



DRAWINGS AND SPECIFICATIONS FOR:

**CAPE LAZO COMMUNICATIONS TOWER**

CANADIAN COAST GUARD (CCG)  
COMOX, BC

CCG WESTERN REGION MARITIME AND CIVIL INFRASTRUCTURE  
CCG PROJECT REFERENCE: 8B200

Prepared by: SMC  
Revision: B  
Revision Date: 03 July 2019

| <u><b>SECTION #</b></u> | <u><b>Description</b></u> | <u><b># of Pages<br/>in Section</b></u> |
|-------------------------|---------------------------|---|
|-------------------------|---------------------------|---|

|          |                        |   |
|----------|------------------------|---|
| 00 01 10 | Table of Contents..... | 1 |
|----------|------------------------|---|

**Division 01 – General Requirements**

|             |                                     |   |
|-------------|-------------------------------------|---|
| 01 11 00    | Summary of Work .....               | 4 |
| 01 14 00    | Work Restrictions .....             | 1 |
| 01 33 00    | Submittal Procedures .....          | 5 |
| 01 35 29.06 | Health and Safety Requirements..... | 8 |
| 01 35 43    | Environmental Procedures .....      | 3 |
| 01 45 00    | Quality Control .....               | 2 |
| 01 51 00    | Temporary Facilities .....          | 3 |

**Division 03 - Concrete**

|          |                            |   |
|----------|----------------------------|---|
| 03 20 00 | Concrete Reinforcing ..... | 2 |
| 03 30 00 | Concrete Work.....         | 3 |

**Division 13 – Special Structures**

|          |                    |   |
|----------|--------------------|---|
| 13 36 13 | Steel Towers ..... | 6 |
|----------|--------------------|---|

**Division 26 - Earthwork**

|          |                 |   |
|----------|-----------------|---|
| 26 05 27 | Grounding ..... | 2 |
|----------|-----------------|---|

**Division 31 - Earthwork**

|             |   |   |
|-------------|---|---|
| 31 05 16    | Aggregate Materials.....                    | 6 |
| 31 23 33.01 | Excavating, Trenching and Backfilling ..... | 9 |

**Division 32 – Exterior Improvements**

|          |                        |   |
|----------|------------------------|---|
| 32 30 00 | Waveguide Bridge ..... | 4 |
|----------|------------------------|---|

**APPENDICIES**

|            |  |    |
|------------|--|----|
| APPENDIX A | Site Location Photos .....   | 2  |
| APPENDIX B | Summary of Submittals .....  | 2  |
| APPENDIX C | Geotechnical Assessment.....   | 10 |
| APPENDIX D | Site Specific Wind Pressure Report.....                                    | 7  |
| APPENDIX E | Fisheries and Oceans Environmental Bulletins .....                         | 19 |
| APPENDIX F | Sample Equipment Cleaning Procedures.....                                  | 8  |
| APPENDIX G | Comox Valley Regional District Weed Control Regulation Bylaw No.2774 ..... | 6  |

**DRAWING LIST**

- WM-110-1009 – CAPE LAZO – 80’ TOWER ANTENNA LAYOUT
- WM-110-1012 – CAPE LAZO – PROPOSED TOWER SITE PLAN
- WM-110-1003 – CAPE LAZO – Existing Site Services Plan (historic info 1991)

**END OF SECTION**

**Part 1 General**

**1.1 MINIMUM STANDARDS**

- .1 Perform Work in accordance with the National Building Code of Canada (NBCC) and any other code of provincial, federal, or local application. In the case of any conflict or discrepancy, the more stringent requirements shall apply.
- .2 Meet or exceed requirements of:
  - .1 Contract documents.
  - .2 Specified standards, codes, and reference documents.

**1.2 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises design, fabrication, and delivery of a self-supported steel communications tower for the Canadian Coast Guard (CCG) site in, Comox BC. Work includes but is not limited to:
  - .1 Design, supply and installation of a new 24.4 m self-supported tower.
  - .2 Provide design loads and reaction loads for foundation design.
  - .3 Provide foundation design drawings stamped and sealed by a qualified Professional Engineer registered in the province of British Columbia.
  - .4 Supply and installation of reinforced concrete tower foundation.
  - .5 Design, supply and installation of waveguide bridge.
  - .6 Design, supply and installation initial antenna mounts.
  - .7 Design, supply and installation of tower and waveguide bridge grounding design in accordance with Motorola R56 for connection to existing building grounding system.
  - .8 Delivery of all items to the Canadian Coast Guard Electronics Workshop in Comox BC.

**1.3 PROJECT LOCATION**

- .1 The tower will be erected at the CCG Cape Lazo Electronics Workshop located on at 299 Wireless Road, Comox BC on Vancouver Island. APPENDIX A provides site location details. Site coordinates area 49° 42' 21.63" N - 124° 51' 46.71" W.

**1.4 USE OF SITE AND FACILITIES**

- .1 Section 01 14 00 Work restriction lists specific
- .2 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .3 Maintain existing services to Electronics Workshop buildings and provide for personnel and vehicle access.
- .4 Where security is reduced by work provide temporary means to maintain security.
- .5 Closures: protect work temporarily until permanent enclosures are completed.

## 1.5 SUBMITTALS

- .1 Mandatory submittals and schedule for submission are detailed below and in APPENDIX B. The following identifies general requirements only. The relevant Sections must be consulted for a complete listing of mandatory content. This summary is not an exhaustive list of all submissions required for the duration of the project, as additional submissions may be required after award.
  - .1 Design Package
    - .1 Deadline: (28) days following contract award.
    - .2 Submission: to conform to requirements outlined in Section 13 36 13 – Steel Towers and Section 32 30 00 – Waveguide Bridge.
  - .2 Fabrication Plan
    - .1 Deadline: (28) days following contract award.
    - .2 Submission: to conform to requirements outlined in Section 13 36 13 – Steel Towers and Section 32 30 00 – Waveguide Bridge.
  - .3 Tower Erection Plan
    - .1 Deadline: (28) days following contract award.
    - .2 Submission: to conform to requirements outlined in Section 13 36 13- Steel Towers.
  - .4 Installation Package
    - .1 Deadline: (28) days following contract award.
    - .2 Submission to conform to requirements outlined in Section 13 36 13 – Steel Towers and Section 32 30 00 – Waveguide Bridge.
  - .5 Grounding Plan
    - .1 Deadline: (28) days following contract award.
    - .2 Submission to conform to requirements outlined in Section 13 36 13 – Steel Towers and Section 26 05 27 – Grounding.
  - .6 Schedule
    - .1 Deadline: (28) days following contract award.
    - .2 Submission to include:
      - .1 Start and completion dates of fabrication;
      - .2 Construction schedule including milestone dates, duration of activities and duration on site.
      - .3 Delivery of tower to the CCG site in Comox, BC.
      - .4 Delivery of waveguide bridge to the CCG site in Comox, BC.
    - .3 Construction schedule to be built in collaboration with CCG.
  - .7 Construction Plan
    - .1 Deadline: (28) days following contract award.
    - .2 Submission to conform to requirements outlined in Section 01 33 00 – Submittal Procedures.
  - .8 As-Built Information
    - .1 Deadline: (21) days following acceptance of completed Works.
    - .2 Submission to include:



- .1 Project as-built drawings Section 01 33 00 - Submittals.
- .2 Concrete tests results Section 01 45 00 – Quality Control.

## **1.6 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each document as follows:
- .2 Health and Safety Plan and Other Safety Related Documents.
- .3 Environmental Protection Plan.
- .1 Other documents as specified.

## **1.7 FEES, PERMITS, AND CERTIFICATES**

- .1 Contractor to pay fees, obtain certificates and permits, and provide information to authorities having jurisdiction where required.
  - .1 Contractor to provide copies to CCG of any documentation submitted to other authorities related to the Work.
- .2 Contractor to furnish certificates and permits when requested.
- .3 Submission of tower construction permits related to temporary crane use for tower erection are responsibility of Contractor. Applicable permitting agencies are NAV Canada and Transport Canada. Copies of permits to be provided to CCG.

## **1.8 TESTING AND INSPECTION**

- .1 Within (21) calendar days after Award of Contract submit list of proposed testing services or testing laboratories for Departmental Representative review and approval.
- .2 Particular requirements for inspecting and testing to be carried out by testing service or laboratory approved by Departmental Representative are specified in Section 01 45 00 – Quality Control.
- .3 Contractor to retain and pay for services of geotechnical testing company acceptable to the Departmental Representative for testing concrete materials.
- .4 Contractor to retain and pay for services of geotechnical testing company acceptable to the Departmental Representative for testing granular materials.
- .5 The Contractor to retain and pay for the services of testing agency or testing laboratory as specified, and where required by 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 Testing:
    - .1 Mill tests and certificates of compliance.
    - .2 Tests specified in the contract documents to be carried out by Contractor which may be under the Departmental Representative's supervision.
- .6 Where test or inspections by designated testing laboratory reveal work is not in accordance with the Contract requirements, Contractor shall pay costs for additional test or inspections as the Departmental Representative may require, to verify, acceptability of corrected work.

- .7 Contractor shall furnish labour and facility to carry out specified testing and notify Departmental Representative in advance of planned testing.
- .8 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .9 Pay costs for uncovering and making good work that is covered before required inspection of testing is completed and approved by Departmental Representative.
- .10 Provide Departmental Representative with digital copy of testing laboratory reports as soon as they are available.
- .11 Departmental Representative will coordinate and pay for review of foundation excavation by Owner's geotechnical engineer prior to foundation installation.
- .12 Departmental Representative will coordinate and pay for services of Soil Management Consultant to conduct soil characterization of stockpiled materials as outlined in Section 31 23 33.13 – Excavating, Trenching & Backfill..

**1.9 EXCAVATION, SOIL SAMPLING AND MATERIAL DISPOSAL**

- .1 As a precautionary procedure for the site, Coast Guard will undertake soils testing on material excavated for tower foundations. Further detail on this is provided in Section 31 23 33.13 – Excavating, Trenching & Backfill.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 WORK COMPLETION DEADLINES**

- .1 All work to be completed by **December 15, 2019.**

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 01 51 00 – Temporary Facilities

**1.2                ACCESS AND EGRESS**

- .1            Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, landing pad, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

**1.3                USE OF SITE AND FACILITIES**

- .1            Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2            Maintain existing services to Electronics Workshop buildings and provide for personnel and vehicle access.
- .3            Where security is reduced by work provide temporary means to maintain security.
- .4            Closures: protect work temporarily until permanent enclosures are completed.

**1.4                SPECIAL REQUIREMENTS**

- .1            Carry out noise generating work from 8:00 to 16:00 hours. Work outside these hours may be permitted on a limited basis and requires prior approval of the Departmental Representative.
- .2            Coordinate delivery of materials and equipment with Departmental Representative.

**1.5                ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDINGS**

- .1            Execute work with least possible interference or disturbance to normal use of premises and continuous operation of Electronics Workshop. Arrange with Departmental Representative to facilitate execution of work.

**1.6                EXISTING SERVICES**

- .1            Notify Departmental Representative of intended interruption of services and obtain required permission minimum (10) calendar days in advance of planned work.
- .2            Where Work involves breaking into or connecting to existing services, give Departmental Representative minimum (5) calendar days' notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum.

**1.7                SECURITY**

- .1            Provide temporary means to maintain security where security has been reduced by Work.

**1.8                BUILDING SMOKING ENVIRONMENT**

- .1            Smoking is not permitted on site.

**END OF SECTION**

**Part 1           General**

**1.1           ADMINISTRATIVE**

- .1   Submit to Canadian Coast Guard (CCG) 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 drawings, product data, samples and mock-ups in SI Metric units.
- .4   Where items or information is not produced in SI Metric units converted values are acceptable.
- .5   Review submittals prior to submission to CCG. 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.
- .6   Notify CCG, 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 CCG's review of submittals.
- .8   Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by CCG's review, unless CCG gives written acceptance of specific deviations.
- .9   All submissions include:
  - .1   Date and revision dates.
  - .2   Project title and number.
  - .3   Name and address of:
    - .1   Subcontractor.
    - .2   Supplier.
    - .3   Manufacturer.
- .10   Unless noted otherwise, submittals in electronic format are required.

**1.2           SHOP DRAWINGS**

- .1   The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2   Submit drawings stamped and signed by professional engineer registered and licensed in British Columbia, Canada.
- .3   Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which

adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

- .4 Allow five working days, or as otherwise stipulated in the specifications, for CCG to review of each submission.
- .5 Adjustments made on shop drawings by CCG are not intended to change contract price. If adjustments affect value of Work, state such in writing to CCG and await authorization prior to proceeding with Work.
- .6 Make changes in shop drawings as CCG may require, consistent with Contract Documents. When resubmitting, notify CCG in writing of revisions other than those requested.
- .7 Submissions to include:
  - .1 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.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.
- .8 After CCG's review, distribute copies.
- .9 Submit electronic copies of shop drawings for each requirement requested in specification Sections and as CCG may reasonably request.
- .10 Submit 3 copies of product data sheets or brochures for requirements requested in specification Sections and as requested by CCG where shop drawings will not be prepared due to standardized manufacture of product.
- .11 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by CCG.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .12 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by CCG.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

- .2 Certificates must be dated after award of project contract complete with project name.
- .13 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by CCG.
- .14 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .15 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by CCG.
- .16 Delete information not applicable to project.
- .17 Supplement standard information to provide details applicable to project.
- .18 If upon review by CCG, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .19 The review of shop drawings by CCG is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that CCG approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

### **1.3 DESIGN DRAWINGS**

- .1 Submit drawings stamped and signed by a professional engineer registered and licensed in British Columbia, Canada.
- .2 Allow five working days, or as otherwise stipulated in the specifications, for CCG to review of each submission.
- .3 Adjustments made on design drawings by CCG are not intended to change contract price. If adjustments affect value of Work, state such in writing to CCG and await authorization prior to proceeding with Work.
- .4 Make changes in design drawings as CCG may require, consistent with Contract Documents. When resubmitting, notify CCG in writing of revisions other than those requested.
- .5 Any changes to engineering plans must be approved by CCG.
- .6 Indicate materials, connections, explanatory notes and other information necessary for completion of Work.
- .7 Submissions to include:

- .1 Details of appropriate portions of Work as applicable:
  - .1 All details required by specifications.
  - .2 All applicable information recommended in Annex A of CSA S37-18.
  - .3 Reference design standards.
  - .4 All design loads for specified load conditions.
  - .5 All analysis, calculations, and reactions for foundations and tower. A capacity profile of tower giving designed % load capacity for tower legs, diagonals, and foundations.
  - .6 Leg diameters for each section, types of connections, and typical details.
  - .7 Details of ice guards, attachments of antennas, anti-climb devices, and transmission line placement.
  - .8 Details of the grounding system and cable requirements.
  - .9 Any other information deemed relevant by the Engineer of Record.
  - .10 For drawings of items outside of the scope of CSA S37-18, the same information recommended in Annex A is to be provided.
- .8 Submit electronic copies of drawings for each requirement requested in specification Sections and as CCG may reasonably request.

#### **1.4 CONSTRUCTION PLAN**

- .1 Submit a Construction Plan to be of sufficient detail to demonstrate that the challenges of the project have been considered and preparations have been made to undertake the Work in a competent and professional manner.
- .2 Allow five working days, or as otherwise stipulated in the specifications, for CCG to review of each submission.
- .3 Submission to include:
  - .1 Key project team members (Site Foreman, Project Manager, Subcontractors, etc...);
  - .2 Logistics Plan (Mobilization, staging, accommodations, etc...);
  - .3 Health and Safety Plan (Section 01 35 30);
  - .4 Environmental Protection Plan (Section 01 35 43);
  - .5 Concrete Construction Plan (Section 03 30 00); and
  - .6 Grounding Plan (Section 26 05 27).

#### **1.5 PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit electronic digital photography in jpg format, standard resolution at completion of Work or as directed by CCG.
- .2 Name photo files in the format of: SiteName\_item\_date.jpeg.
- .3 Take photographs of work completed clearly showing location of installed equipment. Photographs of the tower and mounting brackets to be taken further back to clearly indicate as much information as possible which will help for future additions.

**1.6 AS-BUILTS**

- .1 Submit As-built information following completion of Work.
- .2 Allow five working days, or as otherwise stipulated in the specifications, for CCG to review each submission.
- .3 Submissions to include:
  - .1 1 page written construction summary report outlining Work completed or not completed.
  - .2 As-built drawings clearly marked up in red markings containing any changes or variations from the original design documents.
  - .3 Construction photographs clearly showing completion of Work and any changes of variations from the original design documents corresponding to redlined drawings.
  - .4 Test reports as required in the specifications.
  - .5 1 page signed and stamped letter from the Tower Design Engineer stating that Work relevant to their design has been completed to their satisfaction and in accordance with their design.
  - .6 1 page signed and stamped letter from the Foundation Design Engineer stating that Work relevant to their design has been completed to their satisfaction and in accordance with their design.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**



**Part 1 General**

**1.1 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 The Canadian Electric Code (as amended)
- .4 Canadian Standards Association (CSA):
  - .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 Structures.
  - .4 CSA Z1006-10 Management of Work in Confined Spaces.
  - .5 CSA Z462- Workplace Electrical Safety Standard
- .5 National Fire Code of Canada 2010 (as amended)
  - .1 Part 5 – Hazardous Processes and Operations and Division B as applicable and required.
- .6 American National Standards Institute (ANSI):
  - .1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.
- .7 Province of British Columbia:
  - .1 Workers Compensation Act Part 3 Occupational Health and Safety.
  - .2 Occupational Health and Safety Regulation.

**1.2 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.

**1.3 COMPLIANCE WITH REGULATIONS**

- .1 Public Works and Government Services Canada (PWGSC) may terminate the Contract without liability to PWGSC where Contractor, in the opinion of PWGSC, 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.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with 01 33 00 – Submittal Procedures.
- .2 Submit the following within (14) calendar days of Award of Contract and prior to commencement of Work.
  - .1 Company Safety Manual.
  - .2 Site-specific Health and Safety Plan.
  - .3 Emergency procedures.
  - .4 Copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
  - .5 Copies of incident and accident reports.
  - .6 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
- .3 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within (7) calendar days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within (5) calendar days after receipt of comments from Departmental Representative.
- .4 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .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 On-site Contingency and Emergency Response Plan: Contractor shall coordinate and comply with Departmental Representative regarding any specific emergency response procedures required by Canadian Coast Guard (CCG) at Cape Lazo Electronics Workshop, and address standard operating procedures to be implemented during emergency situations.

#### **1.5 RESPONSIBILITY**

- .1 Assume responsibility as Prime Contractor for the 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.

#### **1.6 HEALTH AND SAFETY CO-ORDINATOR**

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have site-related working experience specific to activities of the Work.

- .2 Have working knowledge of occupational safety and health regulations.
- .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
- .4 Be responsible for implementing, revising, daily enforcing, and monitoring the Site Specific Health and Safety Plan.
- .5 Be on site during execution of work

### **1.7 GENERAL CONDITIONS**

- .1 Provide safety barricades and lights around the Contractor's Work Site (as necessary) to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.
  - .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.
  - .2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the Contractor's Work Site.
  - .3 Secure site(s) at night time as deemed necessary to protect site against entry
- .2 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect other site users.

### **1.8 PROJECT/SITE CONDITIONS**

- .1 Work at site will involve contact with:
  - .1 Multi-employer works site.
  - .2 Federal employees.
  - .3 Other contractors.

### **1.9 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 Reference Drawings or other information provided for utility locations.

### **1.10 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.

### **1.11 WORK PERMITS**

- .1 Obtain required specialty permit(s) related to project before start of work.

**1.12 FILING OF NOTICE**

- .1 Contractor is to complete and submit a Notice of Project with Provincial authorities before work commences.
- .2 Provide copies of all notices to Departmental Representative.

**1.13 HEALTH AND SAFETY PLAN**

- .1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.
- .2 Prepare and comply with 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.
    - .11 Occupational Health and Safety communications 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.
- .3 Develop the 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 Health and Safety Plan as required, and re-submit to the Departmental Representative.
- .5 Departmental Representative's review of Site Specific Health and Safety Plan by Public shall not relieve the Contractor of responsibility for errors or omissions in final Site

Specific Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

#### **1.14 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.
- .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.
- .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.

Design and mark emergency exit routes to provide quick and unimpeded exit.

#### **1.15 HAZARDOUS PRODUCTS DOCUMENTATION**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labelling 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 01 33 00.
  - .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 Section 01 51 00.
  - .4 The contractor shall ensure that the product is applied as per manufacturers recommendations.

- .5 The contractor shall ensure that only pre-approved products are brought onto the work site in an adequate quantity to complete the work.

**1.16 ASBESTOS HAZARD**

- .1 Carry out any activities involving asbestos in accordance with applicable Provincial / Federal Regulations.
- .2 Removal and handling of asbestos will be in accordance with applicable Provincial / Federal Regulations.

**1.17 REMOVAL OF LEAD CONTAINING PAINTS**

- .1 All paints containing TCLP lead concentrations above 5 ppm are classified as hazardous.
- .2 Carry out demolition and/or remediation activities involving lead-containing paints in accordance with Worksafe BC Regulations.
- .3 Dry Scraping/Sanding of any materials containing lead is strictly prohibited.
- .4 The use of Methylene Chloride based paint removal products is strictly prohibited.

**1.18 SILICA**

- .1 Carry out work in accordance with Worksafe BC regulations.

**1.19 OVERLOADING**

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

**1.20 FALSEWORK**

- .1 Design and construct falsework in accordance with CSA SD269.1 (R2003) (Falsework for Construction Purposes).

**1.21 SCAFFOLDING**

- .1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 (Code of Practice for Access Scaffold) and B.C. Occupational Health and Safety Regulations.

**1.22 BLASTING**

- .1 Blasting or other use of explosives is not permitted.

**1.23 POWDER ACTUATED DEVICES**

- .1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

**1.24 FIRE SAFETY AND HOT WORK**

- .1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.
- .2 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.

**1.25 FIRE SAFETY REQUIREMENTS**

- .1 Contractor is responsible for monitoring local fire danger class (temperature, wind, relative humidity), and adjusting the work schedule accordingly.
- .2 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.
- .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.
- .4 All powered equipment used to clear vegetation is to be equipped with spark arresters or mufflers in good condition.
- .5 Suitable fire extinguishers are to be present on all mobile equipment.
- .6 Portable gas and diesel fuel tanks are not permitted on most federal work sites. Approval from the Departmental Representative is required prior to any gas or diesel tank being brought onto the work site.

**1.26 UNFORSEEN HAZARDS**

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

**1.27 POSTING OF 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 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.
  - .7 Workplace Hazardous Materials Information System (WHMIS) documents.
  - .8 Material Safety Data Sheets (MSDS).
  - .9 List of names of 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.

**1.28 MEETINGS**

- .1 Schedule, administer and attend Health and Safety meeting with Departmental Representative prior to commencement of Work.

**1.29 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of 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 General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

**END OF SECTION**



**Part 1           General**

**1.1           REFERENCE STANDARDS**

- .1   Canadian Environmental Protection Act (CEPA)
- .2   Canadian Environmental Assessment Act, 2012 (CEAA)

**1.2           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 humans; or degrade environment aesthetically, culturally and/or historically.
- .2   Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

**1.3           ACTION AND INFORMATIONAL SUBMITTALS**

- .1   Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2   Submit Environmental Protection Plan: Within (21) calendar days following contract award and before commencing construction activities or delivery of materials to site.
- .3   Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
- .4   Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5   Include in Environmental Protection Plan:
  - .1   Name of person responsible for ensuring adherence to Environmental Protection Plan.
  - .2   Name of person responsible for manifesting hazardous waste to be removed from site.
  - .3   Name of person responsible for training site personnel.
  - .4   Drawings indicating locations of:
    - .1   Proposed location of excavated soil stockpiles for characterization.
    - .2   Temporary excavations or embankments for material storage areas.
    - .3   Structures, sanitary facilities.
    - .4   Methods to control runoff and to contain materials on site.
  - .5   Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
    - .1   Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas. Plan to indicate staging, refueling, and cleaning areas.
  - .6   Soil Management Plan to include procedures, instructions and methods to be used in managing stockpiled materials. Specifics regarding placement of poly sheeting (above and below piles) to be included.

- .7 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .8 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .9 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .10 Waste Water Management Plan identifying methods and procedures for management and 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.
- .11 Equipment to be used on site identifying age and spill containment procedures.

#### **1.4 EQUIPMENT CONDITION**

- .1 Equipment mobilized to site is to be clean and free of deleterious materials and leaks.
- .2 Equipment that is not clean upon arrival to site will be rejected by Departmental Representative. Contractor to pay costs of removing and remobilizing equipment to site.
- .3 Sample equipment cleaning procedures provided in APPENDIX for Contractor reference.

