose and flaking paint. SSPC SP-12/NACE 5 shall be reviewed for information on water jetting and appropriate safety considerations.
  - .3 After LP WC, areas of remaining oil/grease shall be cleaned in accordance with SSPC-SP-1.
  - .4 All wash water, cleaning products, debris, etc that results from the cleaning and preparation of the cranes shall be captured and disposed of in accordance with environmental regulations. All drains in the area of the work shall be filtered to prevent

---

the accidental discharge of contaminated cleaning products.

2. Corroded areas of the specified structure shall be cleaned to bare metal in accordance with SSPC-SP-11 to achieve a final surface condition as depicted in SSPC VIS 3, E SP 11. Produce or expose an angular profile of at least 50 microns over the entire SP-11 area.
3. Bare steel areas exhibiting any degree of polishing and burnishing or with an angular profile less than 50 microns must not be over coated until they meet these requirements. The following requirements also apply,
  - .1 The surrounding intact coating shall be feathered back approx. 2 inches to present a smooth final finish when painted.
  - .2 The Contractor shall subject solid wastes (for example paint chips) to testing to determine appropriate disposal options. Dispose of all hazardous waste in accordance with all applicable Municipal, Provincial and Federal regulations and legislation. The Contractor shall provide a Certificate of Disposal.
  - .3 Localized spot surface preparation is to be accomplished by means of power tools to SSPC-SP-11 standards. Each tool is to have local containment as described in Section 02 83 11 to limit the amount of general containment needed.
5. The Contractor shall certify and record that the areas have been prepared and cleaned to the specified standard.

#### **6. Chloride Ion Testing (Bare Metal)**

1. Do not coat over bare metal surfaces until such time as a chloride level of less than 5 pg/cm<sup>2</sup> is achieved.

- .1 Use semi-quantitative tests in accordance with SSPC-TU 4, Cell Retrieval Methods, Swabbing R, or Washing Methods to certify and record the level of chloride ions. The Technical Inspector shall witness these tests.
- .2 Perform one test per every 50 sq.m. area representative of the overall area.

**7. Visual Cleanliness (Bare Metal)**

1. Prior to priming bare metal verify cleanliness by examining a clear adhesive tape pressed on the surface at several locations that are representative of the entire area, and removed. When viewed, the removed tape shall be free from any visible dust, dirt, and other contaminants.

**8. Treatment**

1. The specified structure shall be washed with fresh water to remove all dirt, dust and debris
2. Corroded areas taken to bare metal shall receive sufficient coats of High Build Epoxy Primer to 5-7 mils minimum DFT.
3. On completion of the specified preparation and treatment of corroded areas and the cleaning of all areas an overall coat of Urethane.

**9. Products**

1. High-Build Epoxy Primer shall meet the following criteria:
  - .1 Shall be a high performance, multi-purpose, surface tolerant, two-component chemicallycured epoxy semi-gloss coating.
  - .2 Shall be compatible for application over bare metal and all coatings existing on the cranes,
  - .3 Shall include a minimum of 75% solids by volume,
  - .4 Shall be suitable for salt water immersion,
  - .5 Shall be suitable for corrosive environments,
  - .6 Shall be resistant to solvents and chemicals,
  - .7 Shall be resistant to cathodic disbondment,
2. Urethane Top Coat shall meet the following criteria:
  - .1 Shall be a high performance, two-component chemically-cured aliphatic urethane gloss finish,



- .2 Primer coat applied in 2008      Epoxy
- .3 Finishing coat applied in 2008      Urethane

**13.    Coating Requirements**

1. All coatings shall be applied in accordance with the Manufacturer's Product Data Sheets with the exception of the Dry Film Thickness which shall be as follows:
  - .2 DFT High-Build Epoxy shall be spot applied 5-7 mils over all areas prepared to bare metal (SP11).
  - .3 DFT for Urethane Top Coat shall be 2-3mils as an overall coat.
2. The Contractor shall meet application and environmental requirements of the Manufacturer's Product Data Sheets.
3. The Contractor shall supply all materials, and provide manufacturer's names, product names, material technical data sheets, material batch numbers and any other pertinent information for all materials supplied. Materials shall not exceed manufacturer's stated shelf life.
4. Materials shall be delivered to the work site in the manufacturer's sealed containers, bearing the manufacturer's labels identifying product name, type, color, batch numbers, etc. Materials shall be stored in accordance with the manufacturer's written instructions.
5. The Contractor shall determine material quantities, and quantities shall be sufficient to comply with this specification and inform the Departmental Representative of their requirements.
6. The Contractor shall keep records during the coating application process as detailed in Appendix E including: details concerning the quantities of paint used, manufacturer's name and date of manufacture of paint. The thickness for each coat, temperature and humidity readings. Records of dry bulbs, relative humidity and temperature of surfaces being painted shall be recorded before painting commences and every four hours thereafter or when ambient conditions change.

**14.    Estimating**

1. For estimating purposes the Contractor shall quote on the following areas for the cleaning, surface preparation, and treatment of the specified structure.

- .1 30T Kone

- .1 Random areas to be taken to bare metal and re-coated – estimate on:

1. 2 sq. m. on the Main Boom, including catwalks and platforms
2. 2 sq. m. on the Jib, including catwalks and platforms
3. 2sq. m. on the Rams & Backstays
4. 85sq. m. on the underside of machine house and operator’s cab

- .2 150T Krupp

- .1 Random areas to be taken to bare metal – estimate on:

1. 18 sq. m. consisting 16 sq. m. of walk-on deck surface below Main Boom plus 2 sq. m. randomly distributed corrosion.

- .2 One coat overall – estimate on:

1. 1237 sq. m.

**15. Measurement and Payment**

1. On the 30T Kone:

- .1 Cleaning to bare metal will be measured in square metres of bare, clean metal exposed.
- .2 Payment for each square metre of surface cleaning will be made at the unit price rate tendered for “Clean to Bare Metal, Clean and Prep for New Coating”
- .3 Coatings will be measured in square metres of structure completely coated.
- .4 Payment for each square metre of coated structure will be made at the unit price rate tendered for “Apply New Coating System”

2. On the 150T Krupp:

- .1 Cleaning to bare metal will be measured in square metres of bare, clean metal exposed.

- .2 Payment for each square metre of bare, clean metal exposed shall be made at the unit price rate tendered for “Clean to Bare Metal, Clean and Prep for New Coating”
- .3 Coatings will be measured in square metres of structure completely coated.
- .4 Payment for each square metre of coating shall be made at the unit price rate tendered for “Apply New Coating System”
3. Work completed and paid for under this section shall include all access, rigging, material, equipment and other associated costs required to install the final products as specified.

**16. Safety**

1. Attention is drawn to the highly inflammable nature of the specified coatings and their solvents. Care must be exercised to ensure adequate ventilation is provided to prevent explosive concentrations of vapours and that sources of ignition are eliminated from areas where such concentrations could occur.
2. The Contractor shall comply with all safety regulations and the requirements of all Material Safety Data Sheets.

**17. Environmental Regulations And Requirements**

1. Environmental protection requirements described in Section 01 35 43 – Environmental Procedures, will govern over any requirement noted within this section. Additional information is provided here for reference.
2. The Contractor shall remove, handle, store, transport and dispose of all hazardous materials and waste in accordance with applicable legislation. Precautions shall be taken during cleaning and painting to protect the surrounding area and the environment from contamination. Precautions shall be taken during coatings removal operations as existing coatings may contain heavy metals such as lead and chromates.
3. The following environmental aspects must be considered for the above work specification. This list may not be all inclusive and does not remove the responsibility of the ship repair facility or Contractor to

---

identify all the environmental aspects related to this work specification:

- .1 Air emissions: solvent cleaning, power tool cleaning, coating application;
- .2 Hazardous materials: solvents, epoxies, polyurethanes, alkyd enamel;
- .3 Hazardous waste: solvents, coatings;
- .4 Noise emissions: power tool cleaning;
- .5 Non-hazardous solid waste: cured coating waste;
- .6 Process water: wash water, solvent cleaning; and
- .7 Spills/releases: paints, solvents.

## **18. Workmanship**

1. All work shall be completed to high standard of workmanship. The dried film shall be free from runs, sags, curtains, drips, holidays and shall be within the specified dry film thickness range. All deficiencies shall be corrected and touched up areas shall be allowed to cure as specified before placing the finished coating system into service.
2. There shall be no un-coated areas. Areas not having sufficient build of coatings are to be re-coated with the topcoat until final DFT is achieved.

## **19. Inspections**

1. The Contractor shall conduct self-inspections and supply to the Departmental Representative the required documentation.
  - .1 Self-Inspections shall be completed by a third-party inspector certified to NACE Level 3, retained and paid for by the Contractor.
    - .1 Provide proof of Inspector's NACE Level 3 certification in accordance with Section 01 33 00
2. Mandatory inspections and hold points require Departmental Representative to witness. The Contractor shall inform the Departmental Representative 24 hrs in advance when work is ready to be inspected. These inspections include

- .1 Visual Cleanliness Tests
  - .2 Chloride Ion Tests
  - .3 Surface Profile Tests
  - .4 Dry Film Thickness Tests & paint quality inspections after each coat
3. The Contractor is to identify the type or model of instrument intended to be used for each of the requisite tests, including its last calibration date.
  4. Submit all test reports in accordance with Section 01 33 00.

**20. Quality Assurance**

1. Coatings shall be applied by personnel trained and familiar with the specific product selected for use.
2. Coating application shall be completed in strict accordance with the manufacturer's written instructions
3. Coating application shall be completed in a manner to ensure the manufacturer's warranty is intact and valid.

**21. Deliverables**

4. Forward the following deliverables to the Departmental Representative within five working days of test or examination;
  - .1 Contractor completed forms; and
  - .2 Preparation and Treatment Recording, Form Appendix E.
  - .3 Disposal Certificates

**END OF SECTION**

---

Esquimalt Graving Dock, Victoria, B. C.

30T Kone Crane Painting: Project No. R.090380.001 &  
150T Krupp Crane Painting: Project No. R.090381.001

**APPENDIX A**  
July 2017

---

**APPENDIX A**

**PRELIMINARY HAZARD ASSESSMENT FORM**



**PRELIMINARY HAZARD ASSESSMENT FORM**

Project Number:	R.090380.001 - 30T Kone Crane Painting FY17/18 R.090381.001 - 150T Crane Painting FY17/18
Location:	Esquimalt Graving Dock
Date:	May 5, 2017
Name of Departmental Representative:	Jon Siska, Project Manager
Name of Client:	EGD-EAS-IAM
Name of Client Project Co-ordinator	Jason Wallach, EGD Crane Services Supervisor

Site Specific Orientation Provided at Project Location    Yes     No

Notice of Project Required    Yes     No

**NOTE:**

PWGSC requires "**A Notice of Project**" for all construction work related activities.

**NOTE:**

OHS law is made up of many municipal, provincial, and federal acts, regulations, bylaws and codes. There are also many other pieces of legislation in British Columbia that impose OHS obligations.

*Important Notice: This hazard assessment has been prepared by PWGSC for its own project planning process, and to inform the service provider of actual and potential hazards that may be encountered in performance of the work. PWGSC does not warrant the completeness or adequacy of this hazard assessment for the project and the paramount responsibility for project hazard assessment rests with the service provider.*

TYPES OF HAZARDS TO CONSIDER	Potential Risk for:				COMMENTS
	PWGSC, OGD's, or tenants		General Public or other contractors		
Examples: Chemical, Biological, Natural, Physical, and Ergonomic					Note: When thinking about this pre-construction hazard assessment, remember a <b>hazard</b> is anything that may cause harm, such as chemicals, electricity, working from heights, etc; the <b>risk</b> is the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.
Listed below are common construction related hazards. Your project may include pre-existing hazards that are not listed. Contact the Regional Construction Safety Coordinator for assistance should this issue arise.	Yes	No	Yes	No	

Typical Construction Hazards					
Concealed/Buried Services (electrical, gas, water, sewer etc)	X		X		No natural gas services on site.
Slip Hazards or Unsound Footing	X		X		
Working at Heights	X		X		
Working Over or Around Water	X		X		
Heavy overhead lifting operations, mobile cranes etc.	X		X		



Marine and/or Vehicular Traffic (site vehicles, public vehicles, etc.)	X		X		
Fire and Explosion Hazards	X		X		
High Noise Levels	X		X		
Excavations	X		X		
Blasting	X		X		
Construction Equipment	X		X		
Pedestrian Traffic (site personnel, tenants, visitors, public)	X		X		
Multiple Employer Worksite	X		X		
<b>Electrical Hazards</b>					
Contact With Overhead Wires		X		X	
Live Electrical Systems or Equipment	X		X		
<b>Physical Hazards</b>					
Equipment Slippage Due To Slopes/Ground Conditions		X		X	
Earthquake	X		X		
Tsunami	X		X		
Avalanche		X		X	
Forest Fires		X		X	
Fire and Explosion Hazards	X		X		
Working in Isolation		X		X	
Working Alone	X		X		
Violence in the Workplace	X		X		
High Noise Levels	X		X		
Inclement weather	X		X		
High Pressure Systems	X		X		
Other:					
<b>Hazardous Work Environments</b>					
Confined Spaces / Restricted Spaces		X		X	No confined space entry in scope.
Suspended / Mobile Work Platforms	X		X		
Other:	X		X		Overhead cranes.
<b>Biological Hazards</b>					
Mould Proliferations		X		X	
Accumulation of Bird or Bat Guano	X		X		
Bacteria / Legionella in Cooling Towers / Process Water		X		X	
Rodent / Insect Infestation		X		X	
Poisonous Plants		X		X	
Sharp or Potentially Infectious Objects in Wastes	X		X		Multiple employer workplace
Wildlife	X		X		Resident deer population; aggressive seagulls during nesting season.



Chemical Hazards					
Asbestos Materials on Site		X		X	
Designated Substance Present		X		X	
Chemicals Used in work	X		X		Active ship repair facility
Lead in paint	X		X		See attached reports.
Mercury in Thermostats or Switches		X		X	
Application of Chemicals or Pesticides		X		X	
PCB Liquids in Electrical Equipment		X		X	
Radioactive Materials in Equipment		X		X	
Other:					
Contaminated Sites Hazards					
Hazardous Waste	X		X		Suspected contaminated soils
Hydrocarbons	X		X		Suspected contaminated soils
Metals	X		X		Suspected contaminated soils
Other:	X		X		Suspected contaminated soils
Security Hazards					
Risk of Assault	X		X		Multiple employer workplace
Other:	X		X		No unauthorized entry to site.

Other Compliance and Permit Requirements <sup>1</sup>	YES	NO	Notes / Comments <sup>2</sup>
Is a Building Permit required?		X	Painting project
Is an Electrical permit required?	X		Required for any electrical work.
Is a Plumbing Permit required?			N/A
Is a Sewage Permit required?			N/A
Is a Dumping Permit required?			No dumping allowed on site
Is a Hot Work Permit required?	X		For all spark generating activities.
Is a Permit to Work required?		X	
Is a Confined Space Entry Permit required?			N/A
Is a Confined Space Entry Log required?			N/A
Discharge Approval for treated water required?	X		

**Notes:**

- (1) Does not relieve Service Provider from complying with all applicable federal, provincial, and municipal laws and regulations.
- (2) TBD means To Be Determined by Service Provider.

<b>Service Provider Acknowledgement: We confirm receipt and review of this Pre-Project Hazard Assessment and acknowledge our responsibility for conducting our own assessment of project hazards, and taking all necessary protective measures (which may exceed those cited herein) for performance of the work.</b>			
<b>Service Provider Name</b>			
<b>Signatory for Service Provider</b>		<b>Date Signed</b>	
<b>RETURN EXECUTED DOCUMENT TO PWGSC DEPARTMENTAL REPRESENTATIVE PRIOR TO ANY WORK COMMENCING</b>			

---

Esquimalt Graving Dock, Victoria, B. C.

30T Kone Crane Painting: Project No. R.090380.001 &  
150T Krupp Crane Painting: Project No. R.090381.001

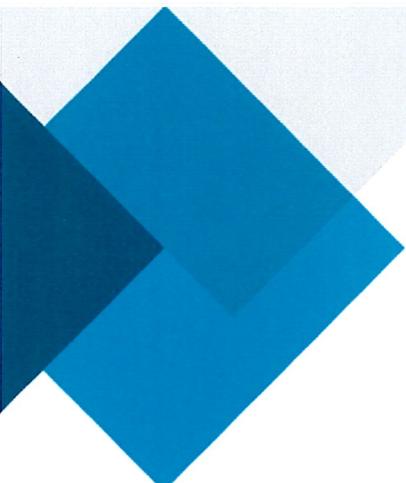
# **APPENDIX B**

July 2017

---

## **APPENDIX B**

### **ASSESSMENT OF LEAD IN PAINT – 30T KONE CRANE**



# Assessment of Lead in Paint

30 Ton Kone Crane, Esquimalt Graving Dock,  
825 Admirals Road, Esquimalt, BC,  
PSPC Project # R.090381.001

July 3, 2017

Project No.: 647911

Prepared For:

Public Services and Procurement Canada

Prepared By:



M. Aaron Hall, B.Sc., A.Sc.T.  
Project Scientist

Environment & Geoscience  
Infrastructure



Reviewed By:



Tim Drozda, P.Eng.  
Environmental Scientist

Environment & Geoscience  
Infrastructure



Doug McMillan, M.Sc., P.Ag.  
Senior Project Manager

Environment & Geoscience  
Infrastructure



SNC • LAVALIN

# Executive Summary

On behalf of Public Services and Procurement Canada (PSPC), SNC-Lavalin Inc. (SNC-Lavalin) has completed an assessment of lead in paint (the “assessment”) of the 30 Ton Kone crane (the “30T crane”) at the PSPC Esquimalt Graving Dock (EGD), Esquimalt, BC (the “Site”). SNC-Lavalin understands that the purpose of the work was to assess lead concentrations in painted surfaces prior to surface preparation for re-painting selected portions of the 30T crane. The 30T crane was reportedly installed at the Site in 2010.

The assessment was completed by SNC-Lavalin on June 14, 2017. Representative paint samples were collected from four (4) select surfaces and submitted for laboratory analysis of total lead concentrations. This report provides the analytical results of the samples collected by SNC-Lavalin during the assessment.

Based on the results of the assessment, all paint samples contained less than 90 mg/kg; therefore, specific procedures for handling or abatement are not required.

## Table of Contents

Executive Summary	i
1 Introduction	1
2 Scope of Work and Methodology	1
3 Regulatory Framework	2
4 Results	3
5 Quality Assurance/Quality Control	5
6 Summary and Recommendations	5
7 Notice to Reader	6

### In-Text Table

1: Detailed Inventory of Suspected Lead-Based Paint Samples – 30 Ton Kone Crane, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC	3
---	---

### Appendices

- I: Photographs
- II: Analytical Laboratory Certifications
- III: Laboratory Analytical Report

# 1 Introduction

On behalf of Public Services and Procurement Canada (PSPC), SNC-Lavalin Inc. (SNC-Lavalin) has completed an assessment of lead in paint (the “assessment”) of the 30 Ton Kone crane (30T crane) at the PSPC Esquimalt Graving Dock (EGD), 825 Admirals Road, Esquimalt, BC (the “Site”). SNC-Lavalin understands that the purpose of the work was to assess lead concentrations in painted surfaces prior to surface preparation for re-painting selected portions of the 30T crane.

SNC-Lavalin understands that the surfaces to be painted will be prepared via pressure washing and hand grinding and/or needle gun paint removal. SNC-Lavalin further understands that the 30T crane was installed at the Site in 2010 and that no previous assessment of lead in paint has been completed.

The PSPC project number is R.090381.001 and the task authorization number is CTA EZ113-150642/003/PWY.

# 2 Scope of Work and Methodology

The work was completed in general accordance with SNC-Lavalin’s proposal *30T Kone Crane Painting, Lead Based Paint Assessment, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC, Project # R.090381.001*, dated June 12, 2017.

On June 14, 2017, SNC-Lavalin personnel collected representative paint samples from selected surfaces of the 30T crane. The samples were submitted for laboratory analysis of total lead.

The following sections outline the specific protocols followed when completing the survey.

## Lead in Paint

Different paint colours may contain different concentrations of lead; therefore, SNC-Lavalin personnel inspected select areas of the 30T crane to determine primary paint colour(s) that had been applied to major surfaces. The approach was to try to obtain samples from structures that may need to be cut, ground, or sanded during surface preparation. Factory painted metal surfaces are not sampled as the paint is applied in thin layers, making it difficult to obtain a sufficient amount of paint to analyze. In addition, due to the area to be prepared, SNC-Lavalin collected additional representative samples of select paint colours.

On June 14, 2017, a total of four (4) samples were collected from the 30T crane as follows:

- › 30T-P1: Portal tube, blue paint over light blue;
- › 30T-P2: Portal girder, light blue;
- › 30T-P3: Gantry leg, light blue; and
- › 30T-P4: Bogey support, yellow paint over grey.

Samples were collected by physically scraping paint chips from the surface using hand tools. Approximately 5 to 10 g of paint chips were collected into clean sample bags and labelled for laboratory submission. Note that approximately 5 to 10 g is the recommended sample size for analysis of total lead in paint chips. Due to the difficulty of collecting sufficient paint mass for analysis via the

Toxicity Characteristic Leaching Procedure (TCLP) methodology, samples were not submitted for analysis of TCLP lead.

Samples were submitted to Maxxam Analytics in Burnaby, BC (Maxxam) for analysis of total lead in accordance with the applicable regulations. Photographs showing the sampling locations are provided in Appendix I.

Maxxam is accredited by CALA, and a copy of their accreditations is presented in Appendix II. Analysis of bulk samples for determination of lead concentration was performed using Inductively Coupled Plasma, Mass Spectrometry (ICP-MS) procedures.

