

# Comox Valley Sanitary Sewer Conveyance Project

Construction Environmental Management Plan

Maple Knappett Joint Venture

Project number: 60719424

May 29, 2024

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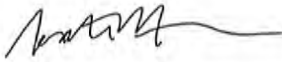


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## Acronym List

Term	Acronym
Area of Potential Environmental Concern	APEC
British Columbia	BC
Best Management Practice	BMP
Comox Valley Regional District	CVRD
Comox Valley Water Pollution Control Centre	CVWPCC
Construction Environmental Management Plan	CEMP
Construction Environmental Management Requirements	CEMR
Contaminated Sites Regulation	CSR
Fisheries and Oceans Canada	DFO
Emergency Management BC	EMBC
Environmental Incident Report	EIR
Environmental Management Act	EMA
Environmental Management Plan	EMP
Environmental Monitor	EM
Environmental Orientation Record	EOR
Environmental Protection Plan	EPP
Environmental Site Assessment	ESA
Erosion and Sediment Control	ESC
Harmful Alteration, Disruption or Destruction of Fish Habitat	HADD
Large Woody Debris	LWD
Maple Knappett Joint Venture	MKJV
Nephelometric Turbidity Units	NTU
Owner's Engineer	OE
Owner's Environmental Consultant	OEC
Qualified Environmental Professional	QEP
Species at Risk Act	SARA
Total Suspended Sediment	TSS
Valued Ecosystem Component	VEC



# 1. Introduction

AECOM Canada Ltd. (AECOM) has been retained by Maple Knappett Joint Venture (MKJV) to design the upgrade to the Courtenay-Lazo sewer conveyance system (Comox Valley Sanitary Sewer Conveyance Project (the Project)) and provide environmental management services during construction. MKJV has been contracted by the Owner, Comox Valley Regional District (CVRD), to finalize the design and construct the Project. This Construction Environmental Management Plan (CEMP) has been prepared based on the general requirements provided within the Construction Environmental Management Requirements (CEMR), the Environmental Management Plan (EMP) documents prepared for Comox Valley Regional District (CVRD) and HDR Inc. by Current Environmental Ltd (Current), and subsequent discussions between AECOM, MKJV and CVRD. The primary objectives of this CEMP are to provide best management practices (BMPs), regulatory requirements, and project-specific mitigation measures to protect the environment during Project construction activities.

## 1.1 Project Description

The Project is a multi-year construction project that will replace existing sanitary forcemains and upgrade three pump stations that move more than 14,000 m<sup>3</sup> of raw sewage each day from the Courtenay Pump Station to the Comox Valley Water Pollution Control Center (CVWPCC) on Brent Road in Comox, BC. The new system will include routing of sewer pipes further inland to reduce exposure to damage by waves, rocks, and logs.

MKJV's design for the Project provides CVRD with a safe and modern operating system designed to operate for anticipated flow volumes until 2060. Pipe capacity will be sufficient until year 2100 flows with future upgrades required to increase pump capacity, and routine repair and replacement of mechanical, electrical and instrumentation equipment. Alignment drawings issued for the purposes of permitting (BC Ministry of Transportation and Infrastructure, *Fisheries Act*, and *BC Water Sustainability Act*) are shown in Appendix C.

The Project involves the design and construction of the following key components:

- Replacement of the Courtenay Pump Station, including a redundant set of dual (i.e., total of 4) VFD-controlled submersible pumps sized to handle both dry weather and peak wet weather flows;
- Retrofits at the K'ómoks and Comox pump stations;
- Replacement of approximately 2.4 km of sanitary forcemain using open trench methods connecting the Courtenay Pump Station;
- Replacement of approximately 3.1 km of sewer main using open trench methods along Lazo Road to the CVWPCC; and
- Odour control kiosk at the intersection of Lazo Road and Forester Avenue strategically located along the sanitary forcemain to treat air exhausted during routine and maintenance operations.

## 1.2 Objectives

The objectives of this CEMP, includes:

- Summarizing the regulatory requirements that apply to the Project for compliance with regulatory and Project objectives;
- Providing site-specific mitigation measures for existing Valued Ecosystem Components (VECs) within or near the Project Site. VECs are identified on the alignment sheets in Appendix C;
- Providing general mitigation measures and response plans related to the various Project components to avoid or minimize risk to identified VECs; and
- Providing the requirements for an environmental monitoring program and the environmental communications plan to be followed during construction.



This CEMP is considered a "living document," whereby revisions and updates may be made as necessary as the project proceeds.

## 2. Project Personnel and Responsibilities

### 2.1 Key Project Personnel & Contact Information

Contacts for project personnel are presented in Table 1. Contacts are subject to change over the duration of the Project and will be updated as necessary.

**Table 1. Key Project Personnel**

Organization/Project Role	Contact Name	Phone	Email
Comox Valley Regional District / The Owner	Cole Makinson	250-334-6003	cmakinson@comoxvalleyrd.ca
Comox Valley Regional District / The Owner	Charlie Gore	250-334-6092	cgore@comoxvalleyrd.ca
Maple Knappett Joint Venture Project Manager	Jenn Racine	250-300-8591	jracine@maple.ca
Maple Knappett Joint Venture Pump Stations (Vertical) Site Superintendent	Peter Loch	250-212-0243	peterl@maple.ca
Maple Knappett Joint Venture Forcemain (Horizontal) Site Superintendent	Peter Loetscher	250-616-5984	peterl@knappettindustries.com
AECOM Project Manager	Nic Smith	604-444-6623	nicholas.smith@aecom.com
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AECOM Environmental Monitors (EM) / Biologists	Brad Stuckless Kathleen Moore Kyle Davis	604-347-6802 604-355-9959 705-690-0360	brad.stuckless@aecom.com kathleen.moore@aecom.com kyle.davis@aecom.com
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Current Environmental	Dusty Silvester	250-792-1793	dusty@currentenv.ca

### 2.2 Maple-Knappett Joint Venture (MKJV) / AECOM

Maple-Knappett Joint Venture (MKJV) / AECOM (the Design-Builder) will comply with and provide for all the environmental requirements described herein with contingencies for additional environmental management resources to address unforeseen issues that may arise during Project implementation. Specifically excluded from AECOM's environmental scope of work is the sampling, testing and characterization of soils excavated as part of the Project beyond 'chance finds,' and any direction on soil disposal of excavated materials. MKJV (excluding AECOM) are responsible for soil management, and for all excavated soil, they will follow, and be responsible for all activities, per BC CSR. MKJV (excluding AECOM) are responsible for soil management and their understanding is that no sampling and classification is required if material is not removed from the CVWPCC and Courtenay Pump Station to disposal facilities, and soil disposal from linear infrastructure projects does not require classification, provided it is not a requirement of the receiving facility.

AECOM will provide an Environmental Manager that is a suitably qualified environmental professional (QEP) registered and in good standing in British Columbia with appropriate BC registration as a professional biologist, agrologist or engineer. The QEP will be acting under that appropriate organization's code of ethics and subject to disciplinary action by that organization.

MKJV and AECOM will:



- Maintain compliance with the Agreement and/or related work instructions.
- Maintain compliance with all applicable regulatory requirements, including federal and provincial laws and any local bylaws or related requirements.
- Acquire all relevant environmental permits based on for-construction designs before the start of any work in areas requiring permits, as indicated in the *Permitting Plan* (AECOM, 2024a).
- Provide additional detailed site- and activity-specific environmental protection plans ("Environmental Protection Plans" or "EPP") during construction for any work in and around identified or unidentified Valued Ecosystem Component (VECs) that may not be sufficiently detailed in the CEMP. The requirement for additional mitigation planning will be determined on a case-by-case basis by the Owner's Engineer (OE)/ Owner's Environmental Consultant (OEC) team in consultation with the Owner and regulators.
- Provide an environmental monitor (the "Environmental Monitor" or EM) during construction who will conduct regular site visits (details are provided in Section 3.3.1 below).
- Review and submit environmental monitoring reports and other environmental reports (e.g., spill reports) prepared by the EM to the Owner and the OE/OEC team (see Section 3 for more details).
- Review and sign off on the environmental orientation record (the "Environmental Orientation Record" or "EOR") form (Appendix A) and submission to the OE/OEC team.
- Submit, as necessary, the environmental incident report form (the "Environmental Incident Report" or "EIR") form (Appendix B) to the OE/OEC team for circulation to Owner and Regulators, as required.
- Submit other information as outlined in this document.
- Retain copies of all related permits, management plans (including this CEMP, CEMR, and any site-specific EPPs) and have them available on site.
- Along with the Environmental Manager and EM, additional Qualified Environmental Professionals as required to address issues requiring specific expertise.

## 2.3 Environmental Monitor Responsibilities

An environmental monitor (EM), who is a QEP or directly supervised by a QEP, will inspect the project work, document compliance with this CEMP, the CEMR, and legislation, and determine if environmental protection objectives of applicable approvals/permits are adhered to. Specific duties of the EM will include but are not limited to:

- Monitoring construction activities to ensure compliance with the CEMP, CEMR, EPPs, tender documents, and federal, provincial, and municipal permits, regulations, and directives;
- Conducting a minimum of one environmental monitoring inspection per week when works are occurring within 30 m of a VEC, as defined by the CEMR;
- Confirming that adequate environmental mitigation supplies (i.e., spill kits, filter fabric, etc.) are available on site;
- Confirming that the crew members on site have had been provided with appropriate information about the requirements of the CEMP and that emergency response procedures are understood through the EOR process;
- Preparation of environmental monitoring reports after each site visit to document the ongoing work progress, mitigation efforts, and to report any incidents;
- Responding to any event or incident that has caused or may create an environmental impact;
- Communicating frequently with the Construction Supervisor, and the OEC, to facilitate ongoing implementation of mitigation requirements, to discuss any environmental management issues, and to address upcoming issues that could cause project delays;
- If necessary, liaise with other relevant parties regarding environmental aspects of the Project;
- Contact appropriate regulatory agency in the event of any non-conformance with applicable legislation and permits; and



- The EM will have the authority to halt construction in the event of observed or imminent environmental damage. The EM can provide advice to the on-site foreman or supervisor on the appropriate measures to mitigate or stop environmental damage. Regular construction activities will not resume until the Environmental Manager, EM, and Owner/OEC are satisfied that no further negative environmental impacts will occur.

### 2.3.1 Site Presence

MKJV's EM is required to be on site for the following:

- A pre-construction meeting between the MKJV, the Owner, the OE/OEC, and other relevant stakeholders prior to the commencement of Construction. This meeting is intended to familiarise key construction personnel with the environmental scope of the work, general environmental concerns, required mitigation and contingency measures, emergency response plans, and any permits and regulations applicable to the construction phase;
- The MKJV's Environmental Manager or EM, or other suitably qualified crew member (person trained by the EM or QEP), will be responsible for administering an EOR (Appendix A) and acquiring signatures confirming completion of an orientation for all MKJV and sub-contractor crew members working on the Project. The EOR will convey critical responsibilities to site personnel, as described in this CEMP and the CEMR, and the physical extents of site sensitivities. All crew members will be made aware of their responsibilities for maintaining adherence to relevant permits and regulations;
  - The EOR will be administered alongside requisite safety orientations for all crew members accessing the Project area. A copy of the sign-off sheet for all trained site personnel will be provided to the Owner's Engineer team for their records.
- During site preparation, construction, and restoration activities within 30 m of a stream<sup>1</sup> (refer to Appendix C overlay drawings) to confirm that all general construction work adheres to the guidelines and mitigation measures outlined in this CEMP, the CEMR, and all applicable permits and environmental regulations;
- During and/or immediately (during regular construction hours) following significant precipitation events (>25 mm in 24 hrs) to assess the impacts of precipitation on construction that could affect VECs, implement any new mitigation measures to maintain site compliance with permits, conditions of this CEMP, and the CEMR, and assess the effectiveness and make necessary adjustments/upgrades to existing mitigation measures; and
- To respond to any event or incident that has caused or may create an environmental impact. All spills, of any volume, of fuels or other hazardous materials to the environment will be reported in an EIR (Appendix B). The EIR will be submitted to the OE/OEC within 24 hrs of the spill occurring. The EIR will also be appended to the next monitoring report for circulation to the Owner and their Engineering team.

## 3. Environmental Monitoring Reports

During periods where MKJV is working greater than 30 m from defined aquatic VECs (Appendix C), the EM will attend and inspect active construction areas, including those sites where mitigation measures have been established to stabilize inactive work areas, every two weeks, and they will provide an environmental monitoring report every two weeks. These reports will be approved by the Environmental Manager and MKJV will submit the reports to the Owner.

During periods where MKJV is working less than 30 m from aquatic VECs identified in Appendix C, the EM will attend and inspect active construction areas a minimum of once per week and provide environmental monitoring reports every two weeks.

As per the definition of "Development" from the CVRD *Official Community Plan No. 337 – Schedule A*, "working" within 30 m of a VEC includes any activity that results in the removal, alteration, disruption, or destruction of vegetation, disturbance of soils, construction of buildings or structures, creation of impervious or semi-impervious

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<sup>1</sup> Definition of a stream from BC Water Sustainability Act: (a) a natural watercourse, including a natural glacier course, or a natural body of water, whether or not the stream channel of the stream has been modified, or; (b) a natural source of water supply, including, without limitation, a lake, pond, river, creek, spring, ravine, gulch, wetland or glacier, whether or not usually containing water, including ice, but does not include an aquifer.



surfaces, construction of roads, provision and maintenance of sewer and water services, construction of drainage systems, and construction of utility corridors.

The monitoring reports will include information on the progress of work near VECs and completion of any major milestones, any environmental incidents or near misses, precipitation affecting the site during the monitoring period, presentation of all water quality measurement data (raw and processed data), description of all wildlife salvage and/or re-location information, and incidental wildlife encounters resulting in harm or death to an animal or their habitat specified for protection under BC or federal acts and regulations (e.g., bird nests, etc.). The environmental monitoring reports will be submitted to CVRD every two weeks by MKJV and will also include the following:

- Project details and reporting period;
- Construction activities (completed during monitoring period and planned for next monitoring cycle);
- Weather conditions (including precipitation amounts);
- EM site presence schedule;
- Environmental incidents or non-compliance issues. Append EIR for period if relevant (example EIR available in Appendix B);
- Mitigation measures employed (measures in place and those anticipated in the next monitoring cycle);
- Description of all wildlife salvaged and relocation information (species, numbers, salvage location and relocation site coordinates);
- Summary of instream work activities and mitigation measures implemented;
- Summary of soil removal, management, and testing activities, as provided by MKJV;
- Summary of water discharge, removal, testing, and/or treatment activities, as provided by MKJV;
- Recommended actions for MKJV to complete (tracking table of past and present recommendations and when/how they were fulfilled);
- Data tables (e.g., turbidity) showing all water quality measurements, including time/date/mapped location;
- Appended copy of EOR sign-off sheet for all indoctrinated crew members during monitoring period; and
- Photographs (time/date stamped), tables, and figures.

## 4. Required Environmental Permits

Permitting requirements for the Project are included in Table 2 below. All listed permits must be received prior to conducting applicable works and all conditions provided within the permits shall be adhered to. Further permitting details are provided in the *Permitting Plan* (AECOM, 2024a).

**Table 2. Summary of Required Provincial and Municipal Environmental Permits**

Regulatory Agency	Permit	Activities Requiring Permit	Status	Expiry Date
City of Courtenay	Tree Cutting Permit	Tree cutting	Application Needed by Dec. 2024	TBD
Town of Comox	Tree Cutting Permit	Tree cutting	Application Needed by Dec. 2024	TBD
Town of Comox	Erosion and Sediment Control Permit	Ground disturbance works	Application Needed by Sept. 2024	TBD
K'omoks First Nation	Cultural Heritage Inspection Permit	Ground disturbance works	Permit Received by CVRD	TBD
Province of BC	Site Alteration and Heritage Inspection Permit	Ground disturbance works	Permit Received by CVRD	TBD

Regulatory Agency	Permit	Activities Requiring Permit	Status	Expiry Date
Province of BC Agricultural Land Commission	Transportation, Utility and Recreation Trail Use Permit	Works within Agricultural Land Reserve	Received by CVRD	N/A
Province of BC	Water Sustainability Act Section 11 Notification – Changes in and About a Stream	Changes in and about a stream (temporary removal of sections from three culverts crossing Lazo Marsh, stream isolation)	Response Received. Works may proceed.	August 15, 2024
Province of BC	Fish Collection Permit	Fish salvaging	Application to be Submitted June 2024	TBD
Province of BC	General Wildlife Permit	Amphibian salvaging	Application to be Submitted	TBD
Fisheries and Oceans Canada	Scientific Fish Collection Permit	Fish salvaging	Application to be Submitted June 2024	TBD
Fisheries and Oceans Canada	Request for Review	Instream works (temporary removal of culvert sections from three culverts crossing Lazo Marsh, installing pipe underneath Glen Urquhart Creek culvert crossings) stream isolation)	Letter of Advice Received	March 20, 2025

## 5. Valued Ecosystem Components

MKJV will avoid or minimize risk to Valued Ecosystem Components ("VECs") that are identified in Appendix C (to be updated as necessary to reflect any new findings). MKJV acknowledges that the Project has been founded on the principles of avoiding or minimizing risk to impacts on identified VECs. VECs have been identified, evaluated, and selected based on ground-level assessments during the creation of the Lazo Marsh Environmental Impact Assessment (CEL, Aug. 2022a), the Project EMP (CEL, 2022b), the Supplementary Biophysical Assessments for the Comox Valley Sanitary Sewer Conveyance Project (AECOM, 2024), and stakeholder input. The identified VECs include and can also be found within the attached Environmental Alignment Sheets (Appendix C):

- **Existing Courtenay Pump Station Vegetated Areas:** One Garry oak (*Quercus garryana*), a tree protected under the City of Courtenay *Tree Protection and Management Bylaw No. 2850*, is located 9 m from the pump station building. Potential green heron (*Butorides virescens*), a Provincially blue-listed species, nesting habitat is present within surrounding vegetation.
- **Comox Road South Toe of Slope Edge:** Henderson's checker-mallow (*Sidalcea hendersonii*), a provincially blue-listed plant species, is present along the Comox Road south toe of slope edge near the Courtenay Pump Station and further east, and likely present along Comox Road at K'omoks First Nation land (see EMP (Current) for figure showing locations).
- **Glen Urquhart Creek and Courtenay River Estuary:** Located immediately adjacent to the forcemain alignment, Glen Urquhart Creek and the Courtenay River Estuary contain a variety of habitat and wildlife and aquatic species.
- **2754 Farview Road:** There is potential for barn owl (*Tyto alba*), a *Species at Risk Act* (SARA) Schedule 1 Threatened and Provincially red-listed species, and barn swallow (*Hirundo rustica*), a SARA Schedule 1 Threatened species, nesting in/on the buildings at 2754 Farmview Road.
- **Roadside Ditch 100 m East of K'omoks Pump Station:** The ditch has connection to the Courtenay River Estuary, a VEC, and is immediately adjacent to the sanitary forcemain alignment. The ditch may contain valuable habitat for a variety of wildlife and is a VEC.



- **Jane Place/Comox Pump Station Adjacent Vegetated Area:** The seashore saltgrass – Pacific swampfire (*Distichlis spicata* – *Sarcocornia pacifica*) Provincially red-listed ecosystem at risk is present next to the Jane Place/Comox Pump Station.
- **Lazo Marsh along Lazo Road:** Lazo marsh potentially contains red-legged frog (*Rana aurora*), a Provincially blue-listed and SARA-listed Schedule 1 Special Concern species, and a variety of other aquatic and wildlife species and valuable habitat.
- **Area North of Comox Valley Water Pollution Control Centre:** The trembling aspen/ Pacific crab apple/ slough sedge (*Populus tremuloides*/ *Malus fusca*/ *Carex obnupta*) Provincially red-listed ecosystem at risk and Sitka spruce/ slough sedge (*Picea sitchensis*/ *Garex obnupta*), Provincially blue-listed ecosystem at risk, are present within the southeastern and southern portions, respectively, of a wetland, that the sanitary forcemain alignment will be adjacent to. The wetland, its riparian zone, and ecosystems at risk are considered VECs.