#### **1.5 FIRES**

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

#### **1.6 DRAINAGE**

- .1 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .2 Ensure pumped water into waterways is free of suspended materials and contaminants.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

#### **1.7 SITE CLEARING AND PLANT PROTECTION**

- .1 Protect trees and plants on site and adjacent properties as indicated.
- .2 Only clear vegetation that interferes with construction.
- .3 Minimize stripping of topsoil and vegetation.
- .4 Restrict tree removal to areas designated by CCG.

#### **1.8 POLLUTION CONTROL**

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Provide methods, means, and facilities to prevent the contamination of soil, water, and atmosphere from the discharge of pollutants produced by construction operations.

- .3 Vehicles, machinery, and equipment shall be in good repair, equipped with emission controls as applicable and operated within regulatory requirements.
- .4 Avoid unnecessary idling of vehicles or heavy machinery.
- .5 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

**1.9 NOTIFICATION**

- .1 CCG will notify Contractor in writing of observed noncompliance 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 CCG of proposed corrective action and take such action for approval by CCG.
- .3 CCG 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.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 CLEANING**

- .1 Progress Cleaning: Leave Work area clean at end of each day.
- .2 Do not bury rubbish and waste materials on site.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .4 Waste Management: separate waste materials for recycling or reuse from materials for disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1     Section 03 30 00 – Concrete Work
- .2     Section 13 36 13 – Steel Towers
- .3     Section 26 05 27 – Grounding
- .4     Section 32 30 00 – Waveguide Bridge

**1.2                INSPECTION**

- .1     Allow Canadian Coast Guard (CCG) access to Work. If part of Work is in preparation at locations other than Project Location, allow access to such Work whenever it is in progress.
- .2     The below list identifies key milestones where CCG will require an opportunity to take samples/inspect. Such inspections are to satisfy CCG's internal requirements and do not alleviate the Engineer of Record's responsibility to review and inspect the work for conformance to design documents.
  - .1     Steel Fabrication: CCG may inspect steel fabricated items after fabrication is complete and prior to site installation.
  - .2     Reinforcing Steel Installation: CCG may inspect rebar for concrete foundations prior to placing concrete.
  - .3     Concrete Formwork: CCG may inspect formwork prior to placing concrete.
  - .4     Concrete Materials: CCG may test concrete for air content, slump, and compressive strength during any concrete pour.
  - .5     Grounding: CCG may inspect placement of below grade grounding materials prior to back filling or encasement in Ground Enhancing Materials (GEMs).
  - .6     Final Completion: CCG will conduct a final inspection upon completion.
- .3     Give a minimum of (96) hours notice for inspections of all key milestones listed above. The Contractor will be responsible for any delays in work if the required notice was not provided as specified.
- .4     If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .5     CCG will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, CCG shall pay cost of examination and replacement.

**1.3                INDEPENDENT INSPECTION AGENCIES**

- .1     Contractor to retain and pay for services of geotechnical testing company acceptable to the Departmental Representative for testing concrete materials.

- .2 Contractor to retain and pay for services of geotechnical testing company acceptable to the Departmental Representative for testing granular materials.
- .3 Independent Inspection/Testing Agencies may be engaged by CCG for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by CCG.
- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised at no cost to CCG. Pay costs for retesting and re-inspection.

**1.4 ACCESS TO WORK**

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

**1.5 REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by CCG as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

**1.6 TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as requested.

**1.7 MILL TESTS**

- .1 Submit mill test certificates as required of specification Sections or as otherwise requested by CCG.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1      General**

**1.1            SUBMITTALS**

- .1      Submit temporary facilities plan for review and approval by Departmental Representative within fourteen (14) calendar days of Award of Contract. Plan to show temporary facilities, utility hookups, and staging areas, parking areas for construction personnel, avenues of ingress/egress to fenced areas and details of fence installation.

**1.2            EXISTING SITE CONDITIONS AND ENVIRONMENTAL PROTECTION**

- .1      The Contractor shall be held responsible for any damage caused to existing streets or services by construction equipment hauling material to the site. This shall include daily cleaning or sweeping all existing roads or dirt and debris caused by construction activity.
- .2      All work areas, roadways, and site accesses to be restored to as-found or better condition once work is complete.
- .3      Mats or tracked equipment fitted with rubber pads are to be used when operating tracked equipment on all paved areas, with the exception of areas stipulated for re-pavement.

**1.3            TEMPORARY HOARDING**

- .1      Contractor to provide temporary hoarding as required to secure open excavations at building site outside normal work hours (8:00 to 16:00 hours). Hoarding to provide protection for:
  - .1      Personnel at site;
  - .2      Wildlife (including black-tailed deer).
- .2      Hoarding to be 2.4m high interlocking steel fence, secured at all corners and ends.
- .3      Secure hoarding as needed to withstand seasonal weather events. Monitor and make good any deficiencies, as needed.

**1.4            ACCESS AND DELIVERY**

- .1      CCG Electronics Workshop and grass Helipad are used by CCG and partner agencies. Access to these facilities is to be maintained at all times.
- .2      Only the designated entrance off of Wireless Road may be used for access to the facility.
  - .1      Maintain for duration of Contract.
  - .2      Make good damage resulting from Contractor's use.
- .3      All contractors are required to use only the designated entrance.
- .4      Any other use of the facility will be granted to the Contractor through the Departmental Representative.
- .5      Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
- .6      Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

**1.5 CONTRACTOR LAYDOWN AREA**

- .1 The Contractor may use the area specified in the construction documents for a laydown area including equipment and material storage, site offices, first aid facilities, washrooms and or other required site facilities.
- .2 The existing ground surface is to be protected and restored to as-found or better condition once construction is complete.
- .3 Fencing, signage and security are to be provided by the Contractor. Any vandalism is to removed or repaired within 24-hours.
- .4 The Contractor is responsible for any theft or incidental damage in the laydown area.

**1.6 CONSTRUCTION PARKING**

- .1 Parking will be permitted within designated Contractor laydown area provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site at all times.

**1.7 FIRE PROTECTION**

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

**1.8 TEMPORARY POWER**

- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.
- .2 Arrange for connection with appropriate utility company. Pay all costs for installation, maintenance and removal.
- .3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.

**1.9 WATER SUPPLY**

- .1 Temporary water supply connection is not available at the site. Contractor to arrange for temporary water supply needed for personal or construction use as required. Where temporarily connected to a pressurized water supply, the Contractor shall furnish a certified testable backflow preventer, all necessary pipe and hose extensions to conduct the water to the points of use, and shall exercise due care not to waste water.

**1.10 SANITARY FACILITIES**

- .1 No washroom facilities are available on construction site. Contractor to provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 The Contractor shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use; and shall rigorously prohibit the committing of nuisances on the site of the Work, on the lands of the CCG, or on adjacent property.

**1.11 SCAFFOLDING**

- .1 Scaffolding in accordance with CSA Z797 and CAN/CSA S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs as required. Remove promptly when no longer required.

**1.12 HOISTING**

- .1 Provide, operate and maintain hoists/cranes required for moving of workers, materials and equipment.
- .2 Hoists/cranes shall be operated by qualified operator.

**1.13 SPILL PROTECTION**

- .1 Provide onsite spill kit.
  - .1 Kit shall include:
    - .2 45 Gallon plastic drum.
    - .3 100 Sorbent pads of 15" X 19" X 12 oz.
    - .4 5 Sorbent socks 3" X 48".
    - .5 2 Sorbent booms 5" X 10'.
    - .6 1 Epoxy stick.
    - .7 3 Disposal bags 40" X 60" x 6mil.
    - .8 2 pairs of nitrile gloves.
- .2 Spill kits must be maintained on site at all times. Personnel must be familiar with spill recovery equipment and its use.

**1.14 CONSTRUCTION SIGNAGE**

- .1 No signs or advertisements, other than warning signs, are permitted on site.

**1.15 SIGNS AND NOTICES**

- .1 Signs and notices for safety and instruction shall be in both official languages and 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.

**1.16 USE CHARGES**

- .1 General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to Departmental Representative, testing agencies, and authorities having jurisdiction.

**1.17 REMOVAL OF TEMPORARY FACILITIES**

- .1 Remove temporary facilities from site upon completion of Work.

**END OF SECTION**



**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 03 30 00 – Concrete Work

**1.2                REFERENCE STANDARDS**

- .1            CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .2            CAN/CSA-A23.3, Design of Concrete Structures.
- .3            CSA-G30.18, Carbon Steel Bars for Concrete Reinforcement.
- .4            CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .5            CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .6            National Building Code of Canada

**1.3                SCOPE OF WORK**

- .1            Work in this section includes the supply of all labour, material, and equipment necessary to complete the design and construction of the following:
  - .1            Reinforced concrete tower foundations.
  - .2            Reinforced concrete waveguide bridge foundations.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in a manner which prevents contamination or damage.
- .2            Clean all loose scaly rust, dirt, oil, paint, or other coatings that may be detrimental from reinforcement prior to being placed.

**Part 2            Products**

**2.1                MATERIALS**

- .1            All reinforcement steel to be of size and grade as per the engineered design drawings.

**2.2                FABRICATION**

- .1            Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2.
- .2            Obtain Engineer of Record's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3            Upon approval of Engineer of Record, weld reinforcement in accordance with CSA W186.
- .4            Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

**2.3 SOURCE QUALITY CONTROL**

- .1 Upon request, provide CCG with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.
- .2 Upon request, inform CCG of proposed source of material to be supplied.

**Part 3 Execution**

**3.1 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by the Engineer of Record.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

**3.2 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on engineered design drawings.
- .2 Ensure cover to reinforcement is maintained during concrete pour.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 03 20 00 - Concrete Reinforcing.

**1.2                REFERENCE STANDARDS**

- .1            Work under this section to be in compliance with all listed references. In the case of conflict or discrepancy, the more stringent shall apply:
  - .1            CSA A23.1, Concrete Materials and Methods of Concrete Construction;
  - .2            CSA A23.2, Methods of Test and Standard Practices for Concrete;
  - .3            CSA A23.3, Design of Concrete Structures;
  - .4            CSA S269.3 Concrete Formwork;
  - .5            National Building Code of Canada;
  - .6            ACI Specification 306 Cold Weather Concreting (if applicable).

**1.3                SCOPE OF WORK**

- .1            Work in this section includes the supply of all labour, material, and equipment necessary to complete the design and construction of the following:
  - .1            Reinforced concrete tower foundations.
  - .2            Reinforced concrete waveguide bridge foundations.

**1.4                PERFORMANCE REQUIREMENTS**

- .1            The Work shall be designed to perform as reasonably expected for a life of 50 years.

**1.5                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2            Submit Foundation Design Drawings: Following contract award and before commencing construction activities or delivery of materials to site. Submission to include:
  - .1            Tower foundation design drawings stamped and sealed by a qualified Professional Engineer registered in the Province of British Columbia;
  - .2            Drawings showing locations, plans and section views of the foundations;
  - .3            Drawings showing reinforcement steel, anchorage steel and bonding to bedrock and required anchorage pull-test results;
  - .4            Other information listed in Section 01 33 00 – Submittal Procedures.
- .3            Submit Concrete Construction Plan: Following contract award and as part of the Construction Plan in accordance with Section 01 11 00 – Summary of Work, and before commencing construction activities or delivery of materials to site. Submission to include:
  - .1            High level summary of mix properties and admixtures to demonstrate compliance with CCG criteria and Foundation Design Drawings;

- .2 Concrete placing plan identifying the location of the source of ready mix concrete, the transport and placement plan and any other relevant information required to demonstrate a plan for placing the concrete in the required amount of time;
  - .3 Finishing procedures;
  - .4 Curing methods and schedule;
  - .5 Clean-up procedures;
  - .6 Procedures to place and cure concrete in hot or cold temperatures where reasonably anticipated during the construction period.
- .4 Provide concrete testing reports for review by CCG and Foundation Engineer and do not proceed without written approval when deviations from mix design or parameters are found.
  - .5 Concrete hauling time: provide for review by Foundation Engineer.

## **1.6 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Concrete cylinders break test to be performed by certified materials testing lab and results be provided to Departmental Representative to determine foundation strength prior to tower erection.

## **1.7 DESIGN REQUIREMENTS**

- .1 Foundation Engineer: design a suitable foundation for the tower in consideration as per:
  - .1 The loading provided by the Tower Engineer and in the Specifications;
  - .2 Any other loads that could be reasonably anticipated to affect the foundation; and
  - .3 The specific site soil conditions provided in APPENDIX C – Geotechnical Assessment Report.
- .2 Foundation to be designed by a qualified Professional Engineer registered in British Columbia.

## **Part 2 Products**

### **2.1 PERFORMANCE CRITERIA**

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Foundation Engineer and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

### **2.2 MIXES**

- .1 Concrete mix to be determined by Contractor and shall meet specifications on Foundation Design Drawings.
- .2 The use of calcium chloride as an admixture is not permitted.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Allow for CCG to review rock anchors, reinforcing steel and formwork prior to placing concrete.
- .2 Obtain CCG's written approval before placing concrete.
- .3 Place, finish, and cure concrete in accordance with the Contractor's submitted Concrete Construction Plan and the Foundation Design Drawings.
- .4 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .5 During concreting operations:
  - .1 Development of cold joints is not allowed unless otherwise approved in writing by CCG.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .6 Ensure reinforcement and inserts are not disturbed during concrete placement.

**3.2 INSTALLATION/APPLICATION**

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Finishing and curing:
  - .1 Finish concrete to CSA A23.1/A23.2 making all adjustments necessary to account for climatic conditions anticipated during the curing period.
  - .2 Provide a lightly brushed non-skid surface on exposed concrete surfaces, unless otherwise specified in the submitted design.
  - .3 Finish concrete so as to slope gently away from the center of the slab. No water shall pond on the finished surface.
  - .4 Provide appropriate chamfers at all exposed concrete edges.
- .3 Provide samples as required for the performance of quality assurance testing.

**3.3 FIELD QUALITY CONTROL**

- .1 Arrange for concrete testing in accordance with Section 01 45 00 – Quality Control and submit report.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory approved by CCG in accordance with Section 01 45 00 – Quality Control.
- .3 Allow for CCG to monitor any concrete pour and provide minimum 3 working days' notice prior to placement of any concrete.

**3.4 CLEANING**

- .1 Clean in accordance with Section 01 35 43 – Environmental Procedures.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1     Section 03 20 00 – Concrete Reinforcing
- .2     Section 03 30 00 – Concrete Work
- .3     Section 26 05 27 - Grounding
- .4     Section 32 30 00 – Waveguide Bridge

**1.2                REFERENCE STANDARDS**

- .1     Work under this section to be in compliance will all listed references. In the case of conflict or discrepancy, the more stringent shall apply:
  - .1     CSA S37-18 Antenna, Towers, and Antenna Supporting Structures;
  - .2     CSA G40.20, General Requirements for Rolled or Welded Structural Quality Steel;
  - .3     CSA G40.21, Structural Quality Steel;
  - .4     CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures;
  - .5     CSA W59, Welded Steel Construction (Metal-Arc Welding);
  - .6     CSA G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles;
  - .7     ASTM A123 / A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products;
  - .8     Canada Labour Code Part II;
  - .9     Health and Welfare Canada Limits of Exposure to Radio-Frequency Fields Frequencies from 3kHz – 300GHz, Safety Code 6;
  - .10    WorkSafeBC Occupational Health and Safety Regulation;
  - .11    National Building Code of Canada;
  - .12    TC CAR Standard 621.19, Standards Obstruction Markings;
  - .13    SSPC-SP 1, Solvent Cleaning;
  - .14    SSPC-SP 7/NACE No. 4, Brush-Off Blast Cleaning.
  - .15    Motorola R56, 2005 - STANDARDS AND GUIDELINES FOR COMMUNICATION SITES

**1.3                SCOPE OF WORK**

- .1     Work in this section includes the supply of all labour, material, and equipment necessary to complete the following activities:
  - .1     Design, supply, delivery and installation of a new self-supported tower, accessories listed in this section, and hardware;
  - .2     Supply and installation of Trylon Cougar Rail fall arrest system;
  - .3     Design, supply and delivery of antenna mounts for antennas identified in drawing WM-110-1009-CAPE LAZO – 80' TOWER ANTENNA LAYOUT.

#### **1.4 PERFORMANCE REQUIREMENTS**

- .1 The Work shall be designed to perform as reasonably expected for a life of 50 years.

#### **1.5 GUARANTEE**

- .1 The Contractor shall guarantee that all material and workmanship used in the fabrication and construction is in accordance with all applicable specifications listed in the Section.
- .2 For a period of one year from the date of the installation, the Contractor shall replace, free of charge, all defective components. A failure of 10% or more of a particular item shall be interpreted as failure in all similar units. All these items shall be replaced by units of a superior design at no cost to CCG.

#### **1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Tower Design Drawings: Following contract award and before commencing fabrication activities. Submission to include:
  - .1 Drawings indicating:
    - .1 Tower design drawings stamped and sealed by a qualified Professional Engineer registered in the Province of British Columbia;
    - .2 Plan and section views of the tower;
    - .3 Other requirements identified in this section; and
    - .4 Design loads and reaction loads for foundation design.
  - .2 Other information listed in Section 01 33 00 – Submittal Procedures.
- .3 Submit Fabrication Plan: Following contract award and before commencing fabrication activities. Contractor to obtain written approval from CCG prior to beginning fabrication. Submission to include:
  - .1 Fabrication shop drawings.
- .4 Submit Tower Erection Plan: Within 28 days following contract award and as part of the Construction Plan in accordance with Section 01 11 00 – Summary of Work, and before commencing construction activities or delivery of materials to site. Submission to include:
  - .1 Procedures and methods to be employed to:
    - .1 Place new tower on new foundation;
    - .2 Monitor that turn of nut has been completed;
    - .3 Remedy any damage to the coating system incurred during erection.
  - .2 CCG reserves the right to request additional documentation verifying the suitability
- .5 Submit Installation Package: Following contract award and in accordance with Section 01 11 00 - Summary of Work and the following:
  - .1 Tower erection drawings containing sufficient information as to be able to adequately erect and install all provided materials;
  - .2 Material lists;
  - .3 Bolt installation procedures;

## **1.7 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

## **1.8 DESIGN REQUIREMENTS**

- .1 Design a tower in accordance with CSA S37-18 to support all equipment indicated in on drawings. The tower must be capable of supporting all antenna loading requirements.
- .2 Design all tower accessories including: new mounts for all initial equipment, Tx brackets with sufficient capacity for all cables listed on drawings for antennas, a climbing facility with a fall arrest assembly, a lightning rod, and anti-climb assembly.
- .3 Tower to be designed to CSA S37 by a qualified Professional Engineer registered in British Columbia.
- .4 Tower to be designed to resist: all loads specified in CSA S37-18, maximum loads caused by all immediate and future equipment installed on the tower, and site specific wind pressure supplied in APPENDIX D – Site Specific Wind Pressure Report.
- .5 Unless otherwise specified, determine loading in accordance with CSA S37, latest edition, reliability Class I.
- .6 Tower to be designed for a minimum radial ice load of +25mm (Class II).
- .7 The operational requirement for maximum twist: 0.05 degrees.
- .8 The operational requirement for maximum tilt: 0.5 degrees.
- .9 Each tower section must be in 6.096m lengths.
- .10 Paint: 7 solid colour bands in accordance with Transport Canada Standard 621.
- .11 Obstruction lights: Dialite LED Dual CL810 complete with controller.
- .12 Tower radar platform to the following requirements:
  - .1 Overall plan dimensions: 4.5m x 4.5m.
  - .2 Steel frame construction.
  - .3 Guardrails around perimeter of platform.

## **Part 2 Products**

### **2.1 GENERAL**

- .1 Structural steel to be grade 300W or better.
- .2 All mounts, mount hardware, and line hangers shall be heavy-duty hot-dip galvanized.
- .3 All tower and anchor hardware, where possible, including turnbuckles, thimbles and shackles shall be Crosby products or approved equivalent, manufactured from AISI 1035 steel, heat treated, and shall be hot-dip galvanized.
- .4 Bolts shall be hot-dip galvanized with hexagonal heads and be supplied with hexagonal nuts. The unthreaded part of the bolt shall be long enough for full bearing of the adjoining parts and enough washers shall be placed on each bolt under the nut to prevent the nut from reaching the end of the bolt threads when tightened.



**Part 3 Execution**

**3.1 FABRICATION**

- .1 Provide to CCG a copy of Canadian Welding Bureau (CWB) certification for the tower fabricating company.
- .2 Designate each tower segment with a number that is easily read after galvanizing. Stamp the mark into each piece in such a manner, or in such a place, as will not injure or reduce the strength of the piece. The marks on like pieces shall be in the same relative position on each piece. The markings on each piece shall correspond with the erection drawings.
- .3 Fabricate all members in accordance with the Engineered Drawings and the referenced codes and standards.
- .4 All like parts to be interchangeable. All like parts to have the same number.
- .5 In any bending or reworking of any material, methods employed shall ensure that the physical properties of the material are not impaired.
- .6 Provide electrical continuity between all tower sections.

**3.2 GALVANIZING**

- .1 All materials, structural steel, pipe and fittings, including bolts, nuts and washers shall be hot-dip galvanized to the requirement of CSA S37-18 and CSA-G164 and as otherwise specified therein.
- .2 All materials shall be completely fabricated before galvanizing (except the tapping of nuts).
- .3 Before galvanizing, the steel shall be thoroughly cleaned of all paint, grease, rust, scale or other materials that will interfere with proper binding of the zinc with the steel.
- .4 Tests for thickness and uniformity of coating shall be made as considered necessary by CCG. Tests shall be conducted in full accordance with the requirements of CSA S37-18. If required, contractor shall pay for testing.
- .5 Steel members that have a slightly damaged finish shall be given three coats of zinc-enriched paint applied according to the manufacturer's printed instructions.

**3.3 SURFACE PREPARATION**

- .1 Galvanized steel must be cleaned prior to painting in accordance with SSPC-SP-1 – "Solvent Cleaning".
- .2 Light sweep blast all surfaces in accordance with SSPC-SP-7 to remove any chromate treatment, or poorly adhered zinc salts that may be present to increase mechanical bonding through increased roughness.
- .3 Care should be taken to remove as little zinc as possible while maintaining desired toughness.
- .4 After sweep blasting, the coating system should be applied ideally the same day and a max of one day later.
- .5 Grit shall not be recycled.

### **3.4 CLIMBING APPARATUS**

- .1 The tower shall be equipped with a climbing apparatus complete with a fall arrest rail, in compliance with CSA S37-18.
- .2 Provide an unobstructed and continuous climbing path and maintain the required climbing clearance radius as per CSA S37-18.
- .3 Climbing apparatus configuration shall comply with CSA S37-18 and the Canada Labour Code. Rungs are to be horizontal, have adequate clearance, and line up vertically.

### **3.5 FALL ARREST SYSTEM**

- .1 The Contractor shall supply and install a Tylon Cougar Fall Arrest Rail to meet CSA S37-18 requirements and CSA Z259.2.4-15 or approved equivalent.
- .2 The fall arrest rail shall be free from obstructions for the complete height of the tower.
- .3 The fall arrest rail shall be supported at spans not more than 1 m, or to meet the manufacturer's instructions.
- .4 The fall arrest rail shall run up the tower or ladder in a manner to facilitate climbing. The fall arrest rail shall be straight and true to prevent trolley binding.
- .5 The extension of the fall arrest rail beyond the top of the tower must be structurally supported for the entire height.
- .6 Proper manufactured stop hardware is to be installed at the top of the fall arrest rail to prevent accidental dislodging of the trolley from the rail.

### **3.6 TRANSMISSION LINE BRACKETS**

- .1 All transmission lines as indicated on drawings.
- .2 All cable to be supported in such a manner that the maximum distance between hangers does not exceed one meter or the manufacturer's recommended spacing, whichever is less.
- .3 All lines to be mounted on the outside of the tower face or ladder mounted brackets. Location of cabling is to be submitted to the Coast Guard for approval, and represented on the stamped tower drawings.

### **3.7 ANTENNA MOUNTS**

- .1 All antennas as indicated on drawings.
- .2 Antennas shall be mounted to the tower face or leg at the azimuth as indicated on drawings.

### **3.8 LIGHTNING ROD**

- .1 Lightning Rod assembly in accordance with Motorola R56, 2005 - STANDARDS AND GUIDELINES FOR COMMUNICATION SITES.
- .2 Orientation and location to be confirmed with Departmental Representative prior to installation on tower.

### **3.9 INSTALLATION**

- .1 Obtain written authorization from CCG prior to site mobilization.

- .2 The precise tower location and orientation will be laid out by CCG.
- .3 The contractor shall give Coast Guard a written notice (14) calendar days prior to the commencement of the standing of the tower.
- .4 The tower shall be erected in a manner that will not bend, scrape, distort, or injure the component parts of the galvanizing.
- .5 Every failure of the tower sections to join together properly shall be reported to CCG.
- .6 Upon completion of erection, the tower shall be inspected by the Contractor for damage. Any damaged or missing items, including nuts, bolts, etc., shall be replaced. The tightness of all bolts shall be rechecked at this time.
- .7 The Contractor shall be responsible to ensure that no members of the tower are overstressed during erection.
- .8 Any members damaged during erection shall be replaced at the Contractor's cost.
- .9 The Contractor shall be responsible for any damages done to the work of others, or to adjoining structures and property during erection.