## 3 Regulatory Framework

Federal and provincial regulations require that hazardous building materials, including lead in paint, be properly identified and managed to prevent potential exposure to workers. In addition, a more intrusive survey is required to identify materials of concern prior to renovations, salvage, or demolition of a building or structure. These materials must be properly controlled, removed, and/or disposed of at a suitably permitted facility in accordance with the applicable federal and provincial regulations. The following federal and provincial regulations relate to lead containing paint:

### **Federal**

Various Regulations made under the *Canadian Environmental Protection Act (CEPA)*, 1999, S.C. 1999, c. 33, last amended on December 21, 2016, including specialized handling and/or disposal requirements for materials including lead. Regulations include the following:

- › *Canada Labour Code, Part II*, R.S.C., 1985, c. L-2, last amended January 3, 2016.
- › *Canada Occupational Health and Safety Regulations*, SOR/86-304, last amended June 14, 2016.
- › *Surface Coating Materials Regulations*, SOR/2016-193<sup>1</sup>, requires the concentration of total lead and total mercury present in a surface coating material to be not more than 90 mg/kg and 10 mg/kg, respectively. SNC-Lavalin notes that requirements for total arsenic are not addressed in this regulation.
- › *Human Resources Social Development Canada (HRSDC), Canada Labour Code Part II*, Canada Occupational Health and Safety Regulations, Part X, Hazardous Substances, as amended, requires that all hazardous substances in the workplace, including lead in paint, be identified and controlled to minimize potential exposure to workers. Under the Canada Labour Code Part II definitions, a “hazardous substance” includes a controlled product and a chemical, biological, or physical agent that, by reason of a property that the agent possess, is hazardous to the safety or health of a person exposed to it.

### **Provincial**

- › *WorkSafeBC Occupational Health and Safety Regulation (OHSR)*, BC Reg. 296/97, includes amendments up to B.C. Reg. 9/2017, May 1, 2017 requires that hazardous materials, including lead or other heavy metal or toxic substances and flammable or explosive materials that may be handled, disturbed, or removed during demolition must be identified and removed or safely contained prior to

---

<sup>1</sup> Available at <http://laws-lois.justice.gc.ca/PDF/SOR-2016-193.pdf>

demolition. In addition, a copy of the observation report identifying these materials must be available at the work site. The requirements for the management of indoor air quality are also included.

- › *Hazardous Waste Regulation* (HWR), B.C. Reg. 63/88, including amendments up to B.C. Reg. 179/2016, requires all Hazardous Wastes (HW) must be properly managed and disposed of.

### **Lead Paint**

Federal and provincial guidelines limit lead concentrations in paint to 90 mg/kg for high risk individuals (i.e., pregnant women and children), and any concentrations that exceed this limit would be considered a lead-containing paint. WorkSafeBC has released a document *Safe Work Practices for Handling Lead*<sup>2</sup> that identifies the hazards posed by lead and provides direction on methods that should be used to control exposure. It also provides basic information regarding development and implementation of an exposure control plan and safe work procedures. Improper removal of paint resulting in airborne lead concentrations that exceed 50% of the airborne lead exposure limit of 0.05 mg/m<sup>3</sup> would trigger the requirement for an employer to file a Notice of Project Lead (NOPL) and the development and implementation of an exposure control plan and safe work procedures prior to any work being completed. Therefore, for the purposes of this report we have identified paint as lead-containing if the total lead concentration is >90 mg/kg as per the federal regulations, and if the paint contains lead concentrations >600 mg/kg, an exposure control plan may be required if the paint is disturbed in such a manner that workers could be exposed to lead at >50% of the exposure limit.

There are no special disposal requirements for materials coated with lead paint unless the lead is found to be leachable in excess of the regulated standard of 5 mg/L in the HW regulations while considering the entire mass of the object the paint is coating.

## 4 Results

Details of the results for the paint samples are presented in Table 1, below. All suspect lead paint samples were given prefix “30T-” to differentiate the crane from other cranes located on the Site.

**Table 1: Detailed Inventory of Suspected Lead-Based Paint Samples – 30 Ton Kone Crane, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC**

Identified Lead-Based Paint Description*	Photo
Portal Tube: <ul style="list-style-type: none"> <li>› Paint colour: Blue over light blue</li> <li>› Substrate: Metal</li> <li>› Approximate Extent: Full surface of portal tube</li> <li>› Analytical Result (Sample 30T-P1): &lt;9.0 mg/kg total lead</li> <li>› Condition: Good, no visible damage</li> <li>› Recommendation: No special handling or abatement required</li> </ul>	

<sup>2</sup> Available at: <https://www.worksafebc.com/en/resources/health-safety/books-guides/safe-work-practices-handling-lead>

**Table 1 (Cont'd): Detailed Inventory of Suspected Lead-Based Paint Samples – 30 Ton Kone Crane, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC**

Identified Lead-Based Paint Description*	Photo
<p>Portal Girder:</p> <ul style="list-style-type: none"> <li>› Paint colour: Light blue</li> <li>› Substrate: Metal</li> <li>› Approximate Extent: Full surface of portal girder</li> <li>› Analytical Result (Sample 30T-P2): &lt;9.0 mg/kg total lead</li> <li>› Condition: Good, no visible damage</li> <li>› Recommendation: No special handling or abatement required</li> </ul>	
<p>Gantry Leg:</p> <ul style="list-style-type: none"> <li>› Paint colour: Light blue</li> <li>› Substrate: Metal</li> <li>› Approximate Extent: Full surface of gantry leg</li> <li>› Analytical Result (Sample 30T-P3): &lt;9.0 mg/kg total lead</li> <li>› Condition: Good, no visible damage</li> <li>› Recommendation: No special handling or abatement required</li> </ul>	
<p>Bogey Support:</p> <ul style="list-style-type: none"> <li>› Paint colour: Yellow over grey</li> <li>› Substrate: Metal</li> <li>› Approximate Extent: Full surface of bogey supports</li> <li>› Analytical Result (Sample 30T-P4): 13.1 mg/kg total lead</li> <li>› Condition: Good; no visible damage.</li> <li>› Recommendation: No special handling or abatement required</li> </ul>	

\* **Bold** – indicates lead concentration greater than 90 mg/kg but less than 600 mg/kg.

\* **Bold and underlined** – indicates lead concentration greater than or equal to 600 mg/kg.

## 5 Quality Assurance/Quality Control

### Procedures

Quality Assurance/Quality Control (QA/QC) measures were undertaken to ensure unbiased and representative sample collection and accuracy of the laboratory analyses. Details of the QA/QC program are summarized below:

- › Use of trained and experienced personnel.
- › Implementation of SNC-Lavalin's preferred operating procedures (POPs).
- › Documentation of all field activities.
- › Sample collection in a manner appropriate for the prevention of cross-contamination and other field sampling errors, using appropriate decontaminated sampling tools, equipment and contaminant-free containers appropriate to the subsequent analyses.
- › Chain-of-custody documentation for sample submission.
- › Use of appropriately accredited laboratories for analysis of the samples.
- › Procedures to confirm accurate transcription of laboratory data into tables.
- › Review of laboratory QA performance to confirm results are acceptable.

Laboratory internal quality control measures are provided in the appended analytical report.

## 6 Summary and Recommendations

Based on the results of the assessment, all paint samples contained less than 90 mg/kg; therefore, specific procedures for handling or abatement are not required. Copies of the laboratory analytical reports for the results of the paint analyses are included in Appendix III.

## 7 Notice to Reader

This report has been prepared and the work referred to in this report has been undertaken by SNC-Lavalin Inc. (SNC-Lavalin), for the exclusive use of Public Services and Procurement Canada (PSPC), who has been party to the development of the scope of work and understands its limitations. The methodology, findings, conclusions and recommendations in this report are based solely upon the scope of work and subject to the time and budgetary considerations described in the proposal and/or contract pursuant to which this report was issued. Any use, reliance on, or decision made by a third party based on this report is the sole responsibility of such third party. SNC-Lavalin accepts no liability or responsibility for any damages that may be suffered or incurred by any third party as a result of the use of, reliance on, or any decision made based on this report.

The findings, conclusions and recommendations in this report (i) have been developed in a manner consistent with the level of skill normally exercised by professionals currently practicing under similar conditions in the area, and (ii) reflect SNC-Lavalin's best judgment based on information available at the time of preparation of this report. No other warranties, either expressed or implied, are made with respect to the professional services provided to PSPC or the findings, conclusions and recommendations contained in this report. The findings and conclusions contained in this report are valid only as of the date of this report and may be based, in part, upon information provided by others. If any of the information is inaccurate, new information is discovered or project parameters change, modifications to this report may be necessary.

This report must be read as a whole, as sections taken out of context may be misleading. If discrepancies occur between the preliminary (draft) and final version of this report, it is the final version that takes precedence. Nothing in this report is intended to constitute or provide a legal opinion.

The contents of this report are confidential and proprietary. Other than by PSPC, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of PSPC and SNC-Lavalin.



# Appendix I

Photographs



Photograph 1: Approximate sample location, 30 ton Kone crane.



30T-P4

Bogeys

Photograph 2: Approximate sample location of yellow paint collected from the bogeys.



# Appendix II

Analytical Laboratory Accreditations



---

**Membership Number:** 2168  
**Laboratory Name:** Maxxam Analytics (Burnaby, Canada Way)  
**Parent Institution:** Maxxam Analytics International Corporation  
**Address:** 4606 Canada Way Burnaby BC V5G 1K5  
**Contact:** Mr. Ray Chapman-Chen  
**Phone:** (604) 639-2619  
**Fax:** (604) 731-2386  
**Email:** rchen2@maxxam.ca

---

**Standard:** Conforms with requirements of ISO/IEC 17025  
**Clients Served:** All Interested Parties  
**Revised On:** March 9, 2017  
**Valid To:** August 11, 2019

---

### Scope of Accreditation

#### **Air (Inorganic)**

Metals - Air Filter (183)

BBY7SOP-00002, BBY7SOP-00016; modified from EPA SW-846 6020A

#### ICP/MS - DIGESTION

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Boron  
Cadmium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Manganese  
Molybdenum  
Nickel  
Phosphorous  
Selenium  
Silver  
Strontium  
Vanadium  
Zinc

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Air (Inorganic)**

Metals - Occupational Health (Cassettes) (015)  
BBY7SOP-00016, BBY7SOP-00018; modified from NIOSH 7303  
ICP - DIGESTION

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Boron  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorous  
Potassium  
Selenium  
Silver  
Sodium  
Strontium  
Sulphur  
Tin  
Titanium  
Vanadium  
Zinc  
Zirconium

**Air (Inorganic)**

Total Particulates - Air (181)  
BBY5SOP-00005; modified from BC MOE LAB MANUAL G, and EPA/600/R-94/038B  
GRAVIMETRIC  
Particulate > 2.5 microns

**Air (Organic)**

Polycyclic Aromatic Hydrocarbons (PAH) - Air (281)  
BBY8SOP-00027; PREPARATION: modified from BC MOE LAB MANUAL H: modified from EPA SW-846 8270D  
GC/MS  
Acenaphthene  
Acenaphthylene  
Anthracene  
Benz(a)anthracene  
Benzo(a)pyrene  
Benzo(b&i)fluoranthene  
Benzo(e)pyrene  
Benzo(g,h,i)perylene  
Benzo(k)fluoranthene  
Chrysene  
Dibenz(a,h)anthracene

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Fluoranthene  
Fluorene  
Indeno(1,2,3-cd)pyrene  
Naphthalene  
Perylene  
Phenanthrene  
Pyrene

**Air (Organic)**

Volatile Hydrocarbons - Air (184)  
BBY5SOP-00031; BC MOE LAB MANUAL SECTION H  
GC/MS - THERMAL DESORPTION  
VHv6-13/VPHv

**Air (Organic)**

Volatile Organic Compounds (VOC) - Air (180)  
BBY5SOP-00031; modified from BC MOE LAB MANUAL SECTION H  
GC/MS - THERMAL DESORPTION

1,1-Biphenyl  
1,1-Dichloroethane  
1,1-Dichloroethene  
1,1-Dichloropropene  
1,1,1-Trichloroethane  
1,1,1,2-Tetrachloroethane  
1,1,2-Trichloroethane  
1,1,2,2-tetrachloroethane  
1,2-Dibromo-3-chloropropane  
1,2-Dibromoethane  
1,2-Dichlorobenzene  
1,2-Dichloroethane  
1,2-Dichloropropane  
1,2,3-Trichlorobenzene  
1,2,3-Trichloropropane  
1,2,4-Trichlorobenzene  
1,2,4-Trimethylbenzene  
1,3-Butadiene  
1,3-Dichlorobenzene  
1,3-Dichloropropane  
1,3,5-Trimethylbenzene  
1,4-Dichlorobenzene  
2-Butanone (MEK)  
2-Chlorophenol  
2-Chlorotoluene  
2-Hexanone (MBK)  
2,2-Dichloropropane  
4-Chlorotoluene  
4-isopropyltoluene (cymene)  
4-Methyl-2-pentanone (MIBK)  
Benzene  
Bromobenzene  
Bromodichloromethane  
Bromoform  
Bromomethane  
Butyl Acetate  
Carbon tetrachloride

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Chlorobenzene  
Chloroethane  
Chloroform  
cis-1,2-Dichloroethene  
cis-1,3-Dichloropropene  
Dibromochloromethane  
Dibromomethane  
Dichlorodifluoromethane (Freon12)  
Dichloromethane  
Epichlorohydrin  
Ethyl Benzene  
Hexachlorobutadiene  
Isobutanol  
Isopropanol  
Isopropylbenzene (cumene)  
m/p-xylene  
Methylcyclohexane  
MTBE  
n-Butylbenzene  
n-Decane (c10)  
n-Dodecane (c12)  
n-Hexane (c6)  
n-Propylbenzene (isocumene)  
n-Tridecane (c13)  
Naphthalene  
Nitrobenzene  
o-xylene  
Phenol  
sec-Butylbenzene  
Styrene  
t-Butylbenzene (dimethylethylbenzene)  
Tetrachloroethene  
Toluene  
trans-1,3-Dichloropropene  
Trichloroethene  
Trichlorofluoromethane (Freon11)  
Trichlorotrifluoroethane (Freon 113)  
Vinyl Chloride

**Leachate (Inorganic)**

Cyanide - Leachates (304)

BBY6SOP-00004, BBY7SOP-00009; prep: modified from BC REG 63/88, SCHEDULE 4, PART 2 ANALYTICAL:  
modified from SM 4500 CN- O

COLOR - DISTILLATION

Cyanide (WAD)

**Leachate (Inorganic)**

Fluoride - Leachates (300)

BBY6SOP-00048, BBY7SOP-00009; PREP: modified from BC REG 63/88, SCHEDULE 4, PART 2;  
ANALYTICAL: modified from SM 4500 F-C

ION SELECTIVE ELECTRODE - (BC MLEP/MODIFIED WEP)

Fluoride

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Leachate (Inorganic)**

Metals (BC MLEP/Modified SWEP) - Leachates (308)  
BBY7SOP-00001, BBY7SOP-00009; prep: modified from BC REG 63/88, SCHEDULE 4, PART 2 AND ANALYTICAL: EPA SW846 METHOD 6020 B  
ICP/MS  
Antimony  
Arsenic  
Barium  
Beryllium  
Boron  
Chromium  
Copper  
Lead  
Mercury  
Selenium  
Silver  
Thallium  
Uranium  
Zinc

**Soil (Inorganic)**

Hot Water Soluble Boron - Soil (301)  
BBY7SOP-00006, BBY7SOP-00018; PREP: BC MOE LAB MANUAL SECTION C; ANALYTICAL: MODIFIED FROM USEPA SW-846 METHOD 6010 C  
ICP/OES  
Soluble Boron

**Solids (Inorganic)**

Chloride - Soil, Saturated Paste (185)  
BBY6SOP-00011, BBY6SOP-00030; modified from SM 4500 Cl- E and modified from SSMA, CHAPTER 15, SECTION 15.2.1  
AUTO COLOR - KONELAB  
Chloride

**Solids (Inorganic)**

Conductivity - Sat Paste Extract (279)  
BBY6SOP-00029; modified from SM 2510 B  
CONDUCTIVITY METER  
Conductivity

**Solids (Inorganic)**

Extractable Metals - Soil (303)  
BBY6SOP-00030, BBY7SOP-00018; PREP: CARTER, M.R., CHAPTER 15, SECTION 15.2.1, 2008  
ANALYTICAL: modified from USEPA SW-846 METHOD 6010 C  
ICP/OES  
Soluble Calcium  
Soluble Magnesium  
Soluble Potassium  
Soluble Sodium  
Soluble Sulphur

**Solids (Inorganic)**

Flashpoint - Soil (260)  
BBY6SOP-00042; modified from ASTM D3828-12a  
SETA FLASH CLOSED TESTER  
Flashpoint C

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Solids (Inorganic)**

Free Liquid - Soil, Waste (261)  
BBY6SOP-00043; modified from EPA SW-846 9095B  
VISUAL EXAMINATION  
Free Liquid

**Solids (Inorganic)**

Hexavalent Chromium - Soil (302)  
BBY6SOP-00015; modified from SM 3500 Cr B  
COLORIMETRIC  
Hexavalent Chromium

**Solids (Inorganic)**

Hot Water Soluble Boron - Soil (171)  
BBY7SOP-00001, BBY7SOP-00006; modified from BC MOE LAB MANUAL C (PREPARATION) and modified from EPA SW-846 6020B (ANALYTICAL)  
ICP/MS - EXTRACTION  
Boron

**Solids (Inorganic)**

Leachable Metals - Soil (100% SOLID MATRICES ONLY) (187)  
BBY7SOP-00001, BBY7SOP-00005; EPA SW-846 1311 (LEACH) and modified from EPA 6020B (ANALYSIS)  
ICP/MS - TCLP  
Antimony  
Arsenic  
Barium  
Beryllium  
Boron  
Cadmium  
Calcium  
Chromium  
Copper  
Lead  
Mercury  
Molybdenum  
Selenium  
Silver  
Thallium  
Uranium  
Zinc

**Solids (Inorganic)**

Lead - Paint (254)  
BBY7SOP-00017, BBY7SOP-00018; modified from BC MOE LAB MANUAL SECTION C  
ICP/OES - DIGESTION  
Lead

**Solids (Inorganic)**

Mercury - Soil, Sediment (038)  
BBY7SOP-00004, BBY7SOP-00012; modified from BC MOE LAB MANUAL SECTION C and EPA 245.7  
COLD VAPOUR ATOMIC FLUORESCENCE - DIGESTION  
Mercury

**Solids (Inorganic)**

Metals - Soil, Sediment (037)  
BBY7 SOP-00004, BBY7-00018; modified from BC MOE LAB MANUAL SECTION C and modified from EPA SW-846 6010C  
ICP - DIGESTION  
Aluminum

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Arsenic  
Barium  
Beryllium  
Bismuth  
Boron  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Selenium  
Silver  
Sodium  
Strontium  
Tin  
Titanium  
Vanadium  
Zinc  
Zirconium

**Solids (Inorganic)**

Metals - Soil, Sediment (116)

BBY6SOP-00007, BBY7SOP-00001; modified from EPA SW-846 6020B and modified from EPA 821-R-91-100

ICP/MS

Cadmium

Copper

Lead

Nickel

Zinc

**Solids (Inorganic)**

Mineral Oil and Grease - Soil (188)

BBY8SOP-00007; modified from BC MOE LAB MANUAL SECTION D

GRAVIMETRIC - EXTRACTION

Mineral Oil and Grease

**Solids (Inorganic)**

Moisture (%) - Soil (189)

BBY8SOP-00017; modified from ONTARIO MOE E3139

GRAVIMETRIC

Moisture (%)

**Solids (Inorganic)**

Nitrite/Nitrate+Nitrite - Soil, Leachate (190)

BBY6SOP-00010, BBY6WI-00009; modified from SM 4500-NO3- I

AUTO COLOR

Nitrate + Nitrite Nitrogen

Nitrite

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Solids (Inorganic)**

Oil and Grease - Soil (191)  
BBY8SOP-00006; modified from BC MOE LAB MANUAL SECTION D  
GRAVIMETRIC - EXTRACTION  
Total Oil and Grease

**Solids (Inorganic)**

pH - Saturated Paste Extract (278)  
BBY6SOP-00025; modified from SM 4500-H+ B  
pH METER  
pH

**Solids (Inorganic)**

pH - Soil/Leachate (192)  
BBY6SOP-00028; modified from SM 4500-H+ B and modified from BC MOE LAB MANUAL SECTION B  
PH METER  
pH

**Solids (Inorganic)**

Saturated Paste - Soil (193)  
BBY6SOP-00030; modified from SOIL SAMPLING AND METHOD OF ANALYSIS, CHAPTER 15, SECTION 15.2.1  
GRAVIMETRIC  
Saturated Paste

**Solids (Inorganic)**

Sulfate - Soil (194)  
BBY6SOP-00017, BBY6SOP-00030; modified from SOIL SAMPLING AND METHOD OF ANALYSIS, CHAPTER 15, SECTION 15.2.1  
AUTO COLOR - KONELAB  
Sulfate

**Solids (Inorganic)**

Sulphide - Soil (195)  
BBY6SOP-00006, BBY6SOP-00007; modified from EPA 821-R-91-100 and modified from SM 4500 S2- D  
SPECTROPHOTOMETRIC- METHYLENE BLUE  
Acid Volatile Sulfide

**Solids (Inorganic)**

Total Metals - Soil (196)  
BBY7SOP-00001, BBY7SOP-00004; modified from EPA SW-846 6020B and BC MOE LAB MANUAL SECTION C  
ICP/MS - DIGESTION  
Aluminum  
Antimony  
Arsenic  
Barium  
Bismuth  
Cadmium  
Calcium  
Copper  
Iron  
Lead  
Magnesium  
Manganese  
Mercury  
Molybdenum  
Phosphorus  
Potassium

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Selenium  
Silver  
Sodium  
Strontium  
Tellurium  
Thallium  
Tin  
Titanium  
Vanadium  
Zinc  
Zirconium

**Solids (Organic)**

BTEX - Soil (Unit# 25) (101)

BBY8SOP-00032; modified from EPA SW-846 8021B and EPA SW-846 5035  
GC/PID - DIRECT INJECTION

Benzene  
Ethylbenzene  
m/p-xylene  
o-xylene  
Styrene  
Toluene

**Solids (Organic)**

BTEX (Unit#378) - Soil, Sediment (297)