Mitigation measures to manage potential risks to the above VECs are provided throughout the CEMP, predominantly within the Species at Risk and Ecosystems at Risk section.

## 6. Environmental Mitigation Measures

The following subsections of mitigation measures shall be implemented by MKJV.

### 6.1 General & Key Environmental Concerns

Prior to the start of construction works, all workers, including the construction contractor and environmental monitors will attend a pre-work meeting to obtain worker sign-off on the Environmental Orientation Record (EOR, Appendix A). Measures to be discussed include:

- Review of the CEMP and other applicable guidelines by all contractors and site managers prior to each project phase or new activity;
- Location of the environmentally sensitive areas (i.e., nesting bird areas, Glen Urquhart Creek, Lazo Marsh, wetlands) and species at risk that may be in or near the construction areas;
- Chance finds procedure for potentially contaminated soils (see applicable subsection below 7.10.2);
- Handling and transportation of hazardous materials and fuels (see applicable subsection below);
- Spill containment, recovery, and clean-up procedures (see applicable subsection below);
- The use of spill response equipment, including the location, type, and correct deployment of spill response equipment relating to the nature and location of work and potential on-site spills;
- The appropriate installation and maintenance of Erosion and Sediment Control (ESC) measures (see applicable subsection below);
- Review of the locations of known invasive species in the work sites, measures to control their spread, and appropriate disposal procedures (see applicable subsection below);
- Installation of tree protection fencing where there is potentially work activities, including laydown locations, that will come within 3.5 m of the stem of a tree;
- Review of the archaeological chance find procedure (see applicable subsection below); and
- Work in areas requiring permitting shall not proceed until the applicable permit has been received (see EOR, Appendix A).

Additional general practices that will be adhered to throughout the duration of the Project, include:

- Prior to any site preparation or construction activities, footprint boundaries, sensitive areas, invasive species and known sensitive habitat features (e.g., nests) will be demarcated on site plans and in the field with 'No Work Area' or similar flags to reduce the possibility of causing unnecessary disturbance to surrounding ecosystems.



Boundaries will be reviewed throughout the construction phase to confirm they are marked and as accurate as possible.

- Make changes to existing measures and BMPs should they fail or if additional measures are required. Notify the EM to confirm changes are adequate and measures are installed effectively and document in EM reports.

## 6.2 Clearing, Grubbing, Tree Protection and Hazard Tree Abatement

Clearing and grubbing by MKJV of existing vegetation and surface soils will be required to facilitate construction along those parts of the Project sites which have not been previously cleared. Mitigation measures to be implemented, include:

- Clearing within VECs for construction is limited to the sanitary forcemain alignment that will go between two wetlands to the north of the CVWPCC. Clearing within 30 m of the wetlands shall be limited to the extent necessary to enable installation of the sanitary forcemain. Any clearing for laydown or staging shall occur at least 30 m away from the wetlands;
- Prior to any vegetation disturbance or clearing, the QEP or EM will physically delineate VECs, other sensitive areas, and clearing limits, with flagging tape/stakes. Once vegetation is removed and soils exposed, erosion and sediment control measures will be implemented to protect aquatic areas from sedimentation (see ESC subsection below);
- Prior to any vegetation disturbance, an area will be surveyed by a QEP or qualified EM supervised by a QEP, prior to the start of work, to identify breeding, nesting, roosting, or rearing areas for birds and other wildlife, to determine if any mitigation measures are required. If potential bird nesting habitat is to be disturbed between March 1 and August 30, and if active nests are found areas will be flagged and no work will be permitted in the flagged area until the nest is no longer active;
- Refer to Section 6.4 below for invasive plant species management requirements to be implemented prior to vegetation disturbance;
- To help limit impacts to potentially present wildlife, carefully remove large woody debris (LWD) (e.g., logs) from the alignment and if possible move the debris to adjacent forested areas where it can continue to provide habitat or retain and use LWD to enhance habitats along rehabilitated corridors (the EM will provide guidance);
- Project areas that intersect riparian vegetation (30 m measured from high-water mark of a stream or wetland) must be inventoried by the QEP for vegetation community composition and stand age prior to clearing;
- No expansion beyond the Project working limits onto neighbouring properties will be allowed. This includes truck turning radiuses, material stockpiles, and spoilage of soils or vegetation;
- Minimize the disturbance of existing vegetation, plant communities, and soil on the construction site and limit to required areas only; and
- MKJV will stockpile clean excavated topsoil for reuse in site restoration.

Tree protection and hazard tree abatement requirements that shall be implemented, include:

- Hazard trees within and adjacent to the work area must be assessed by a qualified professional and appropriate measures taken to meet WorkSafe BC standards. Tree protection zones shall be adhered to, as shown on the construction drawings (Appendix C);
- Avoid all activities (e.g., excavation, laydown, equipment presence) within the drip line of trees to help prevent impacts to root structures; however, when work is required within this area, implement the below mitigation measures provided by an arborist. Felled trees on Crown or CVRD land, outside of working limits, will remain *in-situ*, unless otherwise directed. The Owner's arborist identified specific tree protection (fencing) and hazard tree management requirements in the *Tree Health and Protection Arborist Report* (Mumby, V., Aug. 2022), which shall be reviewed and implemented; they generally include:
  - Installation of tree protection fencing, to protect tree stems and roots, is required in several locations where the sanitary forcemain alignment is near trees;
  - An arborist is required to be on site during certain situations to assess tree roots during excavation;



- Pruning is required for some trees; and
- Root management may be required, such as adding organic matter and implementing mitigation measures to prevent exposed roots from drying out.
- Clearing of hazard trees outside of the required project clearing limits will be completed using hand tools (e.g., chainsaw) where use of mobile machinery will cause environmental damage (e.g., soil rutting, vegetation disturbance). Tree removal will prioritize minimizing ecological impacts; and
- The revised sanitary forcemain alignment along Lazo Road, Brent Road, and within the vegetated area north of the CVWPCC will have an arborist report completed by MKJV and all tree protection and hazard tree recommendations provided, if any, shall be implemented. The report shall be submitted to the Owner and OE/OEC prior to implementation of recommendations.

## 6.3 Site Delineation and Protection of Valued Ecosystem Components

Unnecessary expansion of the project footprint must be minimized, and the following mitigation measures related to this issue which will reduce risk to VECs:

- Design drawings will show all clearing boundaries, including requirements for truck access, laydown and staging areas, additional materials storage (stockpiles and sidecast), pads and machinery control cabins, slurry separation plant, bentonite mixing and concrete batching, site offices and parking, and any additional areas requiring clearing;
- Prior to construction, the EM and Construction Supervisor are to clearly mark the boundaries of project activities, including the limits of all known or newly identified VECs;
- Access and egress routes to the site must be minimized in number and area as much as possible to reduce impact to VECs;
- No machinery access or spoil material storage of any kind is to occur outside the delineated project areas without consent of a representative of the Owner's Engineering team;
- Vegetation identified for protection, (e.g., outside designated work areas) will be left intact and root systems undisturbed unless specifically approved by the Owner's Engineering team and OEC;
- Clearing near VECs must be completed in an incremental manner, not left exposed for longer than necessary, or will be temporarily contained with erosion and sediment countermeasures, such as surface roughening and application of clean mulch; and
- Where there are trees close to but outside of clearing limits, with the approval of an arborist, limbs will be pruned or tied back in place of removing the entire tree to improve sightlines/machine swing areas.

## 6.4 Invasive Species Management

### 6.4.1 Invasive Plant Management Plan

The following measures will be taken to prevent the spread of invasive plants:

- Himalayan blackberry (*Rubus armeniacus*) and Scotch broom (*Cytisus scoparius*) have been identified in the Project area and are located within the construction footprint (see the EMP (CEL 2022b) for details). Scotch broom is listed in the Comox Valley Regional District *Invasive Plant Species Strategy* with a "control" management strategy. Scotch broom is particularly present at Parcels 19 and 20 near Scott Road. Other invasive species are present (e.g., within agricultural field alignment sections, roadside edges) that could be within the construction footprint, such as common tansy and red dead-nettle within Parcel 18 (see the EMP (CEL 2022b) for details and images showing invasive plant locations). The EM shall confirm presence, identify any new invasive plant presence, and flag all areas with invasive species that are proposed for disturbance, prior to clearing.
- Invasive species that may be disturbed must be removed prior to clearing work, under the supervision of the EM. All vegetative matter will be contained (i.e. placed in plastic bags or bins) to prevent the spread of invasive plants during transport for disposal at an appropriate waste facility, see below.



- Species-specific removal requirements shall follow those within the Invasive Species Council of BC's *Factsheets* (Appendix D). Where *Factsheets* are not available for a particular species, removal requirements shall be prescribed by a QEP, which may be based on alternative guidelines or general BMPs for invasive plant management.
- Clean all equipment used to remove invasive species (including hand tools) before equipment is moved to new area or taken offsite, to avoid further spread.
- Clean all equipment and vehicles of soil and plant material prior to accessing the site.
- All soil entering the project site shall be certified free from invasive species.
- Transport invasive species to an appropriate waste facility (e.g., Comox Strathcona Waste Management Centre<sup>2</sup>) for disposal.
- Revegetate disturbed areas with suitable grass seed mix and/or native vegetation upon completion of works.
- Be alert for new invasive plants growing along rights-of-way and remove them promptly before they become established and spread.
- Vehicle and machinery movement will be limited to work areas to reduce seed dispersal and minimize damage to plant communities, both within and beyond the Project site.
- Materials used for ESC should not contain invasive species (i.e., straw bales).
- Noxious weeds listed under the BC *Weed Control Act* are often highly invasive and must be managed with extreme care to minimize spread of the plant to other areas. No noxious weeds have been identified within the Project footprint to date; however, if any are identified, a species-specific management plan shall be prepared and will include:
  - Treatment or removal requirements for noxious weeds based on the management measures within *Factsheets*. Management measures shall be implemented under the supervision of a QEP. If *Factsheets* are not available for a particular species, removal requirements shall be prescribed by the QEP, which may be based on alternative organizational guidelines or general BMPs for invasive plant management.
  - The requirement for any noxious weed material to be well contained and transported to an appropriate disposal facility (e.g., Comox Strathcona Waste Management Centre) to prevent introduction to other areas.
  - Disposal, safety considerations, replanting, ESC, and follow-up monitoring requirements.

## 6.4.2 Wildlife

The BC Ministry of Forests requires that captured invasive animals are to be euthanized, as per requirements provided within General Wildlife Permits issued under the Wildlife Act for salvaging purposes. Accurate identification of invasive wildlife species will occur before deliberately destroying any animals. If an invasive species is encountered, details of the encounter and methods of removal and disposal must be included in the relevant monitoring report. The Fisheries and Oceans Canada (DFO) procedure<sup>3</sup> for invasive species encounters includes:

- Do not return the species to water.
- Note the exact location (GPS coordinates) and the observation date.
- Take photos.
- Take note of identifying features.

If an aquatic invasive species is captured, it will be reported through the Provincial *Report Invasives* mobile app<sup>4</sup>. Aquatic invasive species, including American bullfrog, are known to reside in the region; however, they have not yet been encountered in streams/wetlands intersecting the Project footprint. An *Animal Care Application Form* for

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<sup>2</sup> <https://www.cswm.ca/hazardous-waste/invasive-plants>

<sup>3</sup> <http://www.dfo-mpo.gc.ca/species-especes/ais-eae/identify-eng.html>

<sup>4</sup> <https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/reporting-invasive-species>

amphibian salvage will also require that any encounters with invasive bullfrogs or green frogs, include detailed protocols for euthanasia.

## 6.5 Wildlife Management

At a minimum, where wildlife is encountered, the following mitigation measures will be applied to reduce risk of impact:

### 6.5.1 Incidental Encounters

If there is a wildlife encounter during construction on the Project site, it must be immediately reported to the EM. This includes encounters with nests (active or potentially inactive), dens, and other wildlife habitation sites. If predators, or other large mammals, such as cougars, bears, wolves, elk, etc., should approach the work area, efforts should be made to scare them away (often using loud noise effects). If the animal returns persistently, the Provincial Conservation Officer service must be contacted to determine the appropriate course of action for managing the encounter (1-877-952-7277 (BC Report All Poachers and Polluters 24 hr Hotline)).

### 6.5.2 Salvage

There are a few locations where fish and wildlife may have to be salvaged:

- Where the pipeline crosses underneath the three culverts connecting the north and south ends of Lazo Marsh along Lazo Road, (Appendix C, Sheet Number FM-SKE-H-015);
- The Courtenay Pump Station storm sewer outfall works into Courtenay River Estuary (Appendix C, Sheet Number FM-SKE-H-002); and
- The crossing of Glen Urquhart Creek (required in the event of damage to a culvert) (Appendix C, Sheet Number FM-SKE-H-002).

Temporary removal of sections of the culverts are planned to enable installation of the sanitary forcemain underneath the culvert bed. This may require in-water work and a fish salvage, including:

- Installation of site isolation measures (instream fencing) and salvaging of fish and wildlife from within work areas where work is required instream. Salvaged species will be relocated to suitable habitat at a safe distance from work areas, ideally upstream of the work site, and not in areas that may cause stranding if water levels drop;
- Provincial and federal fish collection permits are required for any fish salvage operations; and
- A General Wildlife Permit under the BC *Wildlife Act* and BC *Animal Care Application Form* for amphibian salvage will be obtained before any amphibians or other wildlife are handled. Amphibian salvage should be done by the QEP or EM if suitably qualified, and any crew that has received specialized training. In the case of seriously injured amphibians, and according to measures detailed in the *Animal Care Application Form* and permit conditions, euthanasia may be required following the *Euthanasia of Animals Used in Science* guidelines (Canadian Council on Animal Care, 2010) and the *Guidelines for the Euthanasia of Animals* (American Veterinary Medical Association, 2013).
- Fish salvaging will include the following BMPs:
  - Fish salvage operations must be conducted by progressing from the least harmful method (passive trapping, netting/seining) to most intrusive (electroshocking);
  - The least impactful salvage method shall be utilized first, if appropriate for the conditions, which is fish trapping. Fish trapping shall occur the day before and overnight, prior to dewatering and instream works. Following trapping, netting/seining shall occur, if appropriate for the conditions. Once netting/seining is not capturing fish or is not an effective means of capture, electrofishing shall occur. Water may be drawn down following initial salvaging efforts to aid in salvage of fish;
  - Dewatering pumps shall be fitted with fish screens, as per DFO's *Interim Code of Practice: End-of-Pipe Fish Protection Screens for Small Water Intakes in Freshwater*;
  - Salvaged fish will be transported from nets into buckets of cool freshwater, and if necessary, the water will be oxygenated using a portable aerator; and

- Effort shall be made to minimize the handling of fish to help reduce harm (e.g., relocating fish immediately after being salvaged, minimal handling with nets, and quick identification and numeration of salvaged fish).
- Record descriptions of all fish and wildlife salvaged, euthanized, and/or re-location information in environmental monitoring reports and as required to meet permit requirements.

### 6.5.3 Birds

The following measures will be implemented to minimize impacts to breeding birds during Construction:

- Clearing vegetation, including tall grass, and other works that disturb nesting will be avoided to the extent practicable during the increased risk migratory and passerine nesting window of March 1 – August 31, as indicated in *Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia* (BC MOE 2014);
- Any clearing or work in vegetated areas that must be completed within the nesting window must be preceded by a pre-clearing nest survey conducted by a QEP or EM, if suitably qualified and supervised by a QEP. The surveys shall follow Environment and Climate Change Canada's (ECCC) *Guidelines to Avoid Harm to Migratory Birds* (2023);
- If a nest is found with a bird/egg, a vegetated buffer will be maintained around the nest tree at a species-specific minimum width determined by a QEP in accordance with *Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia* and ECCC's *Guidelines to Avoid Harm to Migratory Birds* (2023);
- Species-specific mitigation measures will be developed to regulate construction activities near an active nest;
- The QEP/EM must be consulted to determine if a nest survey for raptors is required prior to clearing. Depending on the species raptor nesting can be active between January 1 – September 15, as per the *Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia* (BC MOE 2014);
- A known bald eagle nest (BAEA-106-059) is located approximately 160 m to the southeast of the proposed new location of the Courtenay Pump Station, a distance that construction could potentially cause behavioural disturbance to bald eagles. If construction activities occur at the proposed new location of the Courtenay Pump Station during the bald eagle nesting season (January 1 – September 15), a QEP or a qualified EM under the supervision of a QEP, shall determine whether the nest is active. If active, the nest shall be monitored, at a frequency determined by the QEP, to confirm construction activities are not negatively affecting the nesting bald eagles. If construction activities are negatively affecting nesting bald eagles, the QEP shall provide mitigation measures to MKJV for implementation, followed by additional monitoring by a QEP or qualified EM under the supervision of a QEP, to confirm they are effective;
- There is a recorded bald eagle nest (BAEA-106-353) approximately 15 m south of the sanitary forcemain alignment, off Farmview Road, and a second bald eagle nest (BAEA-106-278) approximately 70 m south of the sanitary forcemain alignment, west of Scott Road. As of 2021, both recorded nests were no longer present<sup>5</sup>. If construction activities occur during the bald eagle nesting season (January 1 – September 15), a QEP or a qualified EM under the supervision of a QEP, shall determine whether the former nest sites are reactivated. If active, the nest sites shall be monitored, at a frequency determined by the QEP, to confirm construction activities are not causing negative behavioural changes of bald eagles. If construction activities are negatively affecting nesting bald eagles, the QEP shall provide mitigation measures to MKJV for implementation, followed by additional monitoring by the QEP or qualified EM under the supervision of a QEP, to confirm they are effective;
- At 435 Scott Road, gravel areas shall be surveyed for killdeer (*Charadrius vociferus*) and other ground nesting species during the breeding bird window (March 1 – August 31) if activities are occurring or are proposed to occur within the area at that time;
- If hazard trees have to be removed, consider topping the tree at a height of 3-7 m above ground to allow the tree to still provide some habitat value;

<sup>5</sup> Nest status determined by Wildlife Tree Stewardship Atlas ([https://cmnmaps.ca/WITS\\_gomap/](https://cmnmaps.ca/WITS_gomap/))

- Although not identified during any surveys to date, in the event any year-round protected wildlife trees are identified that require removal, they shall be replaced with artificial snags with carved nesting cavities sized to target different species or with a nesting platform. A nest habitat compensation proposal will be submitted to the OE/OEC team and Ministry of Forests for review and approval before any offsetting projects may proceed for accidental/extra tree removals beyond the working limits of the Project;
- Although not identified during any surveys to date, if nests belonging to species listed in S. 34(b) of the provincial *Wildlife Act* (eagle, peregrine falcon, osprey, heron or burrowing owl) or federal *Migratory Bird Convention Act* (2022) (piliated woodpecker) are identified near the Project area and there is any likelihood of being affected by the Project, heightened mitigation measures will be required to avoid harm, or should relocation of the nest be required, additional permitting. These extra measures will be subject to review and approval by the Owner and OEC; and
- To help prevent disturbance of birds and other wildlife in the event of night work, light pollution will be reduced by using lighting focused on the work area and minimizing fugitive light.