**3.10 FIELD QUALITY CONTROL**

- .1 Allow for CCG to monitor any tower field erection to confirm submitted plans are being followed.
- .2 Tower Engineer of Record to submit detailed inspection report to Departmental Representative following tower installation. Report to conform to requirements listed in CSA S37.

**3.11 HANDLING OF MATERIAL AND TRANSPORTATION**

- .1 The tower and parts are to be built so they may be safely transported to the Canadian Coast Guard site at Cape Lazo, BC from the manufacturer's premises. The delivery address is 299 Wireless Road, Comox, BC V9M 3T6.
- .2 The delivery must be made during regular working days between the hours of 9:00am and 3:00pm. A minimum 5 days' notice is required to arrange for reception of materials. Contractor to provide a crane or forklift to unload materials from the delivery truck.
- .3 Materials shall be handled and stored in the plant and on the drop off location in such a manner that no damage shall be done to the materials of any existing building or structure.
- .4 Special care shall be taken to ensure that galvanizing is not damaged during handling of materials.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 13 36 13 – Steel Towers
- .2            Section 32 30 00 – Waveguide Bridge

**1.2                REFERENCE STANDARDS**

- .1            Work under this section to be in compliance with all listed references. In the case of conflict or discrepancy, the more stringent shall apply:
  - .1            Motorola R56, Standards and Guidelines for Communication Sites.
  - .2            CSA C22.1, Canadian Electrical Code.
  - .3            CSA S37-18, Antennas, Towers, and Antenna-Supporting Structures.
  - .4            National Building Code of Canada.
  - .5            Canada Labour Code Part II.
  - .6            WorkSafeBC Occupational Health and Safety Act and Regulation.

**1.3                SCOPE OF WORK**

- .1            Work in this section includes the supply of all design, labour, material, and equipment necessary to provide a grounding system comprising: copper-clad steel ground rods and tinned copper ground cable complete with exothermic ground rod connections.
- .2            The grounding system is to be provided for all applicable Sections.

**1.4                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Submit Grounding Design Drawings: Following contract award and before commencing construction activities. Submission to include:
  - .1            Drawings indicating plan and section views of the grounding system, as well as all other requirements identified in this Section.
  - .2            Other information listed in Section 01 33 00 – Submittal Procedures.
- .3            Submit Grounding Plan: As part of the Construction Plan in accordance with Section 0 11 00 – Summary of Work, and before commencing construction activities or delivery of materials to site. Submission to include procedures and methods to be used during construction.

**1.5                DESIGN REQUIREMENTS**

- .1            Provide grounding work in accordance with Motorola R56, Standards and Guidelines for Communication Sites. Any deviation from this standard shall be made known to CCG.

**Part 2            Products**

**2.1                NOT USED**

- .1            Not used.

**Part 3            Execution**

**3.1                GENERAL**

- .1            Ensure other site infrastructure and grounding systems are not disturbed by excavation and backfill activities.
- .2            Obtain CCG's written approval before installing grounding system.
- .3            In areas where topsoil is present, strip 152mm topsoil and stockpile. Upon completion of backfilling, spread topsoil evenly over affected areas.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 32 23 31 – Excavating, Trenching and Backfill

**1.2                REFERENCES**

- .1            ASTM International
  - .1            ASTM D4791 (latest edition), Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 – Shop Drawings, Product Data and Sample.
- .2            Product Data:
  - .1            Submit manufacturer's instructions, printed product literature and data sheets for aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2            Certificates for proposed granular materials to confirm compliance with the Canadian Council of Ministers of the Environment (CCME) Residential/Parkland (RL/PL) Land Usage Soil Quality Guidelines.
- .3            Samples:
  - .1            Submit gradation curves of aggregate material as outlined in Section 31 23 33.01 to Departmental Representative for review.
  - .2            Allow continual sampling by Departmental Representative during production if requested.
  - .3            Provide Departmental Representative with access to source and processed material for sampling.
  - .4            Supply new or clean sample bags or containers according appropriate to aggregate materials.
  - .5            Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2            Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

- .3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Granular Sub-base and Granular Base material: properties in accordance with the following requirements:
  - .1 Crushed or screened stone, gravel or sand.
  - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
  - .3 Table:

| Sieve Designation | % Passing                                  |  |        |
|-------------------|--|--|--------|
|                   | Granular Sub-Base<br>(75mm crushed gravel) | Granular Base<br>(19mm crushed gravel) | Sand   |
| 75 mm             | 100  | -                                      | -      |
| 50 mm             | -  | -                                      | -      |
| 37.5 mm           | 60-100                                     | -                                      | -      |
| 25 mm             | -  | -                                      | -      |
| 19 mm             | 35-80                                      | 100                                    | -      |
| 12.5 mm           | -  | 75-100                                 | 100    |
| 9.5 mm            | 26-60                                      | 60-90                                  | -      |
| 4.75 mm           | 20-40                                      | 40-70                                  | 45-100 |
| 2.36 mm           | 15-30-                                     | 27-55                                  | 30-90  |
| 2.00 mm           | -  | -                                      | -      |
| 1.18 mm           | 10-20                                      | 16-42                                  | -      |
| 0.600 mm          | 5-15                                       | 8-30                                   | 10-50  |
| 0.425 mm          | -  | -                                      | -      |
| 0.300 mm          | 3-10                                       | 5-20                                   | 3-20   |
| 0.180 mm          | -  | -                                      | -      |
| 0.150 mm          | -  | -                                      | -      |
| 0.075 mm          | 0-5  | 2-8                                    | 0-8    |

- .3 Unshrinkable fill: proportioned and mixed to provide:
  - .1 Maximum compressive strength of 0.4 MPa at 28 days.
  - .2 Maximum cement content of 25 kg/m; to CSA-A3001, Type GU.
  - .3 Minimum strength of 0.07MPa at 24 h.
  - .4 Concrete aggregates: to CSA-A23.1/A23.2.
  - .5 Cement: Type GU.
  - .6 Slump: 160 to 200 mm.

- .4 Flat and elongated particles of coarse aggregate: to ASTM D4791.
  - .1 Greatest dimension to exceed 5 times least dimension.
- .5 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
  - .1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
  - .2 Reclaimed asphalt pavement.
  - .3 Reclaimed concrete material.
- .6 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
  - .1 Crushed rock.
  - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
  - .3 Light weight aggregate, including slag and expanded shale.
  - .4 Reclaimed asphalt pavement.
  - .5 Reclaimed concrete material.

## **2.2 SOURCE QUALITY CONTROL**

- .1 Inform Department Representative of proposed source of aggregates and provide access for sampling 4 weeks minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise Department Representative 4 weeks minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Department Representative of unacceptable conditions immediately upon discovery.



- .3 Proceed with topsoil stripping only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.2 PREPARATION**

- .1 Topsoil stripping:
  - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
  - .2 Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared of brush, weeds, grasses and removed from site.
  - .3 Strip topsoil to depths as directed by Departmental Representative. Avoid mixing topsoil with subsoil.
  - .4 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m.
  - .5 Dispose of topsoil as directed by Departmental Representative.
- .2 Aggregate source preparation:
  - .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as approved by authority having jurisdiction.
  - .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
  - .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
  - .4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.
  - .5 Trim off and dress slopes of waste material piles and leave site in neat condition.
  - .6 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.
- .3 Processing:
  - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
  - .2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation

requirements for material and, percentage of crushed particles, or particle shapes specified.

- .1 Use methods and equipment approved in writing by Departmental Representative.
- .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.
- .5 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.
  - .1 Use only equipment approved in writing by Departmental Representative.
- .6 Stockpiling:
  - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
  - .2 Stockpile aggregates in sufficient quantities to meet project schedules.
  - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
  - .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  - .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Department Representative within 48 hours of rejection.
  - .7 Stockpile materials in uniform layers of thickness as follows:
    - .1 Maximum 1.5 m for coarse aggregate and base course materials.
    - .2 Maximum 1.5 m for fine aggregate and sub-base materials.
    - .3 Maximum 1.5 m for other materials.
  - .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
  - .9 Do not cone piles or spill material over edges of piles.
  - .10 Do not use conveying stackers.

- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

### **3.3 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .4 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.
- .5 Waste Management: separate waste materials for reuse or recycling.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .6 Restrict public access to temporary or permanently abandoned stockpiles by means acceptable to Departmental Representative.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 13 36 13 – Steel Towers
- .2 Section 26 05 27 – Grounding
- .3 Section 31 05 16 – Aggregate Materials

**1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422-632002, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN- m/m<sup>3</sup>).
  - .5 ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN- m/m<sup>3</sup>).
  - .6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA S37-13, Antenna, Towers, and Antenna Supporting Structures;
  - .2 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
  - .3 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

**1.3 SCOPE OF WORK**

- .1 Work in this section consist of the excavation of soil for new tower and waveguide bridge foundations and grounding.

## 1.4 DEFINITIONS

### .1 Disposal Facility:

- .1 An existing facility located in Canada where soil or other material is placed in or on land and that is designed, constructed, and operated to prevent any pollution from being caused by the facility outside the area of the facility.
- .2 The facility must hold a valid and subsisting permit, certificate, approval, or any other form of authorization issued by a province or territory for the disposal of soil.
- .3 The facility must comply with federal, provincial, municipal, local, or other legislation, regulations, codes, by-laws, zoning, or other requirements.

### .2 Excavation classes: two classes of excavation will be recognized; rock excavation common excavation and.

- .1 Rock: solid material in excess of 1.00m<sup>3</sup>, and which cannot be removed by means of heavy duty mechanical excavating equipment available on site. Frozen material not classified as rock
- .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

### .3 Unclassified excavation: excavation of deposits of whatever character encountered in Work.

### .4 Topsoil:

- .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.

### .5 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

### .6 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.

### .7 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

### .8 Unsuitable materials:

- .1 Weak, chemically unstable, and compressible materials.
- .2 Frost susceptible materials:
  - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136 : Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

#### .2 Table:

| Sieve Designation | % Passing |
|-------------------|-----------|
| 2.00 mm           | 100       |
| 0.10 mm           | 45 - 100  |
| 0.02 mm           | 10 – 80   |
| 0.005 mm          | 0 - 45    |

- .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .9 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

## **1.5 SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Preconstruction Submittals:
  - .1 Within (21) calendar days of Award of Contract, Contractor to submit to Departmental Representative for review and approval, location of proposed soil disposal facility prior to disposal of any material.
  - .2 Within (2) calendar days of completion of locate work, Contractor to submit records of underground utility pre-locates of existing utilities for review by Departmental Representative.
  - .3 Submit (14) prior to construction start construction equipment list for major equipment to be used in this section prior to start of Work.
    - .1 All tracked equipment to have rubber track pads when working on concrete and paved surfaces on site.
  - .4 Within (21) calendar days of Award of Contract, Contractor must:
    - .1 Inform the Departmental Representative of the proposed fill source(s) and identify the current and historic activities conducted at the source.
    - .2 Submit certificates for proposed granular materials to confirm compliance with the Canadian Council of Ministers of the Environment (CCME) Residential/Parkland (RL/PL) Land Usage Soil Quality Guidelines.
- .3 Construction Submittals:
  - .1 Submit (14) calendar days prior to beginning Work design and supporting data for excavations. Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of British Columbia, Canada.
  - .2 Submit within (14) calendar days of removal of material from site, evidence that materials were disposed of according to all applicable regulatory requirements. Submission to include copies of disposal records including transport manifests, trip tickets and disposal receipts for excavated materials disposed offsite at approved receiving facilities.
  - .3 Submit within (7) calendar days of delivery of fill materials to site, copies of transport manifests, trip tickets and material origin receipts for import materials.
  - .4 Submit within (1) calendar day of testing, compaction testing reports for backfill compaction completed by Contractor's Geotechnical Engineer
- .4 Quality Control: in accordance with Section 01 45 00 - Quality Control:
  - .1 Submit name of testing laboratory retained by Contractor for materials testing for review and approval by Departmental Representative.

- .2 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
- .3 Submit to Departmental Representative written notice when bottom of excavation is reached.
- .4 Submit to Departmental Representative testing inspection results report as described in PART 3 of this Section.
- .5 Samples:
  - .1 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials that meet CCME Residential/Parkland (RL/PL) Land Usage Soil Quality Guidelines.

## **1.6 QUALITY ASSURANCE**

- .1 Owner's geotechnical engineer to conduct field review prior to placement of engineered fill, footing formwork or concrete. Notify Departmental Representative (48) hours in advance of completing foundation excavation to allow for coordination of review by Owner's geotechnical engineer.
- .2 Submit design and supporting data for excavations at least (14) calendar days prior to beginning Work. Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of British Columbia, Canada.
- .3 Keep design and supporting data on site.
- .4 Do not use soil material until written report of soil test results are reviewed and approved by Departmental Representative.
- .5 Health and Safety Requirements:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

## **1.7 EXCAVATION, SOIL SAMPLING AND MATERIAL DISPOSAL**

- .1 As a precautionary procedure for the site, Coast Guard will undertake soils testing on material excavated for tower foundations.
- .2 Excavated material that is to be disposed of offsite is to be managed as follows:
  - .1 Excavated material is to be placed on polyethylene in maximum 50m<sup>3</sup> piles within Contractor work area for soil sampling and testing by Departmental Representative's Soil Management Consultant (SMC).
  - .2 The SMC will complete the task of soils sampling (at the expense of Coast Guard) and provide characterization reports to the Contractor for timely disposal of materials to an approved facility for the disposal based on the characterization report.
  - .3 Should testing indicate a level of contamination requiring specialized disposal, payment for said transport and disposal will be paid as a negotiated change order to the contract. Disposal costs for excavated material not requiring specialized disposal are to be included in contract cost.

- .3 Excavated material that is to be disposed of onsite does not require soil sampling as outlined above.
- .4 Separate waste materials for reuse and recycling and divert materials from landfill to local facility for reuse.

## **1.8 EXISTING CONDITIONS**

- .1 Examine geotechnical report supplied in APPENDIX C.
- .2 Buried services:
  - .1 Before commencing work verify location of buried services on and adjacent to work area.
  - .2 Conduct utility locates in all areas of excavation to identify location and approximate depth of services.
  - .3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .4 Prior to beginning excavation Work, notify applicable Departmental Representative establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during Work.
  - .5 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
  - .6 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing.
  - .7 Record location of maintained, re-routed and abandoned underground lines on project record drawings.
  - .8 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
  - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
  - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Granular Sub-base and Granular Base material: in accordance with Section 31 05 16 – Aggregate Materials.
- .2 All material brought to the site that does not comply with the CCME RL/PL Guidelines will be removed from the property immediately at the Contractors cost. Contractor responsible for all remediation costs associated with import of non-compliant material.



**Part 3 Execution**

**3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control drawings, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2 SITE PREPARATION/PROTECTION**

- .1 Unless otherwise indicated or located in an area to be occupied by new construction, protect existing compacted gravel storage area from loose soils excavated from nearby areas.
  - .1 Only clear vegetation that interferes with construction.
  - .2 Minimize stripping of topsoil and vegetation.
  - .3 Obtain CCG approval prior to any tree removal.

**3.3 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping from work area after has been cleared of brush, weeds, grasses and removed from site.
- .2 Remove and dispose of invasive weed species listed in APPENDIX G in bags and dispose of appropriately at local landfill facilities.
- .3 Strip topsoil to depths required.
  - .1 Do not mix topsoil with subsoil.
- .4 Stockpile in locations as directed by Departmental Representative.
  - .1 Stockpile height not to exceed 1.5 m and should be protected from erosion.
- .5 Dispose of unused topsoil as directed by Departmental Representative.

**3.4 STOCKPILING**

- .1 Stockpile materials in areas designated in temporary facilities plan.
  - .1 Stockpile granular materials in manner to prevent segregation.
  - .2 Protect fill materials from contamination.
  - .3 Protect excavated material stockpiles marked for soil testing with tarps during inclement weather to prevent erosion.
  - .4 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

### **3.5 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.
- .3 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved runoff areas or containment facilities and in manner not detrimental to public and private property, or portion of Work completed or under construction.
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .4 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to watercourses or drainage areas.

### **3.6 EXCAVATION**

- .1 Advise Departmental Representative at least (7) calendar days in advance of excavation operations. Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Excavation must not interfere with bearing capacity of adjacent foundations and slabs. Contractor to notify Departmental Representative immediately where undermining of slabs of foundations occurs. Contractor responsible for devising and executing a remediation plan for filling all voids associated with undermining of slabs and foundations.
- .3 Do not disturb soil within branch spread of trees or shrubs that are to remain.
  - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw, as directed by Departmental Representative.
- .4 Excavated material to be stock piled for sampling and testing by Departmental Representative.
- .5 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .6 Restrict vehicle operations directly adjacent to open trenches.
- .7 Dispose of surplus and unsuitable excavated material at approved receiving facilities. Contractor must provide Departmental Representative with evidence that materials were disposed of according to all applicable regulatory requirements, including provision of all disposal records including weigh bills, disposal receipts and chain of custody documentation.
- .8 Do not obstruct flow of surface drainage or natural watercourses.
- .9 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .10 Notify Departmental Representative when bottom of excavation is reached.
- .11 Obtain Departmental Representative approval of completed excavation.
- .12 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .13 Correct unauthorized over-excavation as follows:

- .1 Fill with granular base material to not less than 95% Modified Proctor Density.
- .14 Hand trim, make firm and remove loose material and debris from excavations.
  - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
  - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

### **3.7 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services where indicated.
- .2 Place bedding and surround material in unfrozen condition.

### **3.8 BACKFILLING**

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Departmental Representative has inspected installations.
  - .2 Inspection, testing, approval, and recording location of underground utilities.
  - .3 Removal of concrete formwork.
  - .4 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
  - .1 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .2 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 0.150 m.
  - .3 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
    - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative.
- .6 Place unshrinkable fill in areas as indicated.
- .7 Consolidate and level unshrinkable fill with internal vibrators.
- .8 Install drainage system in backfill as indicated.

**3.9 GRADING**

- .1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by Departmental Representative.
  - .1 Grade to be gradual between finished spot elevations shown on drawings.

**3.10 RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as indicated.
- .3 Reinstate lawns to elevation as noted on Drawings or as existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1     Section 03 20 00 – Concrete Reinforcing
- .2     Section 03 30 00 – Concrete Work
- .3     Section 13 36 13 – Steel Towers

**1.2                REFERENCE STANDARDS**

- .1     Work under this section to be in compliance with all listed references. In the case of conflict or discrepancy, the more stringent shall apply:
  - .1     CSA S37-18, Antenna, Towers, and Antenna Supporting Structures;
  - .2     CSA G40.20, General Requirements for Rolled or Welded Structural Quality Steel;
  - .3     CSA G40.21, Structural Quality Steel;
  - .4     CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures;
  - .5     CSA W59, Welded Steel Construction (Metal-Arc Welding);
  - .6     ASTM A123 / A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products;
  - .7     Canada Labour Code Part II;
  - .8     WorkSafeBC Occupational Health and Safety Regulation;
  - .9     National Building Code of Canada;
  - .10    SSPC-SP 1, Solvent Cleaning;
  - .11    SSPC-SP 7/NACE No. 4, Brush-Off Blast Cleaning.

**1.3                SCOPE OF WORK**

- .1     Work in this section includes the supply of all labour, material, and equipment necessary to complete the following activities:
  - .1     Design, supply, delivery and installation of a new waveguide bridge, accessories listed in the section, and hardware;
  - .2     Foundation design drawings stamped and sealed by a qualified Professional Engineer registered in the province of British Columbia.

**1.4                PERFORMANCE REQUIREMENTS**

- .1     The Work shall be designed to perform as reasonably expected for a life of 50 years.

**1.5                GUARANTEE**

- .1     The Contractor shall guarantee that all material and workmanship used in the fabrication and construction is in accordance with all applicable specifications listed in the Section.
- .2     For a period of one year from the date of the installation, the Contractor shall replace, free of charge, all defective component. A failure of 10% or more of a particular item shall be

interpreted as failure in all similar units. All these items shall be replaced by units of a superior design at no cost to CCG.

## **1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit Waveguide Bridge Design Drawings: Following contract award and before commencing construction activities. Submission to include:
  - .1 Drawings indicating:
    - .1 Plan, section, and elevation views of the waveguide bridge; and
    - .2 Other requirements identified in this section.
  - .2 Other information listed in Section 01 33 00 – Submittal Procedures.
- .3 Submit Fabrication Plan: Following contract award and before commencing fabrication activities. Contractor to obtain written approval from CCG prior to beginning fabrication. Submission to include:
  - .1 Fabrication shop drawings.
- .4 Submit Installation Package: Following contract award and in accordance with Section 01 11 00 - Summary of Work and the following:
  - .1 Waveguide bridge erection drawings containing sufficient information as to be able to adequately erect and install all provided materials;
  - .2 Material lists;
  - .3 Bolt installation procedures;

## **1.7 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

## **1.8 DESIGN REQUIREMENTS**

- .1 Waveguide bridge to be designed to CSA S37 by a qualified Professional Engineer registered in British Columbia.
- .2 Waveguide bridge to be designed to resist: all loads specified in CSA S37-18, maximum loads caused by all immediate and future equipment installed on the bridge indicated on drawings, all loads specified in the NBCC, and site specific wind pressure supplied in APPENDIX D – Wind Pressure Report.
- .3 Waveguide bridge must provide support for cabling and complete protection for the antenna and power cabling running from the CCG equipment building and shall provide easy access to all cables.
- .4 Waveguide bridge tray must be constructed of steel channel with a minimum width of 457mm (18”) and minimum thickness of 6.35mm (¼”).
- .5 Maximum spacing between waveguide bridge support posts shall be 3.05m (10’).
- .6 Waveguide bridge to be independent of and not directly connected to the tower structure or building.

- .7 Waveguide bridge to support cables at intervals to prevent sagging and to meet manufacturer's specifications.
- .8 Provide a suitable adjustable flair plate extension to the waveguide bridge to protect the cables. The plate must provide optimum coverage for cables transitioning from the tower to the waveguide bridge.
- .9 Waveguide bridge to run between new tower and new building cable entry ports.
- .10 Waveguide bridge to allow a minimum 2.2 m vertical clearance from grade.
- .11 Concrete foundations design to extend 150 mm above finished grade such that all steel not encased in concrete is above finished grade.

## **Part 2 Products**

### **2.1 GENERAL**

- .1 Structural steel to be grade 300W or better.
- .2 All mounts, mount hardware, and line hangers shall be heavy-duty hot-dip galvanized.
- .3 Bolts shall be hot-dip galvanized with hexagonal heads and be supplied with hexagonal nuts.

## **Part 3 Execution**

### **3.1 FABRICATION**

- .1 Provide to CCG a copy of Canadian Welding Bureau (CWB) certification for the fabricating company and for each worker assigned to the project.
- .2 Fabricate all members in accordance with the Engineered Drawings and the referenced codes and standards.
- .3 All like parts to be interchangeable. All like parts to have the same number.
- .4 In any bending or reworking of any material, methods employed shall ensure that the physical properties of the material are not impaired.
- .5 Provide electrical continuity between all sections.

### **3.2 GALVANIZING**

- .1 All materials, structural steel, pipe and fittings, including bolts, nuts and washers shall be hot-dip galvanized to the requirement of CSA S37-18 and CSA-G164 and as otherwise specified therein.
- .2 All materials shall be completely fabricated before galvanizing (except the tapping of nuts).
- .3 Before galvanizing, the steel shall be thoroughly cleaned of all paint, grease, rust, scale or other materials that will interfere with proper binding of the zinc with the steel.