BBY8SOP-00046; BC MOE LAB MANUAL SECTION D  
GC/PID - HEADSPACE

Benzene  
Ethylbenzene  
m/p-xylene  
o-xylene  
Toluene

**Solids (Organic)**

BTEX, MTBE, Styrene - Soil (198)

BBY8SOP-00010; modified from EPA SW-846 8260C and EPA SW-846 5021A and EPA SW-846 5035  
GC/MS - HEADSPACE

Benzene  
Ethylbenzene  
m/p-xylene  
Methyl t-butyl ether  
o-xylene  
Styrene  
Toluene

**Solids (Organic)**

Extractable Petroleum Hydrocarbons (EPH) - Soil (202)

BBY8SOP-00029; modified from BC MOE LAB MANUAL D  
GC/FID - EXTRACTION

EPH (C10-C19)  
EPH (C19-C32)

**Solids (Organic)**

Extractable Petroleum Hydrocarbons (EPH) - Soil (Unit# 378) (273)

BBY8SOP-00029; modified from BC MOE LAB MANUAL SECTION D  
GC/FID - EXTRACTION

EPH C10-19  
EPH C19-C32

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Solids (Organic)**

Extractable Petroleum Hydrocarbons (EPH) - Soil, Sediment (Unit#25) (099)

BBY8SOP-00029; modified from BC MOE LAB MANUAL SECTION D

GC/FID - EXTRACTION

EPH (C10-C19)

EPH (C19-C32)

**Solids (Organic)**

Leachable Polycyclic Aromatic hydrocarbons (PAH) -- Soil (100% SOLID MATRICES ONLY) (307)

BBY7SOP-00005, BBY8SOP-00021; PREP: modified from EPA SW846 8270 D AND ANALYTICAL: modified from EPA SW-846

GC/MS

1-Methylnaphthalene

1,4-Dimethylnaphthalene

2-Methylnaphthalene

3-Methylcholanthrene

7,12-Dimethylbenz (a) anthracene

9-Methylantracene

9,10-Dimethylantracene

Acenaphthene

Acenaphthylene

Acridine

Anthracene

Benz (c) phenanthrene

Benzo (a) anthracene

Benzo (a) pyrene

Benzo (b&j) fluoranthene

benzo(e)fluoranthene

Benzo (e) pyrene

Benzo (g,h,i) perylene

Benzo (k) fluoranthene

Chrysene

Dibenz (a,h) pyrene

Dibenz (a,i) pyrene

Dibenz (a,l) pyrene

Dibenzo (a,h) anthracene

Fluoranthene

Fluorene

Indeno (1,2,3 - cd) pyrene

Naphthalene

Perylene

Phenanthrene

Pyrene

Quinoline

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Soil (205)

BBY8SOP-00030; CCME - REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM HYDROCARBONS IN SOIL-TIER 1 METHOD

GC/FID - EXTRACTION

F2: C10-C16

F3: C16-C34

F4: C34-C50

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Soil (206)  
BBY8SOP-00012; CCME - REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM  
HYDROCARBONS IN SOIL-TIER 1 METHOD  
GC/FID - HEADSPACE  
F1: C6-C10

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Soil (264)  
BBY8SOP-00003; CCME REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM  
HYDROCARBONS IN SOIL-TIER 1 METHOD  
GRAVIMETRIC - SOXHLET  
F4: Gravimetric

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Soil (100% SOLID SAMPLES ONLY) (259)  
BBY8SOP-000015, BBY8SOP-00009; EPA SW-846 1311 (LEACH) AND EPA SW-846 8260C (ANALYSIS)  
TCLP ZERO GC/MS - HEADSPACE  
1,1-Dichloroethylene  
1,1,1-trichloroethane  
1,1,1,2-tetrachloroethane  
1,1,2-trichloroethane  
1,1,2,2-tetrachloroethane  
1,2-Ddichloropropane  
1,2-dibromoethane  
1,2-Dichlorobenzene  
1,2-Dichloroethane  
1,3-dichlorobenzene  
1,4-Dichlorobenzene  
Benzene  
Bromodichloromethane  
Bromoform  
Carbon tetrachloride  
Chlorobenzene  
Chlorodibromomethane  
Chloroethane  
Chloroform  
Chloromethane  
cis-1,2-dichloroethene  
cis-1,3-dichloropropene  
Dichloromethane  
Ethylbenzene  
m & p -Xylene  
Methyl-tert-butylether (MTBE)  
o-Xylene  
Styrene  
Tetrachloroethylene  
Toluene  
trans-1,2-dichloroethene  
trans-1,3-dichloropropene  
Trichloroethylene  
Trichlorofluorometahne  
Vinyl chloride  
Xylenes (Total)

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Soil (Unit# 25) (258)

BBY8SOP-00030; CCME REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM HYDROCARBONS IN SOIL-TIER 1 METHOD

GC/FID - EXTRACTION

F2: C10-C16

F3: C16-C34

F4: C34-C50

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Soil (Unit# 378) (274)

BBY8SOP-00030; CCME REFERENCE METHOD FOR THE CANADA-WIDE PHCS IN SOIL - TIER 1 METHOD.

GC/FID - EXTRACTION

F2: C10-C16

F3: C16-C34

F4: C34-C50

**Solids (Organic)**

Phenols - Soil (207)

BBY8SOP-00025; modified from EPA SW-846 3510C (PREPARATION) and modified from EPA SW-846 8270D (ANALYSIS)

GC/MS - EXTRACTION

2-Chlorophenol

2-Methyl-4,6-Dinitrophenol

2-Methylphenol

2-Nitrophenol

2,3,4,6 Tetrachlorophenol

2,3,5,6-Tetrachlorophenol

2,4-Dimethylphenol

2,4-Dinitrophenol

2,4,5-Trichlorophenol

2,4,6-Trichlorophenol

2,6-Dichlorophenol

3+4 Methylphenol

4-Nitrophenol

Pentachlorophenol

Phenol

**Solids (Organic)**

Polycyclic Aromatic Hydrocarbons (PAH) - Soil (208)

BBY8SOP-00022, BBY8SOP-00038; modified from EPA SW-846 8270D and EPA SW-846 3570

GC/MS - SHAKE EXTRACTION

1-Methylnaphthalene

1-Methylphenanthrene

1,4-Dimethylnaphthalene

2-Methylnaphthalene

2,3,5-Trimethylnaphthalene

2,6-Dimethylnaphthalene

3-Methylcholanthrene

7,12-Dimethylbenz (a) anthracene

9-Methylanthracene

9,10-Dimethylanthracene

Acenaphthene

Acenaphthylene

Anthracene

Benz(c)phenanthrene

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Benzo (a) anthracene  
Benzo (a) pyrene  
Benzo (b) fluoranthene  
Benzo (e) fluoranthene  
Benzo (e) pyrene  
Benzo (g,h,i) perylene  
Benzo (k) fluoranthene  
Chrysene  
Dibenz (a,h) pyrene  
Dibenz (a,i) pyrene  
Dibenz (a,l) pyrene  
Dibenzo (a,h) anthracene  
Fluoranthene  
Fluorene  
Indeno (1,2,3 - cd) pyrene  
Naphthalene  
Perylene  
Phenanthrene  
Pyrene

**Solids (Organic)**

Tributyltin - Soil (276)  
BBY8SOP-00050; modified from RESTEK CORP APPLICATION NOTE# 59550  
GC/MS  
Tributyltin Tin (TBT)

**Solids (Organic)**

Volatile Hydrocarbon (Unit# 378) - Soil, Sediment (296)  
BBY8SOP-00046; BC LAB MANUAL SECTION D  
GC/FID - HEADSPACE  
F1: C6-C10

**Solids (Organic)**

Volatile Hydrocarbons (VH) - Soil, Sediment (Unit# 25) (133)  
BBY8SOP-00032; modified from BC MOE LAB MANUAL SECTION D  
GC/FID  
F1: C6-C10

**Solids (Organic)**

Volatile Organic Compounds (VOC) - Soil (213)  
BBY8SOP-00009, BBY8WI-00011; modified from EPA SW-846 8260C and modified from EPA SW-846 5021  
GC/MS - HEADSPACE  
1,1-Dichloroethane  
1,1-dichloroethylene  
1,1,1 - Trichloroethane  
1,1,1,2- Tetrachloroethane  
1,1,2-Trichloroethane  
1,1,2,2-Tetrachloroethane  
1,2-dichlorobenzene  
1,2-dichloroethane  
1,2-Dichloropropane  
1,3-Dichlorobenzene  
1,4-dichlorobenzene  
Benzene  
Bromodichloromethane  
Bromoform  
Bromomethane

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Carbon Tetrachloride  
Chlorobenzene  
Chlorodibromomethane  
Chloroethane  
Chloroform  
Chloromethane  
cis-1,2-Dichloroethylene  
cis-1,3-Dichloropropene  
Dichloromethane  
Ethylbenzene  
Ethylene Dibromide  
m/p-xylene  
Methyl t-butyl ether  
o-xylene  
Styrene  
Tetrachloroethylene  
Toluene  
trans,1,3-dichloropropene  
trans-1,2-Dichloroethylene  
Trichloroethylene  
Trichlorofluoromethane  
Vinyl Chloride

**Solids (Organic)**

Volatile Petroleum Hydrocarbons (VPH) - Soil (214)  
BBY8SOP-00011; modified from BC MOE LAB MANUAL D  
GC/FID - HEADSPACE  
F1: C6-C10

**Solids (Toxicology)**

Chironomids - Sediment (150)  
BBY2SOP-00010; EPS 1/RM/32  
SURVIVAL AND GROWTH  
Chironomids (10 days)

**Solids (Toxicology)**

Echinoid Larval Development - Sediment (298)  
BBY2SOP-00062; EPS 1/RM/58  
GROWTH AND SURVIVAL  
Echinoid Larval Development (48hr)

**Solids (Toxicology)**

Hyalella azteca - Sediment (149)  
BBY2SOP-00011; EPS 1/RM/33  
SURVIVAL AND GROWTH  
Hyalella azteca (14d)

**Solids (Toxicology)**

Marine Amphipods - Sediment (151)  
BBY2SOP-00012; EPS 1/RM/26 and EPS 1/RM/35  
ACUTE LETHALITY (SURVIVAL)  
Marine Amphipods (10 day)

**Solids (Toxicology)**

Microtox - Solid Phase - Soil, Sediment (152)  
BBY2SOP-00014; EPS 1/RM/42  
BIOLUMINESCENCE  
Microtox IC50

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Tissue (Inorganic)**

Mercury - Tissue (255)

BBY7SOP-00012, BBY7SOP-00013; modified from EPA 200.3 and modified from EPA 245.7

COLD VAPOUR ATOMIC FLUORESCENCE - DIGESTION

Mercury

**Tissue (Inorganic)**

Total Metals - Tissue (215)

BBY7SOP-00002, BBY7SOP-00021; modified from EPA SW-846 6020B and BC MOE LAB MANUAL SECTION

C

ICP/MS

Aluminum

Antimony

Arsenic

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Chromium

Cobalt

Copper

Iron

Lead

Magnesium

Manganese

Mercury

Molybdenum

Nickel

Phosphorus

Potassium

Selenium

Silicon

Silver

Sodium

Strontium

Sulfur

Tellurium

Thallium

Tin

Titanium

Uranium

Vanadium

Zinc

Zirconium

**Water (Inorganic)**

Acidity - Water (137)

BBY6SOP-00037; modified from SM 2310 B

TITRATION

Acidity (pH 8.3)

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Inorganic)**

Alkalinity - Water (216)  
BBY6SOP-00026; modified from SM 2320 B  
TITRIMETRIC - AUTOMATED  
Alkalinity (pH 4.5)

**Water (Inorganic)**

Ammonia (N) - Water (217)  
BBY6SOP-00009; modified from EPA 350.1 and SM 4500 NH3-G  
AUTO COLOR - PHENATE  
Ammonia

**Water (Inorganic)**

Biochemical Oxygen Demand (BOD) - Water (218)  
BBY6SOP-00045; modified from SM 5210 B  
D.O. METER  
BOD (5 day)  
CBOD (5 day)

**Water (Inorganic)**

Carbon - Water (233)  
BBY6SOP-00003; modified from SM 5310 C  
COLORIMETRIC  
Organic Carbon

**Water (Inorganic)**

Carbon - Water (277)  
BBY6SOP-00018; modified from SM 5310 C  
COLORIMETRIC  
Carbon (Total Inorganic)

**Water (Inorganic)**

Chemical Oxygen Demand (COD) - Water (220)  
BBY6SOP-00024; modified from SM 5220 D  
TITRIMETRIC - DIGESTION  
COD

**Water (Inorganic)**

Chloride - Water (221)  
BBY6SOP-00011; modified from SM 4500-Cl- E  
AUTO COLOR - KONELAB  
Chloride

**Water (Inorganic)**

Chlorophyll A and Phaeophytins - Water (122)  
BBY6SOP-00002; modified from SM 10200 H  
UV/VIS/SPECTROPHOTOMETER  
Chlorophyll A  
Phaeophytins

**Water (Inorganic)**

Colour - Water (023)  
BBY6SOP-00021; modified from SM 2120 B  
VISUAL COMPARISON  
Apparent Colour

**Water (Inorganic)**

Colour - Water (295)  
BBY6SOP-00057; modified from SM 2120 C  
SPECTROPHOTOMETRIC  
True Colour

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Inorganic)**

Conductivity - Water (222)

BBY6SOP-00026; modified from SM 2510 B

CONDUCTIVITY METER

Conductivity (25°C)

**Water (Inorganic)**

Conductivity - Water, Wastewater (156)

BBY0SOP-00006; modified from SM 2510 B

CONDUCTIVITY METER

Conductivity (25°C)

**Water (Inorganic)**

Cyanide - Water (223)

BBY6SOP-00004, BBY6W1-00016; modified from SM 4500 CN- O and modified from EPA SW-846 9013

COLOR - DISTILLATION

Cyanide (SAD)

Cyanide (Weak Acid Digestion)

**Water (Inorganic)**

Dissolved and Extractable Metals - Water (004)

BBY7SOP-00018, BBY7WI-00004; modified from EPA SW-846 6010C

ICP

Aluminum (High)

Antimony

Arsenic

Barium (High)

Beryllium (High)

Bismuth (High)

Boron (High)

Cadmium (High)

Calcium

Chromium (High)

Cobalt (High)

Copper (High)

Iron (High)

Lead (High)

Lithium (High)

Magnesium

Manganese (High)

Molybdenum (High)

Nickel (High)

Phosphorus

Potassium

Selenium

Silicon

Silver (High)

Sodium

Strontium (High)

Sulphur

Tin (High)

Titanium (High)

Vanadium (High)

Zinc (High)

Zirconium (High)

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Inorganic)**

Dissolved Metals - Water (225)

BBY7WI-00004, BY7SOP-00002; modified from EPA SW-846 6020B

ICP/MS

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Boron  
Cadmium  
Calcium  
Cesium  
Chromium  
Cobalt  
Copper  
Gold  
Iron  
Lanthanum  
Lead  
Lithium  
Magnesium  
Manganese  
Mercury  
Molybdenum  
Nickel  
Palladium  
Phosphorus  
Platinum  
Potassium  
Rubidium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Sulphur  
Tellurium  
Thallium  
Thorium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Zinc  
Zirconium

**Water (Inorganic)**

Fluoride - Water (226)

BBY6SOP-00048; modified from SM 4500-F- C

SELECTIVE ION ELECTRODE

Fluoride

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Inorganic)**

Hexavalent Chromium - Water (227)  
BBY6SOP-00015; modified from SM 3500 CR B  
COLORIMETRIC  
Hexavalent Chromium

**Water (Inorganic)**

Mercury - Water (095)  
BBY7SOP-00015; modified from BC MOE LAB MANUAL SECTION C  
COLD VAPOUR ATOMIC FLUORESCENCE - DIGESTION  
Mercury

**Water (Inorganic)**

Mercury (Ultra-Low Level) - Water (299)  
BBY7SOP-00022; US EPA METHOD 1631  
COLD VAPOUR ATOMIC FLUORESCENCE  
Mercury

**Water (Inorganic)**

Metals (High Level) - Seawater (228)  
BBY7SOP-00002, BBY7SOP-00007; modified from EPA 200.10  
ICP/MS - CHELATION EXTRACTION  
Aluminum  
Cadmium  
Cobalt  
Copper  
Iron  
Lead  
Manganese  
Nickel  
Titanium  
Uranium  
Vanadium  
Zinc

**Water (Inorganic)**

Mineral Oil and Grease - Water (229)  
BBY8SOP-00004; modified from BC MOE LAB MANUAL D  
GRAVIMETRIC - EXTRACTION  
Mineral Oil and Grease

**Water (Inorganic)**

Nitrite/ Nitrite+Nitrate - Water (230)  
BBY6SOP-00010; modified from SM 4500 -NO3- I  
AUTO COLOR  
Nitrate plus Nitrite  
Nitrite

**Water (Inorganic)**

Nitrogen - Water (231)  
BBY6SOP-00016; modified from SM 4500-N C  
AUTO COLOR - DIGESTION  
Total Dissolved Nitrogen  
Total Nitrogen

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Inorganic)**

Oil and Grease - Water (232)  
BBY8SOP-00004; modified from BC MOE LAB MANUAL D  
GRAVIMETRIC - EXTRACTION  
Total Oil and Grease

**Water (Inorganic)**

pH - Water (155)  
BBY0SOP-00003; modified from SM 4500-H+ B  
pH METER  
pH

**Water (Inorganic)**

pH - Water (234)  
BBY6SOP-00026; modified from SM 4500-H+ B  
pH METER - AUTOMATED  
pH

**Water (Inorganic)**

Phosphorus - Water (236)  
BBY6SOP-00013; modified from SM 4500-P- E  
AUTO COLOR - KONELAB  
Phosphate  
Total Dissolved Phosphorus  
Total Phosphorus

**Water (Inorganic)**

Reactive Silica - Water (237)  
BBY6SOP-00014; modified from SM 4500-SiO<sub>2</sub> E  
AUTO COLOR  
Reactive Silica

**Water (Inorganic)**

Solids - Water (238)  
BBY6SOP-00033, BBY6SOP-00034; modified from SM 2540 C, D  
GRAVIMETRIC  
Total Dissolved Solids  
Total Suspended Solids

**Water (Inorganic)**

Solids - Water (280)  
BBY6SOP-00035; modified from SM 2540 A  
GRAVIMETRIC  
Total Solids  
Total Solids Fixed

**Water (Inorganic)**

Sulphate - Water (239)  
BBY6SOP-00017; modified from SM 4500-SO<sub>4</sub><sup>2-</sup>- E  
AUTO COLOR - KONELAB  
Sulfate

**Water (Inorganic)**

Sulphide - Water (240)  
BBY6SOP-00006; modified from SM 4500-S<sub>2</sub>- D  
SPECTROPHOTOMETRIC - METHYLENE BLUE  
Sulphide

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

**Water (Inorganic)**

Total Metals - Seawater (241)

BBY7SOP-00002, BBY7SOP-00003; modified from EPA SW-846 6020B

ICP/MS

Aluminum

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Chromium

Cobalt

Copper

Iron

Lead

Magnesium

Manganese

Molybdenum

Nickel

Phosphorus

Potassium

Silicon

Silver

Sodium

Strontium

Sulfur

Tellurium

Thallium

Titanium

Vanadium

Zinc

Zirconium

**Water (Inorganic)**

Total Metals - Water (066)

BBY7SOP-00003, BBY7SOP-00018; modified from BC MOE LAB MANUAL SECTION C and EPA SW-846

6010C

ICP - DIGESTION

Aluminum

Antimony

Arsenic

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Chromium

Cobalt

Copper

Iron

Lead

Lithium

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Sulphur  
Tin  
Titanium  
Vanadium  
Zinc  
Zirconium

**Water (Inorganic)**

Total Metals - Water (242)

BBY7SOP-00002, BBY7SOP-00003; modified from EPA SW-846 6020B and BC MOE LAB MANUAL SECTION

C

ICP/MS - DIGESTION

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Bromine  
Cadmium  
Calcium  
Cesium  
Chromium  
Cobalt  
Copper  
Gold  
Iron  
Lanthanum  
Lead  
Lithium  
Magnesium  
Manganese  
Mercury  
Molybdenum  
Nickel  
Palladium  
Phosphorus  
Platinum  
Potassium  
Rubidium  
Selenium  
Silicon  
Silver

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Sodium  
Strontium  
Sulphur  
Tellurium  
Tellurium  
Thallium  
Thorium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Zinc  
Zirconium

**Water (Inorganic)**

Total Recoverable Phenols - Water (243)  
BBY6SOP-00008; modified from SM 5530  
AUTO COLOR - DISTILLATION  
Total Phenolics

**Water (Inorganic)**

Turbidity - Water (244)  
BBY6SOP-00027; modified from SM 2130 B  
TURBIDIMETRIC  
Turbidity

**Water (Organic)**

BTEX, MTBE, Styrene - Water (252)  
BBY8SOP-00010; modified from EPA SW-846 8260C and EPA SW-846 5035 and EPA SW-846 5021A  
GC/MS - HEADSPACE  
Benzene  
Ethylbenzene  
m/p-xylene  
Methyl t-butyl ether  
o-xylene  
Styrene  
Toluene

**Water (Organic)**

Petroleum Hydrocarbons - Water (305)  
BBY8SOP-00012 (ANALYSIS), BBY8SOP-00018 (PREP); modified from CCME CANADA-WIDE STANDARD  
FOR PETROLEUM HYDROCARBONS IN SOIL-TIER 1 (DEC 2000)  
GC/FID - HEADSPACE  
F1: C6-C10

**Water (Organic)**

Petroleum Hydrocarbons (PHC) - Water (263)  
BBY8SOP-00030; modified from CCME REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM  
HYDROCARBONS IN SOIL-TIER 1 METHOD  
GC/FID - EXTRACTION  
F2: C10-C16  
F3: C16-C34  
F4: C34-C50

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Organic)**

Phenols - Water (248)

BBY8SOP-00025; modified from EPA SW-846 3510C (PREPARATION) and modified from EPA SW-846 8270D (ANALYSIS)