#### 6.5.4 Species at Risk and Ecosystems at Risk

The following species-specific mitigation measures are required for implementation, and are generally presented beginning from the west end of the alignment to the east:

- **Garry Oak – Existing Courtenay Pump Station:** One Garry oak (*Quercus garryana*), a tree protected under the City of Courtenay *Tree Protection and Management Bylaw No. 2850*, is located 9 m from the pump station building. The tree requires tree protection zone fencing to be installed prior to construction at 3.5 m around the tree, as indicated in the EMP (Current). See Appendix C, Sheet Number FM-SKE-H-001.
- **Green Heron – Existing Courtenay Pump Station:** Potential green heron (*Butorides virescens*), a Provincially blue-listed species, nesting habitat is present. If vegetation disturbance is required adjacent to the pump station, bird nest surveys shall be completed by a QEP or qualified EM that is supervised by a QEP.
- **Henderson’s Checker-mallow – Comox Road:** Henderson’s checker-mallow (*Sidalcea hendersonii*), a provincially blue-listed plant species is present along the Comox Road south toe of slope edge near the Courtenay Pump Station and further east, and likely present along Comox Road at K’omoks First Nation land (see EMP (Current) for figure showing locations). Although not anticipated to be disturbed by construction activities, measures shall be implemented to help prevent disturbance (e.g., installation of sediment fence), as recommended by the EM prior to construction in the area. See Appendix C, Sheet Number FM-SKE-H-001 and FM-SKE-H-003.
- **Barn Owl and Barn Swallow – 2754 Farview Road:** There is potential for barn owl (*Tyto alba*), a SARA Schedule 1 Threatened and Provincially red-listed species, and barn swallow (*Hirundo rustica*), a SARA Schedule 1 Threatened species, nesting in/on the buildings at 2754 Farmview Road. Works are not anticipated to physically impact nests; however, activities could cause behavioural disturbance of nesting activities. Prior to adjacent construction if starting within the nesting season, the QEP or qualified EM that is supervised by a QEP, shall conduct nest surveys. If active nests are identified, the QEP shall prepare site-specific mitigation measures. See Appendix C, Sheet Number FM-SKE-H-004.
- **Seashore Saltgrass/ Pacific Swampfire – Jane Place/Comox Pump Station:** The seashore saltgrass – Pacific swampfire (*Distichlis spicata – Sarcocornia pacifica*) Provincially red-listed ecosystem at risk is present next to the Jane Place/Comox Pump Station. No works shall occur outside of the existing developed/disturbed footprint without review and approval by the Environmental Manager. See Appendix C, Sheet Number FM-SKE-H-019.
- **Red-legged Frog – Lazo Marsh at Lazo Road:** Red-legged frog (*Rana aurora*), a Provincially blue-listed and SARA-listed Schedule 1 Special Concern species, has a listed occurrence in Lazo Marsh from 2007 documented by the BC Conservation Data Centre. Works shall remain within the road corridor, appropriate ESC measures shall be implemented, as recommended during construction by the EM, and appropriate salvage measures, as provided in the Wildlife Interactions section, shall be implemented during Lazo Marsh sanitary forcemain culvert intersection works. See Appendix C, Sheet Number FM-SKE-H-015.
- **Treed Wetlands – Northeast of Comox Valley Water Pollution Control Centre:** Two wetlands and their riparian areas are present and contain ecosystems at risk. The trembling aspen/ Pacific crab apple/ slough



sedge (*Populus tremuloides/ Malus fusca/ Carex obnupta*) provincially red-listed ecosystem at risk and Sitka spruce/ slough sedge (*Picea stichensis/ Garex obnupta*) provincially blue-listed ecosystem at risk, are present within the southeastern and southern portions of the eastern wetland, as identified by Current Environmental (2022). The sanitary forcemain alignment is between the two wetlands. The extents of the wetlands have been delineated by AECOM (AECOM, 2024b). See Appendix C, Sheet Number FM-SKE-H-018. The following mitigation measures shall be implemented:

- All work and clearing within the boundaries of the wetlands will be avoided;
- Clearing within the riparian areas of the wetlands shall be limited to the extent necessary to enable installation of the sanitary forcemain;
- Any clearing for laydown or staging shall occur outside of a 30 m riparian buffer and outside of ecosystems at risk boundaries, if feasible;
- Clearing limits shall be flagged and fenced (e.g., snow fencing) in this area prior to clearing; and
- A rare plant survey, including wetland riparian areas shall be completed by a QEP during the growing season prior to clearing. If rare plants are present, a QEP shall develop a management plan for implementation, prior to clearing. The plan will include restoration activities to be implemented following construction.

The following general mitigation measures to avoid and minimize harm to species at risk:

- Do not handle wildlife without a General Wildlife Permit issued under the BC *Wildlife Act*;
- Survey suitable habitat for the presence of species at risk (focal species and their key habitats are detailed in the project EMP (CEL, 2022b)) prior to any disturbance being made in those areas (See Appendix C);
- During administration of the Environmental Orientation Record (EOR; Appendix A), the EM will familiarize work crews with identification of species at risk likely to be encountered and will outline crew protocols for informing the EM of occurrences;
- If any species at risk are detected, increase efforts to locate others in the area and/or move work to another part of the site for the remainder of the day; and
- Minimize disturbance of natural vegetation, particularly near streams and wetlands.

## 6.6 Aquatic Habitats and Crossings

Works near waterbodies require the following mitigation measures to be implemented:

- All streams, ditches, wetlands, ponds, or any waterbody associated with this project are presumed to be fish bearing, with exception of the wetlands north of the CVWPCC that are isolated from any watercourse, are unlikely fish bearing. Avoid or minimize riparian clearing near aquatic habitats and do not excessively disturb soils and plants;
- Do not cause any negative effects to any water body that would result in that waterbody being non-compliant with the *BC Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture (2023)* and the associated Canadian Council of Ministers of the Environment (CCME) *Canadian Water Quality Guidelines for the Protection of Aquatic Life (2002)*;
- Water quality monitoring will include collection of baseline (pre-disturbance) measurements as well as during and after any work near or in aquatic areas, at locations and frequencies determined by the EM (in consultation with the Environmental Manager) At a minimum, turbidity measurements are required and will be collected using calibrated handheld electronic meters. Dissolved oxygen, temperature, and pH will be measured at the discretion of the EM. Water quality measurements will be compared against *BC Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture (2023)* and CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life (2002)*; any exceedances will be reported in an Environmental Incident Report (EIR; Appendix B) and biweekly or weekly EM reports;
- Perform frequent visual checks of streams and wetlands near construction activities. If sediment is observed in a stream or wetland, work will stop and the EM contacted;

- Implement sediment and erosion control measures, as appropriate (see details in the Erosion & Sediment Control section);
- Restore any disturbed streambanks to pre-construction or natural conditions;
- Avoid stockpiling of material on stream banks and in riparian zones;
- Use sediment fence along creek banks;
- Limit equipment access to banks or areas adjacent to waterbodies;
- Limit grubbing on watercourse banks to the area required for the footprint of the works, undertakings and activities;
- Construct access points and approaches perpendicular to the watercourse or waterbody, where possible; and
- Operate all equipment from a dry location above the high-water mark.

For instream works, the following mitigation measures shall be implemented:

- Adhere to all requirements for making changes in and about a stream (Lazo Marsh culvert works), as provided in the Terms and Conditions received from the *Water Sustainability Act* Section 11 Notification;
- Adhere to all requirements for works within and near fish habitat (Lazo Marsh culvert works, works along Comox Road), as provided in an anticipated letter provided by Fisheries and Oceans Canada following submittal of a request for project review (request for review submitted on February 2, 2024);
- Adhere to the *BC Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia* (Government of BC 2021);
- Disturbed channels are to be restored to pre-construction condition upon completion of project activities; and
- Equipment to use biodegradable oils and lubricants when working instream, and on banks.
- All instream works, including those through Lazo Marsh (temporary removal of culvert sections), the Courtenay Pump Station storm sewer outfall works into Courtenay River Estuary, and the crossing of Glen Urquhart Creek (required in the event of damage to a culvert), shall be isolated from stream flow/ water and conducted in the dry to help prevent impacts to fish, amphibians, and water quality, and will be completed using the following measures:
  - Following fish salvage (see above requirements in the Salvage subsection), instream isolation measures shall be installed, such as steel road plates for marshland areas or 1 tonne or regular sized sandbags wrapped with plastic (poly or tarpaulin) sheeting. Clean Pit run material (free of sediment) may be used to fully seal the isolation, if needed;
  - Gradually dewatering the instream work area and preventing suction hoses from intaking fine sediment (e.g., suspending the hoses or creating a rock-lined sump); and
  - Rewatering the instream work area gradually and allowing potentially generated sediment to settle before fully removing isolation;
- The following DFO Codes of Practice shall be adhered to during instream works, as required:
  - *End-of-Pipe Fish Protection Screens for Small Water Intakes in Freshwater* (interim) and *In-Water Site Isolation* (interim) (DFO 2023a): These Codes of Practice will be adhered to if dewatering is required for the potential instream work area for the culverts connecting the north and south ends of Lazo Marsh and for installation of a storm sewer headwall in the Courtenay River Estuary from the Courtenay Pump Station.
- The following DFO's *Measures to Protect Fish and Fish Habitat* shall be implemented for instream works (DFO 2023b):
  - Minimize affecting fish by conducting instream work during the default reduced risk work window of August 15 to September 15;
  - Maintaining riparian vegetation where possible, such as by avoiding tree and shrub removal, using existing trails and roads, and using measures to prevent soil compaction (e.g., swamp pads);



- Conducting works, undertakings, and activities on land. This can be achieved by conducting all works from land, when possible, and not disturbing stream/river banks;
- Maintaining fish passage;
- Ensuring proper sediment control by avoiding introduction of sediment into the water, implementing an ESC plan, regularly inspecting ESC mitigation measures, keeping ESC measures installed until disturbed ground is stabilized, maintaining water quality, and avoiding instream works during periods of high rainfall; and
- Preventing entry of deleterious substances in water.

## 6.7 Erosion and Sediment Control (ESC) Plan

Project activities are to be conducted in a manner that avoids potential for erosion and introduction of sediment or sediment-laden waters into any watercourse. The fundamental approach to ESC is to keep clean water clean and contain and manage water that collects or lands within work areas. Areas requiring ESC measures, include but are not limited to:

- Along the banks of waterbodies, including Courtenay River Estuary, Glen Urquhart Creek, Lazo Marsh, and the ditch located approximately 100 m east of K'omoks Pump Station, and any ephemeral streams/seeps where water is present and there is risk of sediment entering a watercourse;
- Laydown areas and areas with stockpiles;
- Along sloped areas where runoff from construction is likely to occur; and
- Areas with increased equipment/vehicle traffic adjacent to watercourses (i.e., bridges and culvert crossings).

MKJV will install and maintain ESC measures where required. It is the responsibility of the EM to monitor and provide recommendations for improvement on ESC measures. The following general BMPs for mitigation and management for ESC will be followed:

- ESC works will be implemented prior to start of land disturbance and will be maintained and repaired in a timely manner throughout the Project;
- Applicable aspects of *Requirements and Best Management Practices for Making Changes In and About a Stream in B.C.* (MoE 2022), *Land Development Guidelines for the Protection of Aquatic Habitat* (DFO 1992), and *Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia* (MOE 2014) will be applied;
- Erosion and sediment transport will be controlled close to the source and to the extent possible, contained within construction areas. This may require tarping of material stockpiles or steep disturbed slopes;
- Additional mitigation measures will be applied as necessary based on site observations to maintain worksite isolation and prevent the introduction of sediment laden water to any waterbody, adjacent property, or roadway. MKJV will store extra ESC equipment and materials onsite to be deployed as necessary;
- All mitigation measures will be maintained until construction is complete and the affected areas are stabilized. This may require revegetation of some areas; and
- Locate laydown areas on flat, stable surfaces at least 30 m from any waterbody.

### 6.7.1 Surface Water Control

Stormwater management is key to minimizing erosion and sediment release. Mitigations to control surface water runoff in and around the construction site, include the following and exclude groundwater:

- Diverting clean water away from work areas to limit management of water within the construction area only;
- Where sediment transport interruption is required to diffuse surface runoff and concentrated road and ditch runoff, ESC measures may include berms/swales; detention ponds; silt fence; straw bales (certified weed-free); and natural vegetated ground;



- Sediment fence will be installed around stockpiles, sloped areas, site perimeters, and environmentally sensitive areas, where ground conditions allow. If installation of silt fencing is not feasible due to ground conditions, perimeter isolation of stockpiles or other erodible features can be conducted using piled sandbags and tarps, or other techniques;
- If pumping is required to dewater the work area, the discharge location must be approved by the EM and discharged water must be tested *in-situ* to document compliance with the *BC Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture (2023)*. If water requiring discharge to the environment does not meet the required guidelines, it shall be treated on site or removed from site for disposal at an appropriate facility. On-site treatment options suitable for the Project may include sediment settling tanks, passive flocculant treatment (sock/belt), or an active flocculent injection and sand filtering system; and
- ESC measures (e.g., sediment fence) shall be implemented to help prevent material and sediment-laden water from entering Courtenay River Estuary, Glen Urquhart Creek, Lazo Marsh, and a roadside ditch with connection to the Courtenay River Estuary that is approximately 100 m east of K'omoks Pump Station and immediately adjacent to the sanitary forcemain alignment.

*In-situ* water quality measurements shall be obtained in nearby watercourses by the EM, as appropriate, to document compliance with the *BC Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture (2023)* (see Table 3), *CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (2002)*, and the *Town of Comox Drainage Infrastructure Protection Bylaw (No. 1824)*, which requires discharge water total suspended solids (TSS) to be less than 25 mg/L and turbidity to be less than 20 nephelometric units (NTU). It should be noted that the CCME guidelines for turbidity are less stringent in some respects and are the same for pH; therefore, requirements have not been provided in Table 3. Turbidity sampling will be conducted; however, where more defensible measurements are required (e.g., in the event of a turbidity non-compliance), samples may be collected for laboratory analysis for TSS. *In-situ* measurements will also be conducted for pH, dissolved oxygen, and temperature, at the discretion of the QEP, using hand-held electronic devices.

**Table 3. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture (2023)**

Parameter	Guidelines
Turbidity	<ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> <li>• Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters.</li> <li>• Change from background of 10% when background is &gt;50 NTU at any time during high flows or in turbid waters.</li> </ul>
pH	<ul style="list-style-type: none"> <li>• 6.5 to 9.0: unrestricted change permitted within this range. This component of the freshwater guidelines should be used cautiously if the pH change causes the carbon dioxide concentration to decrease below a 10 µmol/L minimum or exceed a 1,360 µmol/L maximum, as these concentrations may be toxic to fish.</li> </ul>
Dissolved Oxygen (instantaneous minimum)	<ul style="list-style-type: none"> <li>• All life stages other than buried embryo / alevin (water column): 5 mg/L O<sub>2</sub></li> <li>• Buried embryo / alevin life stages (water column): 9 mg/L O<sub>2</sub></li> <li>• Buried embryo / alevin life stages (interstitial water): 5 mg/L O<sub>2</sub></li> <li>• See guidelines for further details and for long-term chronic guidelines.</li> </ul>
Temperature	<ul style="list-style-type: none"> <li>• Freshwater Aquatic Life – Streams with Unknown Fish Distribution: Mean Weekly Short-Term</li> <li>• Temperature = 18 °C (short-term daily temperature = 19 °C), hourly rate of change not to exceed 1 °C,</li> <li>• Short-term incubation temperature = 12 °C (in spring and fall)</li> </ul>
Oil and Grease	<ul style="list-style-type: none"> <li>• Detectable by sight or smell</li> </ul>

Sources: BC WQRS (2023)

### 6.7.2 Material Storage and Stabilization

Storage and disposal of excess, overburden, soil, or other substances will be done in such a manner as to reduce the potential for entry into any watercourses, including:



- Disposing of and stabilizing all excavated material above the high-water mark and more than 30 m from nearby waterbodies, unless otherwise reviewed by the EM and deemed to pose a low risk of sediment entry into any waterbody, and ensuring sediment re-entry to the watercourse is prevented;
- Stockpiles of erodible materials, such as soil that will be left in a stockpile for more than 24 hours will be contained using appropriate measures, such as sediment fence containment, or covering with plastic sheeting or tarps that are anchored to the ground;
- Compaction of undisturbed soils will be minimized to the extent feasible;
- Site drainage patterns will be restored to natural flow conditions upon completion of the Project;
- Disturbed areas will be restored to a stable vegetated condition as soon as possible (e.g., re-seeding with an approved coastal seed mixture and/or installing biodegradable erosion blankets (without poly mesh)). All seeding shall be planned to allow establishment before the end of growing season; the recommended timing is in the fall during September and October, or spring during March and April; and
- Site revegetation measures are required to stabilize soils, reduce erosion, and avoid the establishment of weed species. The measures are to be implemented, as directed by the EM as construction is completed in each area, include:
  - A Coastal/Vancouver Island standard seed mix, free of invasive species, is recommended for use;
  - Seed mixes will be free of noxious weed species propagules, as listed under the *BC Weed Control Act* and its regulations;
  - Seed mixes will comply with the Federal *Seeds Act* and regulations; and
  - MKJV will provide a Certificate of Analysis for each proposed seed mix at least 5 days prior to purchase, to the OEC for review.

### 6.7.3 Rainfall Events

Construction activities will temporarily cease during intense rainfall events where activities (e.g., earthworks) are causing surface erosion, resulting in turbidity in streams to become non-compliant with the *BC Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture (2023)* and *CCME Canadian Water Quality guidelines for the Protection of Aquatic Life (2002)*. Earthworks will cease during exceedance of 25 mm of rainfall within a 24-hr period or less if there is risk to VECs to warrant continuing work, as determined by the EM in consultation with the Environmental Manager. Any turbidity exceedances will be recorded and reported in EM reports. As mentioned earlier, during and/or immediately following significant precipitation events (>25 mm in 24 hrs), the EM will assess the impacts of precipitation on construction that could affect VECs, prescribe any new mitigation measures to maintain site compliance with permits, conditions of this CEMP, and the CEMR, and assess the effectiveness and make necessary adjustments/upgrades to existing mitigation measures.

### 6.7.4 Contingency Supplies

A contingency supply of ESC materials, such as silt fencing, plastic sheeting, tarps, straw wattles, straw, mulch, and non-erodible gravel will be available at the Project site for rapid deployment during and after extreme events and workers will be sufficiently trained in their appropriate installation and maintenance. The EM will be notified of changes to ESC controls to confirm that they are adequate and that measures are installed effectively.

## 6.8 Spill Prevention and Response

Spill response, containment, recovery, and clean-up procedures are described in this section. MKJV is responsible for providing the necessary equipment required for spill response. MKJV will have a list of hazardous materials and products along with the appropriate Safety Data Sheets on site. The procedures of this spill response plan will be in accordance with the BC Spill Reporting Regulation under the *Environmental Management Act*.

### 6.8.1.1 Spill Response Equipment

The following materials will be readily available on site for implementation, if required:

- Spill kits will be available and labelled at designated locations;



- Spill kits will be inventoried and re-stocked regularly, including immediately after a spill response incident;
- A spill kit capable of containing the largest spill possible, shall be always available during construction.
- Spill response equipment (e.g., absorbent pads, pillows, oil sponges, socks) will be used to clean hydrocarbon spills;
- Absorbent booms and pads will be kept on-site to skim hydrocarbons if detected in water;
- Spill kits will be carried in project vehicles. The required contents are to be carried in each vehicle inside a container marked "Spill Kit". The minimum required content of vehicle spill kits is:
  - Goggles, PVC gloves, 10 absorbent pads, 2 absorbent booms (3 m), 1 container of emergency sealant, 3 heavy duty plastic bags.
- When working within 30 metres of a waterbody with equipment that may result in a spill of a hazardous substance, suitable types and quantities of absorbents and containment measures must be on site and available for deployment in the event of a spill; and
- Appropriate training of workers in the use of spill response equipment, including the location, type, and correct deployment of spill response equipment relating to the nature and location of work and potential onsite spills.

#### 6.8.1.2 Spill Response and Reporting

The following spill response, notification and reporting procedures are to be implemented in sequential order in the event of a spill of fuel, oil, lubricant, or other harmful substance:

1. **Make the area safe**
2. **Stop the flow (when possible)**
3. **Secure the area**
4. **Contain the spill**
5. **Clean-up**
6. **Notify/Report**

The above spill response steps are described in further detail below:

##### 1) Make the area safe:

- Evaluate risk to personal/public, electrical and environmental safety.
- Wear appropriate Personal Protective Equipment (PPE).
- Never rush in, always determine the product spilled before acting.
- Warn people in the immediate vicinity.
- Verify that no ignition sources are present if the spill is a flammable material.