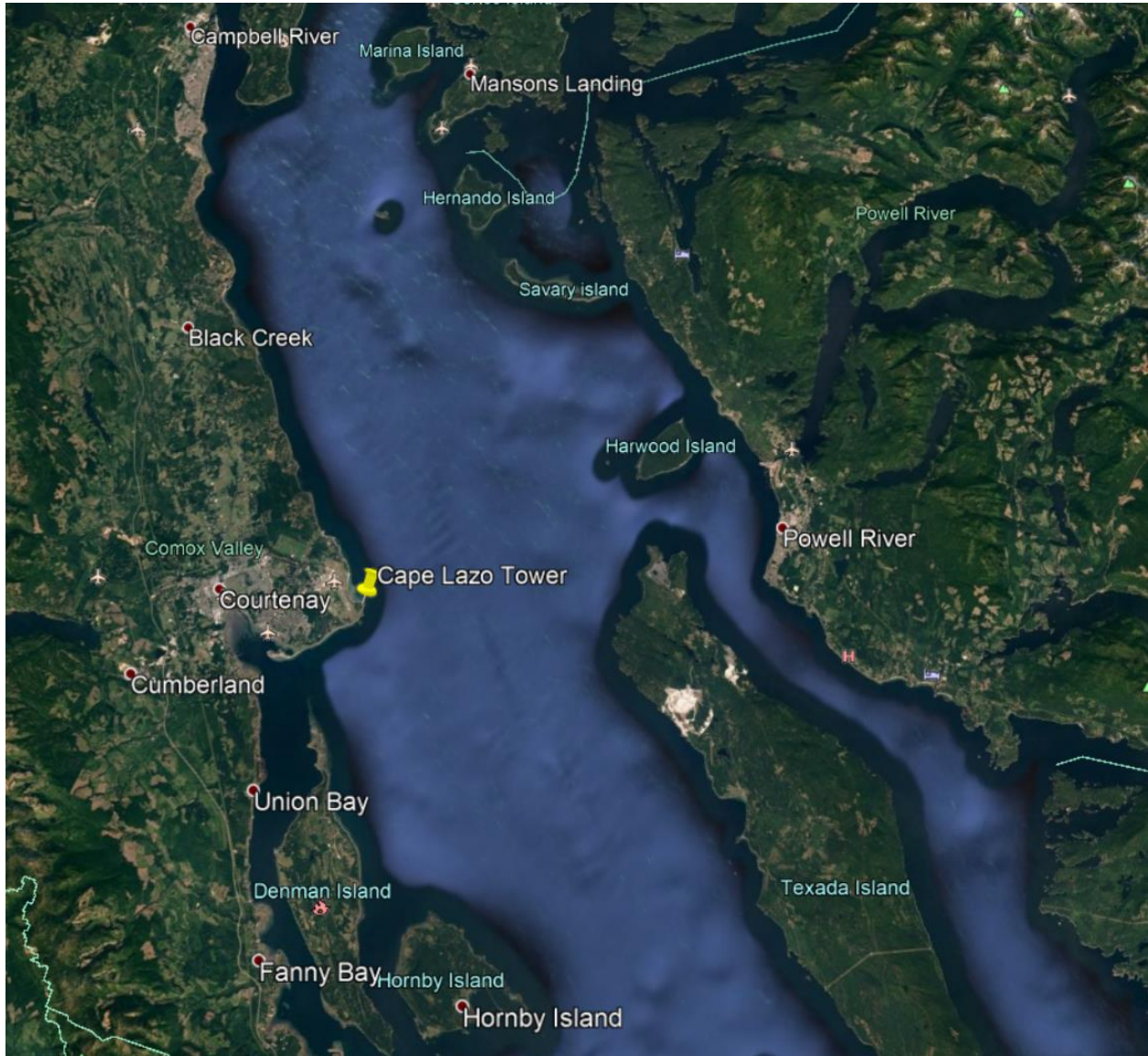
- .4 Tests for thickness and uniformity of coating shall be made as considered necessary by CCG. Tests shall be conducted in full accordance with the requirements of CSA S37-18. If required, contractor shall pay for testing.
- .5 Clean damaged galvanized surfaces in the field with wire brush removing loose and cracked coatings and apply 3 coats of zinc-enriched paint in accordance with the manufacturer's specifications.

### **3.3 HANDLING OF MATERIAL AND TRANSPORTATION**

- .1 The waveguide parts are to be built so they may be safely transported to the Canadian Coast Guard site at Cape Lazo, BC from the manufacturer's premises. The delivery address is 299 Wireless Road, Comox, BC V9M 3T6.
- .2 The delivery must be made during regular working days between the hours of 9:00am and 3:00pm. A minimum 5 days' notice is required to arrange for reception of materials. Contractor to provide a crane or forklift to unload materials from the delivery truck.
- .3 Materials shall be handled and stored in the plant and on the drop off location in such a manner that no damage shall be done to the materials of any existing building or structure.
- .4 Special care shall be taken to ensure that galvanizing is not damaged during handling of materials.

**END OF SECTION**





**Figure 1 - Site Location**



**Figure 2 - Proposed Tower Location**

| <b>SECTION (s)</b> | <b>ITEM</b> | <b>SUBMISSION DESCRIPTION</b>   | <b>REQUIRED DATE</b>                           |
|--------------------|-------------|---|--|
|                    |             |   |  |
| 00 01 00           | 1.4.1.1     | Design Package  | within 28 calendar days of contract award      |
|                    | 1.4.1.2     | Fabrication Plan  | within 28 calendar days of contract award      |
|                    | 1.4.2.3     | Tower Erection Plan   | within 28 calendar days of contract award      |
|                    | 1.4.1.4     | Installation Package  | within 28 calendar days of contract award      |
|                    | 1.4.1.5     | Grounding Plan  | within 28 calendar days of contract award      |
|                    | 1.4.1.6     | Schedule  | within 28 calendar days of contract award      |
|                    | 1.4.1.7     | Construction Plan   | within 28 calendar days of contract award      |
|                    | 1.4.1.8     | As-Built Information  | within 21 calendar days of acceptance of Works |
|                    | 1.6.1       | Testing and inspection services companies   | within 21 calendar days of contract award      |
|                    |             |   |  |
| 01 35<br>29.06     | 1.4.2       | Company Safety Manual   | within 14 calendar days of contract award      |
|                    |             | Site-specific Health and Safety Plan  |  |
|                    |             | Emergency procedures  |  |
|                    |             | Hazardous Products Documentation  |  |
|                    |             | Copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors. |  |
|                    |             | Copies of incident and accident reports   |  |
|                    |             |   |  |
| 01 35 43           | 1.3.2       | Environmental Protection Plan   | within 21 calendar days of contract award      |
|                    |             |   |  |
| 01 51 00           | 1.1.1       | Temporary Facilities Plan   | within 14 calendar days of contract award      |
|                    |             |   |  |
| 03 30 00           | 1.2.2       | Foundation Design Drawings  | within 28 calendar days of contract award      |
|                    |             |   |  |

| <b>SECTION (s)</b> | <b>ITEM</b> | <b>SUBMISSION DESCRIPTION</b>                         | <b>REQUIRED DATE</b>                                     |
|--------------------|-------------|---|--|
| 03 30 00           | 1.5.2       | Foundation Design Drawings                            | within 28 calendar days of contract award                |
|                    | 1.5.3       | Concrete Construction Plan                            | within 28 calendar days of contract award                |
|                    |             |   |  |
| 13 36 13           | 1.6.2       | Design Drawings                                       |  |
|                    | 1.6.3       | Fabrication Plan                                      |  |
|                    | 1.6.4       | Installation Plan                                     |  |
|                    |             |   |  |
| 26 05 27           | 1.4.2       | Grounding Design Drawings                             |  |
|                    | 1.4.3       | Grounding Plan  |  |
|                    |             |   |  |
| 31 05 16           | 1.3.2.2     | Certificates confirming aggregate material compliance |  |
|                    | 1.3.3.2     | Aggregate gradation curved                            |  |
|                    |             |   |  |
| 32 23 31           | 1.5.2.1     | Soil disposal facility documentation                  | within 21 calendar days of contract award                |
|                    | 1.5.2.2     | Underground pre-locates records                       | 2 calendar days of work being completed                  |
|                    | 1.5.2.3     | Construction equipment list                           | 14 calendar days prior to start of construction          |
|                    | 1.5.2.4.1   | Fill source location documentation                    | within 21 calendar days of contract award                |
|                    | 1.5.2.4.2   | Certificates confirming aggregate material compliance | within 21 calendar days of contract award                |
|                    | 1.5.3.1     | Design and supporting data for excavations            | within 14 calendar days prior to beginning Work          |
|                    | 1.5.3.2     | Truck manifest and disposal records documentation     | within 14 calendar days of removal of material from site |
|                    | 1.5.3.3     | Truck manifest and import fill source documentation   | within 7 calendar days of delivery to site               |
|                    | 1.5.3.4     | Compaction testing result submission                  | within 1 calendar day of testing                         |
|                    |             |   |  |
| 32 30 00           | 1.6.2       | Waveguide Bridge Design Drawings                      |  |

Canadian Coast Guard  
**CAPE LAZO COMMUNICATIONS TOWER**  
Ucluelet, B.C.

APPENDIX C  
GEOTECHNICAL ASSESSMENT  
Page 1 of 10

**GEOTECHNICAL ASSESMENT REPORT**

Lewkowich Engineering Geotechnical Report (9 pages)





**Lewkovich Engineering Associates Ltd.**  
geotechnical • health, safety & environmental • materials testing

Canadian Coast Guard – Maritime & Civil Infrastructure  
Fisheries and Oceans Canada  
25 Huron Street  
Victoria, BC V8V 4V9

File Number: F5296.01r1  
Date: January 18, 2018

Attention: Mr. Stephen Childs, P.Eng.

**PROJECT: PROPOSED COMMUNICATIONS TOWER  
CCG CAPE LAZO FACILITY, 299 WIRELESS ROAD, COMOX, BC**

**SUBJECT: PRELIMINARY GEOTECHNICAL ASSESSMENT – TOWER  
FOUNDATION**

Dear Mr. Childs:

**1. INTRODUCTION**

As requested, Lewkovich Engineering Associates Ltd (LEA) has carried out a preliminary geotechnical assessment for the above referenced development with respect to the proposed communications tower. This report provides a summary of our findings and recommendations.

**2. BACKGROUND**

LEA understands the proposed development consists of a 30.5m (100 ft) high, free standing communications tower at the subject site. We have reviewed the *Cliff Recession Review Cape Lazo, Comox, BC* (Golder, 2000) report provided by the Client. We also understand that a protective toe berm design for the base of the foreshore bluff was considered but not constructed.

**3. ASSESSMENT OBJECTIVES**

Our assessment, as summarized within this report, is intended to meet the following objectives:

- i. Provide geotechnically related recommendations with regard to tower siting, foundation options, and preliminary bearing capacities.



---

#### 4. ASSESSMENT METHODOLOGY

LEA completed a field review of the subject site under the direction of CCG project manager, Mr. Stephen Childs. Hand augured test holes were advanced at two locations to the north and south of the operations building (see Figure 1). Unconfined compression strengths of native soils were estimated with a Pocket Penetrometer. Exposed soil deposit thicknesses were measured with a laser range finder and clinometer from the base of the foreshore bluff. Grab samples were then evaluated for gradation. A preliminary slope stability analysis using limit equilibrium methods was reviewed. This analysis provided an approximate guideline for setback distances from the top of bank.

#### 5. SITE CONDITIONS

##### 5.1. General

- a. The Canadian Coast Guard facility at Cape Lazo is located at the east terminus of Wireless Road in Comox BC. The site is bounded by residential developments to the north, south, and west. The east boundary of the site consists of a ~40m high bluff that overlooks the Strait of Georgia.
- b. The site covers approximately 3.75 Ha, and contains a two story operations building, microwave tower, and shed. We understand that a septic dispersal field is located west of the building and parking lot. The site is grass covered with the exception of the forested south west quarter and paved parking areas west of the building.
- c. The study area is generally flat and level from the west boundary to the top of bank bounding the east side. The upper portions of the foreshore slope consist of near vertical scarps. The lower portions consist of colluvium deposits that range in steepness from 30° to 40° above horizontal. The beach to the east of the colluvium is shallow graded and forms a boulder strewn tidal flat that extends into the Strait of Georgia.



- 
- d. The Cape Lazo shoreline lies within a high energy zone with direct exposure to winter storms from the south east. The foreshore slopes are a sediment source for drift cells that carry eroded soils southwards to Goose Spit and northwards to Kye Bay. The bank is actively receding due to wave erosion at the toe. Average annual recession rates were estimated at 0.5m to 0.53m (Golder, 2000).

## 5.2. Soil Conditions

- a. Local surficial geology is dominated by very dense Quadra Sands overlain with Vashon Till. The Quadra unit was at least 25m thick and consisted of horizontally stratified, poorly graded sands with thin laminations of finer grained material.
- b. The Vashon unit observed on site consisted of very dense, lodgement till composed of silty sand with gravel, cobbles, and boulders. Measured thicknesses of this layer ranged from 6m to 10m. Dry densities of this unit typically range from 1920kg/m<sup>3</sup> to 2400kg/m<sup>3</sup>.
- c. Overburden soils were typically 0.5m to 1.2m thick. They varied in gradation and contained siltier gravels and sands (weathered till). Some materials encountered in the shallow test holes appeared to be imported sand and gravel.

## 5.3. Groundwater

- a. Minor seepage was observed in test holes where loose overburden soils transitioned to the dense underlying till. Seepage points were also noted within exposed failure scarps of the Vashon unit. The Quadra sands appeared to be well drained.
- b. Groundwater levels can be expected to fluctuate seasonally with cycles of precipitation. Groundwater conditions at other times and locations can differ from those observed within the test holes at the time of our assessment.





## 6. CONCLUSIONS AND RECOMMENDATIONS

### 6.1. General

The very dense and over consolidated tills observed onsite, offer consistent and favorable foundation bearing conditions. However, final siting of the tower will be governed by adequate setbacks from the actively receding foreshore slopes and existing facilities. We recommend a minimum horizontal set back of 30m from the current top of bank (observed December 14, 2017). Tower siting, foundation options and preliminary design parameters are discussed below.

### 6.2. Tower Siting

- a. Proposed tower locations evaluated during the field investigation were situated immediately north and south of the communications building (Locations 1 & 5). Alternate locations along the west side of the parking lot were also considered.
- b. From a geotechnical point of view, proposed locations outside of the 30m setback should be adequate. Suitable foundation bearing soils appeared to be consistent throughout the site. Subgrade utilities such as buried conduit should be installed above septic dispersal pipe inverts to prevent the ingress of effluent.

### 6.3. Foundation System Options

- a. We understand that the proposed communications tower will be a self-supporting tower, similar to the existing microwave tower onsite. The following foundation types were considered:
  - i. Spread Footing - This foundation consists of a reinforced concrete slab that resists uplift and lateral loads with the mass of concrete and overburden soils. Vertical downward loads are transferred into subgrade soils. This option requires a significant volume of concrete and covers a larger area than other foundation types. However, it



---

is generally less expensive to design and install than more specialized systems.

Concrete volumes may be reduced by increasing the depth of the foundation and adding pedestals to support the tower legs.

- ii. Drilled Shaft Foundation - This system consists of a drilled hole in which reinforcement is placed and concrete is then poured. Uplift loads are resisted mainly by friction at the concrete/soil interface. Lateral load capacity is dependent on the length of shaft and the stiffness of surrounding soils. This system requires far less concrete and offers a much smaller footprint area than spread footings. However, specialty equipment and expertise is needed for effective installation. Longer construction times should also be expected for this system.
  - iii. Micropiles - These piles consist of a single threaded rod grouted into a smaller diameter hole. Piles are typically grouped and connected with a pile cap or mat foundation at the surface grade. Vertical load transfer is similar to that of drilled shaft foundations. Lateral load capacity is often less than that of drilled shaft or spread footing systems. This system is typically indicated for remote sites with restricted access. It has less site impact than other foundation types but requires specialized design and installation equipment. The reduction in materials cost is often offset by specialized design requirements and increased construction time.
- b. We recommend a spread footing foundation for the proposed tower, given the favourable soil conditions, available footprint area, and site accessibility.

#### **6.4. Foundation Design & Construction**

- a. Foundations bearing directly on undisturbed glacial till and may be designed based on a Service Limit State (SLS) bearing capacity of 200 kPa and an Ultimate Limit State (ULS) bearing capacity of 250 kPa. These values assume a minimum 0.6m depth of confinement or cover. Exterior footings should be provided with a minimum 0.6m depth of ground cover



---

for frost protection purposes.

- b. Temporary excavations up to 3m deep into dense Vashon till may be viable without benching or shoring devices. A qualified geotechnical engineer must evaluate conditions before excavations are deemed safe to access.
- c. Conventions outlined in the Occupational Health and Safety Regulations under Part 20, Sections 20.78 through 20.95 should be adhered to for any excavations on site. Where excavations scenarios are not clearly defined under these regulations, a qualified geotechnical engineer should be consulted to assess potential hazards and provide recommendations.
- d. The Geotechnical Engineer should evaluate the bearing soils at the time of construction to confirm that footings are based on appropriate and properly prepared founding material.

#### **6.5. Seismic Issues**

No compressible or liquefiable soils were encountered during the field investigation. Based on the 2012 British Columbia Building Code, Division B, Part 4, Table 4.1.8.4.A, “Site Classification for Seismic Site Response,” the soils and strata encountered during the test pitting investigation would be “Site Class C” (Very Dense Soil or Soft Rock).

### **7. GEOTECHNICAL ASSURANCE AND QUALITY ASSURANCE**

The 2012 British Columbia Building Code requires that a geotechnical engineer be retained to provide Geotechnical Assurance services for the construction of buildings. Geotechnical Assurance services include review of the geotechnical components of the plans and supporting documents, and responsibility for field reviews of these components during construction.

Client: Canadian Coast Guard – Maritime & Civil Infrastructure  
Project: CCG Cape Lazo Facility, Comox, BC  
File #: F5296.01r1  
Date: January 18, 2018  
Page: 7 of 8



## 8. LIMITATIONS

The conclusions and recommendations submitted in this report are based upon the data obtained from a limited number of widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction or further investigation. The recommendations given are based on the subsurface soil conditions encountered during the investigation, current construction techniques, and generally accepted engineering practices. No other warrantee, expressed or implied, is made. Due to the geological randomness of many soil formations, no interpolation of soil conditions between or away from the test holes has been made or implied. Soil conditions are known only at the test hole locations. If other soils are encountered, unanticipated conditions become known during construction or other information pertinent to the structures become available, the recommendations may be altered or modified in writing by the undersigned.

## 9. CLOSURE

Lewkowich Engineering Associates Ltd. appreciates the opportunity to be of service on this project. If you have any comments, or additional requirements at this time, please contact us at your convenience.

Respectfully Submitted,  
Lewkowich Engineering Associates Ltd.



Johannes Fischer, P.Eng.



Chris Hudec, M.A.Sc., P.Eng.  
Senior Project Engineer

Attachments: Site Plan (FIGURE 1)

Client: Canadian Coast Guard – Maritime & Civil Infrastructure  
Project: CCG Cape Lazo Facility, Comox, BC  
File #: F5296.01r1  
Date: January 18, 2018  
Page: 8 of 8

---

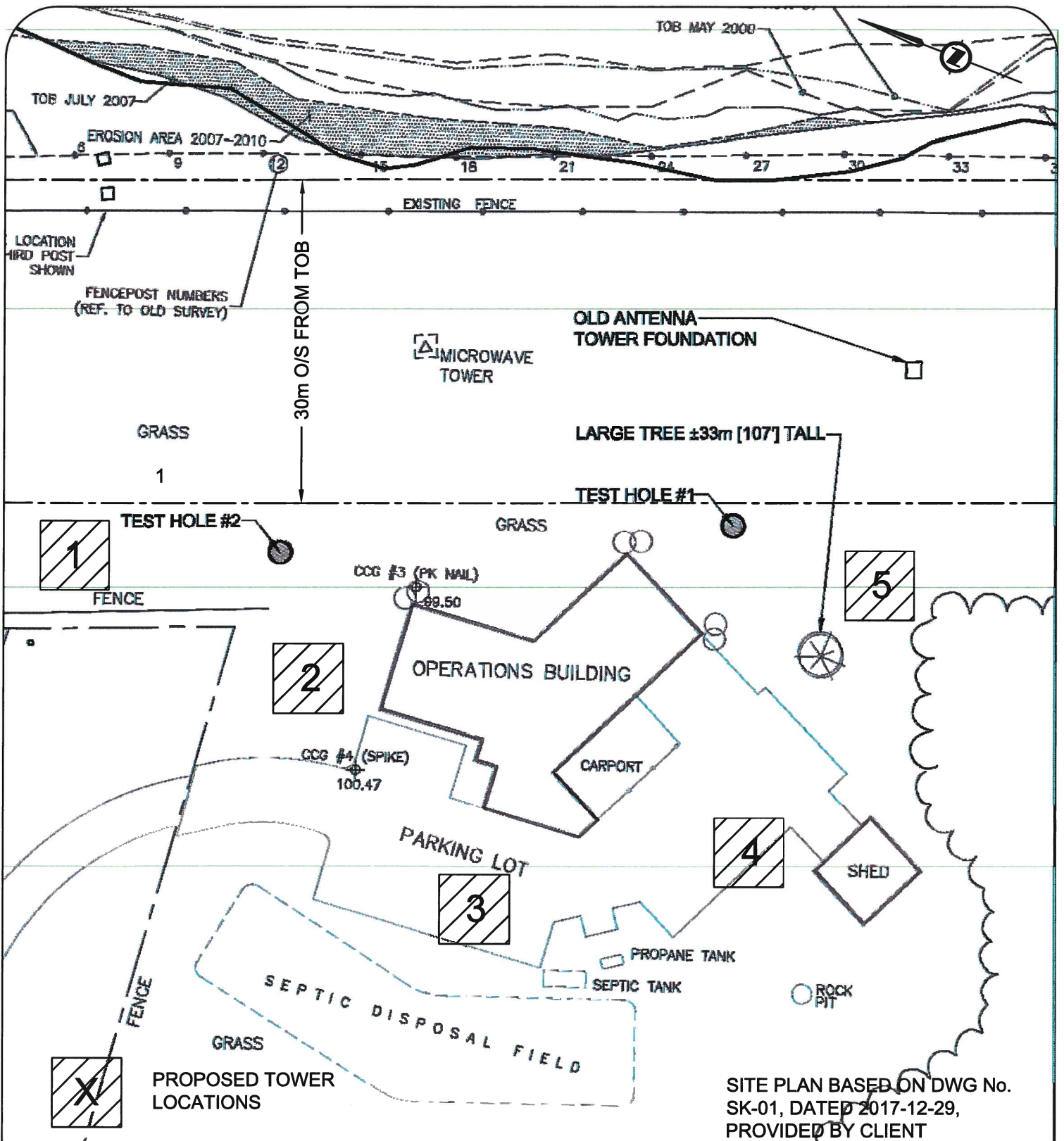


## 10. REFERENCES


Morgan, Peter & Goldbach, Mark, *Cliff Recession Review, Cape Lazo, Comox BC*, Golder Associates Ltd., File No.982-5011A, Abbotsford, September 2000.

Savage, W.Z. et al, *Geotechnical Properties for Landslide Prone Seattle Area Glacial Deposits*, USGS, Open File Report 00-228, 2000.





| REV No. | DATE | BY | P.Eng. | REVISION DESCRIPTION |
|---------|------|----|--------|----------------------|
|         |      |    |        |                      |

|                                   |  |                         |                   |   |
|-----------------------------------|--|-------------------------|-------------------|---|
| DRAWING TITLE<br><b>SITE PLAN</b> | ENGINEER'S SEAL  | PLOT DATE<br>2017-01-04 | DRAWN BY<br>JF    | <br><b>Lewkovich Engineering Associates Ltd.</b> |
|                                   | PROJECT NAME<br>COMMUNICATIONS TOWER SITING<br>CCG CAPE LAZO STATION | REVIEWED BY<br>CMH      | SCALE<br>NTS      |   |
|                                   | LEGAL DESCRIPTION  | PROJECT No.<br>F5296    | DRAWING No.<br>01 |   |

**ENVIRONMENT CANADA SITE SPECIFIC WIND PRESSURE REPORT**

See following pages (6 pages).

# Site-Specific 10-yr. Wind Pressure Report (V2.2 2019-04-22)

## Site Information:

Name: Cape Lazo, BC  
 Latitude: 49° 42' 21.63" N  
 Longitude: 124° 51' 46.71" W  
 Tower Height (m): 28.95  
 Elevation MSL (m): 32

## Results:

**Note:** Following direction from the S37 Committee,  $Q_e$  can no longer be provided.

|                              |                             |                       |
|------------------------------|-----------------------------|-----------------------|
| $Q_{nbc}$ (Pa): 400          | $Q_{nbc} = 400(Z/10)^{0.2}$ | $V_{nbc} = 55.64$ mph |
| Icing: As per CAN/CSA S37-13 |                             |                       |
| $Q_{Min}$ (Pa) 250           | $Q_{Min} = 250(Z/10)^{0.2}$ | $V_{Min} = 43.99$ mph |

## Wind Pressure Formula (for z in metres and result in Pa):

For  $Z \leq 6.2$  metres:  $Q_h = 0.12919 \{ [0.4000 e^{(-0.0625 z)} + 1.1679 \ln(z/0.1000) / \ln(z/0.0500)] 55.71 \}^2 (z/10)^{0.200}$   
 For  $Z > 6.2$  metres:  $Q_h = 0.12919 \{ [1 + 0.4000 e^{(-0.0625 z)}] 55.71 \}^2 (z/10)^{0.200}$

## Profile Formula General Form:

$$Q_h = 0.12919 \{ [a_1 e^{(-a_2 z)} + a_3 \ln(z/z_h) / \ln(z/z_{01})] v_{01} \}^2 (z/10)^{0.200}$$

## Site Values of Coefficients:

For  $Z \leq 6.2$  metres:  $a_1 = 0.4000$ ,  $a_2 = 0.0625$ ,  $a_3 = 1.1679$ ,  $z_h = 0.1000$ ,  $z_{01} = 0.0500$ ,  $v_{01} = 55.71$  mph

For  $Z > 6.2$  metres:  $a_1 = 0.4000$ ,  $a_2 = 0.0625$ ,  $a_3 = 1.0000$ ,  $z_h = 0.0500$ ,  $z_{01} = 0.0500$ ,  $v_{01} = 55.71$  mph

## Definitions

**Tower Height:** Height of the tower from ground level at the base of the tower to the top of the structure.

**$Q_{nbc}$ :** Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada and the  $Q_{nbc}$  value is profiled with the  $^{2/10}$  power law.