## GC/MS - EXTRACTION

2-Chlorophenol  
2-Methyl-4,6-Dinitrophenol  
2-Methylphenol  
2-Nitrophenol  
2,3-Dichlorophenol  
2,3,4-Trichlorophenol  
2,3,4,5 Tetrachlorophenol  
2,3,4,6-tetrachlorophenol  
2,3,5-Trichlorophenol  
2,3,5,6-Tetrachlorophenol  
2,3,6-Trichlorophenol  
2,4 & 2,5-Dichlorophenol  
2,4-Dimethylphenol  
2,4-Dinitrophenol  
2,4,5-Trichlorophenol  
2,4,6-trichlorophenol  
2,6-Dichlorophenol  
3+4-Chlorophenol  
3+4-Methylphenol  
3,4-Dichlorophenol  
3,4,5-Trichlorophenol  
3,5-Dichlorophenol  
4-Nitrophenol  
Pentachlorophenol  
Phenol

**Water (Organic)**

Polycyclic Aromatic Hydrocarbons (PAH) - Water (249)

BBY8SOP-00021; modified from EPA SW-846 8270D and EPA 3510C

## GC/MS - EXTRACTION

1-Methylnaphthalene  
1,4-Dimethylnaphthalene  
2-Methylnaphthalene  
3-Methylcholanthrene  
7,12-Dimethylbenz (a) anthracene  
9-Methylantracene  
9,10-Dimethylantracene  
Acenaphthene  
Acenaphthylene  
Acridine  
Anthracene  
Benz (c) phenanthrene  
Benzo (a) anthracene  
Benzo (a) pyrene  
Benzo (b&j) fluoranthene  
benzo(e)fluoranthene  
Benzo (e) pyrene  
Benzo (g,h,i) perylene  
Benzo (k) fluoranthene

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Chrysene  
Dibenz (a,h) pyrene  
Dibenz (a,i) pyrene  
Dibenz (a,l) pyrene  
Dibenzo (a,h) anthracene  
Fluoranthene  
Fluorene  
Indeno (1,2,3 - cd) pyrene  
Naphthalene  
Perylene  
Phenanthrene  
Pyrene  
Quinoline

**Water (Organic)**

Total Extractable Hydrocarbons (TEH) - Water (250)  
BBY8SOP-00029; modified from BC MOE LAB MANUAL D  
GC/FID - EXTRACTION  
Total Extractable Hydrocarbons (TEH)

**Water (Organic)**

Volatile Hydrocarbons (VH) - Water (251)  
BBY8SOP-00011; modified from BC MOE LAB MANUAL SECTION D  
GC/FID - HEADSPACE  
Volatile Hydrocarbons (VH C6-C10)

**Water (Organic)**

Volatile Organic Compounds (VOC) - Water (253)  
BBY8SOP-00009; modified from EPA SW-846 8260C and EPA 5021A, EPA SW-846 5035  
GC/MS - HEADSPACE  
1,1-Dichloroethane  
1,1-dichloroethylene  
1,1,1-Trichloroethane  
1,1,1,2-tetrachloroethane  
1,1,2-Trichloroethane  
1,1,2,2-Tetrachloroethane  
1,2-dichlorobenzene  
1,2-dichloroethane  
1,2-Dichloropropane  
1,3-Dichlorobenzene  
1,4-dichlorobenzene  
Benzene  
Bromodichloromethane  
Bromoform  
Bromomethane  
Carbon Tetrachloride  
Chlorobenzene  
Chlorodibromomethane  
Chloroethane  
Chloroform  
Chloromethane  
cis-1,2-Dichloroethylene  
cis-1,3-Dichloropropene  
Dibromoethane  
Dibromomethane  
Dichloromethane

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Ethylbenzene  
Ethylene Dibromide  
m/p-xylene  
Methyl t-butyl ether  
o-xylene  
Styrene  
Tetrabromomethane  
Tetrachloroethylene  
Toluene  
trans-1,2-Dichloroethylene  
trans-1,3-Dichloropropene  
Trichloroethylene  
Trichlorofluoromethane  
Vinyl Chloride

**Water (Toxicology)**

Acute Fathead Minnow - Water (287)  
BBY2SOP-00015; EPA-821-R-02-012  
ACUTE LETHALITY  
Fathead Minnow (96h)

**Water (Toxicology)**

Acute Topsmelt - Water (291)  
BBY2SOP-00050; EPA-821-02-012  
ACUTE LETHALITY  
Topsmelt (96h)

**Water (Toxicology)**

Ceriodaphnia dubia - Water (139)  
BBY2SOP-00001; EPS 1/RM/21  
SURVIVAL AND REPRODUCTION  
Ceriodaphnia dubia (7d)

**Water (Toxicology)**

Daphnia magna - Water (141)  
BBY2SOP-00007; EPS 1/RM/11 and EPS 1/RM/14  
LETHALITY  
Daphnia LC50 (48 h)  
Single Concentration (48h)

**Water (Toxicology)**

Echinoid Fertilization - Water (143)  
BBY2SOP-00009; EPS 1/RM/27  
FERTILIZATION SUCCESS  
Echinoderm Fertilization (20 min)

**Water (Toxicology)**

Fathead Minnow - Water (147)  
BBY2SOP-00002; EPS 1/RM/22  
GROWTH AND SURVIVAL  
Fathead Minnow (7d)

**Water (Toxicology)**

Lemna Minor Growth Inhibition - Water (289)  
BBY2SOP-00053; EPS 1/RM/37  
GROWTH INHIBITION  
Lemna Minor (7d)

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Toxicology)**

Microtox - Liquid Phase - Water (144)

BBY2SOP-00013; EPS 1/RM/24

BIOLUMINESCENCE

Microtox IC50 (15 min)

**Water (Toxicology)**

Pseudokirchneriella subcapitata - Water (146)

BBY2SOP-00006; EPS 1/RM/25

GROWTH INHIBITION

Pseudokirchneriella subcapitata (72h)

**Water (Toxicology)**

Rainbow Trout - pH Stabilization - Water (294)

BBY2SOP-00061; EPS 1/RM/50

ACUTE LETHALITY (SURVIVAL)

Single Concentration (96h) pH-stabilized

Trout LC50 (96h) pH Stabilized

**Water (Toxicology)**

Rainbow Trout - Water (140)

BBY2SOP-00004; EPS 1/RM/9 and EPS 1/RM/13

LETHALITY

Single Concentration (96h)

Trout LC50 (96 h)

**Water (Toxicology)**

Topsmelt - Water (142)

BBY2SOP-00008; modified from EPA 600/R-95/136

SURVIVAL AND GROWTH

Topsmelt (7d)

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)



# Appendix III

Laboratory Analytical Report

Your Project #: 647911  
Site Location: 825 ADMIRALS ROAD, ESQUIMALT, BC  
Your C.O.C. #: G123095

**Attention: Aaron Hall**

SNC-LAVALIN INC.  
BURNABY, ENVIRONMENT DIVISION  
8648 COMMERCE COURT  
BURNABY, BC  
CANADA V5A 4N6

**Report Date: 2017/06/19**  
Report #: R2399411  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B747417**

**Received: 2017/06/14, 19:10**

Sample Matrix: PAINT  
# Samples Received: 4

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Elements by ICP-AES (acid extr. solid)	4	2017/06/16	2017/06/16	BBY7SOP-00018	EPA 6010c R3 m

**Remarks:**

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key



Graham Rudkin  
Project Manager, Environmental  
19 Jun 2017 11:43:46

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

VJ Oco, Burnaby Project Manager

Email: VOco@maxxam.ca

Phone# (604)639-8422

=====  
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B747417  
Report Date: 2017/06/19

SNC-LAVALIN INC.  
Client Project #: 647911  
Site Location: 825 ADMIRALS ROAD, ESQUIMALT, BC  
Sampler Initials: MAH

**LEAD IN PAINT CHIPS (PAINT)**

Maxxam ID		RH2430	RH2431	RH2432		RH2433		
Sampling Date		2017/06/14 12:20	2017/06/14 12:30	2017/06/14 12:35		2017/06/14 12:40		
COC Number		G123095	G123095	G123095		G123095		
	<b>UNITS</b>	<b>30T-P1</b>	<b>30T-P2</b>	<b>30T-P3</b>	<b>RDL</b>	<b>30T-P4</b>	<b>RDL</b>	<b>QC Batch</b>
<b>Total Metals by ICP</b>								
Total Lead (Pb)	mg/kg	<9.0 (1)	<9.0 (1)	<9.0 (1)	9.0	13.1	3.0	8665522
RDL = Reportable Detection Limit (1) Detection limits raised due to insufficient sample volume.								

Maxxam Job #: B747417  
Report Date: 2017/06/19

SNC-LAVALIN INC.  
Client Project #: 647911  
Site Location: 825 ADMIRALS ROAD, ESQUIMALT, BC  
Sampler Initials: MAH

### GENERAL COMMENTS

**Results relate only to the items tested.**

Maxxam Job #: B747417  
Report Date: 2017/06/19

**QUALITY ASSURANCE REPORT**

SNC-LAVALIN INC.  
Client Project #: 647911  
Site Location: 825 ADMIRALS ROAD, ESQUIMALT, BC  
Sampler Initials: MAH

QC Batch	Parameter	Date	Method Blank		RPD		QC Standard	
			Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8665522	Total Lead (Pb)	2017/06/16	<3.0	mg/kg	3.5	35	98	80 - 120

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project information (where applicable)	Turnaround Time (TAT) Required
Company Name: <u>SNC-Lavalin Inc.</u>	Company Name: <u>ASAT LEFT</u>	Quotation #: <u>SNC-Lavalin Pricing</u>	<input type="checkbox"/> Regular TAT 5 days (Most analyses)
Contact Name: <u>Doug McMillan/Aaron Hall</u>	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: <u>6648 Commerce Court</u> <u>Burnaby, BC</u> PC: <u>V5A 4H6</u>	Address:	Project #: <u>647911</u>	Rush TAT (Surcharges will be applied)
Phone: <u>604-515-5151</u>	Phone:	Site Location: <u>825 Admirals Reach,</u>	<input type="checkbox"/> Same Day <input checked="" type="checkbox"/> 2 Days
Email: <u>doug.mcmillan@snc-lavalin.com</u>	Email: <u>aaron.hall@snc-lavalin.com</u>	Site #: <u>Esquimalt, BC</u>	<input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Days
		Sampled By: <u>MATT</u>	Date Required:

Regulatory Criteria	Special Instructions	Analysis Requested	Rush Confirmation #:
<input type="checkbox"/> BC CSR Soil <input type="checkbox"/> YK CSR Soil <input type="checkbox"/> CCME (Specify) <input type="checkbox"/> Drinking Water <input type="checkbox"/> BC CSR Water <input type="checkbox"/> YK CSR Water <input type="checkbox"/> Other (Specify) <input type="checkbox"/> BC Water Quality	<input type="checkbox"/> Return Cooler <input type="checkbox"/> Ship Sample Bottles (Please Specify)	<input type="checkbox"/> VOC / BTEX / VPH <input type="checkbox"/> VOC / BTEX / F1 <input type="checkbox"/> PAH <input type="checkbox"/> EPH <input type="checkbox"/> F2 - F4 <input type="checkbox"/> TEH <input type="checkbox"/> MTBE <input type="checkbox"/> Dissolved Metals <input type="checkbox"/> Dissolved Mercury <input type="checkbox"/> Total Metals <input type="checkbox"/> Total Mercury <input type="checkbox"/> Chloride <input type="checkbox"/> Fluoride <input type="checkbox"/> Sulphate <input type="checkbox"/> TSS <input type="checkbox"/> TDS <input type="checkbox"/> BOD <input type="checkbox"/> COD <input type="checkbox"/> pH <input type="checkbox"/> Conductivity <input type="checkbox"/> Nitrate <input type="checkbox"/> Ammonia <input type="checkbox"/> Alkalinity	LABORATORY USE ONLY CUSTODY SEAL Y / <u>10</u> Present Intact NA NA COOLER TEMPERATURES NA COOLING MEDIA PRESENT Y / <u>10</u>

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX / VPH	BTEX / F1	PAH	EPH	F2 - F4	TEH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	Fluoride	Sulphate	TSS	TDS	BOD	COD	pH	Conductivity	Nitrate	Ammonia	Alkalinity	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1 30T-P1	2017/06/14	1220	Paint																									
2 30T-P2	2017/06/14	1230	Paint																									
3 30T-P3	2017/06/14	1235	Paint																									
4 30T-P4	2017/06/14	1240	Paint																									
5 30T-P5	2017/06/14		Paint																									
6																												
7																												
8																												
9																												
10																												

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
	2017/06/14	1910	ROMMEL GODA	2017/06/14	19:10



B747417\_COC

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at



**SNC-Lavalin Inc.**

8648 Commerce Court  
Burnaby, British Columbia, Canada V5A 4N6  
☎ 604.515.5151 🌐 604.515.5150  
[www.snclavalin.com](http://www.snclavalin.com)



**SNC • LAVALIN**

---

Esquimalt Graving Dock, Victoria, B. C.

30T Kone Crane Painting: Project No. R.090380.001 &  
150T Krupp Crane Painting: Project No. R.090381.001

# **APPENDIX C**

July 2017

---

## **APPENDIX C**

### **ASSESSMENT OF LEAD IN PAINT – 150T KRUPP CRANE**



# Assessment of Lead in Paint

150 Ton Krupp Crane, Esquimalt Graving Dock,  
825 Admirals Road, Esquimalt, BC,  
PSPC Project # R.090381.001

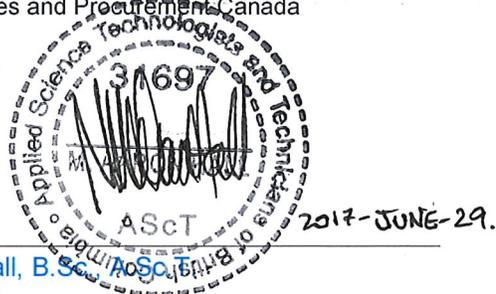
June 29, 2017

Project No.: 647910

Prepared for:

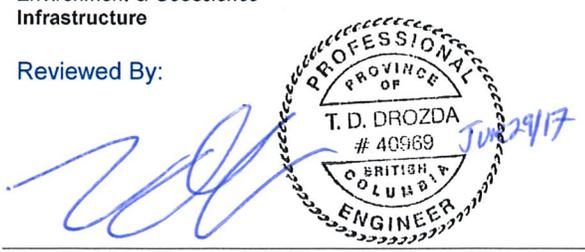
Public Services and Procurement Canada

Prepared By:

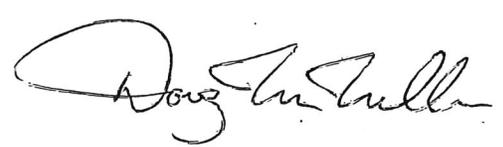
  
M. Aaron Hall, B.Sc.  
Project Scientist

Environment & Geoscience  
Infrastructure

Reviewed By:

  
T. D. DROZDA  
# 40969  
PROFESSIONAL  
PROVINCE OF  
BRITISH COLUMBIA  
ENGINEER

Tim Drozda, P.Eng.  
Environmental Scientist  
Environment & Geoscience  
Infrastructure



Doug McMillan, M.Sc., P.Ag.  
Senior Project Manager  
Environment & Geoscience  
Infrastructure

# Executive Summary

On behalf of Public Services and Procurement Canada (PSPC), SNC-Lavalin Inc. (SNC-Lavalin) has completed an assessment of lead in paint (the “assessment”) of the 150 Ton Krupp crane (the “150T crane”) at the PSPC Esquimalt Graving Dock (EGD), Esquimalt, BC (the “Site”). SNC-Lavalin understands that the purpose of the work was to assess lead concentrations in painted surfaces prior to surface preparation for re-painting selected portions of the 150T crane. The 150T crane was reportedly installed at the Site in 1980.

The assessment was completed by SNC-Lavalin on June 14, 2017. Representative paint samples were collected from five (5) select surfaces and submitted for laboratory analysis of lead concentrations and leachable lead via the toxicity characteristic leachate procedure (TCLP). This report provides the analytical results of the samples collected by SNC-Lavalin during the assessment.

Based on the results of the assessment, there are lead-based paints present on the 150T crane requiring specific procedures for: handling; abatement; demolition; and disposal.

The inspection and sampling program identified paints with concentrations greater than 90 mg/kg at all locations sampled and with concentrations greater than 600 mg/kg on the following surfaces:

- › Portal girder;
- › Gantry leg; and
- › Stairway and hand rail.

All similarly painted surfaces on the 150T crane should be considered as containing/suspected of containing hazardous materials.

The analytical result for the sample analyzed for leachable lead contained a concentration less than the regulatory standard.

## **Recommendations**

A detailed summary and recommendations for the management of the lead-based paint identified is presented in Tables 1 and 2 of Sections 4 and 6. Laboratory reports are presented in Appendix III.

## Table of Contents

Executive Summary	i
1 Introduction	1
2 Scope of Work and Methodology	2
3 Regulatory Framework	3
4 Results	5
5 Quality Assurance/Quality Control	7
6 Summary and Recommendations	8
7 Notice to Reader	9

### In-Text Tables

1: Detailed Inventory of Suspected Lead-Based Paint Samples – 150 Ton Krupp Crane, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC	5
2: Summary Table of Lead-Based Paint Identified on the 150 Ton Krupp Crane, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC	8

### Appendices

- I: Analytical Laboratory Certifications
- II: Photographs
- III: Laboratory Analytical Report

P:\CPI\PWGSC\647910\5.0 DEL\5.3 FINAL\IR629DMA\_150 T CRANE\_FINAL.DOCX

# 1 Introduction

On behalf of Public Services and Procurement Canada (PSPC), SNC-Lavalin Inc. (SNC-Lavalin) has completed an assessment of lead in paint (the “assessment”) of the 150 Ton Krupp crane (150T crane) at the PSPC Esquimalt Graving Dock (EGD), 825 Admirals Road, Esquimalt, BC (the “Site”). SNC-Lavalin understands that the purpose of the work was to assess lead concentrations in painted surfaces prior to surface preparation for re-painting selected portions of the 150T crane.

SNC-Lavalin understands that the surfaces to be painted will be prepared via pressure washing and hand grinding and/or needle gun paint removal. SNC-Lavalin further understands that the 150T crane was installed at the Site in 1980.

The PSPC project number is R.090381.001 and the task authorization number is CTA EZ113-150642/003/PWY.

## 2 Scope of Work and Methodology

The work was completed in general accordance with SNC-Lavalin's proposal *150T Krupp Crane Painting, Lead Based Paint Assessment, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC, Project # R.090381.001*, dated June 12, 2017.

On June 14, 2017, SNC-Lavalin personnel collected representative paint samples from selected surfaces of the 150T crane. The samples were submitted for laboratory analysis of total lead. One sample was also submitted for waste classification (leachability).

The following sections outline the specific protocols followed when completing the survey.

### Lead in Paint

Different paint colours may contain different concentrations of lead; therefore, SNC-Lavalin personnel inspected select areas of the 150T crane to determine primary paint colour(s) that had been applied to major surfaces. The approach was to try to obtain samples from structures that may need to be cut, ground, or sanded during surface preparation. Factory painted metal surfaces are not sampled as the paint is applied in thin layers, making it difficult to obtain a sufficient amount of paint to analyze. Where possible, SNC-Lavalin personnel collected samples of the painted surfaces for potential analysis of leachable metals. In addition, due to the area to be prepared, SNC-Lavalin collected additional representative samples of select paint colours.

On June 14, 2017, a total of five (5) samples were collected from the 150T crane as follows:

- › 150T-P1: Portal tube, blue paint, 1 layer;
- › 150T-P2: Portal girder, blue paint over light blue;
- › 150T-P3: Gantry leg, blue paint over light blue;
- › 150T-P4: Underside of portal girder, blue paint over light blue; and
- › 150T-P5: Stairway and handrail, blue paint, over light blue, over cream, over yellow and/or red.

Samples were collected by physically scraping paint chips from the surface using hand tools. Approximately 5 g to 10 g of paint chips were collected into clean sample bags and labelled for laboratory submission. Note that approximately 5 to 10 g is the recommended sample size for analysis of total lead in paint chips. Sample 150T-P5 was also selected for analysis of leachable lead by Toxicity Characteristic Leaching Procedure (TCLP). Only 10.39 g of paint was collected at sample 150T-P5 due to time limitations which is less than the recommended 100 g for TCLP extraction as per the Reference Method EPA 1311 R1992. Analysis of TCLP leachable lead was completed with a notation that the analytical results for TCLP leachable lead is reported with greater uncertainty.

Samples were submitted to Maxxam Analytics in Burnaby, BC (Maxxam) for analysis of total lead in accordance with the applicable regulations. One (1) sample was also selected for analysis of leachable lead.

Maxxam is accredited by CALA, and a copy of their accreditations is presented in Appendix I. Analysis of bulk samples for determination of lead concentration was performed using Inductively Coupled Plasma, Mass Spectrometry (ICP-MS) procedures. The waste characterization of samples was performed using Toxicity Characteristic Leaching Procedure (TCLP).

## 3 Regulatory Framework

Federal and provincial regulations require that hazardous building materials, including lead in paint, be properly identified and managed to prevent potential exposure to workers. In addition, a more intrusive survey is required to identify materials of concern prior to renovations, salvage, or demolition of a building or structure. These materials must be properly controlled, removed, and/or disposed of at a suitably permitted facility in accordance with the applicable federal and provincial regulations. The following federal and provincial regulations relate to lead containing paint:

### Federal

Various Regulations made under the *Canadian Environmental Protection Act* (CEPA), 1999, S.C. 1999, c. 33, last amended on December 21, 2016, including specialized handling and/or disposal requirements for materials including lead. Regulations include the following:

- › *Canada Labour Code, Part II*, R.S.C., 1985, c. L-2, last amended January 3, 2016.
- › *Canada Occupational Health and Safety Regulations*, SOR/86-304, last amended June 14, 2016.
- › *Surface Coating Materials Regulations*, SOR/2016-193<sup>1</sup>, requires the concentration of total lead and total mercury present in a surface coating material to be not more than 90 mg/kg and 10 mg/kg, respectively. SNC-Lavalin notes that requirements for total arsenic are not addressed in this regulation.
- › *Human Resources Social Development Canada* (HRSDC), *Canada Labour Code Part II*, Canada Occupational Health and Safety Regulations, Part X, Hazardous Substances, as amended, requires that all hazardous substances in the workplace, including lead in paint, be identified and controlled to minimize potential exposure to workers. Under the Canada Labour Code Part II definitions, a “hazardous substance” includes a controlled product and a chemical, biological, or physical agent that, by reason of a property that the agent possess, is hazardous to the safety or health of a person exposed to it.