##### 2) Stop the flow (when possible and safe to do so):

- Act quickly to reduce the risk of environmental impacts.
- Close valves, shut off pumps or plug holes/leaks.
- Stop the flow or the spill at its source.

##### 3) Secure the area:

- Limit access to the spill area.
- Prevent unauthorized entry onto the site.

#### 4) Contain the spill:

- Block off and protect drains and culverts.
- Prevent spilled material from entering drainage structures (e.g., ditches, culverts, drains).
- Use spill containment and sorbent material to contain the spill appropriate to site location and spilled materials.

#### 5) Clean up:

- Mobilize recovery equipment and cleanup crew and conduct cleanup activities.
- Dispose of all equipment and/or material used in clean up (e.g., used sorbent, oil containment materials, etc.) in accordance with Ministry of Water, Lands and Resource Stewardship requirements. Disposal of special wastes (e.g., material with > 3% oil by mass) and contaminated soil must comply with the Environmental Management Act and Regulations.
- Replenish spill response kits and equipment.
- Soil that is contaminated by a spill is excavated and transported off-site to an approved disposal facility.
- Water contaminated by spills is transported off-site to an approved facility.
- Used spill response materials are transported out of the work area to the designated waste disposal site immediately after.
- Used absorbent material is placed in plastic bags and disposed of in a mixed contaminated waste bin.
- In the event of a spill or release of deleterious substances to the environment, water and/or soil samples will be taken by the QEP for laboratory analysis according to the Ministry of Environment and Climate Change Strategy *Technical Guidance on Contaminated Sites (2021)*. Depending on the nature of the spill, the QEP will compare the samples against relevant BC *Contaminated Sites Regulation* or Federal Canadian Council of Ministers of the Environment standards to determine whether exceedances have occurred and whether remediation will be required.

#### 6) Notification/Reporting:

- MKJV Site Superintendent will verbally report to the EM as soon as practical, what, how and where the incident occurred along with how the spill was cleaned up. Further assessment of environmental impact or additional clean up may be required by the EM.
- MKJV Site Superintendent will determine appropriate regulatory notification obligations, with assistance from the Environmental Manager, if needed, and will report spills within 24 hrs (Table 4). MKJV will be responsible for preparing end-of-spill reports for submission to the Province of BC.
- MKJV Site Superintendent will provide written reports of all spills to the Environmental Manager, and OE/OEC within 24 hrs. MKJV will report the spill using the Environmental Incident Report (EIR) (Appendix B), which should be summarized by the EM in the environmental monitoring report.
- Spills in water, regardless of amount, are reported to the **Emergency Management BC (EMBC)** emergency coordination centre (**1-800-663-3456**) within 24 hrs by the MKJV Site Superintendent.
- Report harmful impacts to fish and fish habitat and deposit of deleterious substances to DFO using the **Observe Record and Report hotline (1-800-465-4336)** within 24 hrs by the MKJV Site Superintendent.
- Externally reportable releases are reported as soon as reasonably practicable and within 24 hrs by the MKJV Site Superintendent.
- Externally reportable releases will also be reported to the OE/OEC within 24 hrs by the MKJV Site Superintendent.
- Provincially required End-of-Spill Reports will be prepared and submitted by the MKJV Site Superintendent following review by the Environmental Manager, and the OE/OEC, if desired.
- Contact information for personnel responsible for the Project have been provided earlier in Table 1.



**Table 4. Spill Reporting Matrix from Spill Reporting Regulation Schedule of Reportable Levels for Certain Substances.**

Item	Substance	Quantity	External Reporting Requirements
-	Any Spill	Any amount that enters or is likely to enter aquatic habitat	EMBC/DFO
-	Oil and Waste Oil	Any amount $\geq$ 1L	N/A
1	Class 1, Explosives as defined in section 2.9 of the Federal Regulations	Any quantity that could pose a danger to public safety or 50 kg	EMBC
2	Class 2.1, Flammable Gases, other than natural gas, as defined in section 2.14 (a) of the Federal Regulations	$\geq$ 10 kg	EMBC
3	Class 2.2 Non-Flammable and Non-Toxic Gases as defined in section 2.14 (b) of the Federal Regulations	$\geq$ 10 kg	EMBC
4	Class 2.3, Toxic Gases as defined in section 2.14 (c) of the Federal Regulations	$\geq$ 5 kg	EMBC
5	Class 3, Flammable Liquids as defined in section 2.18 of the Federal Regulations	$\geq$ 100 L	EMBC
6	Class 4, Flammable Solids as defined in section 2.20 of the Federal Regulations	$\geq$ 25 kg	EMBC
7	Class 5.1, Oxidizing Substances as defined in section 2.24 (a) of the Federal Regulations	$\geq$ 50 kg or 50 L	EMBC
8	Class 5.2, Organic Peroxides as defined in section 2.24 (b) of the Federal Regulations	$\geq$ 1 kg or 1 L	EMBC
9	Class 6.1, Toxic Substances as defined in section 2.27 (a) of the Federal Regulations	$\geq$ 5 kg or 5 L	EMBC
10	Class 6.2, Infectious Substances as defined in section 2.27 (b) of the Federal Regulations	$\geq$ 1 kg or 1 L, or less if the waste poses a danger to public safety or the environment	EMBC
11	Class 7, Radioactive Materials as defined in section 2.37 of the Federal Regulations	Any quantity that could pose a danger to public safety and an emission level greater than the emission level established in section 20 of the "Packaging and Transport of Nuclear Substances Regulations"	EMBC
12	Class 8, Corrosives as defined in section 2.40 of the Federal Regulations	$\geq$ 5 kg or 5 L	EMBC
13	Class 9, Miscellaneous Products, Substances or Organisms as defined in section 2.43 of the Federal Regulations	$\geq$ 25 kg or 25 L	EMBC
14	Waste containing dioxin as defined in section 1 of the Hazardous Waste Regulation	$\geq$ 1 kg or 1 L, or less if the waste poses a danger to public safety or the environment	EMBC
15	Leachable toxic waste as defined in section 1 of the Hazardous Waste Regulation	$\geq$ 25 kg or 25 L	EMBC
16	Waste containing polycyclic aromatic hydrocarbons as defined in section 1 of the hazardous Waste Regulation	$\geq$ 5 kg or 5 L	EMBC
17	Waste asbestos as defined in section 1 of the Hazardous Waste Regulation	$\geq$ 50 kg	EMBC
18	Waste oil as defined in section 1 of the Hazardous Waste Regulation	$\geq$ 100 L	EMBC
19	Waste containing a pest control product as defined in section 1 of the Hazardous Waste Regulation	$\geq$ 5 kg or 5 L	EMBC
20	PCB Wastes as defined in section 1 of the Hazardous Waste Regulation	$\geq$ 25 kg or 25 L	EMBC
21	Waste containing tetrachloroethylene as defined in section 1 of the Hazardous Waste Regulation	$\geq$ 50 kg or 50 L	EMBC
22	Biomedical waste as defined in section 1 of the Hazardous Waste Regulation	$\geq$ 1 kg or 1 L, or less if the waste poses a danger to public safety or the environment	EMBC
23	A hazardous waste as defined in section 1 of the Hazardous Waste Regulation and not covered under items 1 – 22	$\geq$ 25 kg or 25 L	EMBC

Item	Substance	Quantity	External Reporting Requirements
24	A substance, not covered by items 1 to 23, that can cause pollution	≥200 kg or 200 L	EMBC
25	Natural gas	≥10 kg, if there is a breakage in a pipeline or fitting operated above 100 psi that results in a sudden and uncontrolled release of natural gas	EMBC

*Note: Federal Regulations means the Transportation of Dangerous Goods Regulations made under the Transportation of Dangerous Goods Act; Hazardous Waste Regulation" means B.C. Reg. 63/88.*

*Source: Appendix of 03 Facts on the Management of Environmental Emergencies, November 2017, issued by Ministry of Environment and Climate Change Strategy*

When reporting a spill, the caller should be prepared to provide the dispatcher with the following information:

- Name and contact phone number of the person who is reporting the spill;
- Name and contact phone number of the person who is responsible for causing the spill;
- Location and time of the spill;
- Type and quantity of the substance spilled;
- Cause and effect of the spill;
- Details of action taken or proposed;
- Description of the spill location and surrounding area;
- Names of agencies/responders on scene; and
- Names of other persons or agencies advised or to be advised concerning the spill.

## 6.8.2 Spill Prevention and Fuel Management

The following spill prevention and fuel management mitigation measures shall be implemented:

- Routine environmental monitoring inspections will be conducted to check for the proper spill prevention and preparedness, fuel management, and for evidence of any unidentified spills;
- All sources of fuel, hazardous products, and hazardous substances, along with their storage and containment measures will be identified. Safety Data Sheets will be stored on site and made available to all construction team members;
- Pre-construction and daily tailgate meetings will be held to identify all materials of a deleterious nature that could be spilled;
- Drip containment measures for fuel dispensing equipment to maximize fuel containment will be incorporated, in accordance with BMPs from *A Field Guide to Fuel Handling, Transportation and Storage* (BC MWLAP and MOF 2002);
- Drip trays will be used under parked heavy equipment;
- Drip trays will be used under temporary generators, light plants, and other stationary equipment;
- Water accumulated in drip trays will be inspected to verify that there is no hydrocarbon sheen before being disposed of;
- Absorbent pads will be used to soak up hydrocarbons in water from drip trays with hydrocarbon sheen before water is discharged to ground;
- Water from drip trays discharged to the ground will be discharged >30 m from watercourses or environmentally sensitive areas in a manner that does not cause erosion;
- Monitoring of vehicles and equipment for leaks will be conducted daily. Since the operation of construction vehicles will likely be necessary within riparian areas, vehicles and equipment will arrive on site in a clean condition and be maintained free of fluid leaks;



- Vehicles and equipment will be regularly maintained;
- Heavy equipment arriving on-site will be inspected for cleanliness and signs of leaks and maintained or washed off-site prior to coming on-site if required;
- Heavy equipment will be washed, serviced, and refuelled at designated facilities >30 m from watercourses or environmentally sensitive areas in a manner that does not cause erosion;
- Biodegradable hydraulic fluids will be used in equipment working within 10 m above or within wetted areas or at the direction of the EM;
- Workers will be trained to avoid spills and in the emergency response procedures in the event of a spill, including the locations of spill response equipment and materials for containment and clean up;
- All site personnel are debriefed on the spill incident and implement additional precautions or measures to help prevent similar accidents from recurring;
- Storage of fuels and petroleum products will comply with safe operating procedures [e.g., A Field Guide to Fuel Handling, Transportation and Storage (BC MWLAP and MOF, 2002)] and include containment facilities;
- Any fuel handling, storage, or refuelling on site will be located on stable ground away from waterbodies, preferably a minimum of 30 m from access locations, taking topography and slope into consideration. Spill containment supplies will be available in the immediate vicinity of the refueling area;
- Vehicles and equipment, including their hydraulic fittings, will be inspected daily to verify that they are in good condition and free of leaks, and excess oil or grease; worn parts will be replaced;
- Equipment will be parked on level ground and secured with wheel chocks and parking brakes at the end of shift;
- Install drip trays with sorbent pads under stationary equipment and under all equipment at the end of shift; inspect, clean out and replace sorbent pads regularly;
- Any vehicle and equipment maintenance will be conducted in a designated location approved by the Owner and Environmental Monitor. This maintenance will be conducted on an impermeable surface (e.g. over asphalt or lined surface). All waste materials (filters, rags, fluids, etc.) must be disposed of at an appropriate facility; and
- Spill kit supplies will be available and labeled at designated locations and accompany each piece of equipment. All construction team members will be trained to avoid spills and in the emergency response procedures in the event of a spill. Report all spills of a substance that is toxic, polluting, or deleterious to aquatic life of reportable quantities to the EMBC 24-hour phone line at 1-800-663-3456.

## 6.9 Concrete Management

Concrete leachate is alkaline and when it contacts water, it has the potential to change pH levels and cause harm to fish and other aquatic life. Concrete work will be carried out according to industry best practices. Best practices to prevent works involving the use of concrete, dust created from pulverized concrete, cement, mortars, and other Portland cement or lime-containing construction materials, from depositing, directly or indirectly, sediment, debris, concrete, concrete fines, wash or contact water into or about any waterbody. These include:

- Isolate uncured cast-in-place concrete from runoff flowing off site for a minimum of 48 hrs, or until pH is 6.5 - 9.0 and turbidity is within acceptable limits;
- Not wash concrete equipment and tools within 10 m of any aquatic areas or in proximity to storm drain systems. Designated concrete wash down station(s) will be located by MKJV at a safe distance away from any VECs and will be lined with plastic sheeting to contain all wash water;
- Monitor pH and implement mitigation measures, as needed, if pH in the receiving environment is altered more than 1.0 pH unit from the background level, or is recorded below 6.0 or above 9.0 pH units;
- Have a CO<sub>2</sub> tank, regulator, and a long hose with a gas diffuser, available during concrete work to neutralize pH in the event of runoff of concrete affecting water into the environment;
- Not use dilution and filtering as methods to control concrete leachate, which may cause further spreading; and
- Contain and remove any concrete waste from site.



## 6.10 Soil Management

### 6.10.1 Environmental Site Assessment Reports

A Limited Phase I Environmental Site Assessment was conducted by Current Environmental (CEL 2022c) and a Limited Phase II Environmental Site Assessment (ESA) was conducted by Core6 Environmental for areas of potential environmental concern (APEC) at Courtenay Pump Station and Comox Valley Pump Station (Core6 2022). The Phase I and II ESA identified APECs associated with:

- APEC 1 – Ferrous chloride storage and spill at Courtenay Pump Station
- APEC 2 – Discarded drums at Comox Water Pollution Centre
- APEC 3 – Potential underground storage tank at the southeast side of the Courtenay Pump Station building

Additional APECs associated with following BC Contaminated Sites Regulation (CSR) Schedule 2 Activities were noted for the Comox Water Pollution Control Centre (CVWPCC):

- H16 – Septic tank pumpage storage or disposal
- H17 – Sewage lagoons or impoundments
- H18 – Hazardous waste storage, treatment or disposal
- H19 – Sludge drying or composting

The identified areas of potential environmental contamination listed above have been overlaid with the Project alignment drawings in Appendix C. It is AECOM's understanding that any soils excavated as part of the project at the CVWPCC and the decommissioned Courtenay Pump Station will be reused on each property. The overlay drawing is being provided for information and MKJV should take extra care to monitor for suspect or known contaminated soils (APEC 1 on Courtenay Pump Station). If suspect or known contaminated soils are expected to be removed from site, MKJV (excluding AECOM) will need to characterize any suspect soil per the BC CSR standards and associated protocols prior to disposal off-site and any known contaminated soils exceeding CSR industrial land use standards shall be disposed of at an authorized facility. Additionally, there is also potential for encountering suspect contaminated soil or excavation water sourced from groundwater along the other parts of the Project alignment. The following subsections provide guidance on handling suspect soil and/or excavation water for the Project.

### 6.10.2 Chance Find Procedure for Contaminated Soil

During all excavation activities, the construction supervisor will notify the EM when suspected contaminated environmental media (i.e. soil and excavation water) is encountered per the indicators noted below. This chance find procedures is not applicable to any known and specified contaminated media being removed during the Project. The following procedure will be followed during access, construction, excavation, and remediation works:

- All excavated and imported soils will be assessed for indicators of potential soil contamination. Indicators of potentially contaminated soils include, but are not limited to:
  - Unusual appearance or odour;
  - Staining or sheens
  - Deleterious materials including but not limited to debris or trash (e.g., bricks, glass, drums, automotive parts, cleaning rags, tanks);
  - Suspect waste (e.g., batteries and metal parts); or
  - Invasive plants or plant seeds
- If suspected contaminated media are encountered, these materials will be segregated, stockpiled, and covered separately. Before these media can be re-located the EM will assess the material through visual inspection and/or sampling and testing for specific chemical compounds in accordance with the BC Environmental Management Act (EMA), BC Contaminated Sites Regulation (CSR) and associated protocols and guidance documents and determine the appropriate course of action. Any testing of samples will be conducted by an accredited laboratory; and the testing results will be evaluated to CSR industrial use standards and the



tabulated results and lab reports will be provided to the MKJV, the Owner and OE/OEC for review and soils management (on-site re-use or off-site disposal) is to be approved by Owner and OE/OEC prior to start of these works.

### 6.10.3 Soil Stockpile and Laydown Areas

MKJV will provide details on proposed laydown areas, soil/aggregate stockpile locations, and any excavation areas outside the existing road prism, for approval by the Owner.

The locations of laydown and soil stockpile sites must be assessed by the EM for sensitivity to nearby environmental receiving areas, such as ditches or streams, and any associated setbacks identified in this CEMP or municipal bylaws. See Section 7.7 for stockpile management and mitigation measures for erosion and sediment control.

Stockpiling procedures for suspected or known contaminated soils shall include controls to eliminate cross-contamination of underlying soils through direct contact (e.g., placed on concrete, asphalt, liner), seepage/leaching, or runoff (e.g., covering of stockpiles, diversion, or collection of water away from soils to avoid contact). Suspected contaminated stockpile areas for chance find materials will be determined prior to starting construction.

### 6.10.4 Dewatering

Water to be discharged to storm sewers or watercourses from the excavated trench that may be sourced from groundwater or precipitation will be monitored, as appropriate, against the applicable provincial Approved Water Quality Guidelines, as outlined in Table 3 in Section 7.7.1, or BC CSR Schedule 3.2 Standards. In addition, the Town of Comox *Drainage Infrastructure Protection Bylaw (No. 1824)* requires discharge water total suspended solids to be less than 25 mg/L and turbidity to be less than 20 NTU. In-situ sampling of water quality parameters listed in Table 3 is to be conducted for compliance with City Bylaw and provincial guidelines and can indicate the need for laboratory analysis. As such, water removed from excavations will be treated, as needed, to meet these standards prior to discharge.

Construction of municipal works that require the pumping of groundwater from excavations do not require a use approval under the *Water Sustainability Act*, as long as the water is immediately discharged, and it is not used for any purpose.

## 6.11 Archaeological and Heritage Resources

The project is situated within the consultative boundaries of K'ómoks First Nation, Nanwakolas Council, Qualicum First Nation, Tla'amin First Nation, We Wai Kai First Nation, Wei Wai Kum First Nation, and Xwemalkwu First Nation. First Nations and other heritage resources will be responsibly managed by the MKJV throughout all aspects of the Project according to the following criteria:

- Through a "Proposed Cultural Heritage Impacts Mitigations" report by Jesse Morin, PhD (Draft #4), a two-phase assessment of program of investigation and identification of project construction mitigation measures have been provided. The Chance Find Procedure (to be developed and provided by the Owner's consultant) will be followed if suspect archaeological material is encountered. The Chance Find Procedure will also provide direction on how to identify suspect archaeological material;
- Site alteration permits (SAP) and Heritage Inspection Permits (HIP) have been acquired by the Owner;
- If any suspect archaeological or heritage material is encountered, MKJV will immediately advise the CVRD of the discovery and follow at a minimum the procedures set out in the Chance Find Procedure established by the Owner's Archaeological Consultant; and
- MKJV shall act reasonably and cooperate with all requests from the archaeologists designated by the CVRD to inspect construction of the Work.

## 6.12 Fire Prevention and Response

MKJV will provide a detailed Fire Prevention and Response Plan separate from this CEMP, which will contain a minimum of the following procedures and protocols to be implemented during construction to minimize the potential for a fire on site:



- Smoking will be prohibited near dry fuel, explosives, fuel and hazardous materials;
- Fire equipment will be located on site including fire extinguishers, fire blankets, shovels, ladders, hand-tank pumps, etc.;
- Construction personnel will be aware of firefighting techniques, as appropriate;
- All vehicles will be equipped with fire extinguishers, as appropriate;
- No open fires or burning of brush is permitted on site;
- Vegetation around the perimeter of the work site will be irrigated or wet down during high fire risk season, as necessitated by the type of activity that could create sparks or open flames;
- Shutdown thresholds and procedures for prevention, equipment, and restrictions will refer to *BC Forest Fire Prevention and Suppression Regulation*; and
- Fuels will be contained in designated and safe storage areas/sheds out of direct sunlight.