**$Q_{Min}$ :** Minimum reference wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the  $^{2/10}$  power law as per Section 5.4.1 of S37-18.

**Wind Pressure Formula:** Formula for the design wind pressure as a function of height. (Ref.: S37-18, 5.3.1)

**Height (Z):** the vertical distance (m) above ground level at the base of the tower.

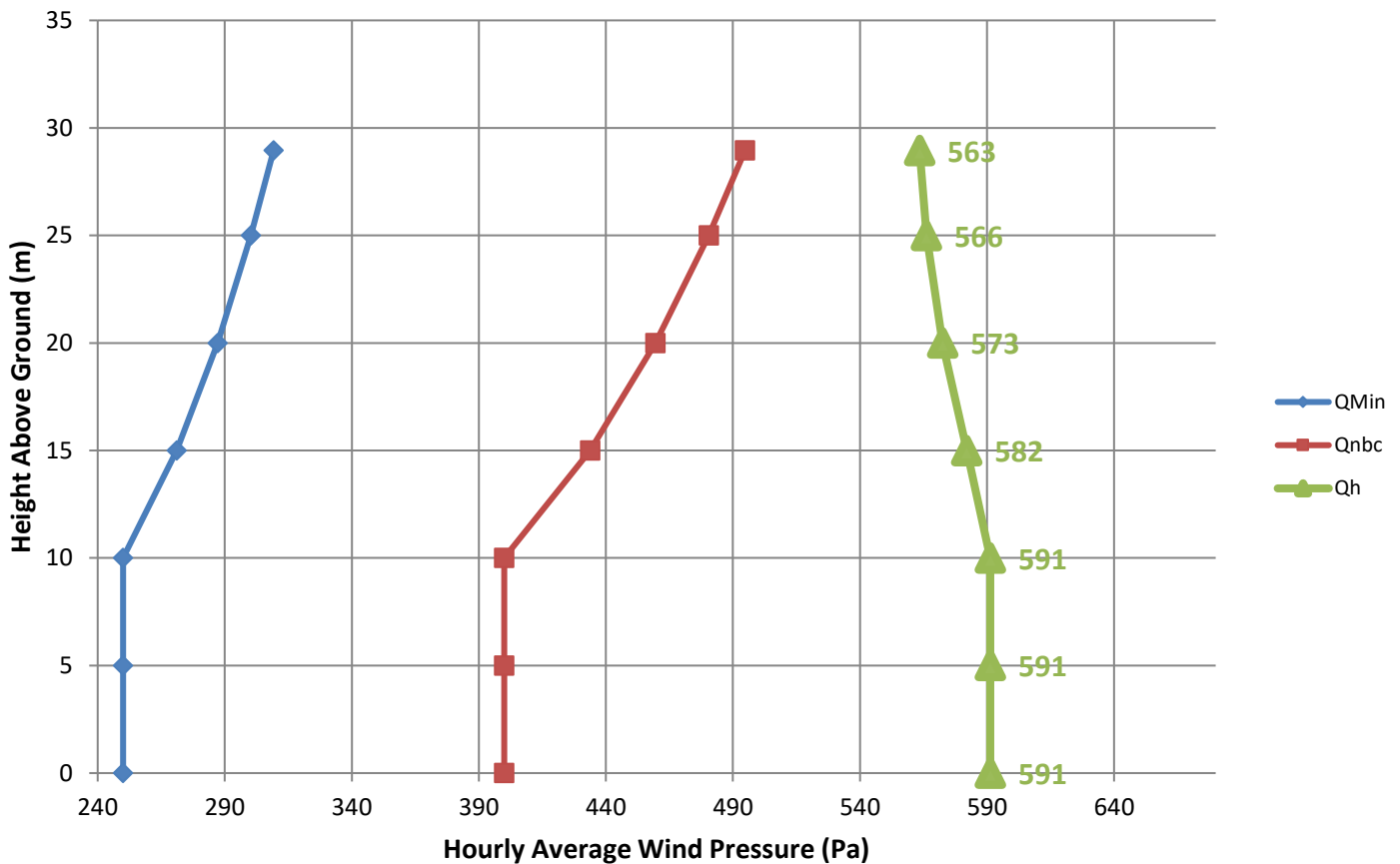
**Note:** No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].

Environment Canada has not made and does not make any representations or warranties, either expressed or implied, arising by law or otherwise, respecting the accuracy of recommended climatic information. In no event will Environment Canada be responsible for any prejudice, loss or damages which may occur as a result of the use of design wind pressure recommendations.



10-yr. Wind Pressure Profile Graph for Cape Lazo, BC 28.95m Tower



**Definitions**

**Tower Height:** Height of the tower from ground level at the base of the tower to the top of the structure.

**Q<sub>nbc</sub>:** Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada and the Q<sub>nbc</sub> value is profiled with the <sup>2</sup>/<sub>10</sub> power law.

**Q<sub>Min</sub>:** Minimum reference wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the <sup>2</sup>/<sub>10</sub> power law as per Section 5.4.1 of S37-18.

**Wind Pressure Formula:** Formula for the design wind pressure as a function of height. (Ref.: S37-18, 5.3.1)

**Height (Z):** the vertical distance (m) above ground level at the base of the tower.

**Note:** No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%, -15%].

Environment Canada has not made and does not make any representations or warranties, either expressed or implied, arising by law or otherwise, respecting the accuracy of recommended climatic information. In no event will Environment Canada be responsible for any prejudice, loss or damages which may occur as a result of the use of design wind pressure recommendations.

# Site-Specific 30-yr. Wind Pressure Report (V2.2 2019-04-22)

## Site Information:

Name: Cape Lazo, BC  
 Latitude: 49° 42' 21.63" N  
 Longitude: 124° 51' 46.71" W  
 Tower Height (m): 28.95  
 Elevation MSL (m): 32

## Results:

**Note:** Following direction from the S37 Committee,  $Q_e$  can no longer be provided.

|                              |                             |                       |
|------------------------------|-----------------------------|-----------------------|
| $Q_{nbc}$ (Pa): 480          | $Q_{nbc} = 480(Z/10)^{0.2}$ | $V_{nbc} = 60.95$ mph |
| Icing: As per CAN/CSA S37-13 |                             |                       |
| $Q_{Min}$ (Pa) 300           | $Q_{Min} = 300(Z/10)^{0.2}$ | $V_{Min} = 48.19$ mph |

## Wind Pressure Formula (for z in metres and result in Pa):

For  $Z \leq 6.2$  metres:  $Q_h = 0.12919 \{ [0.4000 e^{(-0.0625 z)} + 1.1679 \ln(z/0.1000) / \ln(z/0.0500)] 60.97 \}^2 (z/10)^{0.200}$   
 For  $Z > 6.2$  metres:  $Q_h = 0.12919 \{ [1 + 0.4000 e^{(-0.0625 z)}] 60.97 \}^2 (z/10)^{0.200}$

## Profile Formula General Form:

$$Q_h = 0.12919 \{ [a_1 e^{(-a_2 z)} + a_3 \ln(z/z_h) / \ln(z/z_{01})] v_{01} \}^2 (z/10)^{0.200}$$

## Site Values of Coefficients:

For  $Z \leq 6.2$  metres:  $a_1 = 0.4000$ ,  $a_2 = 0.0625$ ,  $a_3 = 1.1679$ ,  $z_h = 0.1000$ ,  $z_{01} = 0.0500$ ,  $v_{01} = 60.97$  mph

For  $Z > 6.2$  metres:  $a_1 = 0.4000$ ,  $a_2 = 0.0625$ ,  $a_3 = 1.0000$ ,  $z_h = 0.0500$ ,  $z_{01} = 0.0500$ ,  $v_{01} = 60.97$  mph

## Definitions

**Tower Height:** Height of the tower from ground level at the base of the tower to the top of the structure.

**$Q_{nbc}$ :** Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada and the  $Q_{nbc}$  value is profiled with the  $^{2/10}$  power law.

**$Q_{Min}$ :** Minimum reference wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the  $^{2/10}$  power law as per Section 5.4.1 of S37-18.

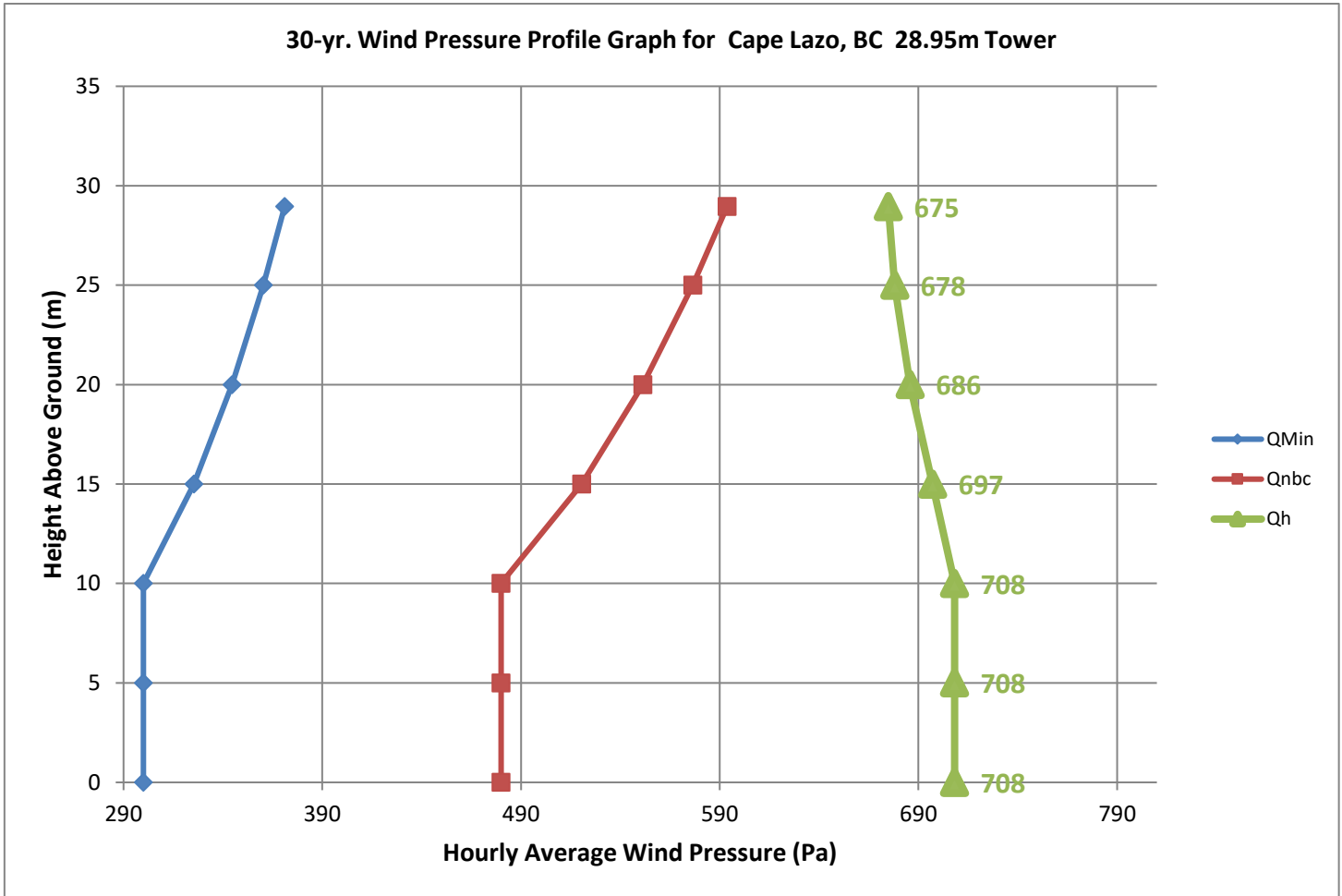
**Wind Pressure Formula:** Formula for the design wind pressure as a function of height. (Ref.: S37-18, 5.3.1)

**Height (Z):** the vertical distance (m) above ground level at the base of the tower.

**Note:** No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].

Environment Canada has not made and does not make any representations or warranties, either expressed or implied, arising by law or otherwise, respecting the accuracy of recommended climatic information. In no event will Environment Canada be responsible for any prejudice, loss or damages which may occur as a result of the use of design wind pressure recommendations.



**Definitions**

**Tower Height:** Height of the tower from ground level at the base of the tower to the top of the structure.

**Q<sub>nbc</sub>:** Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada and the Q<sub>nbc</sub> value is profiled with the <sup>2</sup>/<sub>10</sub> power law.

**Q<sub>Min</sub>:** Minimum reference wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the <sup>2</sup>/<sub>10</sub> power law as per Section 5.4.1 of S37-18.

**Wind Pressure Formula:** Formula for the design wind pressure as a function of height. (Ref.: S37-18, 5.3.1)

**Height (Z):** the vertical distance (m) above ground level at the base of the tower.

**Note:** No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].

Environment Canada has not made and does not make any representations or warranties, either expressed or implied, arising by law or otherwise, respecting the accuracy of recommended climatic information. In no event will Environment Canada be responsible for any prejudice, loss or damages which may occur as a result of the use of design wind pressure recommendations.

# Site-Specific 50-yr. Wind Pressure Report (V2.2 2019-04-22)

## Site Information:

Name: Cape Lazo, BC  
 Latitude: 49° 42' 21.63" N  
 Longitude: 124° 51' 46.71" W  
 Tower Height (m): 28.95  
 Elevation MSL (m): 32

## Results:

**Note:** Following direction from the S37 Committee,  $Q_e$  can no longer be provided.

|                              |                             |                       |
|------------------------------|-----------------------------|-----------------------|
| $Q_{nbc}$ (Pa): 520          | $Q_{nbc} = 520(Z/10)^{0.2}$ | $V_{nbc} = 63.44$ mph |
| Icing: As per CAN/CSA S37-13 |                             |                       |
| $Q_{Min}$ (Pa) 320           | $Q_{Min} = 320(Z/10)^{0.2}$ | $V_{Min} = 49.77$ mph |

## Wind Pressure Formula (for z in metres and result in Pa):

For  $Z \leq 6.2$  metres:  $Q_h = 0.12919 \{ [0.4000 e^{(-0.0625 z)} + 1.1679 \ln(z/0.1000) / \ln(z/0.0500)] 63.38 \}^2 (z/10)^{0.200}$   
 For  $Z > 6.2$  metres:  $Q_h = 0.12919 \{ [1 + 0.4000 e^{(-0.0625 z)}] 63.38 \}^2 (z/10)^{0.200}$

## Profile Formula General Form:

$$Q_h = 0.12919 \{ [a_1 e^{(-a_2 z)} + a_3 \ln(z/z_h) / \ln(z/z_{01})] v_{01} \}^2 (z/10)^{0.200}$$

## Site Values of Coefficients:

For  $Z \leq 6.2$  metres:  $a_1 = 0.4000$ ,  $a_2 = 0.0625$ ,  $a_3 = 1.1679$ ,  $z_h = 0.1000$ ,  $z_{01} = 0.0500$ ,  $v_{01} = 63.38$  mph  
 For  $Z > 6.2$  metres:  $a_1 = 0.4000$ ,  $a_2 = 0.0625$ ,  $a_3 = 1.0000$ ,  $z_h = 0.0500$ ,  $z_{01} = 0.0500$ ,  $v_{01} = 63.38$  mph

## Definitions

**Tower Height:** Height of the tower from ground level at the base of the tower to the top of the structure.

**$Q_{nbc}$ :** Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada and the  $Q_{nbc}$  value is profiled with the  $z/10$  power law.

**$Q_{Min}$ :** Minimum reference wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the  $z/10$  power law as per Section 5.4.1 of S37-18.

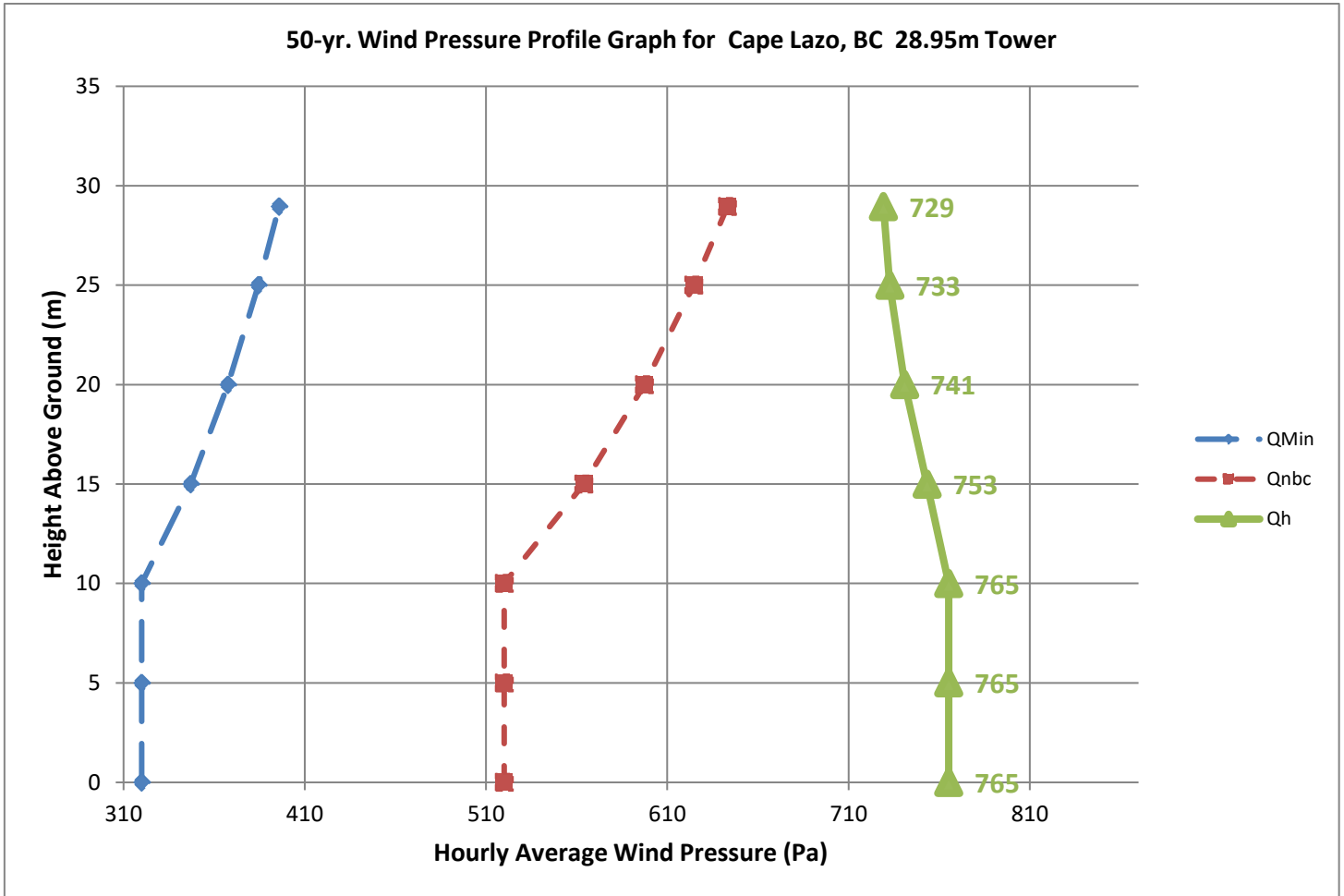
**Wind Pressure Formula:** Formula for the design wind pressure as a function of height. (Ref.: S37-18, 5.3.1)

**Height (Z):** the vertical distance (m) above ground level at the base of the tower.

**Note:** No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].

Environment Canada has not made and does not make any representations or warranties, either expressed or implied, arising by law or otherwise, respecting the accuracy of recommended climatic information. In no event will Environment Canada be responsible for any prejudice, loss or damages which may occur as a result of the use of design wind pressure recommendations.



**Definitions**

**Tower Height:** Height of the tower from ground level at the base of the tower to the top of the structure.

**Q<sub>nbc</sub>:** Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada and the Q<sub>nbc</sub> value is profiled with the <sup>2</sup>/<sub>10</sub> power law.

**Q<sub>Min</sub>:** Minimum reference wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the <sup>2</sup>/<sub>10</sub> power law as per Section 5.4.1 of S37-18.

**Wind Pressure Formula:** Formula for the design wind pressure as a function of height. (Ref.: S37-18, 5.3.1)

**Height (Z):** the vertical distance (m) above ground level at the base of the tower.

**Note:** No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].

Environment Canada has not made and does not make any representations or warranties, either expressed or implied, arising by law or otherwise, respecting the accuracy of recommended climatic information. In no event will Environment Canada be responsible for any prejudice, loss or damages which may occur as a result of the use of design wind pressure recommendations.

**FISHERIES AND OCEANS ENVIRONMENTAL BULLETINS**

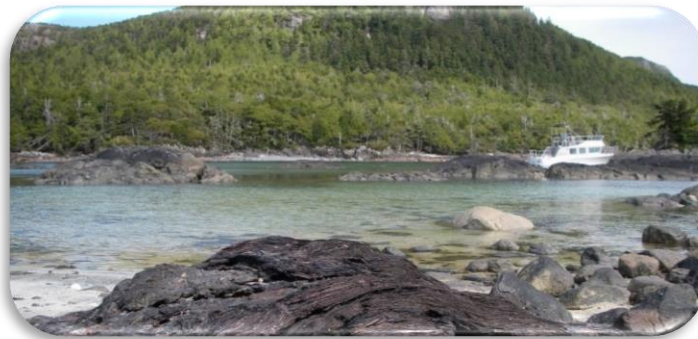
See following pages (18 pages).



## Bulletin 1: General Operations

### Background

Without the implementation of appropriate mitigation measures, construction activities have the potential to affect the biophysical environment (e.g., fish habitat, vegetation, wildlife) directly and indirectly, and may result in adverse environmental effects. Through the use of mitigation measures, potential effects associated with construction activities can be reduced or avoided. The mitigation measures included in this document are intended to provide easy reference to staff and contractors onsite during construction activities and are designed to limit adverse environmental effects. Project personnel have a responsibility to protect environmental, heritage and socio-economic values while undertaking construction work.



### Biophysical Environment

Physical work, associated with operations activities, has the potential to upset the balance of healthy aquatic, and terrestrial ecosystems. Natural water quality or quantity can be affected whenever there is a disruption of water flow, loss of vegetation, increase of sediment in the water, or pollution from harmful substances (such as petroleum products and hazardous washwater) that could contaminate groundwater and soils, and could enter storm drains which discharge to water bodies (EPA 2012). Impacts may include alteration or destruction of habitat, changes in water chemistry leading to potential die-offs of aquatic or other organisms, reproductive failure, disruption of local food chains, the creation of migration barriers, and contamination of local drinking water (DFO 2010, BC MWLAP 2004). Operating heavy equipment can affect local air quality and introduces noise pollution that could disrupt normal wildlife behaviour. Work with machines could also compromise soil structure and vegetation, which may lead to soil erosion or project failures.

Therefore, it is important to have measures in place that minimize the environmental effects of the project. Many mitigation measures apply to all phases of construction activities; such measures are included in this document and



should be implemented on Fisheries and Oceans Canada (DFO) and Canadian Coast Guard (CCG) projects, where applicable.

### Federal and Provincial Legislation

The following table summarizes some of the key federal and provincial environmental legislation that may apply to construction activities carried out by DFO or CCG.

| Federal Legislation                          | Provincial Legislation                               |
|--|--|
| <i>Canadian Environmental Assessment Act</i> | <i>British Columbia Environmental Assessment Act</i> |
| <i>Canadian Environmental Protection Act</i> | <i>Environmental Management Act</i>                  |
| <i>Fisheries Act</i>                         | <i>Heritage Conservation Act</i>                     |
| <i>Species at Risk Act</i>                   | <i>Land Act</i>                                      |
| <i>Migratory Birds Convention Act</i>        | <i>Parks Act</i>                                     |
| <i>Navigation Protection Act</i>             | <i>Water Sustainability Act</i>                      |
| <i>Canada Shipping Act</i>                   | <i>Fish Protection Act</i>                           |
| <i>Transportation of Dangerous Goods Act</i> | <i>Wildlife Act</i>                                  |
|  | <i>Waste Management Act</i>                          |
|  | <i>Forest and Ranges Practices Act</i>               |
|  | <i>Dike Maintenance Act</i>                          |
|  | <i>Drainage, Ditch and Dike Act</i>                  |

### Best Management Practices

#### Permits

- Consult with appropriate Qualified Professionals, as needed, to confirm permitting requirements.
- Copies of all issued permits or approvals issued by regulatory agencies (e.g., DFO, Transport Canada and BC Ministry of Forests, Lands and Natural Resource Operations) must be kept on site (e.g., site trailer, construction barge, accommodation vessel) and readily available. This includes permits and approvals issued directly to DFO or CCG, as well as any issued to contractors or subcontractors.
- Construction-related restrictions, conditions or mitigation measures that are included in regulatory permits should be communicated to the field crew(s).