### Provincial

- › *WorkSafeBC Occupational Health and Safety Regulation* (OHSR), BC Reg. 296/97, includes amendments up to B.C. Reg. 9/2017, May 1, 2017 requires that hazardous materials, including lead or other heavy metal or toxic substances and flammable or explosive materials that may be handled, disturbed, or removed during demolition must be identified and removed or safely contained prior to demolition. In addition, a copy of the observation report identifying these materials must be available at the work site. The requirements for the management of indoor air quality are also included.
- › *Hazardous Waste Regulation* (HWR), B.C. Reg. 63/88, including amendments up to B.C. Reg. 179/2016, requires all Hazardous Wastes (HW) must be properly managed and disposed of.

---

<sup>1</sup> Available at <http://laws-lois.justice.gc.ca/PDF/SOR-2016-193.pdf>  
Internal Ref: 647910

## **Lead Paint**

Federal and provincial guidelines limit lead concentrations in paint to 90 mg/kg for high risk individuals (i.e., pregnant women and children), and any concentrations that exceed this limit would be considered a lead-containing paint. WorkSafeBC has released a document *Safe Work Practices for Handling Lead*<sup>2</sup> that identifies the hazards posed by lead and provides direction on methods that should be used to control exposure. It also provides basic information regarding development and implementation of an exposure control plan and safe work procedures. Improper removal of paint resulting in airborne lead concentrations that exceed 50% of the airborne lead exposure limit of 0.05 mg/m<sup>3</sup>; would trigger the requirement for an employer to file a Notice of Project Lead (NOPL) and the development and implementation of an exposure control plan and safe work procedures prior to any work being completed. Therefore, for the purposes of this report we have identified paint as lead-containing if the total lead concentration is >90 mg/kg as per the federal regulations, and if the paint contains lead concentrations >600 mg/kg, an exposure control plan may be required if the paint is disturbed in such a manner that workers could be exposed to lead at >50% of the exposure limit.

There are no special disposal requirements for materials coated with lead paint unless the lead is found to be leachable in excess of the regulated standard of 5 mg/L in the HW regulations while considering the entire mass of the object the paint is coating. Analytical results of TCLP leachable lead for paint chips (as opposed to the mass of the painted object) as compared to the HW regulations is presented for reference purposes and would be applicable for the disposal of paint removed or stripped from the object.

There are no regulated procedures for removing/handling materials painted with arsenic-containing paint; however, exposure to arsenic is regulated under the WSBC OHSR. Therefore, best management practices should be considered to minimize the potential for dust generation, inhalation and ingestion of contaminants.

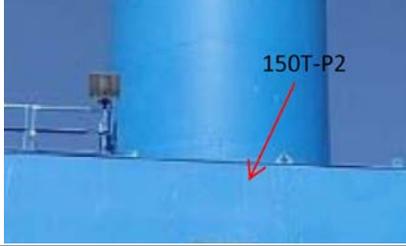
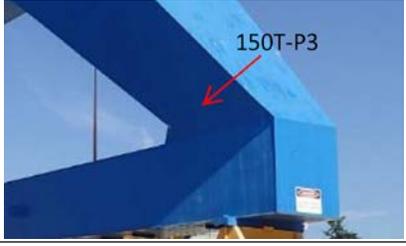
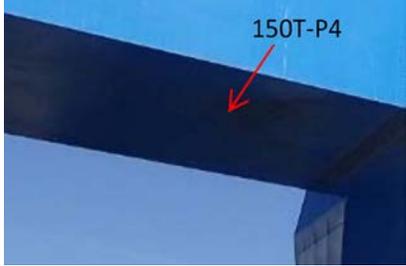
---

<sup>2</sup> Available at: <https://www.worksafebc.com/en/resources/health-safety/books-guides/safe-work-practices-handling-lead>

## 4 Results

Details of the results for the paint samples are presented in Table 1, below. All suspect lead paint samples were given prefix "150T-" to differentiate the crane from other cranes located on the Site.

**Table 1: Detailed Inventory of Suspected Lead-Based Paint Samples – 150 Ton Krupp Crane, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC**

Identified Lead-Based Paint Description*	Photo
<p>Portal Tube:</p> <ul style="list-style-type: none"> <li>› Paint colour: Blue</li> <li>› Substrate: Metal</li> <li>› Approximate Extent: Full surface of portal tube</li> <li>› Analytical Result (<b>Sample 150T-P1</b>): <b>178 mg/kg</b> total lead</li> <li>› Condition: Good, no visible damage</li> <li>› Recommendation: See Table 2</li> </ul>	
<p>Portal Girder:</p> <ul style="list-style-type: none"> <li>› Paint colour: Blue over light blue</li> <li>› Substrate: Metal</li> <li>› Approximate Extent: Full surface of portal girder</li> <li>› Analytical Result (<b>Sample 150T-P2</b>): <b>679 mg/kg</b> total lead</li> <li>› Condition: Good, no visible damage</li> <li>› Recommendation: See Table 2</li> </ul>	
<p>Gantry Leg:</p> <ul style="list-style-type: none"> <li>› Paint colour: Blue over light blue</li> <li>› Substrate: Metal</li> <li>› Approximate Extent: Full surface of gantry leg</li> <li>› Analytical Result (<b>Sample 150T-P3</b>): <b>930 mg/kg</b> total lead</li> <li>› Condition: Good, no visible damage</li> <li>› Recommendation: See Table 2</li> </ul>	
<p>Underside Portal Girder:</p> <ul style="list-style-type: none"> <li>› Paint colour: Blue over light blue</li> <li>› Substrate: Metal</li> <li>› Approximate Extent: Full surface of portal girder</li> <li>› Analytical Result (<b>Sample 150T-P4</b>): <b>114 mg/kg</b> total lead</li> <li>› Condition: Good; some flaking near edges.</li> <li>› Recommendation: See Table 2</li> </ul>	

Stairway and Handrail:

- › Paint colour: Blue over light blue, cream, yellow, and/or red.
- › Substrate: Metal
- › Approximate Extent: Full surface of stairway and handrail
- › Analytical Result (**Sample 150T-P5**): **626 mg/kg** total lead  
1.65 mg/L leachable lead (TCLP)
- › Condition: Good, no visible damage
- › Recommendation: See Table 2



\* **Bold** – indicates lead concentration greater than 90 mg/kg but less than 600 mg/kg.

\* **Bold and underlined** – indicates lead concentration greater than or equal to 600 mg/kg.

## 5 Quality Assurance/Quality Control

### Procedures

Quality Assurance/Quality Control (QA/QC) measures were undertaken to ensure unbiased and representative sample collection and accuracy of the laboratory analyses. Details of the QA/QC program are summarized below:

- › Use of trained and experienced personnel.
- › Implementation of SNC-Lavalin Inc.'s (SNC-Lavalin's) preferred operating procedures (POPs).
- › Documentation of all field activities.
- › Sample collection in a manner appropriate for the prevention of cross-contamination and other field sampling errors, using appropriate decontaminated sampling tools, equipment and contaminant-free containers appropriate to the subsequent analyses.
- › Chain-of-custody documentation for sample submission.
- › Use of appropriately accredited laboratories for analysis of the samples.
- › Procedures to confirm accurate transcription of laboratory data into tables.
- › Review of laboratory QA performance to confirm results are acceptable.

Laboratory internal quality control measures are provided in the appended analytical report.

## 6 Summary and Recommendations

Based on the results of the survey, there are surfaces coated with lead-based paint on the 150T crane requiring specific procedures prior to renovations for: handling; abatement; demolition; and disposal, as outlined below in Table 2. Select photographs, with the sample locations included, are presented in Appendix III. The laboratory analytical report is included in Appendix IV.

A summary of the lead-based paint identified on the 150T crane is included in Table 2, below:

**Table 2: Summary Table of Lead-Based Paint Identified on the 150 Ton Krupp Crane, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC**

Description and Location	Recommendations
<b>LEAD CONTAINING PAINTS</b>	
<p><i>Total Lead in Paint</i></p> <ul style="list-style-type: none"> <li>› <b>Blue</b>, portal tube (Photo 1).</li> <li>› <b>Blue</b>, portal girder (Photo 2).</li> <li>› <b>Blue</b>, gantry leg (Photo 3).</li> <li>› <b>Blue</b>, underside of portal girder (Photo 4).</li> <li>› <b>Blue</b>, stairway and hand railing (Photo 5).</li> </ul>	<p>WorkSafeBC suggests that improper removal of paint with a lead concentration of 600 mg/kg or more can result in airborne lead concentrations that exceed 50% of the airborne lead exposure limit of 0.05 mg/m<sup>3</sup>; this would trigger the requirement for an employer to file a NOPL and the development and implementation of an exposure control plan and safe work procedures prior to any work being completed.</p> <p>If required, the abatement contractor should file a NOPL with WorkSafeBC prior to any lead abatement work taking place. Documentation should be provided by the abatement contractor and retained by PSPC to verify compliance with the applicable regulations.</p> <p>There is the potential for lead exposure for high risk individuals in the event that lead-containing paint with lead concentrations &gt;90 mg/kg is burned and/or becomes airborne during renovation, deconstruction/demolition activities such as cutting, grinding, etc. Therefore, these individuals should be excluded from the work area whenever lead-containing paint is being disturbed by work activities to minimize potential lead exposure to these individuals.</p> <p>The waste generated from removal of paint and surface coatings may be hazardous. Given the possible need for off-site disposal of waste material during deconstruction / demolition activities, laboratory analysis for preliminary waste characterization of select samples (concentrations of metals in the leachate) may be required. If leachate analysis (TCLP) is required for disposal of materials containing elevated lead concentrations, additional sampling may be required.</p> <p>All paints found at the Site of similar colours as those identified to be lead-containing paint should be considered lead-containing.</p>
<p><i>Leachable Lead in Paint</i></p> <ul style="list-style-type: none"> <li>› The sample analyzed for leachable lead contained a concentration less than the regulatory guideline.</li> </ul>	<p>No special disposal requirements necessary.</p>

- All relevant waste disposal documentation should be provided by the qualified contractors and retained by PSPC.
- A Notice of Project – Lead (NOPL) and Safe Work Procedures (included with the NOPL) must be submitted to WorkSafeBC and a copy retained by PSPC.

## 7 Notice to Reader

This report has been prepared and the work referred to in this report has been undertaken by SNC-Lavalin Inc. (SNC-Lavalin), for the exclusive use of Public Services and Procurement Canada (PSPC), who has been party to the development of the scope of work and understands its limitations. The methodology, findings, conclusions and recommendations in this report are based solely upon the scope of work and subject to the time and budgetary considerations described in the proposal and/or contract pursuant to which this report was issued. Any use, reliance on, or decision made by a third party based on this report is the sole responsibility of such third party. SNC-Lavalin accepts no liability or responsibility for any damages that may be suffered or incurred by any third party as a result of the use of, reliance on, or any decision made based on this report.

The findings, conclusions and recommendations in this report (i) have been developed in a manner consistent with the level of skill normally exercised by professionals currently practicing under similar conditions in the area, and (ii) reflect SNC-Lavalin's best judgment based on information available at the time of preparation of this report. No other warranties, either expressed or implied, are made with respect to the professional services provided to PSPC or the findings, conclusions and recommendations contained in this report. The findings and conclusions contained in this report are valid only as of the date of this report and may be based, in part, upon information provided by others. If any of the information is inaccurate, new information is discovered or project parameters change, modifications to this report may be necessary.

This report must be read as a whole, as sections taken out of context may be misleading. If discrepancies occur between the preliminary (draft) and final version of this report, it is the final version that takes precedence. Nothing in this report is intended to constitute or provide a legal opinion.

The contents of this report are confidential and proprietary. Other than by PSPC, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of PSPC and SNC-Lavalin.



# Appendix I

Analytical Laboratory Accreditations



# CALA

Canadian Association for  
Laboratory Accreditation Inc.

## CALA Directory of Laboratories

---

**Membership Number:** 2168  
**Laboratory Name:** Maxxam Analytics (Burnaby, Canada Way)  
**Parent Institution:** Maxxam Analytics International Corporation  
**Address:** 4606 Canada Way Burnaby BC V5G 1K5  
**Contact:** Mr. Ray Chapman-Chen  
**Phone:** (604) 639-2619  
**Fax:** (604) 731-2386  
**Email:** rchen2@maxxam.ca

---

**Standard:** Conforms with requirements of ISO/IEC 17025  
**Clients Served:** All Interested Parties  
**Revised On:** March 9, 2017  
**Valid To:** August 11, 2019

---

### Scope of Accreditation

#### Air (Inorganic)

Metals - Air Filter (183)

BBY7SOP-00002, BBY7SOP-00016; modified from EPA SW-846 6020A

#### ICP/MS - DIGESTION

Aluminum

Antimony

Arsenic

Barium

Beryllium

Boron

Cadmium

Chromium

Cobalt

Copper

Iron

Lead

Manganese

Molybdenum

Nickel

Phosphorous

Selenium

Silver

Strontium

Vanadium

Zinc

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Air (Inorganic)**

Metals - Occupational Health (Cassettes) (015)  
BBY7SOP-00016, BBY7SOP-00018; modified from NIOSH 7303  
ICP - DIGESTION

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Boron  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorous  
Potassium  
Selenium  
Silver  
Sodium  
Strontium  
Sulphur  
Tin  
Titanium  
Vanadium  
Zinc  
Zirconium

**Air (Inorganic)**

Total Particulates - Air (181)  
BBY5SOP-00005; modified from BC MOE LAB MANUAL G, and EPA/600/R-94/038B  
GRAVIMETRIC  
Particulate>2.5 microns

**Air (Organic)**

Polycyclic Aromatic Hydrocarbons (PAH) - Air (281)  
BBY8SOP-00027; PREPARATION: modified from BC MOE LAB MANUAL H: modified from EPA SW-846 8270D  
GC/MS  
Acenaphthene  
Acenaphthylene  
Anthracene  
Benz(a)anthracene  
Benzo(a)pyrene  
Benzo(b&i)fluoranthene  
Benzo(e)pyrene  
Benzo(g,h,i)perylene  
Benzo(k)fluoranthene  
Chrysene  
Dibenz(a,h)anthracene

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Fluoranthene  
Fluorene  
Indeno(1,2,3-cd)pyrene  
Naphthalene  
Perylene  
Phenanthrene  
Pyrene

**Air (Organic)**

Volatile Hydrocarbons - Air (184)  
BBY5SOP-00031; BC MOE LAB MANUAL SECTION H  
GC/MS - THERMAL DESORPTION  
VHv6-13/VPHv

**Air (Organic)**

Volatile Organic Compounds (VOC) - Air (180)  
BBY5SOP-00031; modified from BC MOE LAB MANUAL SECTION H  
GC/MS - THERMAL DESORPTION

1,1-Biphenyl  
1,1-Dichloroethane  
1,1-Dichloroethene  
1,1-Dichloropropene  
1,1,1-Trichloroethane  
1,1,1,2-Tetrachloroethane  
1,1,2-Trichloroethane  
1,1,2,2-tetrachloroethane  
1,2-Dibromo-3-chloropropane  
1,2-Dibromoethane  
1,2-Dichlorobenzene  
1,2-Dichloroethane  
1,2-Dichloropropane  
1,2,3-Trichlorobenzene  
1,2,3-Trichloropropane  
1,2,4-Trichlorobenzene  
1,2,4-Trimethylbenzene  
1,3-Butadiene  
1,3-Dichlorobenzene  
1,3-Dichloropropane  
1,3,5-Trimethylbenzene  
1,4-Dichlorobenzene  
2-Butanone (MEK)  
2-Chlorophenol  
2-Chlorotoluene  
2-Hexanone (MBK)  
2,2-Dichloropropane  
4-Chlorotoluene  
4-isopropyltoluene (cymene)  
4-Methyl-2-pentanone (MIBK)  
Benzene  
Bromobenzene  
Bromodichloromethane  
Bromoform  
Bromomethane  
Butyl Acetate  
Carbon tetrachloride

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Chlorobenzene  
Chloroethane  
Chloroform  
cis-1,2-Dichloroethene  
cis-1,3-Dichloropropene  
Dibromochloromethane  
Dibromomethane  
Dichlorodifluoromethane (Freon12)  
Dichloromethane  
Epichlorohydrin  
Ethyl Benzene  
Hexachlorobutadiene  
Isobutanol  
Isopropanol  
Isopropylbenzene (cumene)  
m/p-xylene  
Methylcyclohexane  
MTBE  
n-Butylbenzene  
n-Decane (c10)  
n-Dodecane (c12)  
n-Hexane (c6)  
n-Propylbenzene (isocumene)  
n-Tridecane (c13)  
Naphthalene  
Nitrobenzene  
o-xylene  
Phenol  
sec-Butylbenzene  
Styrene  
t-Butylbenzene (dimethylethylbenzene)  
Tetrachloroethene  
Toluene  
trans-1,3-Dichloropropene  
Trichloroethene  
Trichlorofluoromethane (Freon11)  
Trichlorotrifluoroethane (Freon 113)  
Vinyl Chloride

**Leachate (Inorganic)**

Cyanide - Leachates (304)

BBY6SOP-00004, BBY7SOP-00009; prep: modified from BC REG 63/88, SCHEDULE 4, PART 2 ANALYTICAL:  
modified from SM 4500 CN- O

COLOR - DISTILLATION

Cyanide (WAD)

**Leachate (Inorganic)**

Fluoride - Leachates (300)

BBY6SOP-00048, BBY7SOP-00009; PREP: modified from BC REG 63/88, SCHEDULE 4, PART 2;  
ANALYTICAL: modified from SM 4500 F-C

ION SELECTIVE ELECTRODE - (BC MLEP/MODIFIED WEP)

Fluoride

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Leachate (Inorganic)**

Metals (BC MLEP/Modified SWEP) - Leachates (308)  
BBY7SOP-00001, BBY7SOP-00009; prep: modified from BC REG 63/88, SCHEDULE 4, PART 2 AND ANALYTICAL: EPA SW846 METHOD 6020 B  
ICP/MS  
Antimony  
Arsenic  
Barium  
Beryllium  
Boron  
Chromium  
Copper  
Lead  
Mercury  
Selenium  
Silver  
Thallium  
Uranium  
Zinc

**Soil (Inorganic)**

Hot Water Soluble Boron - Soil (301)  
BBY7SOP-00006, BBY7SOP-00018; PREP: BC MOE LAB MANUAL SECTION C; ANALYTICAL: MODIFIED FROM USEPA SW-846 METHOD 6010 C  
ICP/OES  
Soluble Boron

**Solids (Inorganic)**

Chloride - Soil, Saturated Paste (185)  
BBY6SOP-00011, BBY6SOP-00030; modified from SM 4500 Cl- E and modified from SSMA, CHAPTER 15, SECTION 15.2.1  
AUTO COLOR - KONELAB  
Chloride

**Solids (Inorganic)**

Conductivity - Sat Paste Extract (279)  
BBY6SOP-00029; modified from SM 2510 B  
CONDUCTIVITY METER  
Conductivity

**Solids (Inorganic)**

Extractable Metals - Soil (303)  
BBY6SOP-00030, BBY7SOP-00018; PREP: CARTER, M.R., CHAPTER 15, SECTION 15.2.1, 2008  
ANALYTICAL: modified from USEPA SW-846 METHOD 6010 C  
ICP/OES  
Soluble Calcium  
Soluble Magnesium  
Soluble Potassium  
Soluble Sodium  
Soluble Sulphur

**Solids (Inorganic)**

Flashpoint - Soil (260)  
BBY6SOP-00042; modified from ASTM D3828-12a  
SETA FLASH CLOSED TESTER  
Flashpoint C

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Solids (Inorganic)**

Free Liquid - Soil, Waste (261)  
BBY6SOP-00043; modified from EPA SW-846 9095B  
VISUAL EXAMINATION  
Free Liquid

**Solids (Inorganic)**

Hexavalent Chromium - Soil (302)  
BBY6SOP-00015; modified from SM 3500 Cr B  
COLORIMETRIC  
Hexavalent Chromium

**Solids (Inorganic)**

Hot Water Soluble Boron - Soil (171)  
BBY7SOP-00001, BBY7SOP-00006; modified from BC MOE LAB MANUAL C (PREPARATION) and modified from EPA SW-846 6020B (ANALYTICAL)  
ICP/MS - EXTRACTION  
Boron

**Solids (Inorganic)**

Leachable Metals - Soil (100% SOLID MATRICES ONLY) (187)  
BBY7SOP-00001, BBY7SOP-00005; EPA SW-846 1311 (LEACH) and modified from EPA 6020B (ANALYSIS)  
ICP/MS - TCLP  
Antimony  
Arsenic  
Barium  
Beryllium  
Boron  
Cadmium  
Calcium  
Chromium  
Copper  
Lead  
Mercury  
Molybdenum  
Selenium  
Silver  
Thallium  
Uranium  
Zinc

**Solids (Inorganic)**

Lead - Paint (254)  
BBY7SOP-00017, BBY7SOP-00018; modified from BC MOE LAB MANUAL SECTION C  
ICP/OES - DIGESTION  
Lead

**Solids (Inorganic)**

Mercury - Soil, Sediment (038)  
BBY7SOP-00004, BBY7SOP-00012; modified from BC MOE LAB MANUAL SECTION C and EPA 245.7  
COLD VAPOUR ATOMIC FLUORESCENCE - DIGESTION  
Mercury

**Solids (Inorganic)**

Metals - Soil, Sediment (037)  
BBY7 SOP-00004, BBY7-00018; modified from BC MOE LAB MANUAL SECTION C and modified from EPA SW-846 6010C  
ICP - DIGESTION  
Aluminum