### 6.13 Air Quality Management

Air emissions, such as vehicle/equipment exhaust, dust, vapours, and greenhouse gasses should be minimized to avoid adverse environmental, health, safety, and nuisance effects both on and off site. The following mitigation measures related to material handling, access, and vehicles will be applied to control emissions of fine particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), dust, and greenhouse gases:

- Equipment will be in good working order;
- Material stockpiles and work areas prone to wind erosion will be stabilized;
- Trucks will be loaded in a manner to avoid spilling during transport and shall be covered to contain soils;
- The burning of oils, rubber, tires, or any other material, shall not occur on site;
- Stationary sources of emissions, such as generators, will be turned off when not in use;
- All equipment will be kept in well maintained condition, used at optimal loads, and repaired, as required, to minimize emissions;
- The use of chemical dust suppressants, such as calcium lignosulphate, sodium lignosulphate, magnesium chloride, or hydrocarbons, are prohibited;
- Fugitive dust emissions will be managed and will be controlled, as necessary, through mitigation measures, such as the application of mulch and/or water to ground, vehicle wash down facilities, crushed rock exits from construction sites, sweeping paved surfaces using a skidsteer sweeper (or equivalent), and full containment of any concrete work that produces dust;
- Engine idling will be minimized to the extent feasible; and
- Truck loads will be optimized to reduce the number of trips between the source and destination.

### 6.14 Noise and Vibration

The following mitigation measures related to noise and vibration will be adhered to during project works:

- Maintain equipment in good working order;
- Maintain vehicles according to manufacturer's guidelines. Vehicles and equipment should be inspected on a regular basis by the contractor and maintained, as required;
- Implementing standard practices and use of "Best Available Control Technologies" for noise control on equipment, such as mufflers and silencers; and
- All personnel, contractors, and suppliers shall adhere to posted speed limits and safe operating speeds for all vehicles along the project access roads to reduce noise, operate safely, and to avoid potential collisions with wildlife.



## 6.15 Waste Management

### 6.15.1 Non-Hazardous Solid Waste Management

Non-hazardous solid wastes shall be sorted into separate, clearly labelled bins and recycled, if possible. Recyclable wastes, include cardboard, wood, metal, and approved plastics. Non-hazardous and non-recyclable wastes shall be included as general refuse and disposed of at the local landfill.

Waste material generated during construction will be handled using industry accepted BMPs, such as:

- Waste disposal containers are to remain within the designated contractor laydown areas;
- Where practical, recyclable materials (e.g., wood, paper, cardboard, plastic, glass, organic, Styrofoam) shall be segregated before transport to the appropriate facility;
- Waste materials must be secured to prevent the development of leachate from material contact with rain and surface water. Examples include placing lids over waste disposal containers or lining with poly sheeting;
- Organic (food) wastes shall be stored in containers with a secured lid and removed from the site daily to avoid attracting wildlife. Removal of food waste materials should be completed daily to help prevent potential wildlife encounters;
- Hauling of project materials with the potential to generate "flyaway" waste, shall be adequately secured;
- Cigarette butts shall be disposed of off site or within on-site disposal containers;
- Any vegetation that needs to be removed from the site will be stored at a designated storage area. No cut vegetation will be left at the work site unless directed otherwise by the EM; and
- Upon completion of work, all surplus materials and equipment will be removed from the site by MKJV. The site will be left in a condition that is acceptable to the EM.

### 6.15.2 Hazardous Waste Management

Hazardous Substances and Hazardous Products used on site will be transported, stored, removed, and disposed in accordance with *Hazardous Waste Legislation Guide* (BC MOE 2016) and with all other relevant legislation.

Hazardous materials may include any controlled or hazardous substances used on the Site, such as, asbestos, fuels, used fuels, oils, oil filters, greases, bitumen, lubricants, solvents, cement, paints, solvents, batteries, cleaners, dust suppressants, PCBs, and used spill cleanup materials.

Hazardous waste that is spilled could affect surface water quality, air quality, fish habitat or wildlife habitat. Prevention of such occurrences is best undertaken by conformance with BMPs and spill prevention measures (e.g., secondary containment, spill kits). All hydrocarbon products and other hazardous wastes potentially present during project activities will be identified and the associated Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS) will be made available to all construction team members. WHMIS labels must be on all controlled materials.

Hazardous waste generated by contractors must be stored and handled according to the BC *Hazardous Waste Regulation*. For temporary storage on-site, this will include:

- Covered containment using approved containers;
- Isolation from flammable and combustible materials (> 10 m);
- Proper labelling, inventory, and documentation; and
- Storage at least 30 m away from storm drains and waterbodies.

All hazardous wastes shall be transported off site to appropriate disposal areas using appropriate manifests and record keeping in accordance with the BC *Hazardous Waste Regulation* and Federal *Transportation of Dangerous Goods Act*. All manifests should be kept on-site and provided to the Project owner and made available to the EM upon request.

## 6.16 Site Restoration and Protection of Sensitive Habitats

MKJV will restore the Project site and disturbed sensitive habitats upon completion of Construction or ideally, as soon as possible. Restoration requirements shall include:

- Disturbed areas will be recontoured to a stable angle, returning them as closely as possible to their natural state, and protected from erosion using permanent natural methods and materials. Permanent erosion protection may include re-seeding with an approved weed-free seed mixture and/or installing biodegradable erosion control blankets. All seeding shall be planned to allow establishment before the end of the growing season (early fall or early spring).
- At the end of the project, all equipment, supplies, and non-biodegradable materials will be removed from the site.
- Under the direction of a QEP, place salvaged large woody debris (LWD) in impacted riparian areas (e.g., in disturbed areas outside of long-term maintenance access paths) within 30 m of wellands to provide habitat for wildlife.
- Retain and use LWD to enhance habitats along rehabilitated corridors, but avoid creation of long linear stacks of woody debris (windrows) that may hinder wildlife movement;
- Install gates at permanent and natural barriers (e.g., boulders, LWD, berms) at temporary Project access points to prevent public vehicular access into sensitive habitat; and
- Stockpile excavated topsoil for reuse in site remediation when such topsoil does not contain invasive plant species.



## 7. References

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## **Appendix A Environmental Orientation Record**



# Environmental Orientation Record

<b>Project Title:</b> Comox Valley Regional District Sanitary Sewer Conveyance Project	
<b>Revision number:</b> 0	<b>Date:</b> May 28, 2024

The Environmental Orientation Record (EOR) shall be completed as a component of the project kick-off or orientation, and during all subsequent crew indoctrinations alongside the safety orientation. The EOR must be amended if there is a significant change in scope, a new phase of work commences, or if new contractors mobilize to the site.

By signing the EOR, the parties listed on the contact sheet indicate they have been advised of, and understand, the environmental requirements, and that they will communicate the environmental requirements to all personnel including, but not limited to, subcontractors and replacement crew leaders.

**Project Location:** Courtenay, Comox, Comox Valley Regional District, BC

**Project Description:** The Project is a multi-year construction project that will replace existing sanitary forcemains and upgrade the pump stations that move more than 14,000 m<sup>3</sup> of raw sewage each day from the Courtenay Pump Station to the Comox Valley Water Pollution Control Centre on Brent Road in Comox, BC.

Key mitigation measures and requirements excerpts from the Construction Environmental Management Plan (CEMP) have been provided in this EOR. Refer to the CEMP for more details.

Mitigation of Potential Environmental Impacts	Reviewed (initial)
<u>Valued Ecosystem Components</u>	
<ul style="list-style-type: none"> <li>• <b>Existing Courtenay Pump Station Vegetated Areas:</b> One Garry oak (<i>Quercus garryana</i>), a tree protected under the City of Courtenay <i>Tree Protection and Management Bylaw No. 2850</i>, is located 9 m from the pump station building. Potential green heron (<i>Butorides virescens</i>), a Provincially blue-listed species, nesting habitat is present within surrounding vegetation.</li> <li>• <b>Comox Road South Toe of Slope Edge:</b> Henderson's checker-mallow (<i>Sidalcea hendersonii</i>), a provincially blue-listed plant species, is present along the Comox Road south toe of slope edge near the Courtenay Pump Station and further east, and likely present along Comox Road at K'omoks First Nation land (see EMP (Current) for figure showing locations).</li> <li>• <b>Glen Urquhart Creek and Courtenay River Estuary:</b> Located immediately adjacent to the forcemain alignment, Glen Urquhart Creek and the Courtenay River Estuary contain a variety of habitat and wildlife and aquatic species.</li> <li>• <b>2754 Farview Road:</b> There is potential for barn owl (<i>Tyto alba</i>), a <i>Species at Risk Act</i> (SARA) Schedule 1 Threatened and Provincially red-listed species, and barn swallow (<i>Hirundo rustica</i>), a SARA Schedule 1 Threatened species, nesting in/on the buildings at 2754 Farmview Road.</li> <li>• <b>Roadside Ditch 100 m East of K'omoks Pump Station:</b> The ditch has connection to the Courtenay River Estuary, a VEC, and is immediately adjacent to the sanitary forcemain alignment. The ditch may contain valuable habitat for a variety of wildlife and is a VEC.</li> <li>• <b>Jane Place/Comox Pump Station Adjacent Vegetated Area:</b> The seashore saltgrass – Pacific swampfire (<i>Distichlis spicata</i> – <i>Sarcocornia pacifica</i>) Provincially red-listed</li> </ul>	

Mitigation of Potential Environmental Impacts	Reviewed (initial)
<p>ecosystem at risk is present next to the Jane Place/Comox Pump Station.</p> <ul style="list-style-type: none"> <li>• <b>Lazo Marsh along Lazo Road:</b> Lazo marsh potentially contains red-legged frog (<i>Rana aurora</i>), a Provincially blue-listed and SARA-listed Schedule 1 Special Concern species, and a variety of other aquatic and wildlife species and valuable habitat.</li> <li>• <b>Area North of Comox Valley Water Pollution Control Centre:</b> The trembling aspen/ Pacific crab apple/ slough sedge (<i>Populus tremuloides/ Malus fusca/ Carex obnupta</i>) Provincially red-listed ecosystem at risk and Sitka spruce/ slough sedge (<i>Picea stichensis/ Garex obnupta</i>), Provincially blue-listed ecosystem at risk, are present within the southeastern and southern portions, respectively, of a wetland, that the sanitary forcemain alignment will be adjacent to. The wetland, its riparian zone, and ecosystems at risk are considered VECs.</li> </ul>	
<p><b><u>Clearing, Grubbing, Tree Protection and Hazard Tree Abatement</u></b></p> <ul style="list-style-type: none"> <li>• Clearing within VECs for construction is limited to the sanitary forcemain alignment that will go between two wetlands to the north of the CVWPCC. Clearing within 30 m of the wetlands shall be limited to the extent necessary to enable installation of the sanitary forcemain. Any clearing for laydown or staging shall occur at least 30 m away from the wetlands.</li> <li>• Prior to any vegetation disturbance or clearing, the QEP or EM will physically delineate VECs, other sensitive areas, and clearing limits, with flagging tape/stakes. Once vegetation is removed and soils exposed, erosion and sediment control measures will be implemented to protect aquatic areas from sedimentation.</li> <li>• Prior to any vegetation disturbance, an area will be surveyed by a QEP, or qualified EM supervised by a QEP, prior to the start of work, to identify breeding, nesting, roosting, or rearing areas for birds and other wildlife, to determine if any mitigation measures are required. If potential bird nesting habitat is to be disturbed between March 1 and August 30, and if active nests are found areas will be flagged and no work will be permitted in the flagged area until the nest is no longer active.</li> <li>• To help limit impacts to potentially present wildlife, carefully remove large woody debris (LWD) (e.g., logs) from the alignment and if possible, move the debris to adjacent forested areas where it can continue to provide habitat or retain and use LWD to enhance habitats along rehabilitated corridors (the EM will provide guidance).</li> <li>• No expansion beyond the Project working limits onto neighbouring properties will be allowed. This includes truck turning radiuses, material stockpiles, and spoilage of soils or vegetation;</li> <li>• Minimize the disturbance of existing vegetation, plant communities, and soil on the construction site and limit to required areas only;</li> <li>• MKJV will stockpile clean excavated topsoil for reuse in site restoration;</li> <li>• Tree protection and hazard tree abatement requirements that shall be implemented, include:</li> <li>• Hazard trees within and adjacent to the work area must be assessed by a qualified professional and appropriate measures taken to meet WorkSafe BC standards. <u>Tree protection zones shall be adhered to, as shown on the construction drawings;</u></li> <li>• Avoid all activities (e.g., excavation, laydown, equipment presence) within the drip line of trees to help prevent impacts to root structures; however, when work is required within this area, implement the below mitigation measures provided by an arborist. Felled trees on Crown or CVRD land, outside of working limits, will remain <i>in-situ</i>, unless otherwise directed. The Owner's arborist identified specific tree protection (fencing) and hazard tree management requirements in the <i>Tree Health and Protection Arborist Report</i> (Mumby, V., Aug. 2022), which shall be reviewed and implemented; they generally include: <ul style="list-style-type: none"> <li>• Installation of tree protection fencing, to protect tree stems and roots, is required in several locations where the sanitary forcemain alignment is near trees;</li> <li>• An arborist is required to be on site during certain situations to assess tree roots during</li> </ul> </li> </ul>	



Mitigation of Potential Environmental Impacts	Reviewed (initial)
<p>excavation;</p> <ul style="list-style-type: none"> <li>• Pruning is required for some trees; and</li> <li>• Root management may be required, such as adding organic matter and implementing mitigation measures to prevent exposed roots from drying out.</li> <li>• Clearing of hazard trees outside of the required project clearing limits will be completed using hand tools (e.g., chainsaw) where use of mobile machinery will cause environmental damage (e.g., soil rutting, vegetation disturbance). Tree removal will prioritize minimizing ecological impacts; and</li> <li>• The revised sanitary forcemain alignment along Lazo Road, Brent Road, and within the vegetated area north of the CVWPCC will have an arborist report completed by MKJV and all tree protection and hazard tree recommendations provided, if any, shall be implemented. <u>The report shall be submitted to the Owner and OE/OEC prior to implementation of recommendations.</u></li> </ul>	
<p><b><u>Site Delineation and Protection of Valued Ecosystem Components</u></b></p> <p>Unnecessary expansion of the project footprint must be minimized, and the following mitigation measures related to this issue which will reduce risk to VECs:</p> <ul style="list-style-type: none"> <li>• Design drawings will show all clearing boundaries, including requirements for truck access, laydown and staging areas, additional materials storage (stockpiles and side castings), pads and machinery control cabins, slurry separation plant, bentonite mixing and concrete batching, site offices and parking, and any additional areas requiring clearing;</li> <li>• Prior to construction, the EM and Construction Supervisor are to clearly mark the boundaries of project activities, including the limits of all known or newly identified VECs;</li> <li>• Access and egress routes to the site must be minimized in number and area as much as possible to reduce impact to VECs;</li> <li>• No machinery access or spoil material storage of any kind is to occur outside the delineated project areas without consent of a representative of the Owner's Engineering team;</li> <li>• Vegetation identified for protection, (e.g., outside designated work areas) will be left intact and root systems undisturbed unless specifically approved by the Owner's Engineering team and OEC;</li> <li>• Clearing near VECs must be completed in an incremental manner, not left exposed for longer than necessary, or will be temporarily contained with erosion and sediment countermeasures, such as surface roughening and application of clean mulch; and</li> <li>• Where there are trees close to but outside of clearing limits, with the approval of an arborist, limbs will be pruned or tied back in place of removing the entire tree to improve sightlines/machine swing areas.</li> </ul>	
<p><b><u>Invasive Species Management</u></b></p> <ul style="list-style-type: none"> <li>• Himalayan blackberry (<i>Rubus ameniacus</i>) and Scotch broom (<i>Cytisus scoparius</i>) have been identified in the Project area and are located within the construction footprint. Scotch broom is listed in the Comox Valley Regional District <i>Invasive Plant Species Strategy</i> with a "control" management strategy. Scotch broom is particularly present at Parcels 19 and 20 near Scott Road. Other invasive species are present (e.g., within agricultural field alignment sections, roadside edges) that could be within the construction footprint, such as common tansy and red deadnettle within Parcel 18. The EM shall confirm presence, identify any new invasive plant presence, and flag all areas with invasive species that are proposed for disturbance, prior to clearing.</li> <li>• Invasive species that may be disturbed must be removed prior to clearing work, under the supervision of the EM. All vegetative matter will be contained (i.e. placed in plastic bags or bins) to prevent the spread of invasive plants during transport for disposal <u>at an appropriate</u></li> </ul>	

Mitigation of Potential Environmental Impacts	Reviewed (initial)
<p><u>waste facility</u></p> <ul style="list-style-type: none"> <li>• Species-specific removal requirements shall follow those within the Invasive Species Council of BC's <i>Factsheets</i> (Appendix D). Where <i>Factsheets</i> are not available for a particular species, removal requirements shall be prescribed by the QEP, which may be based on alternative guidelines or general BMPs for invasive plant management.</li> <li>• Clean all equipment used to remove invasive species (including hand tools) before equipment is moved to new area or taken offsite, to avoid further spread;</li> <li>• Clean all equipment and vehicles of soil and plant material prior to accessing the site;</li> <li>• All soil entering the project site shall be certified free from invasive species;</li> <li>• Transport invasive species to an appropriate waste facility (e.g., Comox Strathcona Waste Management Centre<sup>2</sup>) for disposal;</li> <li>• Revegetate disturbed areas with suitable grass seed mix and/or native vegetation upon completion of works;</li> <li>• Be alert for new invasive plants growing along rights-of-way and remove them promptly before they become established and spread;</li> <li>• Vehicle and machinery movement will be limited to work areas to reduce seed dispersal and minimize damage to plant communities, both within and beyond the Project site.</li> <li>• Materials used for ESC should not contain <u>invasive species</u> (i.e., straw bales); and</li> <li>• Noxious weeds listed under the BC <i>Weed Control Act</i> are often highly invasive and must be managed with extreme care to minimize spread of the plant to other areas. No noxious weeds have been identified within the Project footprint to date.</li> </ul>	
<p><u>Wildlife Interactions</u></p> <p>If there is a wildlife encounter during construction on the Project site, it must be immediately reported to the EM. This includes encounters with nests (active or potentially inactive), dens, and other wildlife habitation sites. If predators, or other large mammals, such as cougars, bears, wolves, elk, etc., should approach the work area, efforts should be made to scare them away (often using loud noise effects). If the animal returns persistently, the Provincial Conservation Officer service must be contacted to determine the appropriate course of action for managing the encounter (1-877-952-7277 (BC Report All Poachers and Polluters 24 hr Hotline)).</p>	
<p><u>Species at Risk and Ecosystems at Risk</u></p> <p>The following species-specific mitigation measures are required for implementation, and are generally presented beginning from the west end of the alignment to the east:</p> <ul style="list-style-type: none"> <li>• <b>Garry Oak – Existing Courtenay Pump Station:</b> One Garry oak (<i>Quercus garryana</i>), a tree protected under the City of Courtenay <i>Tree Protection and Management Bylaw No. 2850</i>, is located 9 m from the pump station building. The tree requires tree protection zone fencing to be installed prior to construction at 3.5 m around the tree, as indicated in the EMP.</li> <li>• <b>Green Heron – Existing Courtenay Pump Station:</b> Potential green heron (<i>Butorides virescens</i>), a Provincially blue-listed species, nesting habitat is present. If vegetation disturbance is required adjacent to the pump station, bird nest surveys shall be completed by a QEP or qualified EM that is supervised by a QEP.</li> <li>• <b>Henderson's Checker-mallow – Comox Road:</b> Henderson's checker-mallow (<i>Sidalcea hendersonii</i>), a provincially blue-listed plant species is present along the Comox Road south toe of slope edge near the Courtenay Pump Station and further east, and likely present along Comox Road at K'omoks First Nation land (see EMP (Current) for figure showing</li> </ul>	