#### Timing

- Choose appropriate timing of works (weather conditions, regional timing windows for species at risk). Have contingency plans designed and in place to address unforeseen weather events.
- Permits and approvals may include construction timing restrictions. Refer to regulatory permits to see if construction timing is restricted.





- In-water work should aim to occur within the DFO (DFO 2015) or Provincially (BC MOE 2017a) identified least-risk work window for the area, where practicable. Where in-water work cannot be conducted within the least-risk window, additional mitigation measures may be needed and should be developed in consultation with the appropriate regulatory authority.
- Construction timing should be planned to occur outside of the nesting periods for raptors, migratory birds and seabirds, whenever possible. General nesting periods of migratory birds in Canada are provided by Environment and Climate Change Canada (ECCC 2016a). Breeding seasons are provided by ECCC (ECCC 2016b) and Atlas of Breeding Birds of British Columbia (ABBBC n.d.). If unavoidable, mitigation measures must reflect the necessary protocols for avoiding or mitigating harm to birds, nests, and fledglings (ECCC 2016c).

### **Training**

- Project personnel will be adequately trained and will use appropriate personal protective equipment.

### **Tailgate Meetings**

- Applicable Environmental Management Plans (EMP) and regulatory permit conditions will be reviewed by the RPSS Project Manager, Site Manager and Environmental Monitor (EM; where applicable)
- The author of the EMP (or the delegate) will provide a briefing to the crews.

### **Stop Work**

- Where an EM is onsite, they will have authority to issue a Stop Work Order where activities are harming, or may imminently harm the biophysical environment. The EM will make recommendations in the field as needed, to limit or avoid damage to the environment.
- Work will stop and the EM will be contacted for assistance prior to starting or continuing with activities that may pose any environmental or archaeological risk not addressed in project health, safety or environment documents (e.g., EMP, environmental regulatory permit requirements).

### **Public Notice**

- If applicable, proper notice should be given to transportation and navigation authorities to warn of potential disruptions during works.
- Construction areas will be clearly marked and, to the extent necessary, isolated from the public to prevent public access to the active construction site.

### **Site Cleanliness**

- Aesthetic effects created by construction activities will be short-term and localized. The site should be kept tidy during activities and left in a good condition at the end of the project.
- Garbage in the form of coffee cups, lunch wrappers, cigarette butts, and other such items will be placed in covered trash containers at all times.



- Waste or miscellaneous unused materials will be recovered for either disposal in a designated facility or placed in storage. Under no circumstances will materials be deliberately thrown into the aquatic or terrestrial environments.
- Where practicable, recyclable materials, such as drink containers, plastics and paper will be separated onsite and recycled at an appropriate offsite facility.
- Onsite personnel will make best efforts to prevent debris from entering the aquatic and terrestrial environment outside of the worksite.

#### **Wastewater**

- Sewage from portable toilets will be disposed of in an approved sewage disposal facility on an as-needed basis.

#### **Contractors/Subcontractors**

- Contractors and subcontractors must comply with the mitigation measures outlined in this bulletin and measures identified within applicable regulatory permits or approvals.

#### **Noise and Air Quality**

- Machinery must be operated efficiently, to limit noise and air quality effects.
- Noise abatement fittings (e.g., mufflers) on equipment and machinery will be kept in good working order.
- Painting activities should be completed in such a way as to limit fumes entering the environment.
- Smoking will only be permitted in designated areas.
- Fire suppressing equipment must be present at designated smoking areas.
- Fires and burning of rubbish and vegetation is not permitted on work sites.
- Dust will be controlled via the application of water or similar dust control measures.
- Chemical dust suppressants are prohibited.
- To prevent unnecessary local air pollution, anti-idling measures should be put in place when vehicles and machines are not in use.

#### **Paint**

- The amount of paint used should be limited and unused containers must be covered.
- Wash water from equipment should be contained and disposed of appropriately.

#### **Safety Data Sheets**

- Chemical products must have their applicable Safety Data Sheets onsite and readily available to all construction crew members.



### **Stock Piles/Laydown Areas**

- Stockpiling of material will be conducted in accordance with Best Management Practices (BMPs) and limited to material staging areas and barges, where practicable.
- Stockpiles should remain covered during inclement weather.
- Temporary stockpiling areas located adjacent to the aquatic environment will be approved by the EM and materials will be removed prior to inundation by the tide or high water levels. These sites should be identified in advance of construction.

### **Soils**

- Care should be taken to prevent soils from being exposed and eroded into waterbodies.

### **Deleterious Substances**

- Harmful substances (e.g., fine sediments, hydrocarbons, contaminants) will not be deposited into aquatic environments.
- Storage of fuels and petroleum products will comply with safe operating procedures, including secondary containment devices (e.g., drip trays) in case of a leak or spill.
- Routinely inspect heavy equipment for lubricant and fuel leaks
- Onsite crews will have emergency spill equipment available and readily accessible, and will know how to use it properly.
- Refuel diesel-powered equipment at least 30m from the water.
- Work will be conducted such that no contaminated water or other effluent potentially harmful to aquatic life enters the marine environment. Examples of contaminated water or effluent may include silt laden water, wash water containing concrete, site run off, oil or fuel spills, and sewage.

### **Sediment**

- Where necessary, sediment control measures (e.g., silt curtains) will be used to limit the dispersal of sediments and sediment-laden waters beyond the immediate work area.
- Intertidal work should be conducted at low tide and in the dry where practicable.
- Prop wash should be limited in shallow aquatic environments in such a way to reduce disturbance of sediment.

### **Power Washing**

- Power washing should be limited to the immediate construction area.

### **Spudding/Anchoring**

- Where practicable, crews will position barges and vessels in a way that minimizes damage to sensitive aquatic habitat (e.g., surfgrass, eelgrass, kelp beds, spawning gravels, large woody debris) and alternative



methods will be employed (e.g., use of anchors instead of spuds, flat deck barge rather than spud barge) as needed. In the event that sensitive habitats cannot be avoided, the EM (or appropriate delegate) must approve the location of the spudding or anchoring to construction crews in order to limit disturbance.

- Prop-wash and scouring will be avoided within 30 m of kelp, eelgrass or surfgrass beds, where practicable.

### Grounding

- Barge grounding will be avoided to the extent practicable.
- Rock drilling must be conducted conservatively so that physical changes to rock remain small and localized.
- Rock drilling is to be done in the dry (i.e., not in-water).
- Dust and fines entering the water must be avoided (e.g., vacuum or otherwise collect fines and dust).

### Blasting

- Blasting will follow the *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (Wright and Hopky 1998).
- In the marine environment, use a protection shield, such as a bubble curtain, around the blast area to limit shockwaves.
- In the terrestrial environment, place rubber mats over the blasting area to limit flying debris.
- Using a sounder, monitor fish movement; if schools of fish are present, blasting may be halted until the fish move out of the area.

### Water Quality

- Before allowing water to leave the work site, crews will verify that the following water turbidity criteria are achieved (MOE 2017b):
  - Change from background of 8 NTU at any one time for a duration of 24 h in all waters during clear flows or in clear waters
  - Change from background of 2 NTU at any one time for a duration of 30 d in all waters during clear flows or in clear waters
  - Change from background of 5 NTU at any time when background is 8–50 NTU during high flows or in turbid waters
- Change from background of 10% when background is >50 NTU at any time during high flows or in turbid waters
- Before allowing water to leave the work site, crews will verify that water is within the pH range of 7.0–8.7 pH units unless it can be demonstrated that such a pH is a result of natural processes (MOE 2017b).
- Before allowing water to leave the work site, crews will verify that water does not have detectable oil and grease (detectable by sight or smell).



## Flora and Fauna (General)

- Activities should be completed in such a way as to limit stress and disturbance to resident flora and fauna (aquatic or terrestrial).
- Construction footprints should be limited to the area necessary to safely complete the works, to reduce effects to nearby soils, vegetation, and resident species.
- Feeding of wildlife is not permitted.
- If dead, sick or injured animals are observed, report to the EM (or delegate) immediately. Also, contact DFO's Observe, Record, Report phone line (1800-465-4336).
- Site-access routes should consider resident flora and fauna, especially during times of the year when they are most sensitive.
- Foot traffic on riparian and foreshore areas will be limited to prevent trampling flora and fauna.
- All activities should be completed in a way that reduces stress and disturbance to resident flora and fauna.
- The project footprint should be clearly defined by construction crews. Equipment presence within the aquatic environment (e.g., intertidal, riparian areas, stream banks) will be restricted to the immediate work area. The establishment of approved work areas will reduce disturbance and the potential to alter, damage, or destroy fish habitat.
- Locations where project activities may occur (e.g., Fixed Aid footprint, barge landing, laydown areas, watercourse crossings, or in-water components) should be inspected for sensitive habitats and species at risk before and during work.
- Work in and around the marine foreshore environment (e.g., tide pools, intertidal areas) that may be affected by project activities will be reviewed in consultation with a Qualified Professional.
- If intakes are used to withdraw water from the aquatic environment, they will be appropriately screened to prevent the entrainment and impingement of fish. Intake screens will be monitored every half hour while in use for fish entrainment and impingement.
- Any instances of fish kill must be reported to the EM promptly. It is the EMs responsibility to inform the relevant regulatory agency (DFO or Ministry of Forests, Lands and Natural Resource Operations)
- Site- or project-specific mitigation measures may be needed to limit or avoid damage to sensitive habitats or species (e.g., abalone presence, herring spawn in the marine environment; spawning gravels in the freshwater environment). A Qualified Professional should be consulted to identify sensitive habitats in advance of construction, where appropriate.

## Birds

- When travelling near seabird colonies, travel parallel to shore rather than approaching a colony directly.
- Avoid travelling through areas where concentrations of seabirds are observed on water.
- Avoid sharp loud noises, blowing whistles or horns, and maintain constant engine noise levels when within 300 m of seabird colonies.
- If breeding birds, seabird colonies or nests are encountered at the construction site, contact the EM (or delegate) for guidance. If work is expected to occur during the nesting window for raptors, migratory



birds or seabirds, construction should not go ahead until given approval by the EM and, if required, under applicable regulatory permits. If allowable, work must be conducted as efficiently as possible and not disturb birds, nests, and their fledglings. Walk with care as nests and juveniles can be camouflaged on the ground.

- Site- or project-specific mitigation measures (e.g., no-disturbance buffers) may be required where breeding birds, seabird colonies or nests are encountered at the construction site; attempts should be made to identify these resources ahead of construction.

### **Brushing/ Falling**

- No falling will occur without the EM's (or delegate) prior knowledge and approval and must follow applicable regulations.
- Prior to brushing and falling, the area will be inspected for bird nests, wildlife dens and culturally modified trees. Trees containing these features will not be removed without approval from the EM (or delegate) and under appropriate permits, if applicable.
- Prior to brushing and falling, the EM (or delegate) will monitor trees and understory vegetation within 30 m of the construction site for nesting activity. The EM should monitor the active trees and branches identified for brushing and falling, including the path for falling, for a minimum of 15 minutes (or longer, if necessary) to assess nesting activity.
- If an active raptor, migratory bird, or seabird nest or cavity is identified directly at a construction site (i.e., at or within 10 m of the site), brushing and falling activities should be stopped and the EM should consult with a wildlife biologist.
- If an active raptor, migratory bird, or seabird nest or cavity is identified near a construction site, the EM (or delegate) should initiate monitoring activities (described below) for the duration of construction at those sites.
- If an inactive active raptor, migratory bird, or seabird nest or cavity is identified at a construction site, brushing and falling activities can be completed as scheduled.
- If an inactive bald eagle, peregrine falcon, osprey, or great blue heron nest is present in a tree that is proposed to be fallen or within the pathway for falling the EM will determine how to proceed as unoccupied nests of these birds are protected year round.
- Physical injury to tree roots, bark, trunk and crown (e.g., from machinery) will be avoided.
- Use discretion when deciding whether to remove cut debris or leave it on site. In remote sites, cut or brushed debris may be left above highest high water or top of bank to decompose. Remove debris from sites that are not remote.
- Do not dispose of or leave cut vegetation debris in the aquatic environment.

### **Archaeological and Heritage Resources**

- Archaeological and heritage sites in remote locations are not likely to have been previously identified. Care should be taken to avoid archaeological deposits while work is being completed. If an archaeological





or heritage resource is encountered during construction, the work should be stopped in the vicinity of the find and the work crew the EM (or delegate) notified.

- Inspect the proposed construction site footprint (including laydown areas, temporary work areas, and barge landings) for archaeological evidence (e.g., rock art pictographs and petroglyphs) before construction activities (e.g., power washing, rock drilling, concrete pour). If project activities will impact an archaeological site, stop work and contact the EM (or delegate). Trees should be inspected for cultural modification prior to brushing or falling.
- The location of Aboriginal communities and information pertaining to their potential or established Aboriginal or Treaty rights can be found on ATRIS (INAC 2017).





## References

- BC MOE (Ministry of Environment). 2017a. Regional Terms & conditions & Timing Windows. Available at: <http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/working-around-water/regional-terms-conditions-timing-windows>. Accessed April 2017.
- BC MOE. 2017b. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture. Summary Report. Available at: [http://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](http://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf). Accessed April 2017.
- BC MOE. 2017c. General BMPs and Standard Project Considerations. British Columbia Ministry of Environment. Available at: <http://www.env.gov.bc.ca/wld/instreamworks/generalBMPs.htm> Accessed: April 2017.
- BC MOE. 2005. *A User's Guide to Working In and Around Water. Understanding the Regulation Under British Columbia's Water Act*. British Columbia Ministry of the Environment, Water Stewardship Division
- BC MWLAP (Ministry of Water, Land and Air Protection). 2004. Standards and Best Practices for Instream Works. British Columbia Ministry of Water, Land and Air Protection, Ecosystems Standards and Planning, Biodiversity Branch: Victoria, BC.
- DFO. 2010. Projects Near Water: Pathways of Effects – Structure Removal. Fisheries and Oceans Canada. Available at: <http://www.dfo-mpo.gc.ca/pnw-ppe/pathways-sequences/removal-enlevement-eng.html> Accessed: April 2018.
- DFO (Fisheries and Oceans Canada). 2015. Timing Windows to conduct Projects in or around Water, Available at: <http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/index-eng.html>. Accessed April 2017.
- DFO. 2016. Photograph inventory. Pacific Regional Office of Environmental Coordination, Real Property, Safety & Security Branch, Sidney, BC. Accessed December 2017.
- ECCC (Environment and Climate Change Canada). 2016a. General Nesting Periods of Migratory Birds in Canada. Available at: [http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4f39a78f-1#\\_03](http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4f39a78f-1#_03) Accessed: April 2017.
- ECCC. 2016b. Birds at Sea. Table 1: Dates Selected for the breeding and non-breeding seasons used in the data analysis for each species. Available at: <https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=FD3D610E-1> Accessed: April 2017.
- ECCC. 2016c. Guidelines to Avoid Disturbance to Seabird and Waterbird Colonies in Canada. Available at: <https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=E3167D46-1> Accessed April 2017
- Wright, D.G. and G.E. Hopky. 1998. Guidelines for the use of explosives in or near Canadian fisheries waters. Can. Tech. Rep. Fish. Aquat. Sci. 2107: iv + 34p





## Additional Information

Atlas of the Breeding Birds of British Columbia. n.d. Breeding Bird Atlas. Species breeding dates. Available at <https://www.birdatlas.bc.ca/download/brdates.pdf>. Accessed May 3, 2018.

CCG. 2000. Best Management Practices for Concrete Pouring Programs at DFO – Canadian Coast Guard Sites. Prepared by Canadian Coast Guard Pacific Region Technical Services. Prepared for DFO – Canadian Coast Guard – Marine Programs.

CCG (Canadian Coast Guard). 1999. Best Management Practices for Undertaking Maintenance Cleaning/Painting of Canadian Coast Guard Lightstations. Prepared by Canadian Coast Guard Pacific Region Technical Services. Prepared for DFO – Canadian Coast Guard – Marine Programs.

CCG. 2009. Best Management Practices for Brushing Activities at DFO - Canadian Coast Guard Sites. Prepared by Canadian Coast Guard Pacific Region.

CCG. 2005. CCG Protocol for On-site Visits to Navigation Aids in Sensitive Bird Nesting Sites. Prepared by Canadian Coast Guard Aids to Navigation Program.

DFO (Fisheries and Oceans Canada). 1992, updated 1993. Land Development Guidelines for the Protection of Aquatic Habitat

EC (Environment Canada). 2013. Guidelines to Avoid Disturbance to Seabird and Waterbird Colonies in Canada. Accessed November 2015, from: <https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=E3167D46-1>

EPA (Environmental Protection Agency). 2012. Best Management Practice Concrete Washout. United States Environmental Protection Agency.

INAC (Indigenous and Northern Affairs Canada). 2017. Aboriginal and Treaty Rights Information System (ATRIS). Available at <https://www.aadnc-aandc.gc.ca/eng/1100100014686/1100100014687>. Accessed May 5, 2018.

Manning, Cooper and Associates. 2013. Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (2013). A Companion Document to Develop with Care 2012. MOE. 2015. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture. Summary Report.

Province of BC (Province of British Columbia). 2014. Develop with Care 2014. Environmental Guidelines for Urban and Rural Land Development in British Columbia.



## Bulletin 9: Concrete Works

### Background

Concrete is made up of cement, water, and other aggregate materials. Cement is a mixture of limestone and clay which contain oxides of calcium, aluminum, silicon and other metals (EPA 2012). Best management practices (BMPs) serve as planning tools that, if implemented successfully, will avoid or mitigate adverse environmental effects associated with the use of concrete, and should be considered prior to the commencement of work.



(Burton Marine Pile Driving Inc. 2017)

### Best Management Practices

In addition to the BMPs outlined below, refer also to the “GENERAL OPERATIONS” bulletin.

#### Mixing and Pouring

- Schedule concrete work during dry weather, when feasible.
- Carefully estimate the quantity of concrete required to avoid excess waste.
- Consider alternative foundations that may require less concrete (e.g., pre-cast concrete systems).
- Limit the use of chemical additives.
- If concrete is to be mixed on the worksite, store cement bags in a leak-proof, covered container to provide protection from wind or rain/snow and other influences (e.g., waves).
- During mixing operations, once cement bags are opened, take all necessary precautions to limit dispersal of dry cement by the wind.
- When pouring concrete, spills of fresh concrete must be prevented. If concrete is discharged from the transit mixer directly to the form work or placed by wheelbarrow, proper sealed chutes should be constructed to avoid spillage. If the concrete is being placed with a concrete pump, all hose and pipe connections must be sealed and locked properly to limit the chance of leaks or uncoupling.
- If concrete is transported and discharged by crane and hopper, hopper will be inspected for structural integrity prior to being elevated by crane.
- Crews will monitor that concrete forms are not filled to overflowing.
- If scribe work is required, crew will ensure that forms are fitted tight to the rock surface to avoid concrete escape from the bottom of the form.

#### Pouring Concrete Near Water

- In the marine environment, concrete pouring work that must occur below the Highest High Water Mark should be scheduled to occur during periods of low tide, when the site is exposed or dry.



(Concrete Washout Filter (EPA 2012),  
Mark Shaw, Ultra Tech International, Inc.)

- In freshwater environments, concrete pouring work that must occur below the High Water Mark should be scheduled to occur during periods of low water levels (e.g., summer low flows).
  - Operators should be familiar with spill response procedures, and have the appropriate spill response equipment on hand, in case of an environmental emergency to limit any deleterious impact on the surrounding environment.
  - Prevent water (e.g., rain/snow) that contacts uncured or partly cured concrete (during activities such as exposed aggregate wash-off, wet curing, or equipment washing) from entering aquatic environments (directly or indirectly).
  - Once pouring has ceased, forms should be wrapped in plastic for two tidal cycles or until cured (e.g., 72 hours) to isolate the wet/setting concrete from weather (e.g., rain and snow).
- Concrete forms will be constructed and sealed in a manner which will prevent fresh concrete or cement laden water from leaking into surrounding water.
- The integrity of the form work should be routinely inspected prior to, during and immediately after the pour. Deficiencies should be addressed immediately.
- Keep a CO<sub>2</sub> tank with regulator, hose and gas diffuser available and train staff to neutralize spills.
- Monitor runoff for acceptable pH levels and contain and neutralize, if necessary. (Ensure a pH monitor is accessible to measure the pH levels.)
- Onsite concrete tests (e.g., slump tests) will be conducted in a contained area (e.g., a leak proof tray) to prevent the deposition of deleterious substances into the aquatic environment.

### Spills

- Accidental release of concrete will be, appropriately, cleaned up prior to curing.
- Spill clean-up materials, such as tarps and shovels should be readily available on site.
- Immediately report any spills of uncured concrete, concrete fines, wash or contact water of reportable quantities to the onsite Environmental Monitor (EM; or delegate). It is the contractor's legal responsibility to notify the BC Environmental Emergency Management Branch of any reportable spills, hotline 1-800-663-3456.
- Immediately implement emergency mitigation and clean-up measures (such as use of carbon dioxide gas, if required, and immediate removal of the material).

### Washwater Recycling, Treatment and Disposal

- The cleaning of concrete and cement laden materials (e.g., tools and equipment) must be conducted in a contained area to prevent the release of deleterious substances (e.g., washwater) into the marine and terrestrial environments.



- Collect and contain washwater from tools, pumps, pipes, hoses and trucks in leak proof containers. Workers will be made aware of all washout locations and will be watchful for improper dumping of material.
- Tools, pumps, pipes, hoses and trucks used for finishing, placing or transporting fresh concrete must be washed off in such a way as to prevent the wash off water from entering the aquatic environment.
- Sealed, leak-proof containers for washwater from concrete delivery trucks, concrete pumping equipment, and other tools and equipment must be provided to prevent the release of deleterious substances into the receiving environment.
- Water that contacts uncured or partly cured concrete shall be isolated and held until the pH is between 7.0 and 8.7 and the turbidity is less than 100 nephelometric turbidity units (NTU), or other level approved by the onsite EM, before being released into waters frequented by fish and other marine organisms.
- Do not completely fill washwater containment basins; allow for sufficient freeboard. Washout containers will not exceed 75 percent capacity to prevent overflows.
- Filtered washwater can be reused for making concrete or to continue cleaning equipment. Concrete washwater will be contained and removed offsite to a designated facility or at the manufacturer's place of business. In the event that the washwater must be disposed of on site, the washwater must be neutralized (e.g., Carbon dioxide tank with regulator, hose and gas diffuser) and filtered through a sediment control device, under the supervision of an EM.



#### Waste Control

- Filtered aggregate can be reused in making fresh concrete at the construction site or returned to the concrete mixing facility.
- If concrete cutting occurs on site, concrete dust will be collected (e.g., vacuum, wet sweeping) and disposed of appropriately.
- Excess/unused concrete will be removed from the site and disposed of/recycled offsite, appropriately, at an approved facility.
- Collect and dispose of concrete chips at an approved disposal site. Other waste materials collected during the concrete pouring operations should be retained for disposal at a municipal landfill. Waste materials must not be deposited into the aquatic environment, including riparian zones and marine foreshore.
- Waste deposited in exposed (dry) intertidal areas will be collected daily before the area is inundated by the tide.
- Depositing of concrete waste into the unexposed (wet) subtidal areas during demolition will be avoided, and deposited waste will otherwise be recovered from these areas where safely possible.
- Cured concrete waste, such as waste created during base demolition, will be collected and disposed of at an appropriate offsite facility.