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Arsenic  
Barium  
Beryllium  
Bismuth  
Boron  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Selenium  
Silver  
Sodium  
Strontium  
Tin  
Titanium  
Vanadium  
Zinc  
Zirconium

**Solids (Inorganic)**

Metals - Soil, Sediment (116)

BBY6SOP-00007, BBY7SOP-00001; modified from EPA SW-846 6020B and modified from EPA 821-R-91-100

ICP/MS

Cadmium

Copper

Lead

Nickel

Zinc

**Solids (Inorganic)**

Mineral Oil and Grease - Soil (188)

BBY8SOP-00007; modified from BC MOE LAB MANUAL SECTION D

GRAVIMETRIC - EXTRACTION

Mineral Oil and Grease

**Solids (Inorganic)**

Moisture (%) - Soil (189)

BBY8SOP-00017; modified from ONTARIO MOE E3139

GRAVIMETRIC

Moisture (%)

**Solids (Inorganic)**

Nitrite/Nitrate+Nitrite - Soil, Leachate (190)

BBY6SOP-00010, BBY6WI-00009; modified from SM 4500-NO3- I

AUTO COLOR

Nitrate + Nitrite Nitrogen

Nitrite

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Solids (Inorganic)**

Oil and Grease - Soil (191)  
BBY8SOP-00006; modified from BC MOE LAB MANUAL SECTION D  
GRAVIMETRIC - EXTRACTION  
Total Oil and Grease

**Solids (Inorganic)**

pH - Saturated Paste Extract (278)  
BBY6SOP-00025; modified from SM 4500-H+ B  
pH METER  
pH

**Solids (Inorganic)**

pH - Soil/Leachate (192)  
BBY6SOP-00028; modified from SM 4500-H+ B and modified from BC MOE LAB MANUAL SECTION B  
PH METER  
pH

**Solids (Inorganic)**

Saturated Paste - Soil (193)  
BBY6SOP-00030; modified from SOIL SAMPLING AND METHOD OF ANALYSIS, CHAPTER 15, SECTION 15.2.1  
GRAVIMETRIC  
Saturated Paste

**Solids (Inorganic)**

Sulfate - Soil (194)  
BBY6SOP-00017, BBY6SOP-00030; modified from SOIL SAMPLING AND METHOD OF ANALYSIS, CHAPTER 15, SECTION 15.2.1  
AUTO COLOR - KONELAB  
Sulfate

**Solids (Inorganic)**

Sulphide - Soil (195)  
BBY6SOP-00006, BBY6SOP-00007; modified from EPA 821-R-91-100 and modified from SM 4500 S2- D  
SPECTROPHOTOMETRIC- METHYLENE BLUE  
Acid Volatile Sulfide

**Solids (Inorganic)**

Total Metals - Soil (196)  
BBY7SOP-00001, BBY7SOP-00004; modified from EPA SW-846 6020B and BC MOE LAB MANUAL SECTION C  
ICP/MS - DIGESTION  
Aluminum  
Antimony  
Arsenic  
Barium  
Bismuth  
Cadmium  
Calcium  
Copper  
Iron  
Lead  
Magnesium  
Manganese  
Mercury  
Molybdenum  
Phosphorus  
Potassium

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Selenium  
Silver  
Sodium  
Strontium  
Tellurium  
Thallium  
Tin  
Titanium  
Vanadium  
Zinc  
Zirconium

**Solids (Organic)**

BTEX - Soil (Unit# 25) (101)

BBY8SOP-00032; modified from EPA SW-846 8021B and EPA SW-846 5035  
GC/PID - DIRECT INJECTION

Benzene  
Ethylbenzene  
m/p-xylene  
o-xylene  
Styrene  
Toluene

**Solids (Organic)**

BTEX (Unit#378) - Soil, Sediment (297)

BBY8SOP-00046; BC MOE LAB MANUAL SECTION D  
GC/PID - HEADSPACE

Benzene  
Ethylbenzene  
m/p-xylene  
o-xylene  
Toluene

**Solids (Organic)**

BTEX, MTBE, Styrene - Soil (198)

BBY8SOP-00010; modified from EPA SW-846 8260C and EPA SW-846 5021A and EPA SW-846 5035  
GC/MS - HEADSPACE

Benzene  
Ethylbenzene  
m/p-xylene  
Methyl t-butyl ether  
o-xylene  
Styrene  
Toluene

**Solids (Organic)**

Extractable Petroleum Hydrocarbons (EPH) - Soil (202)

BBY8SOP-00029; modified from BC MOE LAB MANUAL D  
GC/FID - EXTRACTION

EPH (C10-C19)  
EPH (C19-C32)

**Solids (Organic)**

Extractable Petroleum Hydrocarbons (EPH) - Soil (Unit# 378) (273)

BBY8SOP-00029; modified from BC MOE LAB MANUAL SECTION D  
GC/FID - EXTRACTION

EPH C10-19  
EPH C19-C32

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Solids (Organic)**

Extractable Petroleum Hydrocarbons (EPH) - Soil, Sediment (Unit#25) (099)

BBY8SOP-00029; modified from BC MOE LAB MANUAL SECTION D

GC/FID - EXTRACTION

EPH (C10-C19)

EPH (C19-C32)

**Solids (Organic)**

Leachable Polycyclic Aromatic hydrocarbons (PAH) -- Soil (100% SOLID MATRICES ONLY) (307)

BBY7SOP-00005, BBY8SOP-00021; PREP: modified from EPA SW846 8270 D AND ANALYTICAL: modified from EPA SW-846

GC/MS

1-Methylnaphthalene

1,4-Dimethylnaphthalene

2-Methylnaphthalene

3-Methylcholanthrene

7,12-Dimethylbenz (a) anthracene

9-Methylantracene

9,10-Dimethylantracene

Acenaphthene

Acenaphthylene

Acridine

Anthracene

Benz (c) phenanthrene

Benzo (a) anthracene

Benzo (a) pyrene

Benzo (b&j) fluoranthene

benzo(e)fluoranthene

Benzo (e) pyrene

Benzo (g,h,i) perylene

Benzo (k) fluoranthene

Chrysene

Dibenz (a,h) pyrene

Dibenz (a,i) pyrene

Dibenz (a,l) pyrene

Dibenzo (a,h) anthracene

Fluoranthene

Fluorene

Indeno (1,2,3 - cd) pyrene

Naphthalene

Perylene

Phenanthrene

Pyrene

Quinoline

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Soil (205)

BBY8SOP-00030; CCME - REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM HYDROCARBONS IN SOIL-TIER 1 METHOD

GC/FID - EXTRACTION

F2: C10-C16

F3: C16-C34

F4: C34-C50

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Soil (206)  
BBY8SOP-00012; CCME - REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM  
HYDROCARBONS IN SOIL-TIER 1 METHOD  
GC/FID - HEADSPACE  
F1: C6-C10

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Soil (264)  
BBY8SOP-00003; CCME REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM  
HYDROCARBONS IN SOIL-TIER 1 METHOD  
GRAVIMETRIC - SOXHLET  
F4: Gravimetric

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Soil (100% SOLID SAMPLES ONLY) (259)  
BBY8SOP-000015, BBY8SOP-00009; EPA SW-846 1311 (LEACH) AND EPA SW-846 8260C (ANALYSIS)  
TCLP ZERO GC/MS - HEADSPACE  
1,1-Dichloroethylene  
1,1,1-trichloroethane  
1,1,1,2-tetrachloroethane  
1,1,2-trichloroethane  
1,1,2,2-tetrachloroethane  
1,2-Ddichloropropane  
1,2-dibromoethane  
1,2-Dichlorobenzene  
1,2-Dichloroethane  
1,3-dichlorobenzene  
1,4-Dichlorobenzene  
Benzene  
Bromodichloromethane  
Bromoform  
Carbon tetrachloride  
Chlorobenzene  
Chlorodibromomethane  
Chloroethane  
Chloroform  
Chloromethane  
cis-1,2-dichloroethene  
cis-1,3-dichloropropene  
Dichloromethane  
Ethylbenzene  
m & p -Xylene  
Methyl-tert-butylether (MTBE)  
o-Xylene  
Styrene  
Tetrachloroethylene  
Toluene  
trans-1,2-dichloroethene  
trans-1,3-dichloropropene  
Trichloroethylene  
Trichlorofluorometahne  
Vinyl chloride  
Xylenes (Total)

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Soil (Unit# 25) (258)

BBY8SOP-00030; CCME REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM HYDROCARBONS IN SOIL-TIER 1 METHOD

GC/FID - EXTRACTION

F2: C10-C16

F3: C16-C34

F4: C34-C50

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Soil (Unit# 378) (274)

BBY8SOP-00030; CCME REFERENCE METHOD FOR THE CANADA-WIDE PHCS IN SOIL - TIER 1 METHOD.

GC/FID - EXTRACTION

F2: C10-C16

F3: C16-C34

F4: C34-C50

**Solids (Organic)**

Phenols - Soil (207)

BBY8SOP-00025; modified from EPA SW-846 3510C (PREPARATION) and modified from EPA SW-846 8270D (ANALYSIS)

GC/MS - EXTRACTION

2-Chlorophenol

2-Methyl-4,6-Dinitrophenol

2-Methylphenol

2-Nitrophenol

2,3,4,6 Tetrachlorophenol

2,3,5,6-Tetrachlorophenol

2,4-Dimethylphenol

2,4-Dinitrophenol

2,4,5-Trichlorophenol

2,4,6-Trichlorophenol

2,6-Dichlorophenol

3+4 Methylphenol

4-Nitrophenol

Pentachlorophenol

Phenol

**Solids (Organic)**

Polycyclic Aromatic Hydrocarbons (PAH) - Soil (208)

BBY8SOP-00022, BBY8SOP-00038; modified from EPA SW-846 8270D and EPA SW-846 3570

GC/MS - SHAKE EXTRACTION

1-Methylnaphthalene

1-Methylphenanthrene

1,4-Dimethylnaphthalene

2-Methylnaphthalene

2,3,5-Trimethylnaphthalene

2,6-Dimethylnaphthalene

3-Methylcholanthrene

7,12-Dimethylbenz (a) anthracene

9-Methylanthracene

9,10-Dimethylanthracene

Acenaphthene

Acenaphthylene

Anthracene

Benz(c)phenanthrene

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Benzo (a) anthracene  
Benzo (a) pyrene  
Benzo (b) fluoranthene  
Benzo (e) fluoranthene  
Benzo (e) pyrene  
Benzo (g,h,i) perylene  
Benzo (k) fluoranthene  
Chrysene  
Dibenz (a,h) pyrene  
Dibenz (a,i) pyrene  
Dibenz (a,l) pyrene  
Dibenzo (a,h) anthracene  
Fluoranthene  
Fluorene  
Indeno (1,2,3 - cd) pyrene  
Naphthalene  
Perylene  
Phenanthrene  
Pyrene

**Solids (Organic)**

Tributyltin - Soil (276)  
BBY8SOP-00050; modified from RESTEK CORP APPLICATION NOTE# 59550  
GC/MS  
Tributyltin Tin (TBT)

**Solids (Organic)**

Volatile Hydrocarbon (Unit# 378) - Soil, Sediment (296)  
BBY8SOP-00046; BC LAB MANUAL SECTION D  
GC/FID - HEADSPACE  
F1: C6-C10

**Solids (Organic)**

Volatile Hydrocarbons (VH) - Soil, Sediment (Unit# 25) (133)  
BBY8SOP-00032; modified from BC MOE LAB MANUAL SECTION D  
GC/FID  
F1: C6-C10

**Solids (Organic)**

Volatile Organic Compounds (VOC) - Soil (213)  
BBY8SOP-00009, BBY8WI-00011; modified from EPA SW-846 8260C and modified from EPA SW-846 5021  
GC/MS - HEADSPACE  
1,1-Dichloroethane  
1,1-dichloroethylene  
1,1,1 - Trichloroethane  
1,1,1,2- Tetrachloroethane  
1,1,2-Trichloroethane  
1,1,2,2-Tetrachloroethane  
1,2-dichlorobenzene  
1,2-dichloroethane  
1,2-Dichloropropane  
1,3-Dichlorobenzene  
1,4-dichlorobenzene  
Benzene  
Bromodichloromethane  
Bromoform  
Bromomethane

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Carbon Tetrachloride  
Chlorobenzene  
Chlorodibromomethane  
Chloroethane  
Chloroform  
Chloromethane  
cis-1,2-Dichloroethylene  
cis-1,3-Dichloropropene  
Dichloromethane  
Ethylbenzene  
Ethylene Dibromide  
m/p-xylene  
Methyl t-butyl ether  
o-xylene  
Styrene  
Tetrachloroethylene  
Toluene  
trans,1,3-dichloropropene  
trans-1,2-Dichloroethylene  
Trichloroethylene  
Trichlorofluoromethane  
Vinyl Chloride

**Solids (Organic)**

Volatile Petroleum Hydrocarbons (VPH) - Soil (214)  
BBY8SOP-00011; modified from BC MOE LAB MANUAL D  
GC/FID - HEADSPACE  
F1: C6-C10

**Solids (Toxicology)**

Chironomids - Sediment (150)  
BBY2SOP-00010; EPS 1/RM/32  
SURVIVAL AND GROWTH  
Chironomids (10 days)

**Solids (Toxicology)**

Echinoid Larval Development - Sediment (298)  
BBY2SOP-00062; EPS 1/RM/58  
GROWTH AND SURVIVAL  
Echinoid Larval Development (48hr)

**Solids (Toxicology)**

Hyalella azteca - Sediment (149)  
BBY2SOP-00011; EPS 1/RM/33  
SURVIVAL AND GROWTH  
Hyalella azteca (14d)

**Solids (Toxicology)**

Marine Amphipods - Sediment (151)  
BBY2SOP-00012; EPS 1/RM/26 and EPS 1/RM/35  
ACUTE LETHALITY (SURVIVAL)  
Marine Amphipods (10 day)

**Solids (Toxicology)**

Microtox - Solid Phase - Soil, Sediment (152)  
BBY2SOP-00014; EPS 1/RM/42  
BIOLUMINESCENCE  
Microtox IC50

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Tissue (Inorganic)**

Mercury - Tissue (255)

BBY7SOP-00012, BBY7SOP-00013; modified from EPA 200.3 and modified from EPA 245.7

COLD VAPOUR ATOMIC FLUORESCENCE - DIGESTION

Mercury

**Tissue (Inorganic)**

Total Metals - Tissue (215)

BBY7SOP-00002, BBY7SOP-00021; modified from EPA SW-846 6020B and BC MOE LAB MANUAL SECTION

C

ICP/MS

Aluminum

Antimony

Arsenic

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Chromium

Cobalt

Copper

Iron

Lead

Magnesium

Manganese

Mercury

Molybdenum

Nickel

Phosphorus

Potassium

Selenium

Silicon

Silver

Sodium

Strontium

Sulfur

Tellurium

Thallium

Tin

Titanium

Uranium

Vanadium

Zinc

Zirconium

**Water (Inorganic)**

Acidity - Water (137)

BBY6SOP-00037; modified from SM 2310 B

TITRATION

Acidity (pH 8.3)

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Inorganic)**

Alkalinity - Water (216)  
BBY6SOP-00026; modified from SM 2320 B  
TITRIMETRIC - AUTOMATED  
Alkalinity (pH 4.5)

**Water (Inorganic)**

Ammonia (N) - Water (217)  
BBY6SOP-00009; modified from EPA 350.1 and SM 4500 NH3-G  
AUTO COLOR - PHENATE  
Ammonia

**Water (Inorganic)**

Biochemical Oxygen Demand (BOD) - Water (218)  
BBY6SOP-00045; modified from SM 5210 B  
D.O. METER  
BOD (5 day)  
CBOD (5 day)

**Water (Inorganic)**

Carbon - Water (233)  
BBY6SOP-00003; modified from SM 5310 C  
COLORIMETRIC  
Organic Carbon

**Water (Inorganic)**

Carbon - Water (277)  
BBY6SOP-00018; modified from SM 5310 C  
COLORIMETRIC  
Carbon (Total Inorganic)

**Water (Inorganic)**

Chemical Oxygen Demand (COD) - Water (220)  
BBY6SOP-00024; modified from SM 5220 D  
TITRIMETRIC - DIGESTION  
COD

**Water (Inorganic)**

Chloride - Water (221)  
BBY6SOP-00011; modified from SM 4500-Cl- E  
AUTO COLOR - KONELAB  
Chloride

**Water (Inorganic)**

Chlorophyll A and Phaeophytins - Water (122)  
BBY6SOP-00002; modified from SM 10200 H  
UV/VIS/SPECTROPHOTOMETER  
Chlorophyll A  
Phaeophytins

**Water (Inorganic)**

Colour - Water (023)  
BBY6SOP-00021; modified from SM 2120 B  
VISUAL COMPARISON  
Apparent Colour

**Water (Inorganic)**

Colour - Water (295)  
BBY6SOP-00057; modified from SM 2120 C  
SPECTROPHOTOMETRIC  
True Colour

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Inorganic)**

Conductivity - Water (222)

BBY6SOP-00026; modified from SM 2510 B

CONDUCTIVITY METER

Conductivity (25°C)

**Water (Inorganic)**

Conductivity - Water, Wastewater (156)

BBY0SOP-00006; modified from SM 2510 B

CONDUCTIVITY METER

Conductivity (25°C)

**Water (Inorganic)**

Cyanide - Water (223)

BBY6SOP-00004, BBY6W1-00016; modified from SM 4500 CN- O and modified from EPA SW-846 9013

COLOR - DISTILLATION

Cyanide (SAD)

Cyanide (Weak Acid Digestion)

**Water (Inorganic)**

Dissolved and Extractable Metals - Water (004)

BBY7SOP-00018, BBY7WI-00004; modified from EPA SW-846 6010C

ICP

Aluminum (High)

Antimony

Arsenic

Barium (High)

Beryllium (High)

Bismuth (High)

Boron (High)

Cadmium (High)

Calcium

Chromium (High)

Cobalt (High)

Copper (High)

Iron (High)

Lead (High)

Lithium (High)

Magnesium

Manganese (High)

Molybdenum (High)

Nickel (High)

Phosphorus

Potassium

Selenium

Silicon

Silver (High)

Sodium

Strontium (High)

Sulphur

Tin (High)

Titanium (High)

Vanadium (High)

Zinc (High)

Zirconium (High)

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Inorganic)**

Dissolved Metals - Water (225)

BBY7WI-00004, BY7SOP-00002; modified from EPA SW-846 6020B

ICP/MS

Aluminum

Antimony

Arsenic

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Cesium

Chromium

Cobalt

Copper

Gold

Iron

Lanthanum

Lead

Lithium

Magnesium

Manganese

Mercury

Molybdenum

Nickel

Palladium

Phosphorus

Platinum

Potassium

Rubidium

Selenium

Silicon

Silver

Sodium

Strontium

Sulphur

Tellurium

Thallium

Thorium

Tin

Titanium

Tungsten

Uranium

Vanadium

Zinc

Zirconium

**Water (Inorganic)**

Fluoride - Water (226)

BBY6SOP-00048; modified from SM 4500-F- C

SELECTIVE ION ELECTRODE

Fluoride

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Inorganic)**

Hexavalent Chromium - Water (227)  
BBY6SOP-00015; modified from SM 3500 CR B  
COLORIMETRIC  
Hexavalent Chromium

**Water (Inorganic)**

Mercury - Water (095)  
BBY7SOP-00015; modified from BC MOE LAB MANUAL SECTION C  
COLD VAPOUR ATOMIC FLUORESCENCE - DIGESTION  
Mercury

**Water (Inorganic)**

Mercury (Ultra-Low Level) - Water (299)  
BBY7SOP-00022; US EPA METHOD 1631  
COLD VAPOUR ATOMIC FLUORESCENCE  
Mercury

**Water (Inorganic)**

Metals (High Level) - Seawater (228)  
BBY7SOP-00002, BBY7SOP-00007; modified from EPA 200.10  
ICP/MS - CHELATION EXTRACTION  
Aluminum  
Cadmium  
Cobalt  
Copper  
Iron  
Lead  
Manganese  
Nickel  
Titanium  
Uranium  
Vanadium  
Zinc

**Water (Inorganic)**

Mineral Oil and Grease - Water (229)  
BBY8SOP-00004; modified from BC MOE LAB MANUAL D  
GRAVIMETRIC - EXTRACTION  
Mineral Oil and Grease

**Water (Inorganic)**

Nitrite/ Nitrite+Nitrate - Water (230)  
BBY6SOP-00010; modified from SM 4500 -NO3- I  
AUTO COLOR  
Nitrate plus Nitrite  
Nitrite

**Water (Inorganic)**

Nitrogen - Water (231)  
BBY6SOP-00016; modified from SM 4500-N C  
AUTO COLOR - DIGESTION  
Total Dissolved Nitrogen  
Total Nitrogen

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Inorganic)**

Oil and Grease - Water (232)  
BBY8SOP-00004; modified from BC MOE LAB MANUAL D  
GRAVIMETRIC - EXTRACTION  
Total Oil and Grease

**Water (Inorganic)**

pH - Water (155)  
BBY0SOP-00003; modified from SM 4500-H+ B  
pH METER  
pH

**Water (Inorganic)**

pH - Water (234)  
BBY6SOP-00026; modified from SM 4500-H+ B  
pH METER - AUTOMATED  
pH

**Water (Inorganic)**

Phosphorus - Water (236)  
BBY6SOP-00013; modified from SM 4500-P- E  
AUTO COLOR - KONELAB  
Phosphate  
Total Dissolved Phosphorus  
Total Phosphorus

**Water (Inorganic)**

Reactive Silica - Water (237)  
BBY6SOP-00014; modified from SM 4500-SiO<sub>2</sub> E  
AUTO COLOR  
Reactive Silica

**Water (Inorganic)**

Solids - Water (238)  
BBY6SOP-00033, BBY6SOP-00034; modified from SM 2540 C, D  
GRAVIMETRIC  
Total Dissolved Solids  
Total Suspended Solids

**Water (Inorganic)**

Solids - Water (280)  
BBY6SOP-00035; modified from SM 2540 A  
GRAVIMETRIC  
Total Solids  
Total Solids Fixed