Mitigation of Potential Environmental Impacts	Reviewed (initial)
<p>locations). Although not anticipated to be disturbed by construction activities, measures shall be implemented to help prevent disturbance (e.g., installation of sediment fence), as recommended by the EM prior to construction in the area.</p> <ul style="list-style-type: none"> <li>• <b>Barn Owl and Barn Swallow – 2754 Farview Road:</b> There is potential for barn owl (<i>Tyto alba</i>), a SARA Schedule 1 Threatened and Provincially red-listed species, and barn swallow (<i>Hirundo rustica</i>), a SARA Schedule 1 Threatened species, nesting in/on the buildings at 2754 Farmview Road. Works are not anticipated to physically impact nests; however, activities could cause behavioural disturbance of nesting activities. Prior to adjacent construction if starting within the nesting season, the QEP or qualified EM that is supervised by a QEP, shall conduct nest surveys. If active nests are identified, the QEP shall prepare site-specific mitigation measures. See Appendix C, Sheet Number FM-SKE-H-004.</li> <li>• <b>Seashore Saltgrass/ Pacific Swampfire – Jane Place/Comox Pump Station:</b> The seashore saltgrass – Pacific swampfire (<i>Distichlis spicata – Sarcocornia pacifica</i>) Provincially red-listed ecosystem at risk is present next to the Jane Place/Comox Pump Station. No works shall occur outside of the existing developed/disturbed footprint without review and approval by the QEP. See Appendix C, Sheet Number FM-SKE-H-019.</li> <li>• <b>Red-legged Frog – Lazo Marsh at Lazo Road:</b> Red-legged frog (<i>Rana aurora</i>), a Provincially blue-listed and SARA-listed Schedule 1 Special Concern species, has a listed occurrence in Lazo Marsh from 2007 documented by the BC Conservation Data Centre. Works shall remain within the road corridor, appropriate ESC measures shall be implemented, as recommended during construction by the EM, and appropriate salvage measures, as provided in the Wildlife Interactions section, shall be implemented during Lazo Marsh sanitary forcemain culvert intersection works. See Appendix C, Sheet Number FM-SKE-H-015.</li> <li>• <b>Treed Wetlands – Northeast of Comox Valley Water Pollution Control Centre:</b> Two wetlands and their riparian areas are present and contain ecosystems at risk. The trembling aspen/ Pacific crab apple/ slough sedge (<i>Populus tremuloides/ Malus fusca/ Carex obnupta</i>) provincially red-listed ecosystem at risk and Sitka spruce/ slough sedge (<i>Picea stichensis/ Garex obnupta</i>) provincially blue-listed ecosystem at risk, are present within the southeastern and southern portions of the eastern wetland, as identified by Current Environmental (2022). The sanitary forcemain alignment is between the two wetlands. The extents of the wetlands have been delineated by AECOM (AECOM, 2024b). See Appendix C, Sheet Number FM-SKE-H-018. The following mitigation measures shall be implemented: <ul style="list-style-type: none"> <li>- All work and clearing within the boundaries of the wetlands will be avoided;</li> <li>- Clearing within the riparian areas of the wetlands shall be limited to the extent necessary to enable installation of the sanitary forcemain;</li> <li>- Any clearing for laydown or staging shall occur outside of a 30 m riparian buffer and outside of ecosystems at risk boundaries, if feasible;</li> <li>- Clearing limits shall be flagged and fenced (e.g., snow fencing) in this area prior to clearing; and</li> <li>- A rare plant survey, including wetland riparian areas shall be completed by a QEP during the growing season prior to clearing. If rare plants are present, a QEP shall develop a management plan for implementation, prior to clearing. The plan will include restoration activities to be implemented following construction.</li> </ul> </li> </ul> <p>The following general mitigation measures to avoid and minimize harm to species at risk:</p> <ul style="list-style-type: none"> <li>• Do not handle wildlife without a General Wildlife Permit issued under the BC <i>Wildlife Act</i>;</li> <li>• Survey suitable habitat for the presence of species at risk (focal species and their key habitats are detailed in the project EMP (CEL, 2022b)) prior to any disturbance being made in those areas (See Appendix C);</li> <li>• During administration of the Environmental Orientation Record (EOR; Appendix A), the EM</li> </ul>	

Mitigation of Potential Environmental Impacts	Reviewed (initial)
<p>will familiarize work crews with identification of species at risk likely to be encountered and will outline crew protocols for informing the EM of occurrences.</p> <ul style="list-style-type: none"> <li>• If any species at risk are detected, increase efforts to locate others in the area and/or move work to another part of the site for the remainder of the day; and</li> <li>• Minimize disturbance of natural vegetation, particularly near streams and wetlands.</li> </ul>	
<p><b><u>Aquatic Habitats and Crossings</u></b></p>	
<p>Works near waterbodies require the following mitigation measures to be implemented:</p> <ul style="list-style-type: none"> <li>• All streams, <u>ditches</u>, wetlands, ponds, or any waterbody associated with this project are presumed to be fish bearing, <u>with exception of the wetlands north of the CVWPCC that are isolated from any watercourse, are unlikely fish bearing</u>. Avoid or minimize riparian clearing near aquatic habitats and do not excessively disturb soils and plants;</li> <li>• Do not cause any negative effects to any water body that would result in that waterbody being non-compliant with the <i>BC Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture (2023)</i> and the associated Canadian Council of Ministers of the Environment (CCME) <i>Canadian Water Quality Guidelines for the Protection of Aquatic Life (2002)</i>;</li> <li>• Water quality monitoring will include collection of baseline (pre-disturbance) measurements as well as during and after any work near or in aquatic areas, at locations and frequencies determined by the QEP. At a minimum, turbidity measurements are required and will be collected using calibrated handheld electronic meters. Dissolved oxygen, temperature, and pH will be measured at the discretion of the QEP. Water quality measurements will be compared against <i>BC Approved Water Quality Guidelines: Aquatic Life, Wildlife &amp; Agriculture (2023)</i> and <i>CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (2002)</i>; any exceedances will be reported in an Environmental Incident Report (EIR; Appendix B) and weekly EM reports.</li> <li>• Perform frequent visual checks of streams and wetlands near construction activities. If sediment is observed in a stream or wetland, work will stop and the EM contacted;</li> <li>• Implement sediment and erosion control measures, as appropriate (see details in the Erosion &amp; Sediment Control section);</li> <li>• Restore any disturbed streambanks to pre-construction or natural conditions;</li> <li>• Avoid stockpiling of material on stream banks and in riparian zones;</li> <li>• Use sediment fence along creek banks;</li> <li>• Limit equipment access to banks or areas adjacent to waterbodies;</li> <li>• Limit grubbing on watercourse banks to the area required for the footprint of the works, undertakings and activities;</li> <li>• Construct access points and approaches perpendicular to the watercourse or waterbody, where possible; and</li> <li>• Operate all equipment from a dry location above the high-water mark.</li> <li>• For instream works, the following mitigation measures shall be implemented:</li> <li>• Adhere to all requirements for making changes in and about a stream (Lazo Marsh culvert works, as provided in the Terms and Conditions received from the <i>Water Sustainability Act Section 11 Notification</i>);</li> <li>• Adhere to all requirements for works within and near fish habitat (Lazo Marsh culvert works, works along Comox Road), as provided in an anticipated letter provided by Fisheries and Oceans Canada following submittal of a request for project review;</li> </ul>	



Mitigation of Potential Environmental Impacts	Reviewed (initial)
<ul style="list-style-type: none"> <li>• Adhere to the BC <i>Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia</i> (Government of BC 2021);</li> <li>• Disturbed channels are to be restored to pre-construction condition upon completion of project activities; and</li> <li>• Equipment to use biodegradable oils and lubricants when working instream, and on banks.</li> <li>• All instream works, including those through Lazo Marsh (temporary removal of culvert sections), the Courtenay Pump Station storm sewer outfall works into Courtenay River Estuary, and the crossing of Glen Urquhart Creek (required in the event of damage to a culvert), shall be isolated from stream flow/ water and conducted in the dry to help prevent impacts to fish, amphibians, and water quality, and will be completed using the following measures:             Following fish salvage (see above requirements in the Salvage subsection), instream isolation measures shall be installed, such as steel road plates for marshland areas or 1 tonne or regular sized sandbags wrapped with plastic (poly or tarpaulin) sheeting. Clean Pit run material (free of sediment) may be used to fully seal the isolation, if needed;             Gradually dewatering the instream work area and preventing suction hoses from intaking fine sediment (e.g., suspending the hoses or creating a rock-lined sump); and             Rewatering the instream work area gradually and allowing potentially generated sediment to settle before fully removing isolation;</li> <li>• The following DFO Codes of Practice shall be adhered to during instream works, as required:               <ul style="list-style-type: none"> <li>- <i>End-of-Pipe Fish Protection Screens for Small Water Intakes in Freshwater</i> (interim) and <i>In-Water Site Isolation</i> (interim) (DFO 2023a): These Codes of Practice will be adhered to if dewatering is required for the potential instream work area for the culverts connecting the north and south ends of Lazo Marsh and for installation of a storm sewer headwall in the Courtenay River Estuary from the Courtenay Pump Station.</li> </ul> </li> <li>• The following DFO's <i>Measures to Protect Fish and Fish Habitat</i> shall be implemented for instream works (DFO 2023b):               <ul style="list-style-type: none"> <li>- Minimize affecting fish by conducting instream work during the default reduced risk work window of August 15 to September 15;</li> <li>- Maintaining riparian vegetation where possible, such as by avoiding tree and shrub removal, using existing trails and roads, and using measures to prevent soil compaction (e.g., swamp pads);</li> <li>- Conducting works, undertakings, and activities on land. This can be achieved by conducting all works from land, when possible, and not disturbing stream/river banks;</li> <li>- Maintaining fish passage;</li> <li>- Ensuring proper sediment control by avoiding introduction of sediment into the water, implementing an ESC plan, regularly inspecting ESC mitigation measures, keeping ESC measures installed until disturbed ground is stabilized, maintaining water quality, and avoiding instream works during periods of high rainfall; and</li> <li>- Preventing entry of deleterious substances in water.</li> </ul> </li> </ul>	
<p><b><u>Erosion and Sediment Control Plan</u></b></p>	
<p>Project activities are to be conducted in a manner that avoids potential for erosion and introduction of sediment or sediment-laden waters into any watercourse. The fundamental approach to ESC is to keep clean water clean and contain and manage water that collects or lands within work areas. Areas requiring ESC measures, include but are not limited to:</p> <ul style="list-style-type: none"> <li>• Along the banks of waterbodies, including Courtenay River Estuary, Glen Urquhart Creek,</li> </ul>	

Mitigation of Potential Environmental Impacts	Reviewed (initial)
<p>Lazo Marsh, and the ditch located approximately 100 m east of K'omoks Pump Station, and any ephemeral streams/seeps where water is present and there is risk of sediment entering a watercourse;</p> <ul style="list-style-type: none"> <li>• Laydown areas and areas with stockpiles;</li> <li>• Along sloped areas where runoff from construction is likely to occur; and</li> <li>• Areas with increased equipment/vehicle traffic adjacent to watercourses (i.e., bridges and culvert crossings).</li> </ul> <p>MKJV will install and maintain ESC measures where required. It is the responsibility of the EM to monitor and provide recommendations for improvement on ESC measures. The following general BMPs for mitigation and management for ESC will be followed:</p> <ul style="list-style-type: none"> <li>• ESC works will be implemented prior to start of land disturbance and will be maintained and repaired in a timely manner throughout the Project;</li> <li>• Applicable aspects of <i>Requirements and Best Management Practices for Making Changes In and About a Stream in B.C.</i> (MoE 2022), <i>Land Development Guidelines for the Protection of Aquatic Habitat</i> (DFO 1992), and <i>Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia</i> (MOE 2014) will be applied;</li> <li>• Erosion and sediment transport will be controlled close to the source and to the extent possible, contained within construction areas. This may require tarping of material stockpiles or steep disturbed slopes;</li> <li>• Additional mitigation measures will be applied as necessary based on site observations to maintain worksite isolation and prevent the introduction of sediment laden water to any waterbody, adjacent property, or roadway;</li> <li>• All mitigation measures will be maintained until construction is complete and the affected areas are stabilized. This may require revegetation of some areas; and</li> <li>• Locate laydown areas on flat, stable surfaces at least 30 m from any waterbody.</li> </ul>	
<p><b><u>Spill Prevention and Emergency Response</u></b></p> <p>Spill response, containment, recovery, and clean-up procedures are described in this section. MKJV is responsible for providing the necessary equipment required for spill response. MKJV will have a list of hazardous materials and products along with the appropriate Safety Data Sheets on site. The procedures of this spill response plan will be in accordance to the BC Spill Reporting Regulation under the <i>Environmental Management Act</i>.</p> <p>The following materials will be readily available on site for implementation, if required:</p> <ul style="list-style-type: none"> <li>• Spill kits will be available and labelled at designated locations;</li> <li>• Spill kits will be inventoried and re-stocked regularly, including immediately after a spill response incident;</li> <li>• A spill kit capable of containing the largest spill possible, shall be always available during construction.</li> <li>• Spill response equipment (e.g., absorbent pads, pillows, oil sponges, socks) will be used to clean hydrocarbon spills;</li> <li>• Absorbent booms and pads will be kept on-site to skim hydrocarbons if detected in water;</li> <li>• Spill kits will be carried in project vehicles. The required contents are to be carried in each vehicle inside a container marked "Spill Kit". The minimum required content of vehicle spill kits is:</li> <li>• Goggles, PVC gloves, 10 absorbent pads, 2 absorbent booms (3 m), 1 container of emergency sealant, 3 heavy duty plastic bags.</li> <li>• When working within 30 metres of a waterbody with equipment that may result in a spill of a hazardous substance, suitable types and quantities of absorbents and containment</li> </ul>	



Mitigation of Potential Environmental Impacts	Reviewed (initial)
<p>measures must be on site and available for deployment in the event of a spill; and</p> <ul style="list-style-type: none"> <li>• Appropriate training of workers in the use of spill response equipment, including the location, type, and correct deployment of spill response equipment relating to the nature and location of work and potential onsite spills.</li> </ul> <p>The following spill response, notification and reporting procedures are to be implemented in sequential order in the event of a spill of fuel, oil, lubricant, or other harmful substance:</p> <ul style="list-style-type: none"> <li>• <b>Make the area safe</b></li> <li>• <b>Stop the flow (when possible)</b></li> <li>• <b>Secure the area</b></li> <li>• <b>Contain the spill</b></li> <li>• <b>Clean-up</b></li> <li>• <b>Notify/Report</b></li> <li>• MKJV Site Superintendent will verbally report to the EM as soon as practical, what, how and where the incident occurred along with how the spill was cleaned up. Further assessment of environmental impact or additional clean up may be required by the EM.</li> <li>• MKJV Site Superintendent will determine appropriate regulatory notification obligations, with assistance from the EM, if needed, and will report spills within 24 hrs. MKJV will be responsible for preparing end-of-spill reports for submission to the Province of BC.</li> <li>• Spills in water, regardless of amount, are reported to the <b>Emergency Management BC (EMBC)</b> emergency coordination centre (<b>1-800-663-3456</b>) within 24 hrs by the MKJV Site Superintendent.</li> <li>• Report harmful impacts to fish and fish habitat and deposit of deleterious substances to DFO using the <b>Observe Record and Report hotline (1-800-465-4336)</b> within 24 hrs by the MKJV Site Superintendent.</li> <li>• Refer to the CEMP for more information.</li> </ul>	
<p><b><u>Concrete Management</u></b></p>	
<p>Concrete leachate is alkaline and when it contacts water, it has the potential to change pH levels and cause harm to fish and other aquatic life. Concrete work will be carried out according to industry best practices. Best practices to prevent works involving the use of concrete, dust created from pulverized concrete, cement, mortars, and other Portland cement or lime-containing construction materials, from depositing, directly or indirectly, sediment, debris, concrete, concrete fines, wash or contact water into or about any waterbody. These include:</p> <ul style="list-style-type: none"> <li>• Isolate uncured cast-in-place concrete from runoff flowing off site for a minimum of 48 hrs, or until pH is 6.5 - 9.0 and turbidity is within acceptable limits;</li> <li>• Not wash concrete equipment and tools within 10 m of any aquatic areas or in proximity to storm drain systems. Designated concrete wash down station(s) will be located by MKJV at a safe distance away from any VECs and will be lined with plastic sheeting to contain all wash water;</li> <li>• Monitor pH and implement mitigation measures, as needed, if pH in the receiving environment is altered more than 1.0 pH unit from the background level, or is recorded below 6.0 or above 9.0 pH units;</li> <li>• Have a CO<sub>2</sub> tank, regulator, and a long hose with a gas diffuser, available during concrete work to neutralize pH in the event of runoff of concrete affecting water into the environment;</li> <li>• Not use dilution and filtering as methods to control concrete leachate, which may cause further spreading; and</li> <li>• Contain and remove any concrete waste from site.</li> </ul>	

Mitigation of Potential Environmental Impacts	Reviewed (initial)
<p><b><u>Soil and Groundwater Management</u></b></p> <p>A Limited Phase I Environmental Site Assessment was conducted by Current Environmental (CEL 2022c) and a Limited Phase II Environmental Site Assessment (ESA) was conducted by Core6 Environmental for areas of potential environmental concern (APEC) at Courtenay Pump Station and Comox Valley Pump Station (Core6 2022). The Phase I and II ESA identified APECs associated with:</p> <ul style="list-style-type: none"> <li>• APEC 1 – Ferrous chloride storage and spill at Courtenay Pump Station</li> <li>• APEC 2 – Discarded drums at Comox Water Pollution Centre</li> <li>• APEC 3 – Potential underground storage tank at the southeast side of the Courtenay Pump Station building</li> </ul> <p>Additional APECs associated with following BC Contaminated Sites Regulation (CSR) Schedule 2 Activities were noted for the Comox Water Pollution Control Centre (CVWPCC):</p> <ul style="list-style-type: none"> <li>• H16 – Septic tank pumpage storage or disposal</li> <li>• H17 – Sewage lagoons or impoundments</li> <li>• H18 – Hazardous waste storage, treatment or disposal</li> <li>• H19 – Sludge drying or composting</li> </ul> <p>The identified areas of potential environmental contamination listed above have been overlaid with the Project alignment drawings in Appendix C. It is AECOM's understanding that any soils excavated as part of the project at the CVWPCC and decommissioned Courtenay Pump Station will be reused on that property. The overlay drawing is being provided for information and MKJV should take extra care to monitor for suspect contaminated soils (APEC 1 on Courtenay Pump Station). If suspect or known contaminated soils are expected to be removed from site, MKJV (excluding AECOM) will need to characterize any suspect soil per the BC CSR standards and associated protocols prior to disposal off-site and any known contaminated soils exceeding CSR industrial land use standards shall be disposed of at an authorized facility. Additionally, there is also potential for encountering suspect contaminated soil or excavation water sourced from groundwater along the other parts of the Project alignment.</p> <p>Refer to the CEMP, Section 6.10.2 for Chance Find Procedure for Contaminated Soil and Section 6.10.3 for Soil Stockpile and Laydown Areas.</p> <p>Water to be discharged to storm sewers or watercourses from the excavated trench that may be sourced from groundwater or precipitation will be monitored, as appropriate, against the applicable provincial Approved Water Quality Guidelines, as outlined in Table 3 in Section 7.7.1, or BC CSR Schedule 3.2 Standards. In addition, the Town of Comox <i>Drainage Infrastructure Protection Bylaw (No. 1824)</i> requires discharge water total suspended solids to be less than 25 mg/L and turbidity to be less than 20 NTU. In-situ sampling of water quality parameters listed in Table 3 is to be conducted for compliance with City Bylaw and provincial guidelines and can indicate the need for laboratory analysis. As such, water removed from excavations will be treated, as needed, to meet these standards prior to discharge.</p> <p>Construction of municipal works that require the pumping of groundwater from excavations do not require a use approval under the <i>Water Sustainability Act</i>, as long as the water is immediately discharged, and it is not used for any purpose.</p>	
<p><b><u>Archaeological and Heritage Resources</u></b></p> <p>The project is situated within the consultative boundaries of K'ómoks First Nation, Nanwakolas Council, Qualicum First Nation, Tla'amin First Nation, We Wai Kai First Nation, Wei Wai Kum First Nation, and Xwemalkwu First Nation. First Nations and other heritage resources will be responsibly managed by the MKJV throughout all aspects of the Project according to the following criteria:</p>	