## References and Additional Information:

- BC MOE. 2005. *A User's Guide to Working In and Around Water. Understanding the Regulation Under British Columbia's Water Act*. British Columbia Ministry of the Environment, Water Stewardship Division
- BC MOE (Ministry of Environment). 2017a. *General BMPs and Standard Project Considerations*. British Columbia Ministry of Environment. <http://www.env.gov.bc.ca/wld/instreamworks/generalBMPs.htm>
- BC MOE. 2017b. Regional Terms & conditions & Timing Windows. Available online at: <http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/working-around-water/regional-terms-conditions-timing-windows>. Accessed April 2017.
- BC MWLAP (Ministry of Water, Land and Air Protection). 2004. *Standards and Best Practices for Instream Works*. British Columbia Ministry of Water, Land and Air Protection, Ecosystems Standards and Planning, Biodiversity Branch: Victoria, BC.
- BC MPDCA (BC Marine and Pile Driving Association). 2003. *Best Management Practices for Pile Driving and Related Operations*. BC Marine and Pile Driving Contractors Association.
- Building Green. 1993. *Cement and Concrete: Environmental Considerations*. Available at: <http://www.wbcdcement.org/pdf/tf2/cementconc.pdf> Accessed: April 2017.
- CCG. 2000. *Best Management Practices for Concrete Pouring Programs at DFO – Canadian Coast Guard Sites*. Prepared by Canadian Coast Guard Pacific Region Technical Services. Prepared for DFO – Canadian Coast Guard – Marine Programs.
- DFO (Fisheries and Oceans Canada). 2015. *Timing Windows to conduct Projects in or around Water*, Available online at: <http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/index-eng.html>. Accessed April 2017
- EPA (Environmental Protection Agency). 2012. *Best Management Practice Concrete Washout*. United States Environmental Protection Agency.

## Images:

- Burton Marine Pile Driving Inc. 2017. <http://www.burtonpiledriving.com/land-pile-driving/prestressed-concrete-piles>
- EPA (Environmental Protection Agency). 2012. *Best Management Practice Concrete Washout*. United States Environmental Protection Agency.





## Bulletin 12: Vegetation Brushing

### Background

The clearing of vegetation is sometimes necessary to create enough workable space for construction activities or for safety (e.g., clearing vegetation around helicopter-landing areas). Vegetation is an important component of local ecosystems as it, among other things, provides habitat for other living organisms, moderates local temperatures and ground moisture, limits soil erosion, and provides nutrients to surrounding soils and water bodies. Best management practices (BMPs) serve as planning tools that, if implemented successfully, will avoid or mitigate harmful environmental impacts resulting from vegetation brushing and should be considered prior to the commencement of work.



### Best Management Practices

In addition to the BMPs below, refer also to the 'GENERAL OPERATIONS' and 'IN-WATER WORKS' bulletins.

### Preparation

- Species at risk must be considered before brushing activities occur; contact your Environmental Officer.
- Brushing activities that are not part of maintenance or repair of existing physical work require an Environmental Assessment under the Canadian Environmental Assessment Act.

### Brushing Activities

- Complete all activities in such a way that minimizes stress and disturbance to surrounding ecosystems (e.g., soil, noise etc.) (CCG, 2009).
- Avoid the removal of wildlife trees and other vegetation that would affect birds and other wildlife that are breeding or roosting (BC MWLAP, 2004).
- Removal, relocation or destruction of bird nests is prohibited without prior approval. When topping or removing trees within riparian areas, have them assessed by a qualified professional biologist. Fall away from the channel if safe to do so and clean up all woody debris (BC MWLAP, 2004).



- When removing hazardous trees, consult with a professional arborist (BC MWLAP, 2004).

### Riparian Areas

- Minimize riparian vegetation removals. If unavoidable, use proper clearing techniques and protect retained vegetation (Coker, Ming & Mandrak, 2010).
- Methods such as selective or phased vegetation removal or species management should be used to maintain or reduce shade on stream and provide specialized riparian communities or habitats (Coker et al., 2010).
- Prohibit or limit access to banks or areas adjacent to waterbodies, to the extent required to protect the structural integrity of banks or shorelines (Coker et al., 2010).
- Use sediment and erosion control methods to minimize the erosion of exposed soils to adjacent waterbody (e.g., erosion control fencing, fabrics, straw) (Coker et al., 2010).
- Use in-water silt curtains to contain suspended sediments, if required (Coker et al., 2010).
- Properly store and dispose of all generated debris (e.g., organics, soils, woody debris, temporary stockpiles, construction debris) during all phases of operation in a manner that mitigates their entry to waterbody (Coker et al., 2010).

### Site Clean Up

- Use discretion when deciding whether to remove cut debris or leave it on site. In remote sites, cut debris may be left above highest high water to decompose. Remove debris in sites that are not remote or when there is a copious amount of debris (CCG, 2009).



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada



## References and Additional Information

- BC MWLAP (British Columbia Ministry of Water, Land and Air Protection). 2004. Standards and Best Practices for Instream Works. Ecosystems Standards and Planning, Biodiversity Branch: Victoria, BC.
- Canadian Coast Guard. 2009. Best Management Practices for Brushing Activities at DFO-Canadian Coast Guard Sites. Canadian Coast Guard-Pacific Region
- Coker, G.A., Ming, D.L., and Mandrak, N.E. 2010. Mitigation guide for the protection of fishes and fish habitat to accompany the species at risk recovery potential assessments conducted by Fisheries and Oceans Canada (DFO) in Central and Arctic Region. Version 1.0. Can. Manuscr. Rep. Fish. Aquat. Sci. 2904: vi + 40 p.



**SAMPLE EQUIPMENT CLEANING PROCEDURES**

See following pages (7 pages).

# Steps to Prevent the Unintentional Introduction of Invasive Species from Equipment

Inspection and cleaning of all machinery and equipment should be performed in accordance with the procedures, checklists and diagrams provided in this protocol.

When visiting more than one site, always schedule work in the sites that are the least disturbed and free of known invasive species first, and visit sites with known invasive species infestations last. This will greatly reduce the risk of transferring plants to new locations.

---

## When to Inspect

### Inspection should be done before:

- Moving vehicles out of a local area of operation
- Moving machinery between properties or sites within the same property where invasive species may be present in one area, and not in another
- Using machinery along roadsides, in ditches, and along watercourses
- Vehicles using unformed dirt roads, trails or off road conditions
- Using machinery to transport soil and quarry materials
- Visiting remote areas where access by vehicles is limited

### Inspection should be done after:

- Operating in areas known to have terrestrial invasive plants or are in high risk areas (i.e. recently disturbed areas near known invaded areas)
- Transporting material (i.e. soil) that is known to contain, or has the potential to contain, invasive species
- Operating in an area or transporting material that you are uncertain contain invasive species
- In the event of rain. If mud contains seeds, they can travel indefinitely until it rains or the road surface is wet, allowing for long distance transport. This may result in transporting seeds to areas where those species did not previously exist

---

## How to Inspect

- Inspect the vehicle thoroughly inside and out for where dirt, plant material and seeds may be lodged or adhering to interior and exterior surfaces.
- Remove any guards, covers or plates that are easy to remove.
- Attention should be paid to the underside of the vehicle, radiators, spare tires, foot wells and bumper bars.

If clods of dirt, seed or other plant material are found, removal should take place immediately, using the techniques outlined below.

## When to Clean

Vehicles and heavy equipment that stay on formed and sealed roads have a low risk of spreading invasive species. Cleaning is only required when inspection identifies visible dirt clods and plant material or when moving from one area to another.

Depending on the invasive species present, vehicles may need to be cleaned even when deep snow is present. Invasive *Phragmites*, for example, can still be spread, even in packed snow because the seed heads are usually above the surface of the snow. Other plants, such as dog-strangling vine, will be contained beneath deep snow.

*\*Regular inspection of vehicles and machinery will identify if any soil or plant material has been collected on or in vehicles and machinery.*

## Where to Clean

Clean the vehicle/equipment in an area where contamination and seed spread is not possible (or limited). The site should be:

- Ideally, mud free, gravel covered or a hard surface. If this option is not available, choose a well maintained (i.e. regularly mowed) grassy area.
- Gently sloping to assist in draining water and material away from the vehicle or equipment. Care should be taken to ensure that localized erosion will not be created, and that water runs back into the area where contamination occurred.
- At least 30m away from any watercourse, water body and natural vegetation.
- Large enough to allow for adequate movement of larger vehicles and equipment.

*\*Safely locate the vehicle and equipment away from any hazards. If mechanized, ensure engine is off and the vehicle or equipment is immobilized.*

## How to Clean Inside

Clean the interior of the vehicle by sweeping, vacuuming or using a compressed air device. Particular attention should be paid to the floor, foot wells, pedals, seats, and under the seats.

## How to Clean Outside

Knock off all large clods of dirt. Use a pry bar or other device if necessary.

Identify areas that may require cleaning with compressed air rather than water such as radiators and grills. Clean these areas first prior to using water.

Clean the vehicle with a high pressure hose in combination with a stiff brush and/or pry bar to further assist the removal of dirt clods.

Start cleaning from the top of the vehicle and work down to the bottom.

Emphasis should be placed on the undersides, wheels, wheel arches, guards, chassis, engine bays, radiator, grills, and other attachments.

When the cleaning is finished avoid driving through the waste water when removing the vehicle or equipment from the cleaning site.

For equipment such as water trucks that may be exposed to aquatic invasive species, trucks should be disinfected with bleach solution before conducting work in a new area. For further information please refer to the Invading Species Awareness Program's Technical Guidelines listed under Contacts and Resources.



**Hosing down a vehicle in Queensland, Australia**

Photo by: TH9 Outdoor Services

# Final Inspection Checklist

**Conduct a final inspection to ensure the following general clean standard has been achieved:**

- No clods of dirt should be visible after wash down.
- Radiators, grills, and the interiors of vehicles should be free of accumulations of seed, soil, mud and plant material parts including seeds, roots, flowers, fruit, and or stems.

Diagrams have been provided to assist in quickly identifying key areas to inspect and clean on a variety of vehicles associated with the targeted industries. These can be used in combination with vehicle checklists to ensure all areas of the vehicles have been inspected and cleaned.

## Equipment Required

- A pump and high pressure hose OR high pressure water unit
- Minimum water pressure for vehicle cleaning should be at least 90 pounds per square inch. Water can be supplied as high volume/low pressure or low volume/high pressure (NOAA Fisheries Service).
- Air compressor and blower OR vacuum
- Shovel
- Pry bar
- Stiff brush or broom



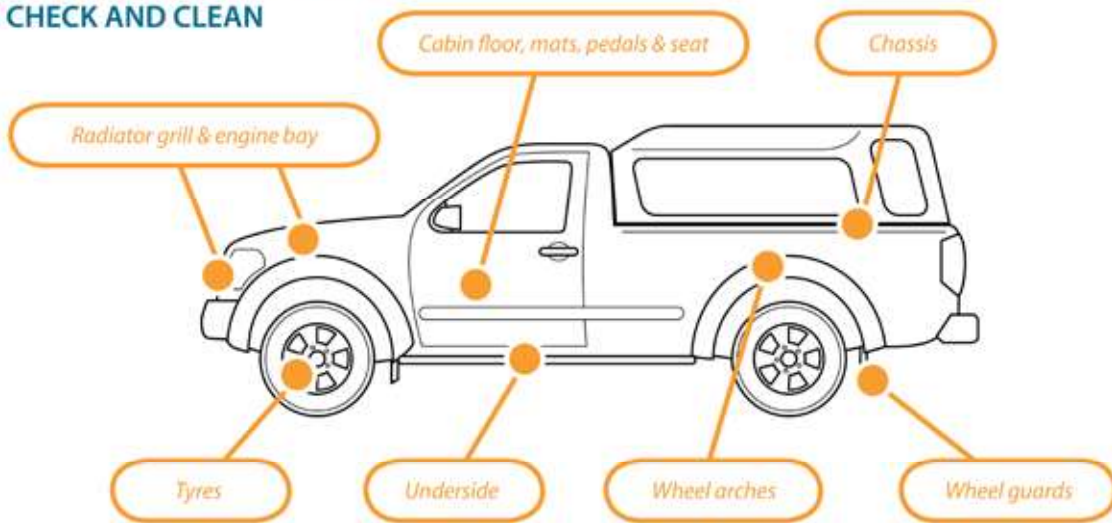
**Cleaning station at construction site.**

Photo by: Mark Heaton, OMNR

# Inspection and Cleaning Diagrams and Checklists

## 2WD and 4WD Vehicles

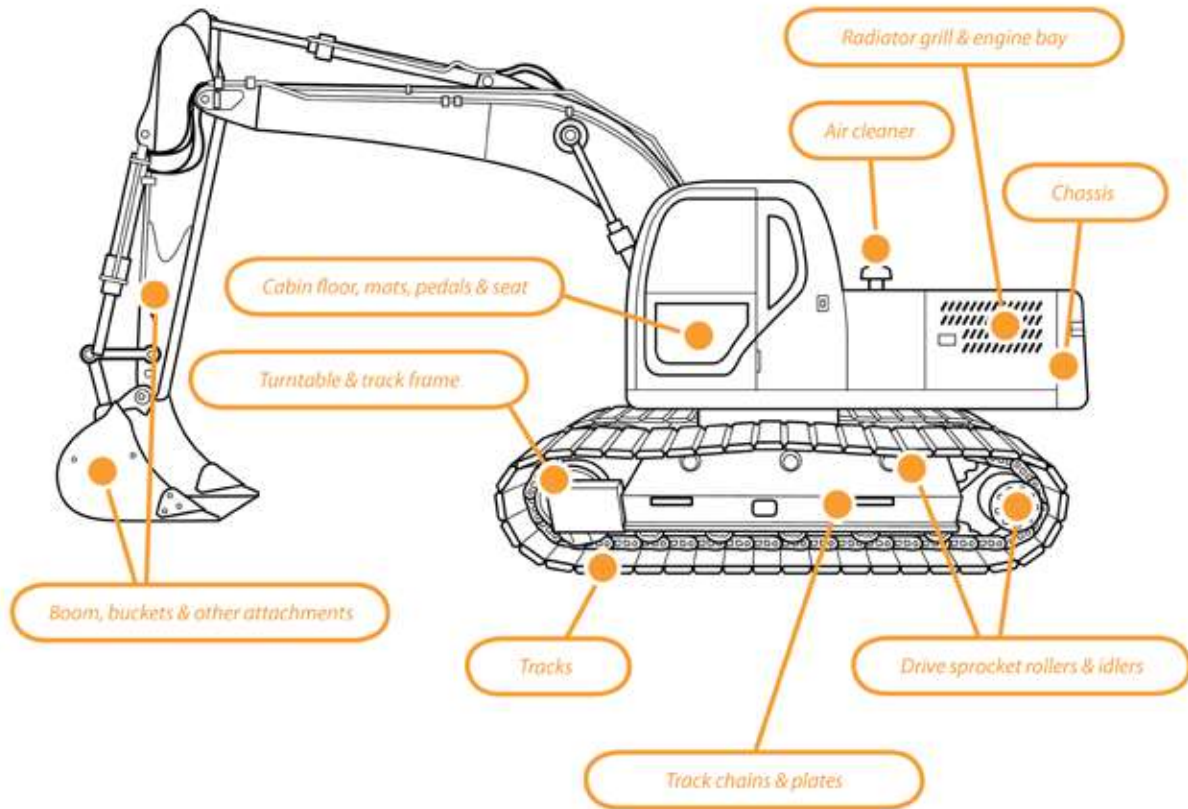
### 4WD VEHICLE WITH KEY SPOTS TO CHECK AND CLEAN



|               |  |   |
|---------------|--|---|
|               |  | ✓ |
| <b>Cabin</b>  | Floor, mats, pedals, seats                         |   |
| <b>Engine</b> | Radiators, engine bay, grill                       |   |
| <b>Body</b>   | Underside, chassis, crevices, ledges, bumper bars  |   |
| <b>Wheels</b> | All wheels (including spare), wheel arches, guards |   |
| <b>Tray</b>   | Floor, canopy (if included)                        |   |

# Excavator

## EXCAVATOR WITH KEY SPOTS TO CHECK AND CLEAN

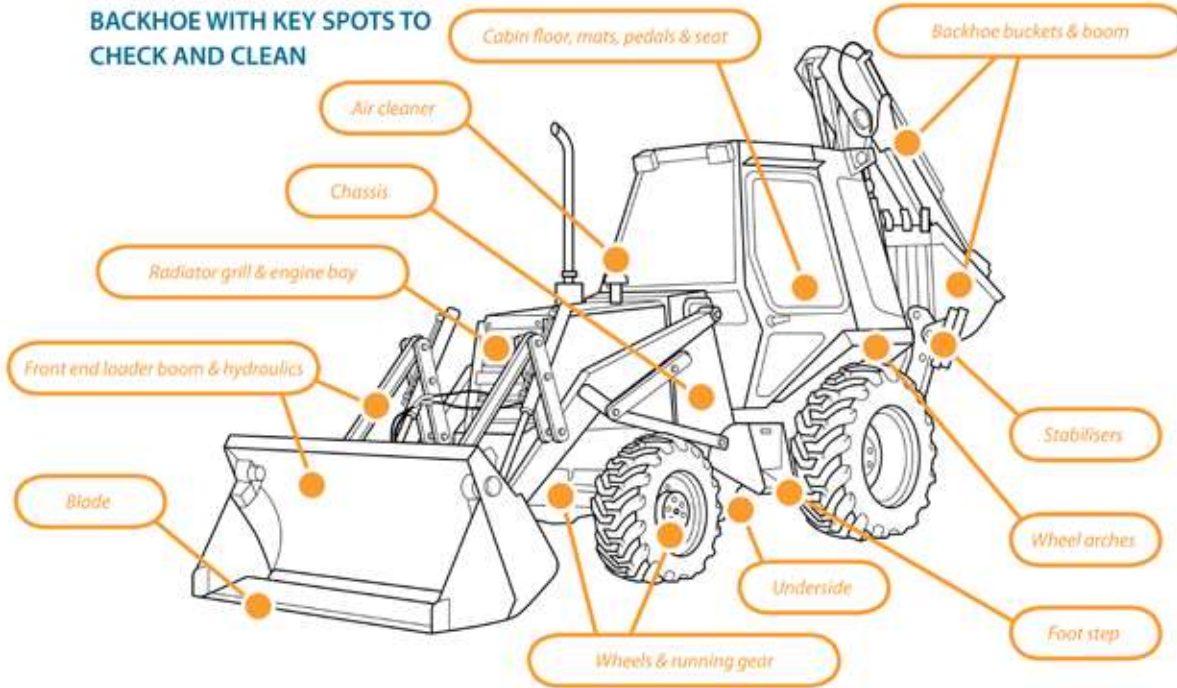


|                     |   |   |
|---------------------|---|---|
|                     |   | ✓ |
| <b>Cabin</b>        | Floor, mats, pedals, seats                          |   |
| <b>Engine</b>       | Radiators, engine bay, grill, air cleaner           |   |
| <b>Tracks</b>       | Tracks, track frame, drive sprocket rollers, idlers |   |
| <b>Body Plates</b>  | Plates of cabin                                     |   |
| <b>Body</b>         | Ledges, channels                                    |   |
| <b>Bucket</b>       |   |   |
| <b>Booms</b>        |   |   |
| <b>Turret Pivot</b> |   |   |



# Backhoe

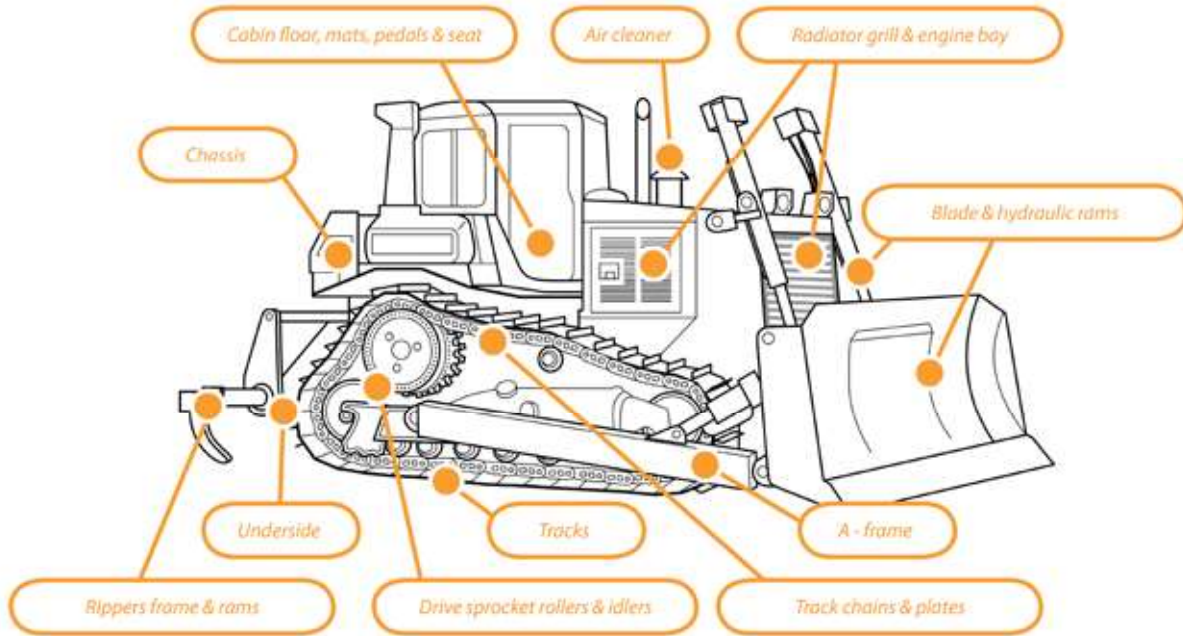
## BACKHOE WITH KEY SPOTS TO CHECK AND CLEAN



|                         |  |   |
|-------------------------|--|---|
|                         |  | ✓ |
| <b>Cabin</b>            | Floor, mats, pedals, seats, foot step              |   |
| <b>Engine</b>           | Radiators, engine bay, grill, air cleaner          |   |
| <b>Wheels</b>           | All wheels (including spare), wheel arches, guards |   |
| <b>Front end loader</b> | Blade, hydraulics, booms                           |   |
| <b>Backhoe</b>          | Buckets, boom, hydraulics, stabilisers             |   |

# Bulldozer

## BULLDOZER WITH KEY SPOTS TO CHECK AND CLEAN



|                    |   |   |
|--------------------|---|---|
|                    |   | ✓ |
| <b>Cabin</b>       | Floor, mats, pedals, seats                          |   |
| <b>Engine</b>      | Radiators, engine bay, grill, air cleaner           |   |
| <b>Tracks</b>      | Tracks, track frame, drive sprocket rollers, idlers |   |
| <b>Body Plates</b> | Belly plates, rear plates                           |   |
| <b>Body</b>        | Ledges, channels                                    |   |
| <b>Blade</b>       | Pivot points, hydraulic rams, a-frame               |   |
| <b>Ripper</b>      | Ripper frame, ripper points                         |   |



Canadian Coast Guard  
**CAPE LAZO COMMUNICATIONS TOWER**

APPENDIX G  
Comox Valley Regional District Weed Control  
Regulation Bylaw No.2774

Comox, B.C.

Page 1 of 6

**COMOX VALLEY REGIONAL DISTRICT WEED CONTROL REGULATION BYLAW  
NO.2774**

See following pages (5 pages).

The following is a consolidated copy of Bylaw 2347 being “Regional District Weed Control Regulation Bylaw 2001” and includes the following bylaws:

| BYLAW No. | BYLAW NAME   | ADOPTED        | PURPOSE  |
|-----------|--|----------------|--|
| 2347      | Regional District Weed Control Regulation Bylaw 2001”                        | March 26, 2001 | To eradicate noxious weeds located in Areas A, B, C and K. |
| 2704      | Regional District Weed Control Regulation Bylaw 2001”, Amendment Bylaw No. 1 | Sept 27, 2004  | Amends Schedule A by adding 7 more noxious weeds           |
| 2760      | Regional District Weed Control Regulation Bylaw 2001”, Amendment Bylaw No. 2 | Feb 23, 2005   | Amends Schedule A by adding Dalmatian Toadflax             |
| 2774      | Regional District Weed Control Regulation Bylaw 2001”, Amendment Bylaw No. 3 | March 25, 2005 | Amends Schedule A by adding Himalayan Blackberry           |

**This bylaw may not be complete due to pending updates or revisions and therefore is provided for reference purposes only. THIS BYLAW SHOULD NOT BE USED FOR ANY LEGAL PURPOSES. Please contact the corporate legislative officer at the Comox Valley Regional District to view the complete bylaw when required.**

**REGIONAL DISTRICT OF COMOX-STRATHCONA**

**BYLAW NO. 2347**

**A BYLAW TO REGULATE NOXIOUS WEEDS**

WHEREAS the Board of the Regional District of Comox-Strathcona adopted Bylaw No. 2346 being "Regional District Weed Control Service Establishment Bylaw 2001" on the 26<sup>th</sup> day of March, 2001;

AND WHEREAS under Section 797.1(1)(d) of the Local Government Act, a Regional District may exercise the regulatory powers of a municipality under Section 725(1)(e) of the Local Government Act to require the owners or occupiers of real property, or their agents, to clear the property of brush, trees, noxious weeds or other growths;

AND WHEREAS the Regional District deems the plants listed in Schedule 'A' to this Bylaw to be noxious weeds;

AND WHEREAS the Regional District wishes to enact a Bylaw to eradicate the noxious weeds listed in Schedule 'A' within Electoral Areas 'A', 'B', 'C' and 'K' of the Regional District of Comox-Strathcona;

NOW THEREFORE, the Board of the Regional District of Comox-Strathcona, in open meeting assembled, enacts as follows:

**1. CITATION**

This Bylaw may be cited for all purposes as the "**REGIONAL DISTRICT WEED CONTROL REGULATION BYLAW 2001**"

**2. DEFINITIONS**

In this Bylaw:

- a) Administration Officer means a person appointed under that title by the Board pursuant to its powers under the Local Government Act.
- b) Board means the Board of the Regional District of Comox-Strathcona
- c) Bylaw Enforcement Officer means a person appointed by or contracted by the Board to enforce this Bylaw.
- d) Occupier has the same meaning as in the Local Government Act.
- e) Owner has the same meaning as in the Local Government Act.
- f) Real property has the same meaning as in the Local Government Act.
- g) Regional District means the Regional District of Comox-Strathcona

### **3. PROHIBITION**

Every owner or occupier of real property in Electoral Areas ‘A’, ‘B’, ‘C’ and ‘K’ of the Regional District of Comox-Strathcona, or that person’s agent, shall ensure that his or her property be cleared of, and remain free from, all noxious weeds listed in Schedule ‘A’ to this Bylaw.