**Water (Inorganic)**

Sulphate - Water (239)  
BBY6SOP-00017; modified from SM 4500-SO<sub>4</sub><sup>2-</sup>- E  
AUTO COLOR - KONELAB  
Sulfate

**Water (Inorganic)**

Sulphide - Water (240)  
BBY6SOP-00006; modified from SM 4500-S<sub>2</sub>- D  
SPECTROPHOTOMETRIC - METHYLENE BLUE  
Sulphide

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

**Water (Inorganic)**

Total Metals - Seawater (241)

BBY7SOP-00002, BBY7SOP-00003; modified from EPA SW-846 6020B

ICP/MS

Aluminum

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Chromium

Cobalt

Copper

Iron

Lead

Magnesium

Manganese

Molybdenum

Nickel

Phosphorus

Potassium

Silicon

Silver

Sodium

Strontium

Sulfur

Tellurium

Thallium

Titanium

Vanadium

Zinc

Zirconium

**Water (Inorganic)**

Total Metals - Water (066)

BBY7SOP-00003, BBY7SOP-00018; modified from BC MOE LAB MANUAL SECTION C and EPA SW-846

6010C

ICP - DIGESTION

Aluminum

Antimony

Arsenic

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Chromium

Cobalt

Copper

Iron

Lead

Lithium

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Sulphur  
Tin  
Titanium  
Vanadium  
Zinc  
Zirconium

**Water (Inorganic)**

Total Metals - Water (242)

BBY7SOP-00002, BBY7SOP-00003; modified from EPA SW-846 6020B and BC MOE LAB MANUAL SECTION C

ICP/MS - DIGESTION

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Bromine  
Cadmium  
Calcium  
Cesium  
Chromium  
Cobalt  
Copper  
Gold  
Iron  
Lanthanum  
Lead  
Lithium  
Magnesium  
Manganese  
Mercury  
Molybdenum  
Nickel  
Palladium  
Phosphorus  
Platinum  
Potassium  
Rubidium  
Selenium  
Silicon  
Silver

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Sodium  
Strontium  
Sulphur  
Tellurium  
Tellurium  
Thallium  
Thorium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Zinc  
Zirconium

**Water (Inorganic)**

Total Recoverable Phenols - Water (243)  
BBY6SOP-00008; modified from SM 5530  
AUTO COLOR - DISTILLATION  
Total Phenolics

**Water (Inorganic)**

Turbidity - Water (244)  
BBY6SOP-00027; modified from SM 2130 B  
TURBIDIMETRIC  
Turbidity

**Water (Organic)**

BTEX, MTBE, Styrene - Water (252)  
BBY8SOP-00010; modified from EPA SW-846 8260C and EPA SW-846 5035 and EPA SW-846 5021A  
GC/MS - HEADSPACE  
Benzene  
Ethylbenzene  
m/p-xylene  
Methyl t-butyl ether  
o-xylene  
Styrene  
Toluene

**Water (Organic)**

Petroleum Hydrocarbons - Water (305)  
BBY8SOP-00012 (ANALYSIS), BBY8SOP-00018 (PREP); modified from CCME CANADA-WIDE STANDARD  
FOR PETROLEUM HYDROCARBONS IN SOIL-TIER 1 (DEC 2000)  
GC/FID - HEADSPACE  
F1: C6-C10

**Water (Organic)**

Petroleum Hydrocarbons (PHC) - Water (263)  
BBY8SOP-00030; modified from CCME REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM  
HYDROCARBONS IN SOIL-TIER 1 METHOD  
GC/FID - EXTRACTION  
F2: C10-C16  
F3: C16-C34  
F4: C34-C50

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Organic)**

Phenols - Water (248)

BBY8SOP-00025; modified from EPA SW-846 3510C (PREPARATION) and modified from EPA SW-846 8270D (ANALYSIS)

## GC/MS - EXTRACTION

2-Chlorophenol  
2-Methyl-4,6-Dinitrophenol  
2-Methylphenol  
2-Nitrophenol  
2,3-Dichlorophenol  
2,3,4-Trichlorophenol  
2,3,4,5 Tetrachlorophenol  
2,3,4,6-tetrachlorophenol  
2,3,5-Trichlorophenol  
2,3,5,6-Tetrachlorophenol  
2,3,6-Trichlorophenol  
2,4 & 2,5-Dichlorophenol  
2,4-Dimethylphenol  
2,4-Dinitrophenol  
2,4,5-Trichlorophenol  
2,4,6-trichlorophenol  
2,6-Dichlorophenol  
3+4-Chlorophenol  
3+4-Methylphenol  
3,4-Dichlorophenol  
3,4,5-Trichlorophenol  
3,5-Dichlorophenol  
4-Nitrophenol  
Pentachlorophenol  
Phenol

**Water (Organic)**

Polycyclic Aromatic Hydrocarbons (PAH) - Water (249)

BBY8SOP-00021; modified from EPA SW-846 8270D and EPA 3510C

## GC/MS - EXTRACTION

1-Methylnaphthalene  
1,4-Dimethylnaphthalene  
2-Methylnaphthalene  
3-Methylcholanthrene  
7,12-Dimethylbenz (a) anthracene  
9-Methylantracene  
9,10-Dimethylantracene  
Acenaphthene  
Acenaphthylene  
Acridine  
Anthracene  
Benz (c) phenanthrene  
Benzo (a) anthracene  
Benzo (a) pyrene  
Benzo (b&j) fluoranthene  
benzo(e)fluoranthene  
Benzo (e) pyrene  
Benzo (g,h,i) perylene  
Benzo (k) fluoranthene

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Chrysene  
Dibenz (a,h) pyrene  
Dibenz (a,i) pyrene  
Dibenz (a,l) pyrene  
Dibenzo (a,h) anthracene  
Fluoranthene  
Fluorene  
Indeno (1,2,3 - cd) pyrene  
Naphthalene  
Perylene  
Phenanthrene  
Pyrene  
Quinoline

**Water (Organic)**

Total Extractable Hydrocarbons (TEH) - Water (250)  
BBY8SOP-00029; modified from BC MOE LAB MANUAL D  
GC/FID - EXTRACTION  
Total Extractable Hydrocarbons (TEH)

**Water (Organic)**

Volatile Hydrocarbons (VH) - Water (251)  
BBY8SOP-00011; modified from BC MOE LAB MANUAL SECTION D  
GC/FID - HEADSPACE  
Volatile Hydrocarbons (VH C6-C10)

**Water (Organic)**

Volatile Organic Compounds (VOC) - Water (253)  
BBY8SOP-00009; modified from EPA SW-846 8260C and EPA 5021A, EPA SW-846 5035  
GC/MS - HEADSPACE  
1,1-Dichloroethane  
1,1-dichloroethylene  
1,1,1-Trichloroethane  
1,1,1,2-tetrachloroethane  
1,1,2-Trichloroethane  
1,1,2,2-Tetrachloroethane  
1,2-dichlorobenzene  
1,2-dichloroethane  
1,2-Dichloropropane  
1,3-Dichlorobenzene  
1,4-dichlorobenzene  
Benzene  
Bromodichloromethane  
Bromoform  
Bromomethane  
Carbon Tetrachloride  
Chlorobenzene  
Chlorodibromomethane  
Chloroethane  
Chloroform  
Chloromethane  
cis-1,2-Dichloroethylene  
cis-1,3-Dichloropropene  
Dibromoethane  
Dibromomethane  
Dichloromethane

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Ethylbenzene  
Ethylene Dibromide  
m/p-xylene  
Methyl t-butyl ether  
o-xylene  
Styrene  
Tetrabromomethane  
Tetrachloroethylene  
Toluene  
trans-1,2-Dichloroethylene  
trans-1,3-Dichloropropene  
Trichloroethylene  
Trichlorofluoromethane  
Vinyl Chloride

**Water (Toxicology)**

Acute Fathead Minnow - Water (287)  
BBY2SOP-00015; EPA-821-R-02-012  
ACUTE LETHALITY  
Fathead Minnow (96h)

**Water (Toxicology)**

Acute Topsmelt - Water (291)  
BBY2SOP-00050; EPA-821-02-012  
ACUTE LETHALITY  
Topsmelt (96h)

**Water (Toxicology)**

Ceriodaphnia dubia - Water (139)  
BBY2SOP-00001; EPS 1/RM/21  
SURVIVAL AND REPRODUCTION  
Ceriodaphnia dubia (7d)

**Water (Toxicology)**

Daphnia magna - Water (141)  
BBY2SOP-00007; EPS 1/RM/11 and EPS 1/RM/14  
LETHALITY  
Daphnia LC50 (48 h)  
Single Concentration (48h)

**Water (Toxicology)**

Echinoid Fertilization - Water (143)  
BBY2SOP-00009; EPS 1/RM/27  
FERTILIZATION SUCCESS  
Echinoderm Fertilization (20 min)

**Water (Toxicology)**

Fathead Minnow - Water (147)  
BBY2SOP-00002; EPS 1/RM/22  
GROWTH AND SURVIVAL  
Fathead Minnow (7d)

**Water (Toxicology)**

Lemna Minor Growth Inhibition - Water (289)  
BBY2SOP-00053; EPS 1/RM/37  
GROWTH INHIBITION  
Lemna Minor (7d)

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Toxicology)**

Microtox - Liquid Phase - Water (144)

BBY2SOP-00013; EPS 1/RM/24

BIOLUMINESCENCE

Microtox IC50 (15 min)

**Water (Toxicology)**

Pseudokirchneriella subcapitata - Water (146)

BBY2SOP-00006; EPS 1/RM/25

GROWTH INHIBITION

Pseudokirchneriella subcapitata (72h)

**Water (Toxicology)**

Rainbow Trout - pH Stabilization - Water (294)

BBY2SOP-00061; EPS 1/RM/50

ACUTE LETHALITY (SURVIVAL)

Single Concentration (96h) pH-stabilized

Trout LC50 (96h) pH Stabilized

**Water (Toxicology)**

Rainbow Trout - Water (140)

BBY2SOP-00004; EPS 1/RM/9 and EPS 1/RM/13

LETHALITY

Single Concentration (96h)

Trout LC50 (96 h)

**Water (Toxicology)**

Topsmelt - Water (142)

BBY2SOP-00008; modified from EPA 600/R-95/136

SURVIVAL AND GROWTH

Topsmelt (7d)

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

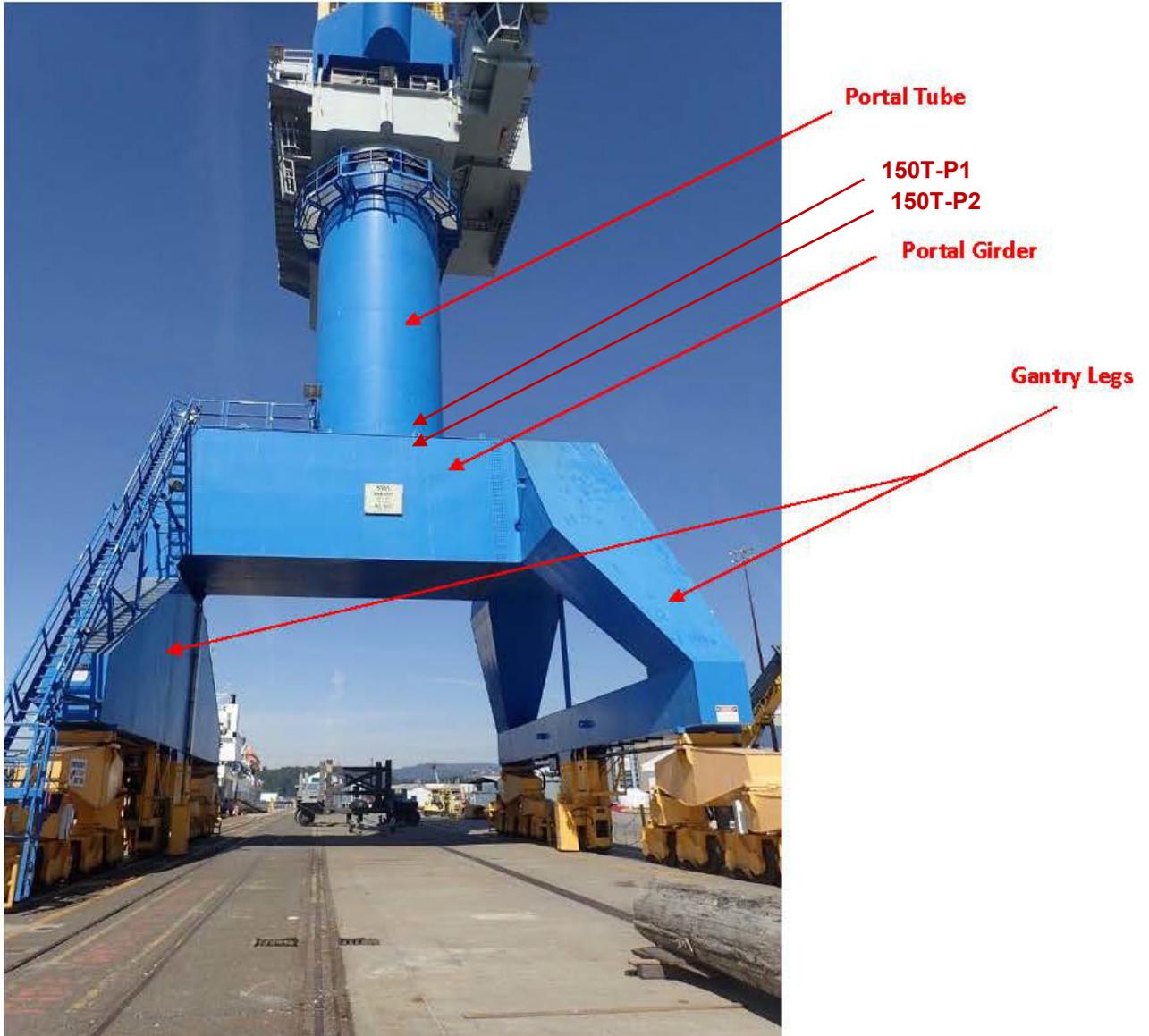


# Appendix II

Photographs



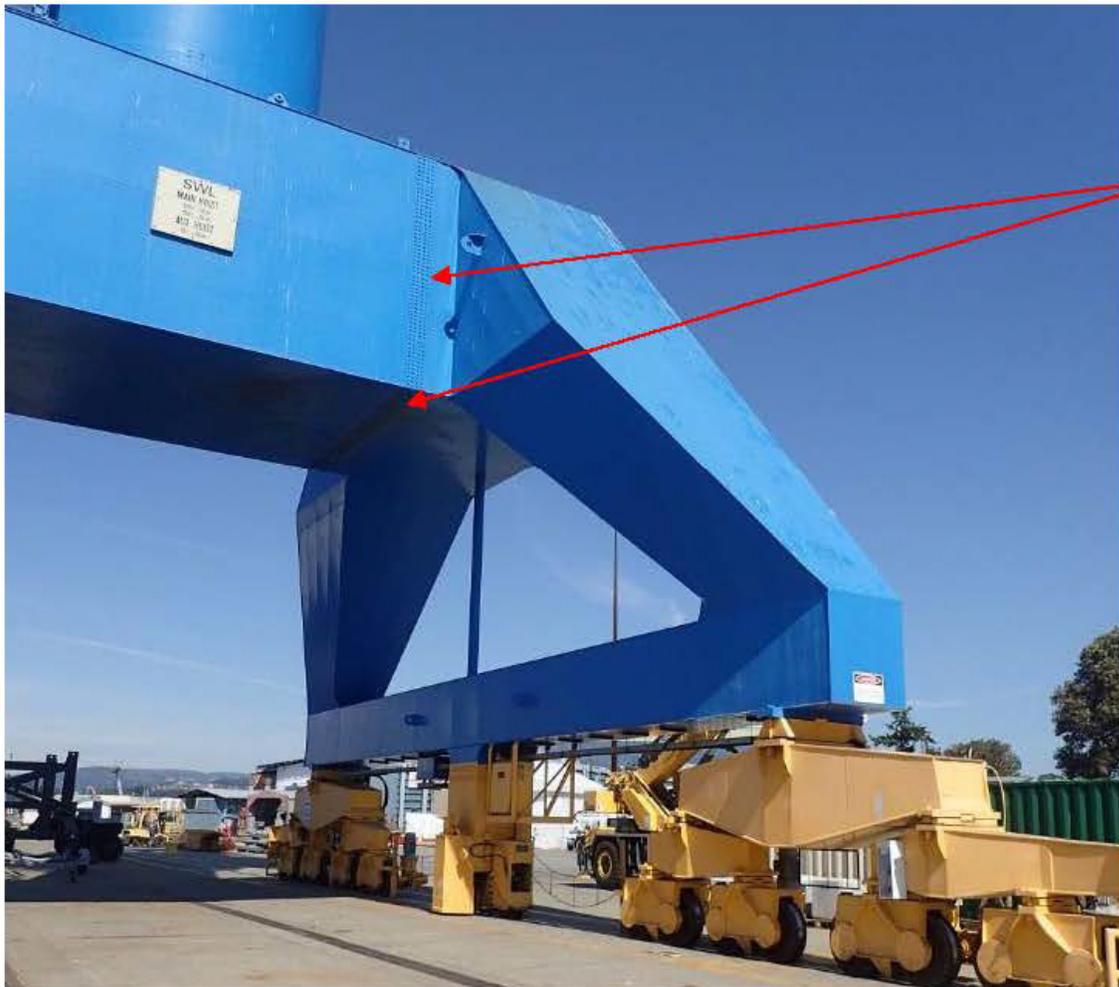
150T Krupp Crane



Photograph 1: Paint sample locations on the 150T Krupp Crane. Samples 150T-P1 and 150T-P2 were collected from the opposite side of the crane shown above.



Photograph 2: Location of paint sample 150T-P5.



Photograph 3: Location of paint sample.



# Appendix III

Laboratory Analytical Report

Your Project #: 647910  
 Site Location: 825 ADMIRALS ROAD ESQUIMALT, BC  
 Your C.O.C. #: G123094

**Attention: Aaron Hall**

SNC-LAVALIN INC.  
 BURNABY, ENVIRONMENT DIVISION  
 8648 COMMERCE COURT  
 BURNABY, BC  
 CANADA V5A 4N6

**Report Date: 2017/06/20**  
 Report #: R2400488  
 Version: 2 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B747415**

**Received: 2017/06/14, 19:10**

Sample Matrix: PAINT  
 # Samples Received: 5

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Metals - TCLP	1	2017/06/20	2017/06/20	BBY7SOP-00005,	EPA 1311, 6020bR2 m
Elements by ICP-AES (acid extr. solid)	5	2017/06/16	2017/06/16	BBY7SOP-00018	EPA 6010c R3 m
TCLP pH Measurements (<100g sample used)	1	N/A	2017/06/20	BBY7SOP-00020	EPA 1311 R1992 m

**Remarks:**

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your Project #: 647910  
Site Location: 825 ADMIRALS ROAD ESQUIMALT, BC  
Your C.O.C. #: G123094

**Attention: Aaron Hall**

SNC-LAVALIN INC.  
BURNABY, ENVIRONMENT DIVISION  
8648 COMMERCE COURT  
BURNABY, BC  
CANADA V5A 4N6

**Report Date: 2017/06/20**  
Report #: R2400488  
Version: 2 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B747415**

**Received: 2017/06/14, 19:10**

Encryption Key



VJ Oco  
Burnaby Project Manager  
20 Jun 2017 18:30:46

Please direct all questions regarding this Certificate of Analysis to your Project Manager.  
VJ Oco, Burnaby Project Manager  
Email: VOco@maxxam.ca  
Phone# (604)639-8422

=====  
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B747415  
Report Date: 2017/06/20

SNC-LAVALIN INC.  
Client Project #: 647910  
Site Location: 825 ADMIRALS ROAD ESQUIMALT, BC  
Sampler Initials: MAH

**ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)**

<b>Maxxam ID</b>		RH2427	
<b>Sampling Date</b>		2017/06/14 11:40	
<b>COC Number</b>		G123094	
	<b>UNITS</b>	<b>150T-P5</b>	<b>QC Batch</b>

<b>TCLP Extraction Procedure</b>			
Initial pH of Sample	pH	7.23	8668820
pH after HCl	pH	1.21	8668820
Final pH of Leachate	pH	5.08	8668820
pH of Leaching Fluid	pH	4.97	8668820

Maxxam Job #: B747415  
Report Date: 2017/06/20

SNC-LAVALIN INC.  
Client Project #: 647910  
Site Location: 825 ADMIRALS ROAD ESQUIMALT, BC  
Sampler Initials: MAH

**TCLP METALS (PAINT)**

<b>Maxxam ID</b>		RH2427		
<b>Sampling Date</b>		2017/06/14 11:40		
<b>COC Number</b>		G123094		
	<b>UNITS</b>	<b>150T-P5</b>	<b>RDL</b>	<b>QC Batch</b>
<b>TCLP Extraction Procedure</b>				
LEACHATE Lead (Pb)	mg/L	1.65	0.10	8670169
RDL = Reportable Detection Limit				

Maxxam Job #: B747415  
Report Date: 2017/06/20

SNC-LAVALIN INC.  
Client Project #: 647910  
Site Location: 825 ADMIRALS ROAD ESQUIMALT, BC  
Sampler Initials: MAH

**LEAD IN PAINT CHIPS (PAINT)**

Maxxam ID		RH2423	RH2424	RH2425	RH2426	RH2427		
Sampling Date		2017/06/14 11:00	2017/06/14 11:05	2017/06/14 11:10	2017/06/14 11:20	2017/06/14 11:40		
COC Number		G123094	G123094	G123094	G123094	G123094		
	<b>UNITS</b>	<b>150T-P1</b>	<b>150T-P2</b>	<b>150T-P3</b>	<b>150T-P4</b>	<b>150T-P5</b>	<b>RDL</b>	<b>QC Batch</b>
<b>Total Metals by ICP</b>								
Total Lead (Pb)	mg/kg	178	679	930	114	626	3.0	8665522
RDL = Reportable Detection Limit								

Maxxam Job #: B747415  
Report Date: 2017/06/20

SNC-LAVALIN INC.  
Client Project #: 647910  
Site Location: 825 ADMIRALS ROAD ESQUIMALT, BC  
Sampler Initials: MAH

### GENERAL COMMENTS

Sample RH2427 [150T-P5] : Insufficient sample received to use standard sample weight (100g) for TCLP extraction as per Reference Method EPA 1311 R1992. The uncertainty of the analysis may be increased.