Mitigation of Potential Environmental Impacts	Reviewed (initial)
<ul style="list-style-type: none"> <li>• Through a “Proposed Cultural Heritage Impacts Mitigations” report by Jesse Morin, PhD (Draft #4), a two-phase assessment of program of investigation and identification of project construction mitigation measures have been provided. The Chance Find Procedure (to be developed and provided by the Owner’s consultant) will be followed if suspect archaeological material is encountered. The Chance Find Procedure will also provide direction on how to identify suspect archaeological material;</li> <li>• Site alteration permits (SAP) and Heritage Inspection Permits (HIP) have been acquired by the Owner;</li> <li>• If any suspect archaeological or heritage material is encountered, MKJV will immediately advise the CVRD of the discovery and follow at a minimum the procedures set out in the Chance Find Procedure established by the Owner’s Archaeological Consultant; and</li> <li>• MKJV shall act reasonably and cooperate with all requests from the archaeologists designated by the CVRD to inspect construction of the Work.</li> </ul>	
<p><b><u>Fire Prevention and Response</u></b></p> <p>MKJV will provide a detailed Fire Prevention and Response Plan separate from this CEMP, which will contain a minimum of the following procedures and protocols to be implemented during construction to minimize the potential for a fire on site:</p> <ul style="list-style-type: none"> <li>• Smoking will be prohibited near dry fuel, explosives, fuel and hazardous materials;</li> <li>• Fire equipment will be located on site including fire extinguishers, fire blankets, shovels, ladders, hand-tank pumps, etc.;</li> <li>• Construction personnel will be aware of firefighting techniques, as appropriate;</li> <li>• All vehicles will be equipped with fire extinguishers, as appropriate;</li> <li>• No open fires or burning of brush is permitted on site;</li> <li>• Vegetation around the perimeter of the work site will be irrigated or wet down during high fire risk season, as necessitated by the type of activity that could create sparks or open flames;</li> <li>• Shutdown thresholds and procedures for prevention, equipment, and restrictions will refer to <i>BC Forest Fire Prevention and Suppression Regulation</i>; and</li> <li>• Fuels will be contained in designated and safe storage areas/sheds out of direct sunlight.</li> </ul>	
<p><b><u>Air Quality Management</u></b></p> <p>Air emissions, such as vehicle/equipment exhaust, dust, vapours, and greenhouse gasses should be minimized to avoid adverse environmental, health, safety, and nuisance effects both on and off site. The following mitigation measures related to material handling, access, and vehicles will be applied to control emissions of fine particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), dust, and greenhouse gases:</p> <ul style="list-style-type: none"> <li>• Equipment will be in good working order;</li> <li>• Material stockpiles and work areas prone to wind erosion will be stabilized;</li> <li>• Trucks will be loaded in a manner to avoid spilling during transport and shall be covered to contain soils;</li> <li>• The burning of oils, rubber, tires, or any other material, shall not occur on site;</li> <li>• Stationary sources of emissions, such as generators, will be turned off when not in use;</li> <li>• All equipment will be kept in well maintained condition, used at optimal loads, and repaired, as required, to minimize emissions;</li> <li>• The use of chemical dust suppressants, such as calcium lignosulphate, sodium lignosulphate, magnesium chloride, or hydrocarbons, are prohibited;</li> </ul>	

Mitigation of Potential Environmental Impacts	Reviewed (initial)
<ul style="list-style-type: none"> <li>• Fugitive dust emissions will be managed and will be controlled, as necessary, through mitigation measures, such as the application of mulch and/or water to ground, vehicle wash down facilities, crushed rock exits from construction sites, sweeping paved surfaces using a skidsteer sweeper (or equivalent), and full containment of any concrete work that produces dust.</li> <li>• Engine idling will be minimized to the extent feasible; and</li> <li>• Truck loads will be optimized to reduce the number of trips between the source and destination.</li> </ul>	
<p><b><u>Noise and Vibration</u></b></p>	
<p>The following mitigation measures related to noise and vibration will be adhered to during project works:</p> <ul style="list-style-type: none"> <li>• Maintain equipment in good working order;</li> <li>• Maintain vehicles according to manufacturer's guidelines. Vehicles and equipment should be inspected on a regular basis by the contractor and maintained, as required;</li> <li>• Implementing standard practices and use of "Best Available Control Technologies" for noise control on equipment, such as mufflers and silencers; and</li> <li>• All personnel, contractors, and suppliers shall adhere to posted speed limits and safe operating speeds for all vehicles along</li> </ul>	
<p><b><u>Waste Management</u></b></p>	
<p>Non-hazardous solid wastes shall be sorted into separate, clearly labelled bins and recycled, if possible. Recyclable wastes, include cardboard, wood, metal, and approved plastics. Non-hazardous and non-recyclable wastes shall be included as general refuse and disposed of at the local landfill.</p> <p>Waste material generated during construction will be handled using industry accepted BMPs, such as:</p> <ul style="list-style-type: none"> <li>• Waste disposal containers are to remain within the designated contractor laydown areas;</li> <li>• Where practical, recyclable materials (e.g., wood, paper, cardboard, plastic, glass, organic, Styrofoam) shall be segregated before transport to the appropriate facility;</li> <li>• Waste materials must be secured to prevent the development of leachate from material contact with rain and surface water. Examples include placing lids over waste disposal containers or lining with poly sheeting;</li> <li>• Organic (food) wastes shall be stored in containers with a secured lid and removed from the site daily to avoid attracting wildlife. Removal of food waste materials should be completed daily to help prevent potential wildlife encounters;</li> <li>• Hauling of project materials with the potential to generate "flyaway" waste, shall be adequately secured;</li> <li>• Cigarette butts shall be disposed of off-site or within on-site disposal containers;</li> <li>• Any vegetation that needs to be removed from the site will be stored at a designated storage area. No cut vegetation will be left at the work site unless directed otherwise by the EM; and</li> <li>• Upon completion of work, all surplus materials and equipment will be removed from the site by QEP. The site will be left in a condition that is acceptable to the EM.</li> </ul> <p>Hazardous Substances and Hazardous Products used on site will be transported, stored, removed, and disposed in accordance with <i>Hazardous Waste Legislation Guide</i> (BC MOE 2016) and with all other relevant legislation.</p>	

Mitigation of Potential Environmental Impacts	Reviewed (initial)
<p>Hazardous materials may include any controlled or hazardous substances used on the Site, such as, asbestos, fuels, used fuels, oils, oil filters, greases, bitumen, lubricants, solvents, cement, paints, solvents, batteries, cleaners, dust suppressants, PCBs, and used spill cleanup materials.</p> <p>Hazardous waste that is spilled could affect surface water quality, air quality, fish habitat or wildlife habitat. Prevention of such occurrences is best undertaken by conformance with BMPs and spill prevention measures (e.g., secondary containment, spill kits). All hydrocarbon products and other hazardous wastes potentially present during project activities will be identified and the associated Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS) will be made available to all construction team members. WHMIS labels must be on all controlled materials.</p> <p>Hazardous waste generated by contractors must be stored and handled according to the BC <i>Hazardous Waste Regulation</i>. For temporary storage on-site, this will include:</p> <ul style="list-style-type: none"> <li>• Covered containment using approved containers;</li> <li>• Isolation from flammable and combustible materials (&gt; 10 m);</li> <li>• Proper labelling, inventory, and documentation; and</li> <li>• Storage at least 30 m away from storm drains and waterbodies.</li> <li>• All hazardous wastes shall be transported off site to appropriate disposal areas using appropriate manifests and record keeping in accordance with the BC <i>Hazardous Waste Regulation</i> and Federal <i>Transportation of Dangerous Goods Act</i>. All manifests should be kept on-site and provided to the Project owner and made available to the EM upon request.</li> </ul>	
<p><b><u>Site Restoration and Protection of Sensitive Habitats</u></b></p>	
<p>MKJV will restore the Project site and disturbed sensitive habitats upon completion of Construction or ideally, as soon as possible. Restoration requirements shall include:</p> <ul style="list-style-type: none"> <li>• Disturbed areas will be recontoured to a stable angle, returning them as closely as possible to their natural state, and protected from erosion using permanent natural methods and materials. Permanent erosion protection may include re-seeding with an approved weed-free seed mixture and/or installing biodegradable erosion control blankets. All seeding shall be planned to allow establishment before the end of the growing season (early fall or early spring).</li> <li>• At the end of the project, all equipment, supplies, and non-biodegradable materials will be removed from the site.</li> <li>• Under the direction of a QEP, place salvaged large woody debris (LWD) in impacted riparian areas (e.g., in disturbed areas outside of long-term maintenance access paths) within 30 m of wetlands to provide habitat for wildlife.</li> <li>• Retain and use LWD to enhance habitats along rehabilitated corridors, but avoid creation of long linear stacks of woody debris (windrows) that may hinder wildlife movement;</li> <li>• Install gates at permanent and natural barriers (e.g., boulders, LWD, berms) at temporary Project access points to prevent public vehicular access into sensitive habitat; and</li> <li>• Stockpile excavated topsoil for reuse in site remediation when such topsoil does not contain invasive plant species.</li> </ul>	



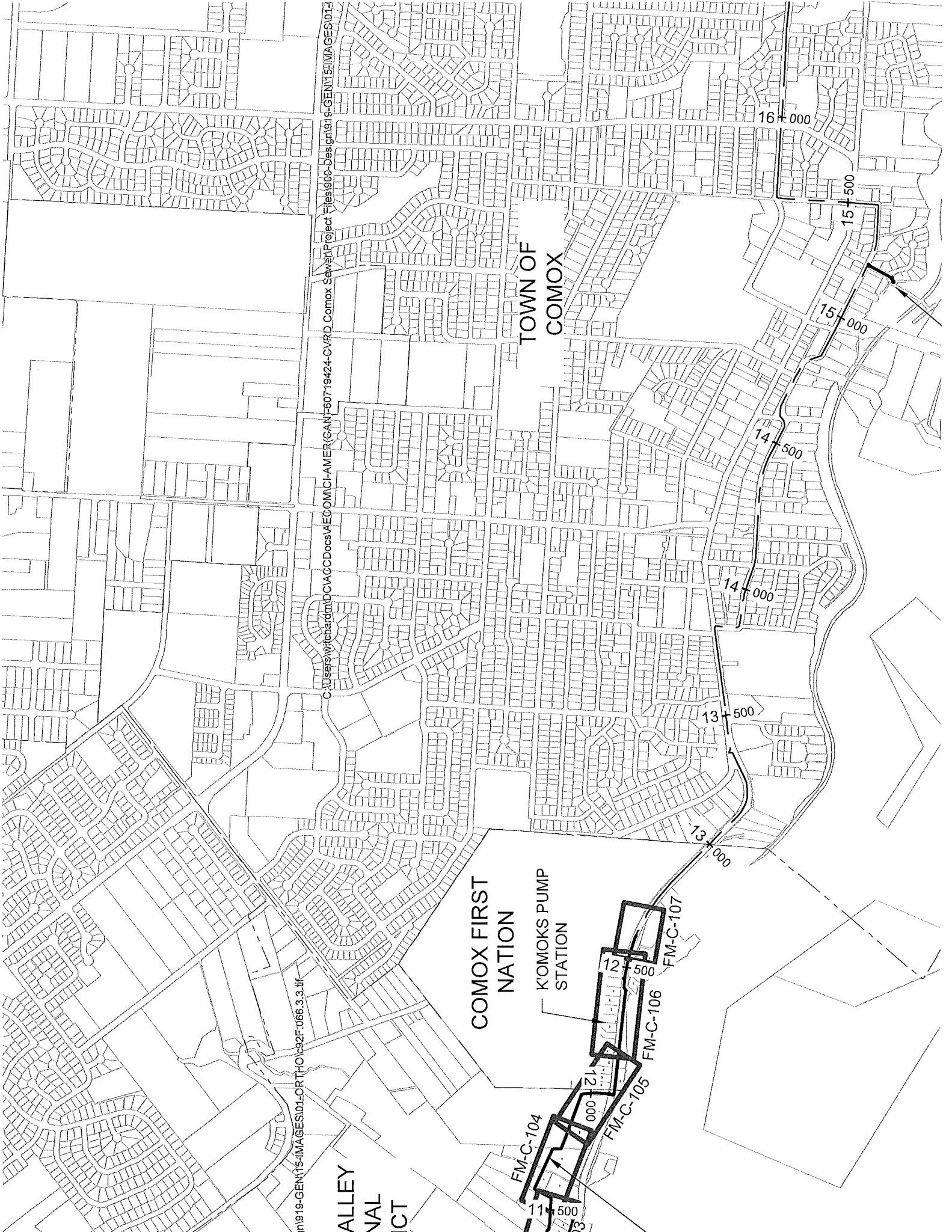


## **Appendix B Environmental Incident Report**

Environmental Spill/ Incident Report Form		
Date Spill/Incident Started:	Time Spill/Incident Started:	
Date Spill Incident Ended:	Date Spill/Incident Ended:	
Type of Spill/Incident:	Location of Spill/Incident	
<b>Contact Information of Person Reporting the Spill</b>		
Name:	Tel:	Firm:
<b>Contact Information of Person Involved in the Spill (if different from above)</b>		
Name:	Tel:	Firm:
<b>What was affected?</b> <input type="checkbox"/> Soil <input type="checkbox"/> Surface Water <input type="checkbox"/> Groundwater <input type="checkbox"/> Air		
<b>Description of Spill/Incident and Cause:</b>		
<b>Spill Response Completed (Describe):</b>		
Containment:		
Cleanup/ Recovery:		
Disposal of Spilled or Contaminated Materials:		
<b>Reporting Details and Agencies Involved:</b>		
<b>Steps for Future Prevention:</b>		
<b>Reporter Information:</b>		
Name:	Phone:	Company:
Signature: _____		



## Appendix C Environmental Alignment Sheets



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TOWN OF  
COMOX

COMOX FIRST  
NATION

KOMOKS PUMP  
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VALLEY  
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RICT

FM-C-104

FM-C-103

FM-C-105

FM-C-106

FM-C-107

13+000

13+500

14+000

14+500

15+000

15+500

16+000

MATCH LINE  
REFER TO YARD  
PIPING FOR  
CONTINUATION

BC 10+318.76

COMO

10+300

2095

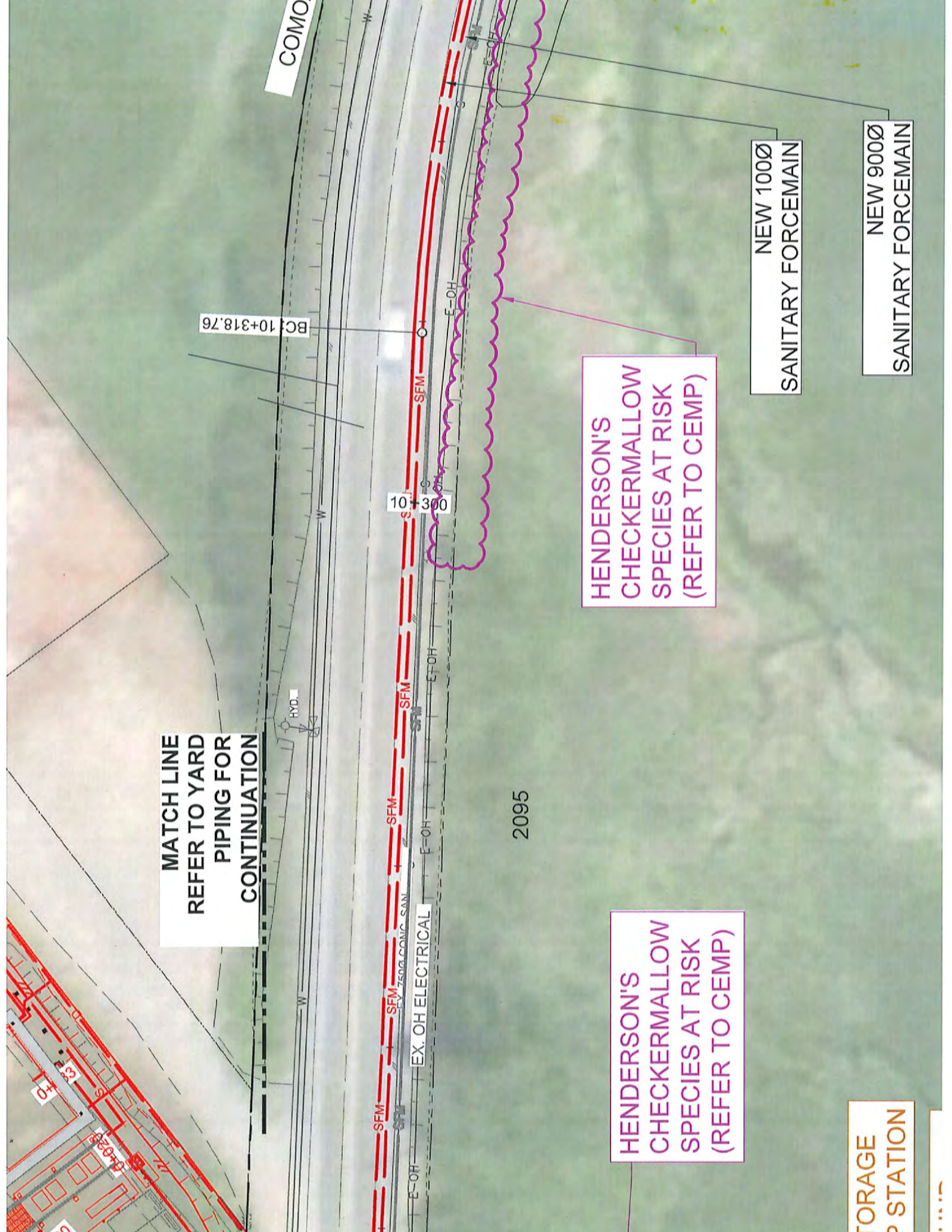
HENDERSON'S  
CHECKERMALLOW  
SPECIES AT RISK  
(REFER TO CEMP)

HENDERSON'S  
CHECKERMALLOW  
SPECIES AT RISK  
(REFER TO CEMP)

NEW 1000  
SANITARY FORCEMAIN

NEW 9000  
SANITARY FORCEMAIN

TORAGE  
P STATION





COMOX ROAD

BC: 10+678.22

EC: 10+558.48

10+600

EX-2000 21/6 W/M

SFM

SFM

SFM

E-EX. OH ELECTRICAL

EX-750Ø CONIC SAN

E-OH

E-OH

E-OH

E-OH

OH

NEW 900Ø  
SANITARY FORCEMAIN

NEW 100Ø  
SANITARY FORCEMAIN

ENAY RIVER  
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STEM  
NENT"(VEC).  
TO CEMP)