### **4. AUTHORIZED INSPECTION OFFICER**

A Bylaw Enforcement Officer or the Administration Officer is authorized to enter upon any real property within the Regional District at all reasonable times, after having given notice to the owner or occupier, for the purpose of inspecting the same property in order to ascertain whether noxious weeds listed in Schedule ‘A’ to this Bylaw are present.

### **5. NOTIFICATION TO OWNERS AND OCCUPIERS**

- 1) If the Administration Officer determines that there are noxious weeds present on any property within the Regional District, he or she shall notify the owner or occupier of such real property, by letter, to take steps to eradicate the weeds within fourteen (14) days of the date of the inspection.
- 2) If, after the expiry of 14 days from the date inspection, the noxious weeds have not been eradicated to the satisfaction of the Administration Officer and no appeal from the Administration Officer’s order has been filed, it shall be lawful for the Regional District, by its employees, agents or contractors, to enter upon such real property to eradicate the noxious weeds by any means necessary, at the expense of the person defaulting.

### **6. COSTS OF ERADICATION**

The charges incurred by the Regional District for eradicating the weeds, if unpaid on the 31<sup>st</sup> day of December in any year, shall be added to and form part of the taxes applicable in respect of such real property as taxes in arrears.

### **7. NOTICE**

Where notice is to be given pursuant to this bylaw, such notice shall be given in writing. Notice shall be deemed sufficiently delivered if:

- a) personally service upon the owner or occupier of the property affected by such notice; or
- b) mailed by registered mail to the address of the real property or the last known address of the owner or occupier, and subsequently signed for by or on behalf of the owner or occupier.

### **8. PENALTY**

Every person who contravenes a provision of this Bylaw commits an offence and is liable on summary conviction to the penalties prescribed by the Offence Act.

**9. SEVERABILITY**

If any provision of this Bylaw is found invalid by any court of competent jurisdiction, the offending portion shall be severed. Such decision shall not affect the validity of the remaining portions of this bylaw.

**10. HEADINGS**

The headings in this Bylaw are inserted for convenience and reference only and in no way define, limit or enlarge the scope of this bylaw or any portion thereof.

**11. COMING INTO FORCE**

This bylaw shall come into force and take effect on or after the date of its adoption.

|  |                        |               |              |              |
|--|------------------------|---------------|--------------|--------------|
| <b>READ A FIRST AND SECOND TIME THIS</b> | <b>26<sup>TH</sup></b> | <b>DAY OF</b> | <b>MARCH</b> | <b>2001.</b> |
| <b>READ A THIRD TIME THIS</b>            | <b>26<sup>TH</sup></b> | <b>DAY OF</b> | <b>MARCH</b> | <b>2001.</b> |
| <b>ADOPTED THIS</b>                      | <b>26<sup>TH</sup></b> | <b>DAY OF</b> | <b>MARCH</b> | <b>2001.</b> |

*“D.M. Andrews”*

*“B. Randall”*

\_\_\_\_\_  
Chair

\_\_\_\_\_  
Manager of Corporate Administration

I hereby certify the foregoing to be a true and correct copy of Bylaw 2347 being “Regional District Weed Control Regulation Bylaw 2001” as adopted by the Board of the Regional District of Comox-Strathocna on the 26<sup>th</sup> day of March, 2001.

*“B. Randall”*

\_\_\_\_\_  
Manager of Corporate Administration

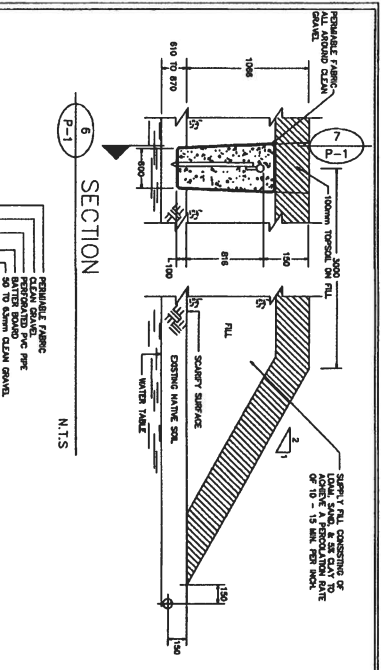
**REGIONAL DISTRICT OF COMOX-STRATHCONA**

**BYLAW NO. 2774 (AMENDMENT)**

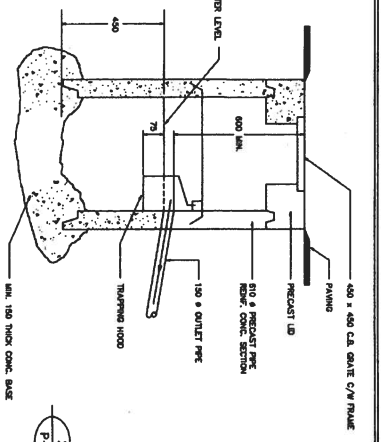
**“REGIONAL DISTRICT WEED CONTROL REGULATION BYLAW 2001, AMENDMENT BYLAW NO. 3”**

**SCHEDULE ‘A’**

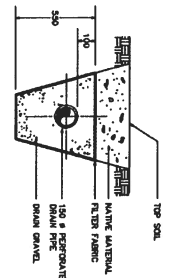
|                             |                           |
|-----------------------------|---------------------------|
| Purple Loosestrife          | (Lythrum Salicaria)       |
| Japanese Knotweed           | (Polygonum cuspidatum)    |
| Yellow Flag Iris            | (Iris pseudacorus)        |
| Spotted Knapweed            | (Centaurea biersteinii)   |
| English Ivy                 | (Hedera helix)            |
| Giant Cow Parsnip (Hogweed) | Heracleum mantegazzianum) |
| Scotch Broom                | (Cytisus scoparius)       |
| Gorse                       | (Ulex europaeus)          |
| Dalmatian Toadflax          | (Linaria dalmatica)       |
| Himalayan Blackberry        | (Rubus discolor)          |



SECTION 6  
N.T.S.

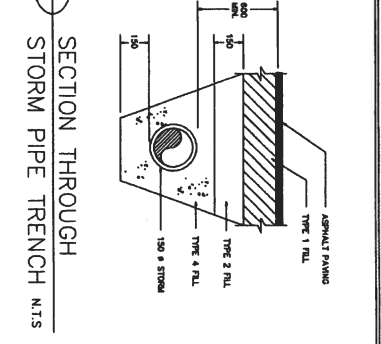


SECTION 7  
N.T.S.

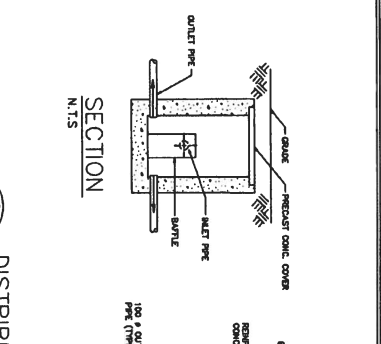


SECTION 8  
N.T.S.

SECTION 9  
N.T.S.

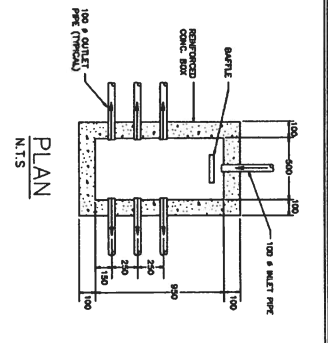


SECTION 1  
N.T.S.

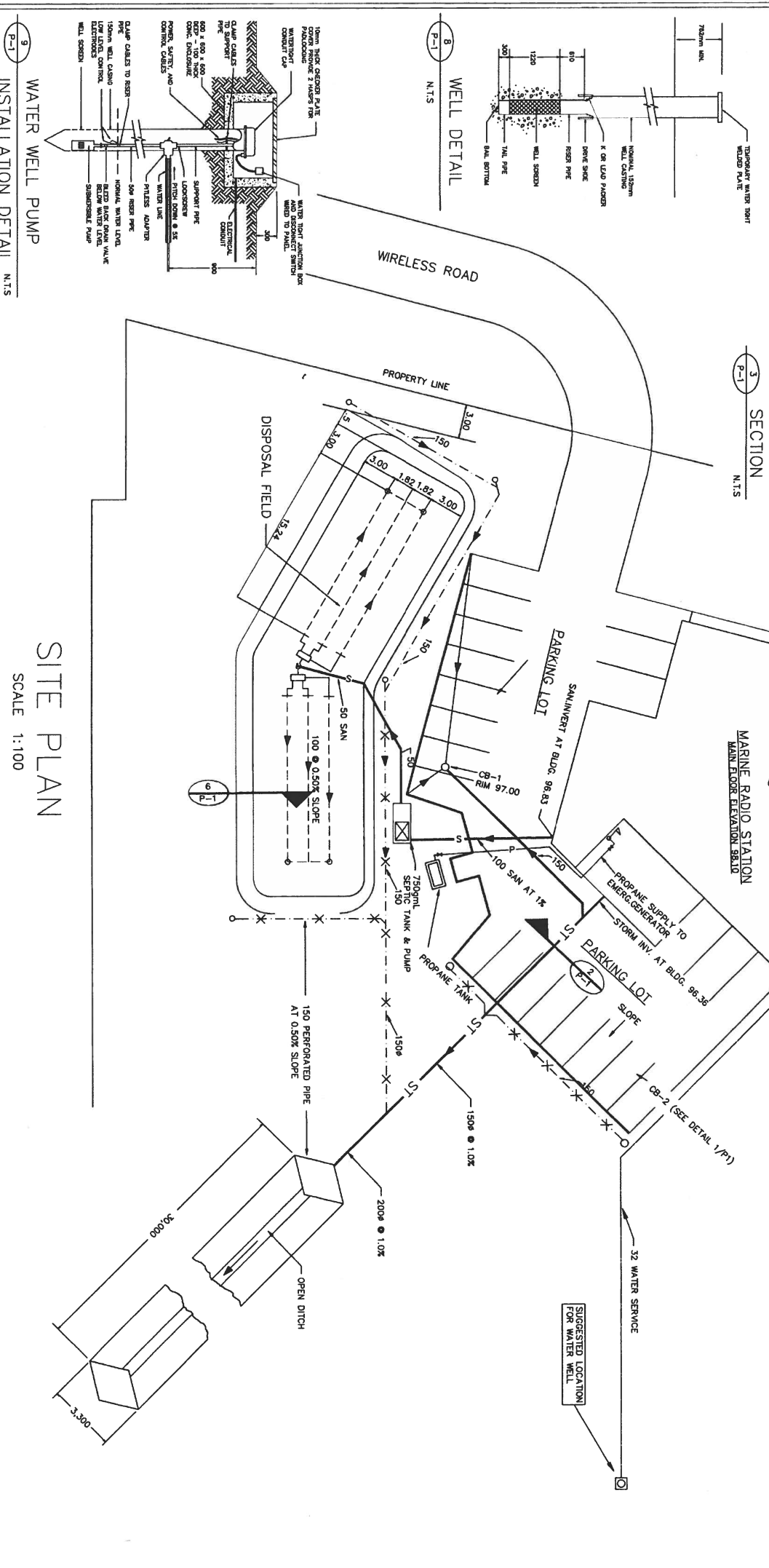


SECTION 2  
N.T.S.

SECTION 3  
N.T.S.



SECTION 5  
N.T.S.



SITE PLAN  
SCALE 1:100

Public Works  
Canada  
Provincial  
Canada

PACIFIC REGION  
WESTERN REGION  
CANADIAN COAST GUARD  
WESTERN REGION  
AND AIR SERVICES DIVISIONS

|              |              |          |
|--------------|--------------|----------|
| 0            | AS-BUILT     | JAN 1983 |
| 1. AS-BUILT  |              |          |
| 2. REVISIONS |              |          |
| A            | 1. AS-BUILT  |          |
| B            | 2. REVISIONS |          |
| C            | 3. REVISIONS |          |

PROJECT  
CAPE LAZO  
COMOX B.C.  
CANADIAN COAST GUARD  
MARINE RADIO STATION

SITE SERVICES  
AND  
DETAILS

DESIGNED BY  
S. FROLY  
DATE  
MAY 1981

DRAWN BY  
D. BOWLANDS  
DATE  
MAY 1981

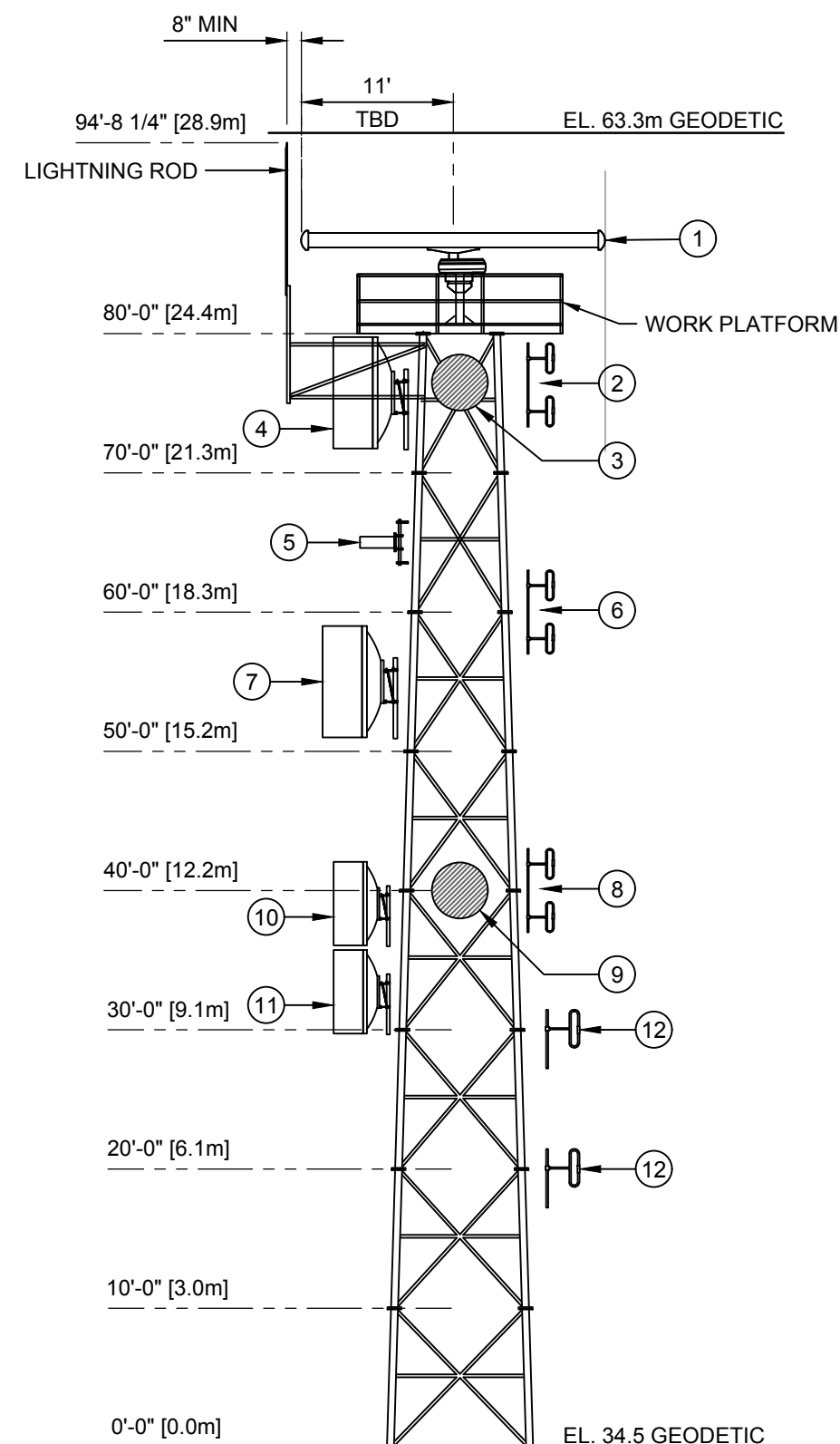
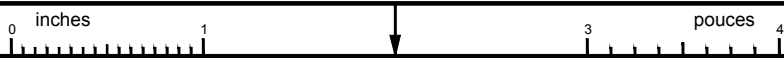
CHECKED BY  
J. BROWN  
DATE  
MAY 1981

APPROVED BY  
D. BERTS  
DATE  
MAY 1981

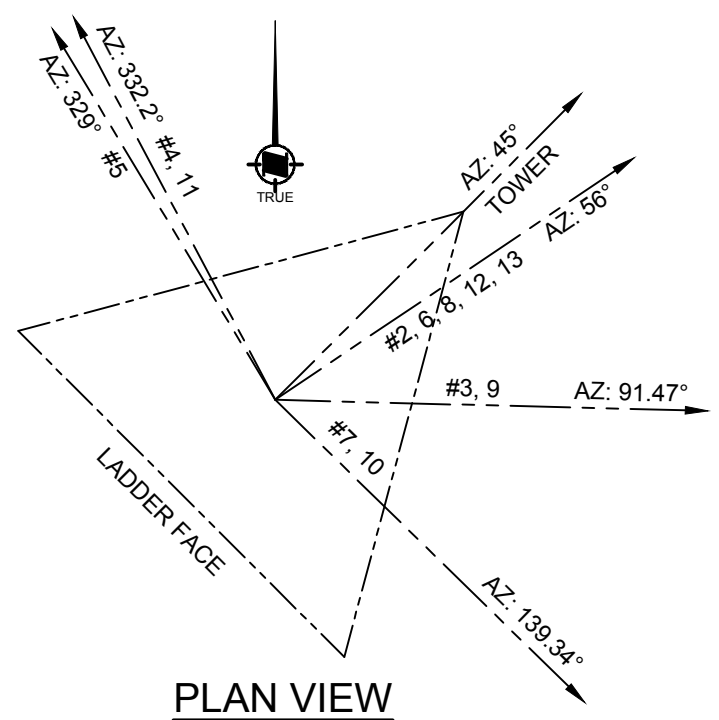
PROJECT NUMBER  
709901

SCALE  
P1 of 4

WM-110-1093



**TOWER ELEVATION**  
SCALE 1:150



**PLAN VIEW**  
SCALE 1:50

**TOWER SPECIFICATIONS**

| SITE:                 | CAPE LAZO   |
|-----------------------|---|
| Latitude-NAD83:       | 49° 42' 21.63" N  |
| Longitude-NAD83:      | 124° 51' 46.71" W   |
| Site Elevation:       | 32.5m   |
| Design Standard:      | CSA S37-18  |
| Design Wind:          | TBD (based on data from Environment Canada)                               |
| Design Ice:           | TBD (from CSA S37)  |
| Reliability:          | Class 1   |
| Serviceability:       | 1   |
| Tower Twist:          | 0.05°   |
| Tower Tilt:           | 0.5°  |
| Tower Type:           | Self Support - Triangular in cross section                                |
| Tower Height:         | 24.38m (80'-0")   |
| Tower Section Height: | 6.096m (20'-0")   |
| Paint:                | 7 solid color bands in accordance with Transport Canada Standard 621.     |
| Lights:               | Obstruction Light - Dual CL810 c/w Control                                |
| Ice Guard:            | None  |
| Safety Climb:         | None  |
| Anticlimb:            | On ladder face  |
| Lighting Protection:  | Lightning Rod to provide 45° protection for top antenna                   |
| Tx Brackets:          | Tx Brackets on either side of ladder rail or tower face - 6 line capacity |
| Antenna Mounts:       | Required for all initial antennas   |

**ANTENNA SCHEDULE - CAPE LAZO**

| ANTENNA (#) | USER | ELEV            | ANTENNA TYPE   | INITIAL or FUTURE | AZIMUTH | Tx-LINE    | ANTENNA MOUNT TYPE |
|-------------|------|-----------------|--|-------------------|---------|------------|--------------------|
| 1           | CCG  | 26.4m (86'-8")  | RADAR-HIGH GAIN X-BAND SWG ANTENNA                       | INITIAL           | OMNI    | EW85       | PEDESTAL           |
| 2           | CCG  | 24.4m (80'-0")  | COMPROD 872F-70 VHF RECEIVE DIPOLE                       | INITIAL           | 56°     | LDF4-50A   | LEG                |
| 3           | CCG  | 24.0m (78'-8")  | HSX4-107 MICROWAVE ANTENNA (main) - TEXADA               | INITIAL           | 91.47°  | EWP90      | FACE               |
| 4           | CCG  | 24.0m (78'-8")  | HX8-6W MICROWAVE ANTENNA (main) - DISCOVERY              | INITIAL           | 332.2°  | EWP63 (x2) | FACE               |
| 5           | CCG  | 19.8m (65'-0")  | SY206-SF2SNM YAGI ANTENNA - ALEN                         | INITIAL           | 329°    | LDF4-50A   | FACE               |
| 6           | CCG  | 18.3m (60'-0")  | COMPROD 872F-70 VHF TRANSMIT DIPOLE                      | INITIAL           | 56°     | LDF4-50A   | LEG                |
| 7           | CCG  | 17.0m (55'-10") | HSX8-59 MICROWAVE ANTENNA (main) - LITTLE MOUNTAIN       | INITIAL           | 139.34° | EWP63 (x2) | FACE               |
| 8           | CCG  | 12.2m (40'-0")  | COMPROD 872F-70 VHF MULTI DIPOLE                         | INITIAL           | 56°     | LDF4-50A   | LEG                |
| 9           | CCG  | 12.0m (39'-5")  | HSX4-107 MICROWAVE ANTENNA (diversity) - TEXADA          | INITIAL           | 91.47°  | EWP90      | FACE               |
| 10          | CCG  | 12.0m (39'-5")  | HSX6-59A MICROWAVE ANTENNA (diversity) - LITTLE MOUNTAIN | INITIAL           | 139.34° | EWP63 (x2) | FACE               |
| 11          | CCG  | 11.0m (36'-1")  | HX6-6W MICROWAVE ANTENNA (diversity) - DISCOVERY         | INITIAL           | 332.2°  | EWP63 (x2) | FACE               |
| 12          | CCG  | 9.1m (30'-0")   | SINCLAIR SD210 VHF SINGLE - TECH'S                       | INITIAL           | 56°     | LDF4-50A   | LEG                |
| 13          | CCG  | 6.1m (20'-0")   | SINCLAIR SD210 VHF SINGLE - TEST                         | INITIAL           | 56°     | LDF4-50A   | FACE               |

Fisheries and Oceans Canada  
 Pêches et Océans Canada  
 Canadian Coast Guard  
 Garde côtière Canadienne

|                             |                 |                     |             |
|-----------------------------|-----------------|---------------------|-------------|
| designed - conception       | date            | checked - vérifié   | date        |
| SMC                         | 2018-04-06      | SMC                 | 2018-04-06  |
| drawn - dessiné             | date            | approved - approuvé | date        |
| TDK                         | 2018-04-06      | -                   | -           |
| CCG ref. no. - no. réf. GCC | scale - échelle | rev                 | description |
| 8B200                       | AS SHOWN        |                     |             |

|                              |                |
|------------------------------|----------------|
| Asset - Actif                | CAPE LAZO      |
| VHF PERIPHERAL RADIO STATION |                |
| ISSUED FOR TENDER            | TDK 2019-06-05 |

Drawing - Dessin  
 80' TOWER ANTENNA LAYOUT  
 drawing no. - no. dessin  
 WM-110-1009

|               |     |
|---------------|-----|
| sheet-feuille | rev |
| 01/01         | 0   |

File / Fichier: C:\USERS\KLASSENT\DOCUMENTS\WM-110-1009 CAPE LAZO- ANTENNA TOWER LAYOUT REV 01.DWG - Printed / Imprimé: 2019/06/05 2:58  
 ANSI B