**Results relate only to the items tested.**

Maxxam Job #: B747415  
Report Date: 2017/06/20

**QUALITY ASSURANCE REPORT**

SNC-LAVALIN INC.  
Client Project #: 647910  
Site Location: 825 ADMIRALS ROAD ESQUIMALT, BC  
Sampler Initials: MAH

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8665522	Total Lead (Pb)	2017/06/16					<3.0	mg/kg	3.5	35	98	80 - 120
8670169	LEACHATE Lead (Pb)	2017/06/20	89	75 - 125	98	75 - 125	<0.10	mg/L	NC	35		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference  $\leq 2x$  RDL).

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: <u>Snr Lavalin Inc</u>	Company Name: <u>AS IT LEFT</u>	Quotation #: <u>Snr Lavalin Potting</u>	<input type="checkbox"/> Regular TAT 5 days (Most analyses)
Contact Name: <u>Doug McMillan / Aaron Hall</u>	Contact Name: _____	P.O. #/ AFE#: <u>44790</u>	<b>PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS</b>
Address: <u>8648 Commerce Court</u>	Address: _____	Project #: <u>647910</u>	Rush TAT (Surcharges will be applied)
<u>Burnaby, BC</u> PC: <u>V5A 4A6</u>	PC: _____	Site Location: <u>825 Adminals Rd</u>	<input type="checkbox"/> Same Day <input checked="" type="checkbox"/> 2 Days
Phone: <u>604-575-5151</u>	Phone: _____	Site #: <u>Equipment, BC</u>	<input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Days
Email: <u>doug.mcmillan@snrlavalin.com</u>	Email: <u>aaron.hall@snrlavalin.com</u>	Sampled By: <u>MAH</u>	Date Required: _____

Regulatory Criteria	Special Instructions	Analysis Requested	Rush Confirmation #:
<input type="checkbox"/> BC CSR Soil <input type="checkbox"/> YK CSR Soil <input type="checkbox"/> CCME (Specify) <input checked="" type="checkbox"/> Drinking Water <input type="checkbox"/> BC CSR Water <input type="checkbox"/> YK CSR Water <input type="checkbox"/> Other (Specify) <input type="checkbox"/> BC Water Quality	<input type="checkbox"/> Return Cooler <input type="checkbox"/> Ship Sample Bottles (Please Specify)	<input type="checkbox"/> MTBE <input type="checkbox"/> VOC / BTEX / VPH <input type="checkbox"/> VOC / BTEX / F1 <input type="checkbox"/> LEPH/NERH/PAH <input type="checkbox"/> TEH <input type="checkbox"/> F2 - F4 <input type="checkbox"/> Filtered? Preserved? <input type="checkbox"/> Filtered? Preserved? <input type="checkbox"/> Field Preserved? <input type="checkbox"/> Field Preserved? <input type="checkbox"/> Sulphate <input type="checkbox"/> Fluoride <input type="checkbox"/> TDS <input type="checkbox"/> BOD <input type="checkbox"/> COD <input type="checkbox"/> pH <input type="checkbox"/> Conductivity <input type="checkbox"/> Alkalinity <input type="checkbox"/> Nitrate <input type="checkbox"/> Ammonia <u>Lead in Paint</u> <u>TCLP Lead</u>	LABORATORY USE ONLY CUSTODY SEAL Y / <u>N</u> Present Intact <u>NA</u> <u>NA</u> COOLING MEDIA PRESENT Y / <u>N</u> COMMENTS

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX / VPH	BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	Nitrate	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1 150T-P1	2017/06/14	1100	Paint														1		
2 150T-P2	2017/06/14	1105	Paint														1		
3 150T-P3	2017/06/14	1110	Paint														1		
4 150T-P4	2017/06/14	1120	Paint														1		No TCLP
5 150T-P5	2017/06/14	1140	Paint														1		
6																			
7																			
8																			
9																			
10																			

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
<u>M. Aaron Hall</u>	<u>2017/06/14</u>	<u>1910</u>	<u>POMMEL GORDA</u>	<u>2017/06/14</u>	<u>19:10</u>



B747415\_COC

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at



**SNC-Lavalin Inc.**

8648 Commerce Court

Burnaby, British Columbia, Canada V5A 4N6

☎ 604.515.5151 🌐 604.515.5150

[www.snclavalin.com](http://www.snclavalin.com)



**SNC • LAVALIN**

---

Esquimalt Graving Dock, Victoria, B. C.

30T Kone Crane Painting: Project No. R.090380.001 &  
150T Krupp Crane Painting: Project No. R.090381.001

# **APPENDIX D**

July 2017

---

## **APPENDIX D**

### **EGD 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

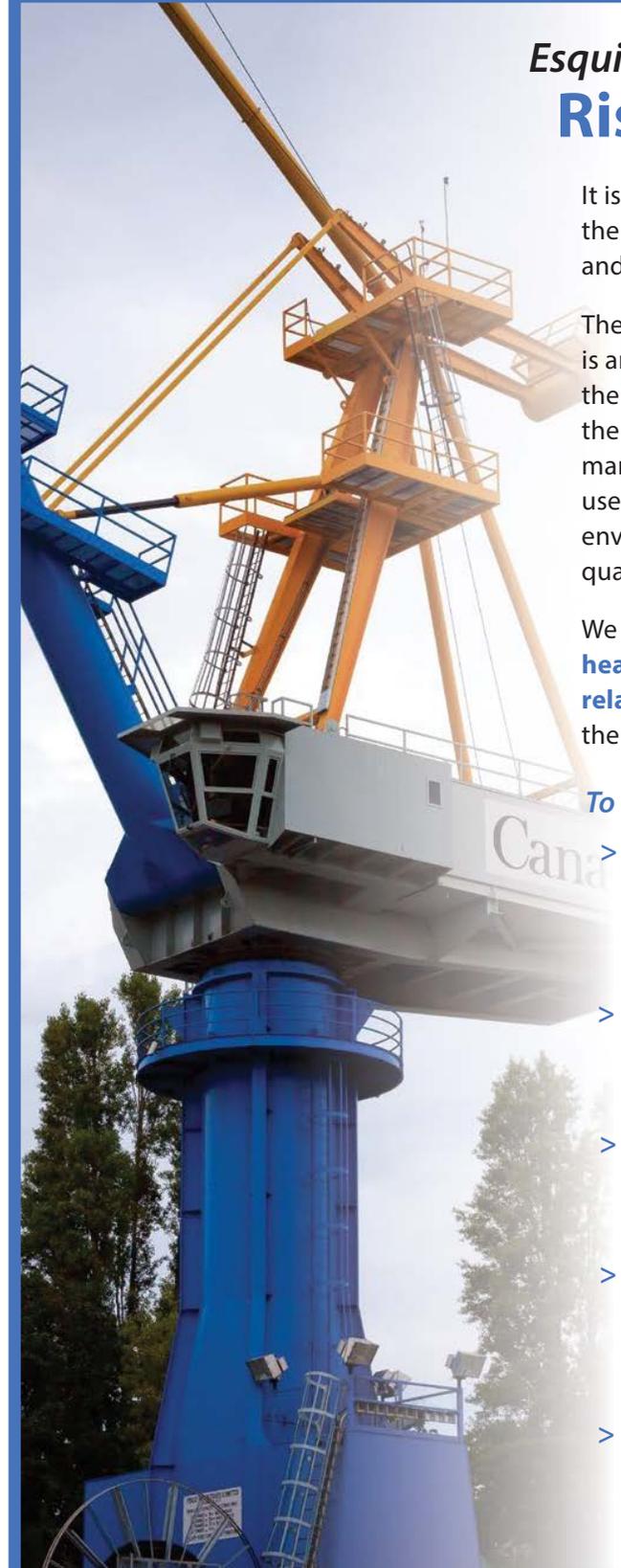
The **Esquimalt Graving Dock (EGD)** is a federal government owned and operated, multi-user ship repair and maintenance facility located in Esquimalt, British Columbia. The facility has been in operation since 1925, and provides service to local, Federal, and international vessels. The vessel repair 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

**David Latoski**  
Operations Manager  
Esquimalt Graving Dock  
Engineering Assets  
Strategy Sector

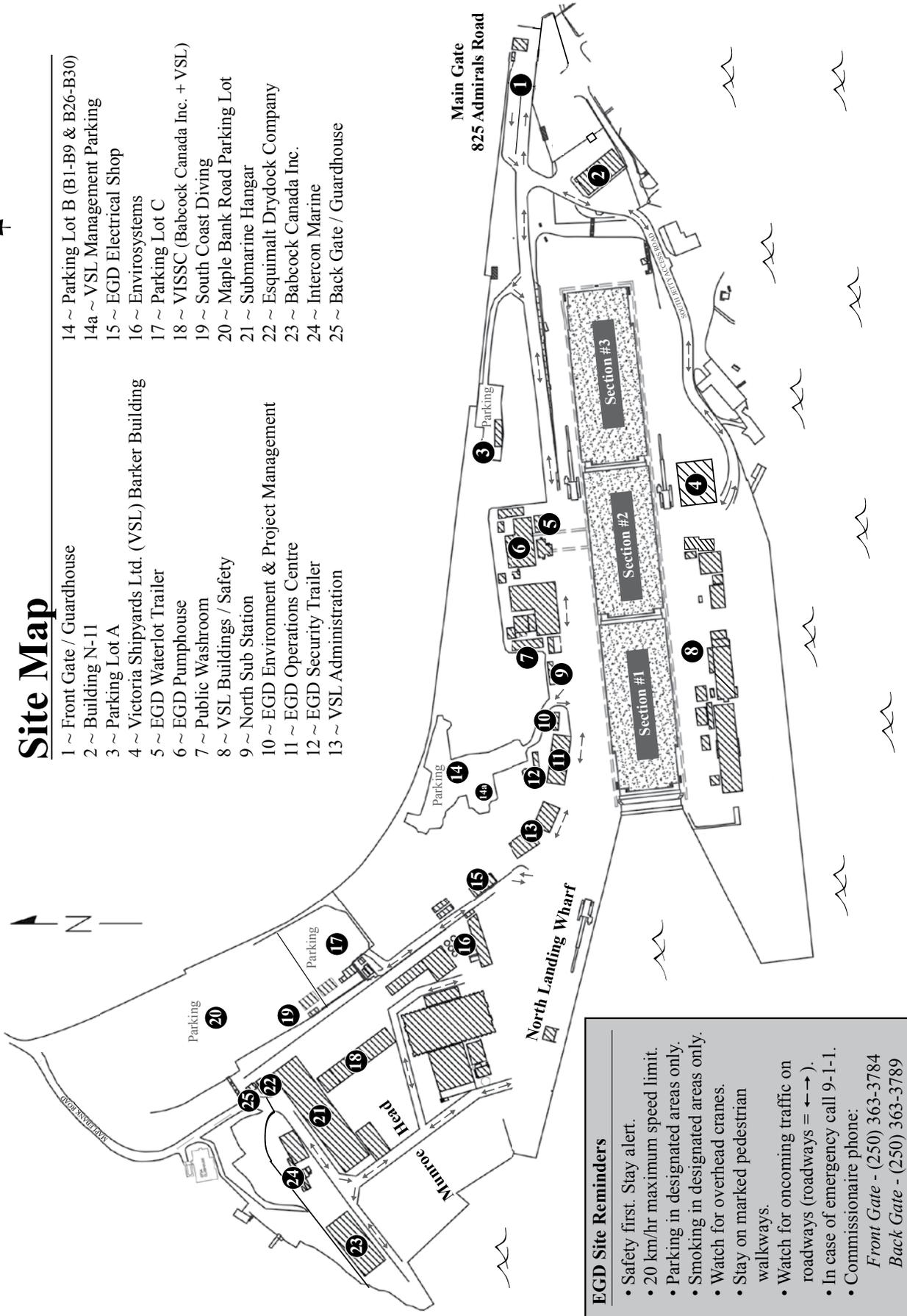
Canada 

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
<b>EBMP #1: Pressure Washing</b>	

## 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.*

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



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
<b>EBMP #1: Pressure Washing</b>	

## 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
<b>EBMP #2: Abrasive Blasting</b>	

## 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

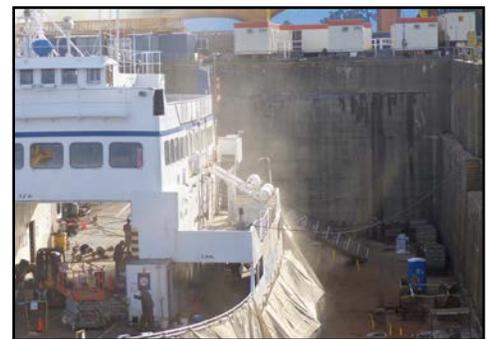
- Establish dust suppression controls in advance of starting any work.
- Do not abrasive blast during conditions that render containment ineffective (*e.g. during windy conditions*).
- No abrasive blasting of vessels shall be performed while vessels are docked alongside the North Landing Wharf or South 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
<b>EBMP #2: Abrasive Blasting</b>	

## 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
<b>EBMP #2: Abrasive Blasting</b>	



*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
<b>EBMP #3: Painting and Coating</b>	

## 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
<b>EBMP #3: Painting and Coating</b>	



*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
<b>EBMP #3: Painting and Coating</b>	



**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
<b>EBMP #4: Dry Dock Floor</b>	

## 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.



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

## 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
<b>EBMP #4: Dry Dock Floor</b>	



*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
<b>EBMP #5: Hazardous Materials</b>	

## 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
<b>EBMP #5: Hazardous Materials</b>	

## 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
<b>EBMP #5: Hazardous Materials</b>	

## 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
<b>EBMP #6: Waste Management</b>	

## 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
<b>EBMP #6: Waste Management</b>	

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.

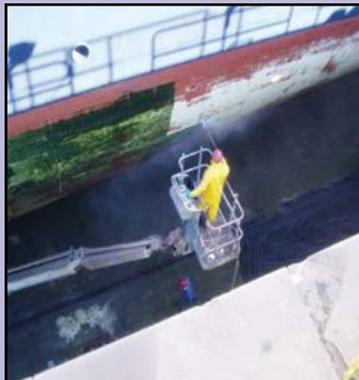
## General Refuse

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
<b>EBMP #6: Waste Management</b>	

## 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.



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

## 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
<b>EBMP #7: Fuelling &amp; Oil Transfer</b>	

## 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
<b>EBMP #7: Fuelling &amp; Oil Transfer</b>	

## 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
<b>EBMP #9: Fish &amp; Wildlife Management</b>	

## 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
<b>EBMP #9: Fish &amp; Wildlife Management</b>	

- 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
<b>EBMP #10: Water Use</b>	

## 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.*

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 2
Approved by:	Stafford Bingham
<b>EBMP #10: Water Use</b>	

## 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
<b>EBMP #11: Energy Conservation</b>	

## 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
<b>EBMP #11: Energy Conservation</b>	

## 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
<b>EBMP #12: Nuisance Pollution</b>	

## 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
<b>EBMP #12: Nuisance Pollution</b>	

## Odour

- Daily dock operations often create strong and unpleasant odours whether from the release of VOCs, H<sub>2</sub>S, 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.*



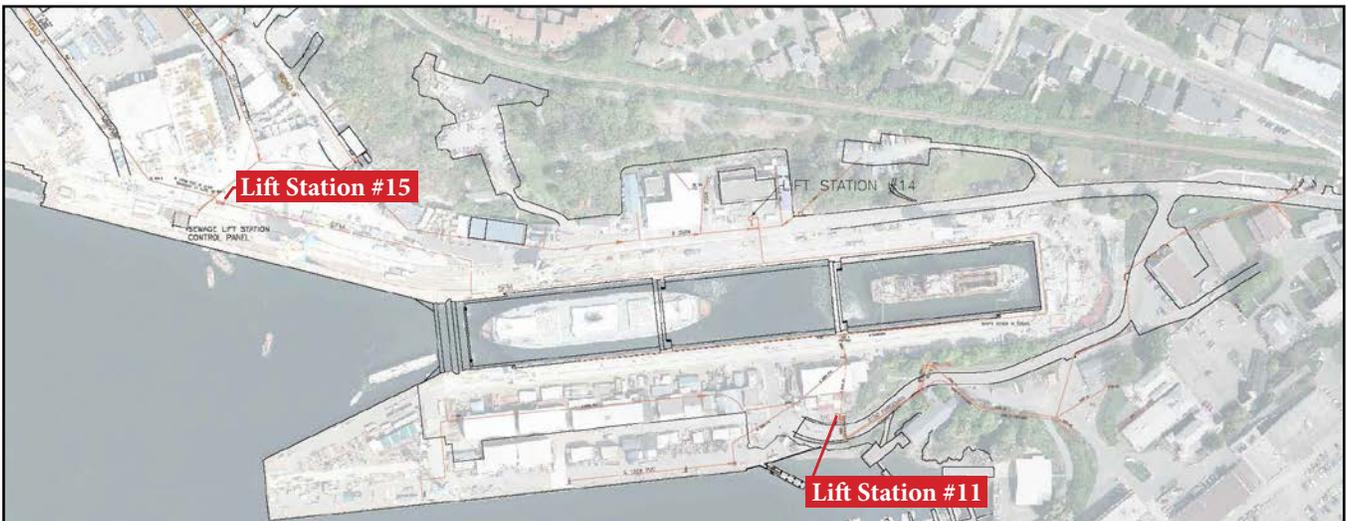
# Environmental Best Management Practices

Revision Number:	05
Revision Date:	October 2016
Page:	Page 1 of 3
Approved by:	Stafford Bingham
<b>EBMP #13: Sanitary Waste &amp; Sewer</b>	

## 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
<b>EBMP #13: Sanitary Waste &amp; Sewer</b>	

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
<b>EBMP #13: Sanitary Waste &amp; Sewer</b>	

## 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
<b>EBMP #14: Spill Preparedness</b>	

## 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.**

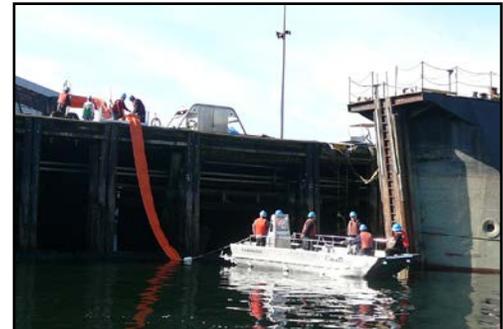
- User employees must have adequate training in spill response.
- User employees must have access to spill response equipment and materials appropriate to the work they are performing.
- Users must have plans and procedures in place to respond to spills.

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.*

Revision Number:	05
Revision Date:	October 2016
Page:	Page 2 of 3
Approved by:	Stafford Bingham
<b>EBMP #14: Spill Preparedness</b>	



*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
<b>EBMP #14: Spill Preparedness</b>	

## 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
<b>EBMP #15: In-Water Hull Cleaning</b>	

## 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
<b>EBMP #16: Housekeeping</b>	

## 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
<b>EBMP #17: Stormwater Management</b>	

## EBMP #17: Stormwater Management

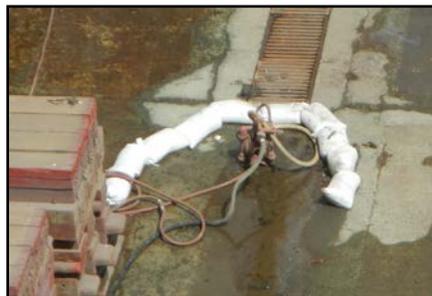
Stormwater has been identified as one of the primary pathways of contaminant loading to the local harbour associated with Esquimalt Graving Dock (EGD) operations. Common contaminants found in stormwater samples include metals, extractable petroleum hydrocarbons (LEPH/HEPH), and total suspended solids (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
<b>EBMP #17: Stormwater Management</b>	

## 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
<b>EBMP #18: Property &amp; Infrastructure</b>	

## **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
<b>EBMP #18: Property &amp; Infrastructure</b>	

## 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.

 <b>Environmental Best Management Practices</b>	Revision Number:	05
	Revision Date:	October 2016
	Page:	Page 3 of 5
	Approved by:	Stafford Bingham
	<b>EBMP #18: Property &amp; Infrastructure</b>	

## 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
<b>EBMP #18: Property &amp; Infrastructure</b>	



*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 50m<sup>3</sup> 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
<b>EBMP #18: Property &amp; Infrastructure</b>	

## 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, Victoria, B. C.

30T Kone Crane Painting: Project No. R.090380.001 &  
150T Krupp Crane Painting: Project No. R.090381.001

# **APPENDIX E**

July 2017

---

## **APPENDIX E**

### **PREPARATION AND TREATMENT RECORDING FORM**

Esquimalt Graving Dock, Victoria, B. C.

30T Kone Crane Painting: Project No. R.090380.001 &  
150T Krupp Crane Painting: Project No. R.090381.001

# APPENDIX E

July 2017

## PREPARATION AND TREATMENT RECORDING FORM

CRANE DESIGNATION	LOCATION	SPECIFIC AREA			
PREPARATION	INITIALS	DATE	COMMENTS		
SSPC-SP-12					
SSPC-SP-1					
SSPC-SP-2					
SSPC-SP-3					
SSPC-SP-11					
SSPC-SP-5					
SSPC-SP-10					
CHLORIDE IONS (measured in $\mu\text{g}/\text{cm}^2$ )					
CONTRACTOR SIGNATURE:			DATE:		
TREATMENT	PRIMER/ 1 <sup>st</sup> COAT	STRIPE COAT/2 <sup>nd</sup> (if required)	INTERMEDIATE COAT	TOPCOAT	TOPCOAT
MANUFACTURER'S PRODUCT NAME					
BATCH No.					
COLOUR No.					
QUANTITY USED (No. of Gals. or Kits)					
SURFACE TEMP.					
AMBIENT TEMP. MIN MAX					
RELATIVE HUMIDITY					
DEW POINT					
DFT					
INITIALS					