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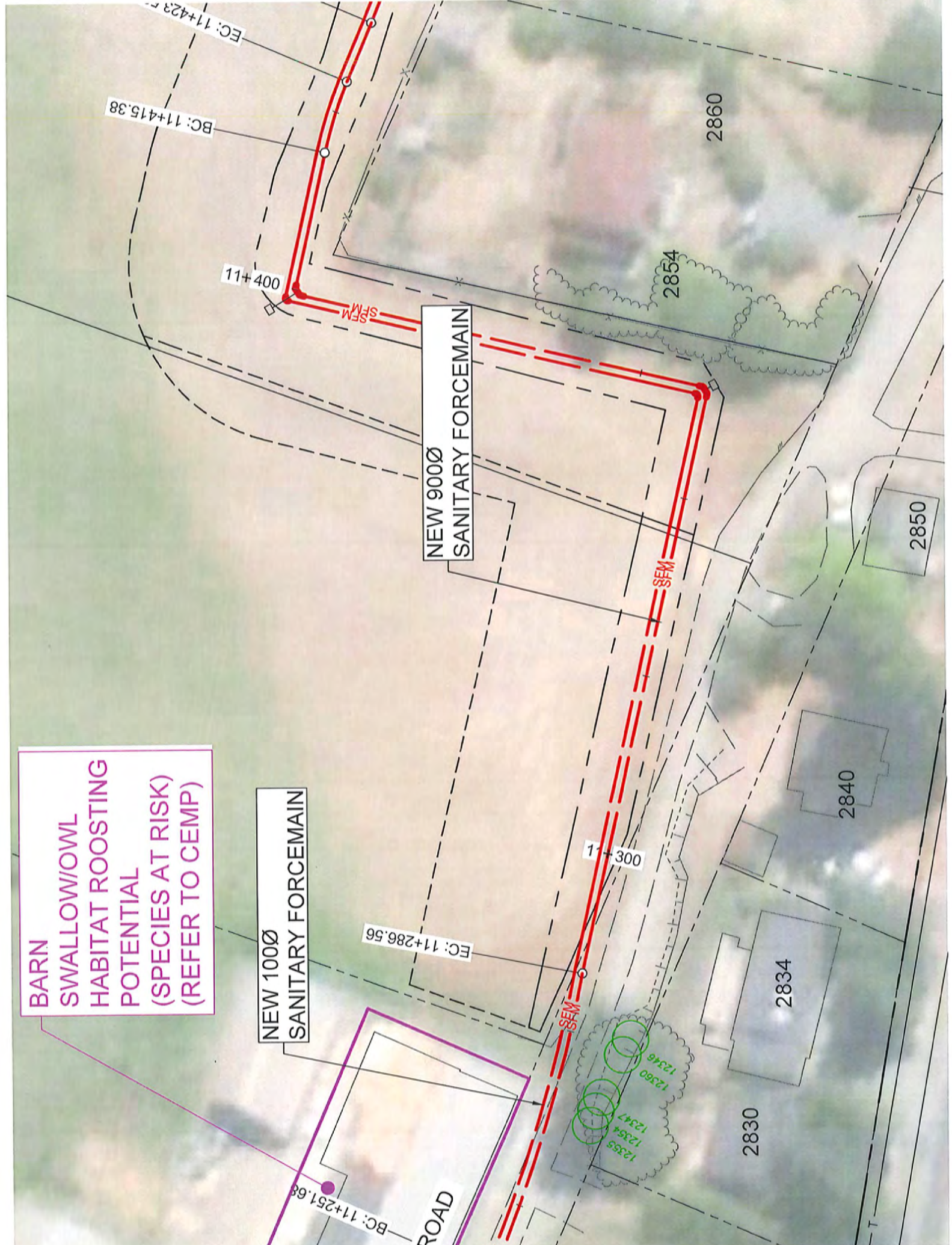




BARN  
SWALLOW/OWL  
HABITAT ROOSTING  
POTENTIAL  
(SPECIES AT RISK)  
(REFER TO CEMP)

NEW 100Ø  
SANITARY FORCEMAIN

NEW 900Ø  
SANITARY FORCEMAIN





NEW 1000Ø  
SANITARY FORCEN

11+700

3020

3016

3010

440

EX. UNKØ WM

EX. UNKØ WM

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12795

12794

12793

12792

12790

12789

12788

12787

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600

SFM

SFM

SFM

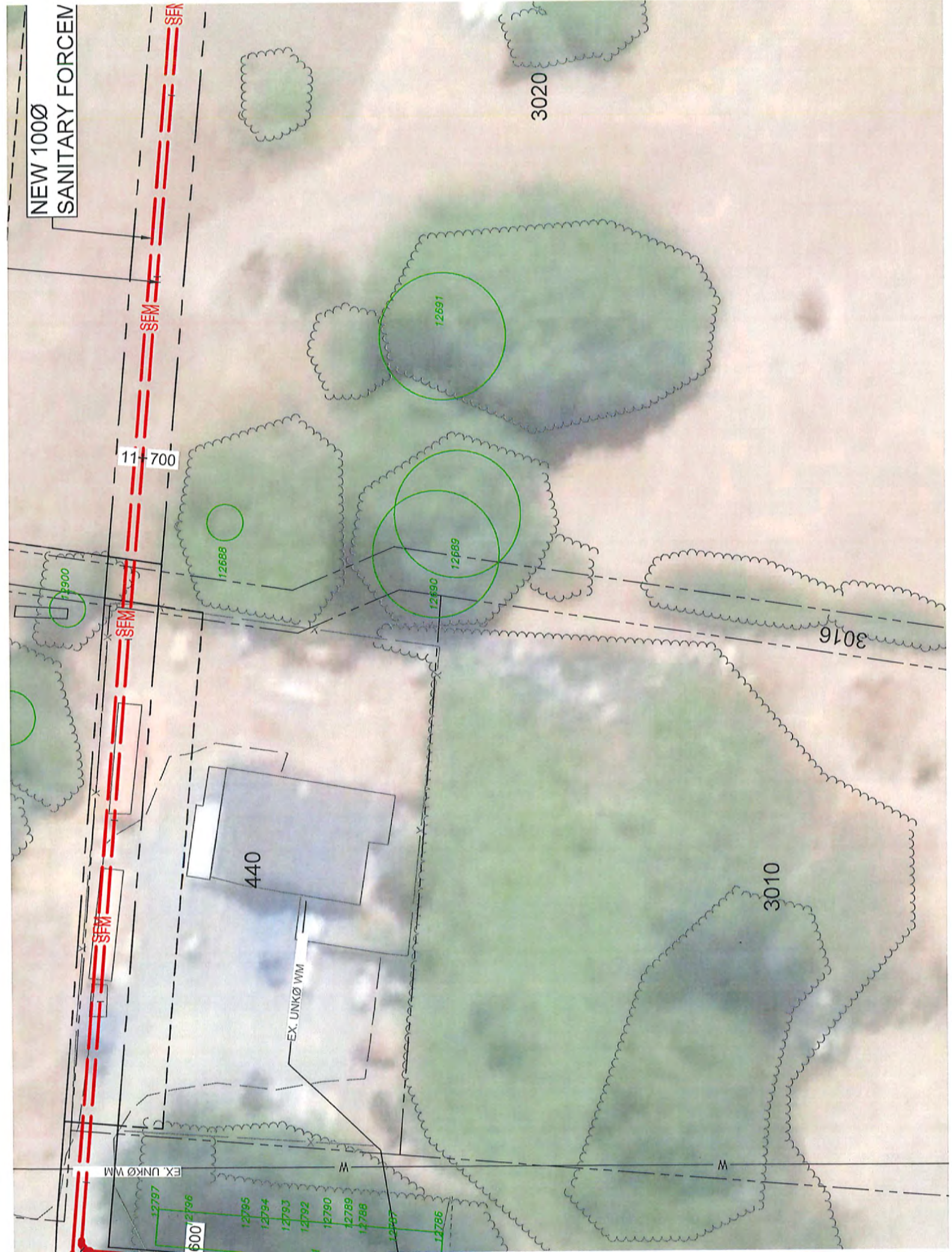
SFM

12691

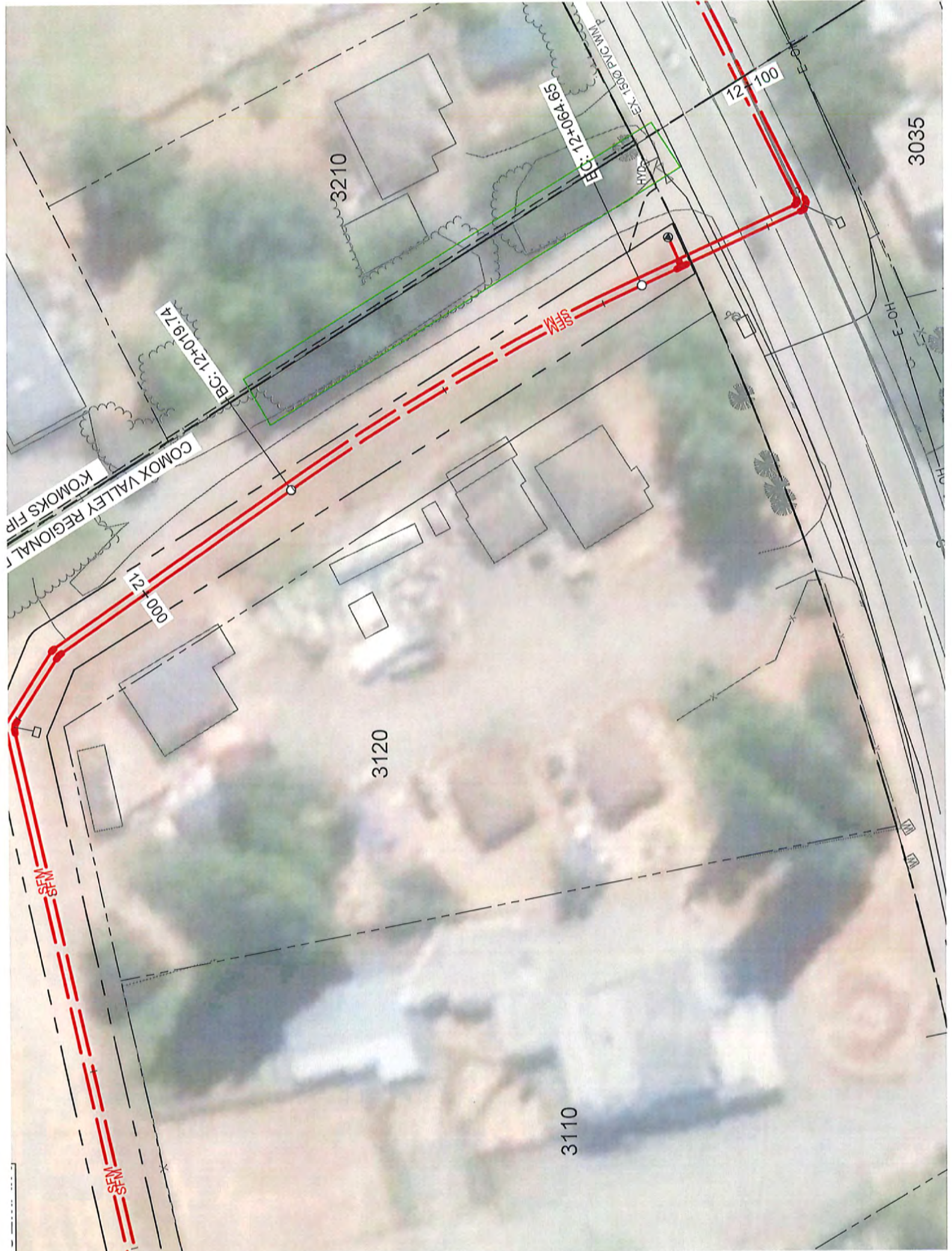
12689

12688

12690







3035

3210

3120

3110

COMOX VALLEY REGIONAL  
KOMOKS FIP

BC: 12+019.74

EQ: 12+064.65

12+100

12+000

SEM

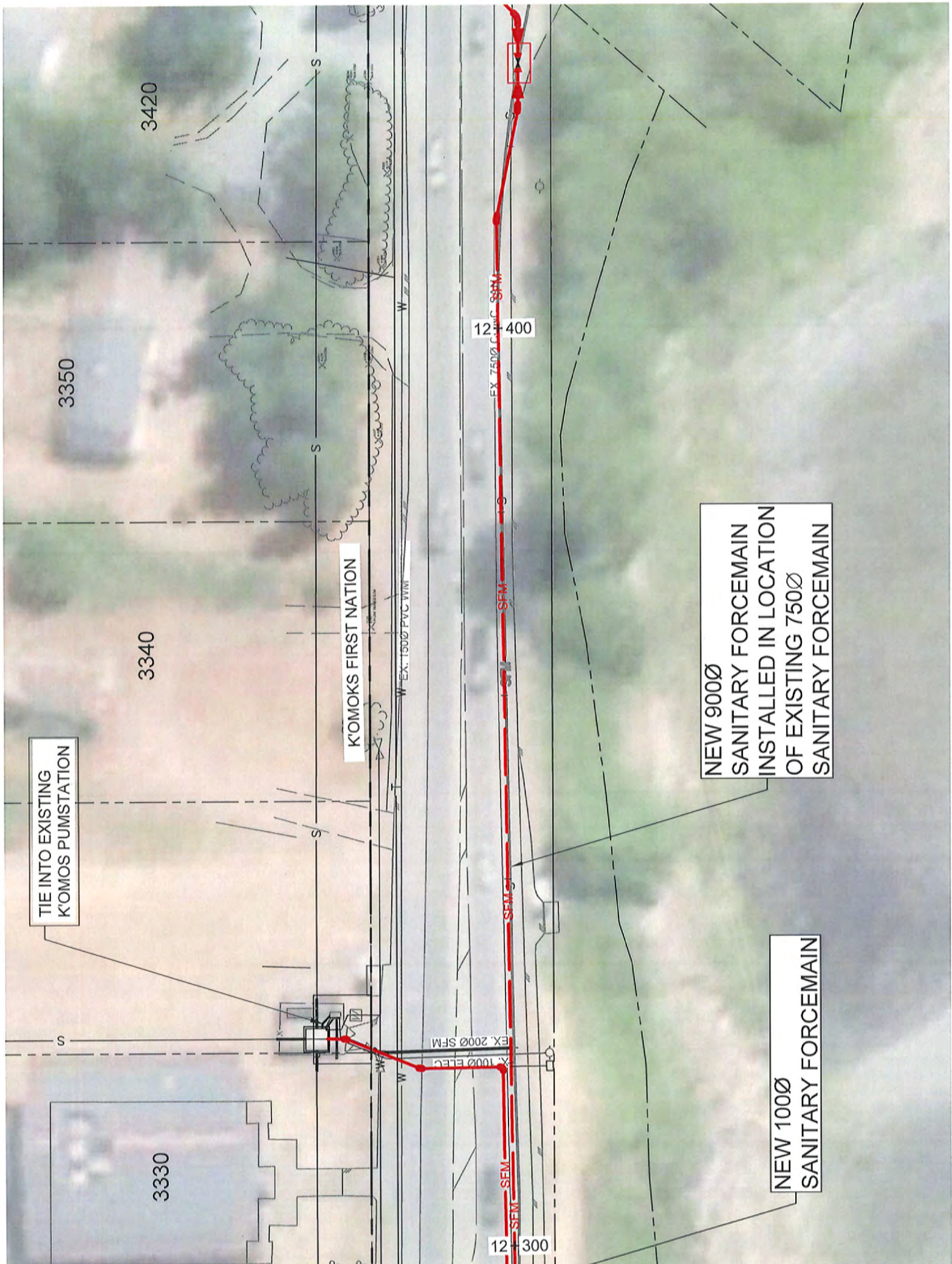
SEM

SEM

1/2"

E-OH





TIE INTO EXISTING  
KOMOS PUMSTATION

K'OMOKS FIRST NATION

NEW 900Ø  
SANITARY FORCEMAIN  
INSTALLED IN LOCATION  
OF EXISTING 750Ø  
SANITARY FORCEMAIN

NEW 100Ø  
SANITARY FORCEMAIN

3350

3340

3420

3330

12+400

12+300

EX. 2000 SFM

EX. 1000 ELEC

EX. 750Ø C.C. SFM

W EX. 150Ø PVC W/M



KOMOKS FIRST NATION

SANITARY F  
BY OTHERS

SFM

12+624

LIMIT OF

12+600

SFM

BAYSIDE ROAD

3503

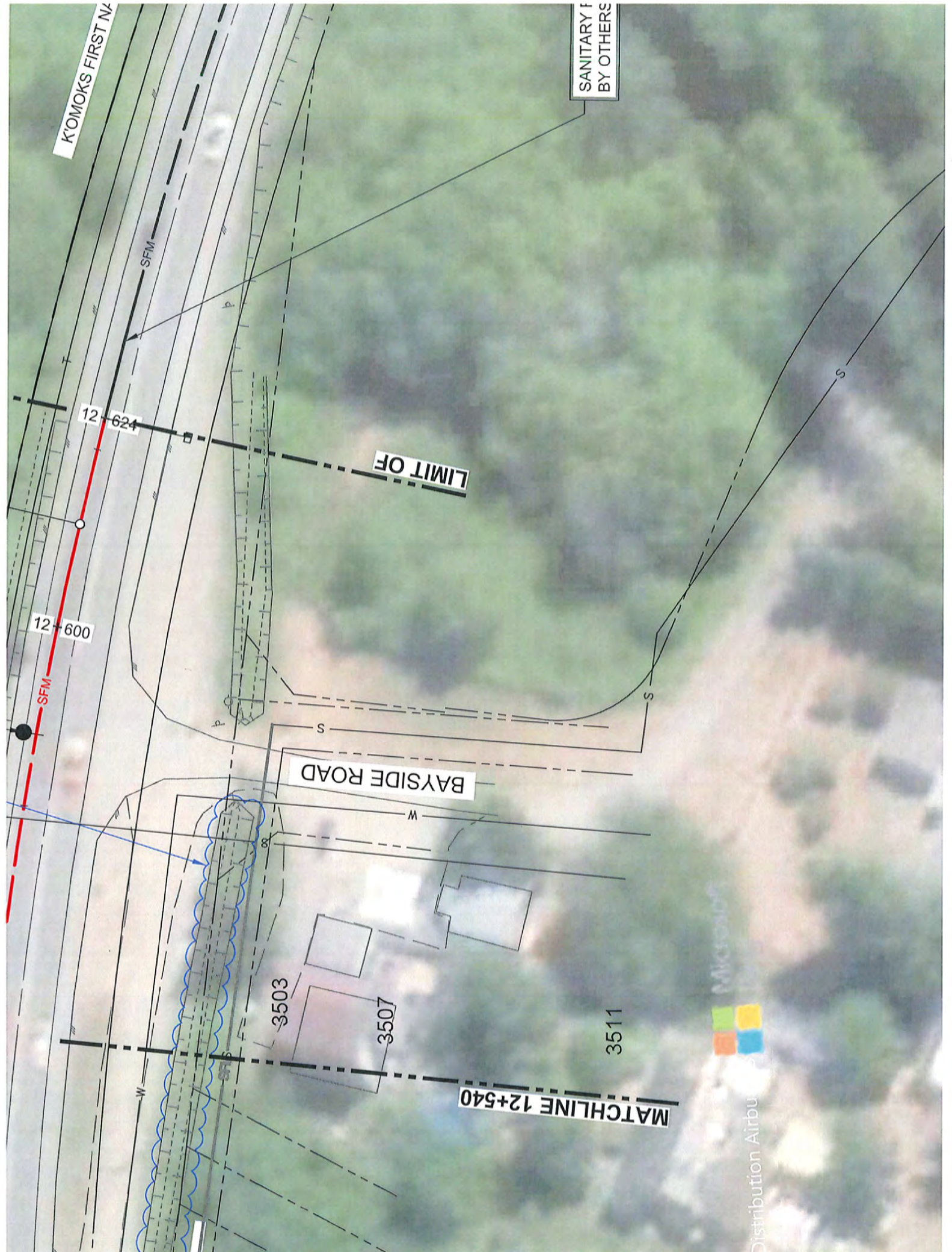
3507

3511

MATCHLINE 12+540



Distribution Airbu







# Lazo Rd.

16+700

SANITARY FORCEMAIN TO WEST BY OTHERS - NOT IN PROJECT

LIMIT OF

EX. GAS 60" PIPE



1204

1225

1198

17 + 100

17 + 000

SFM

SFM

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SFM

E-OH

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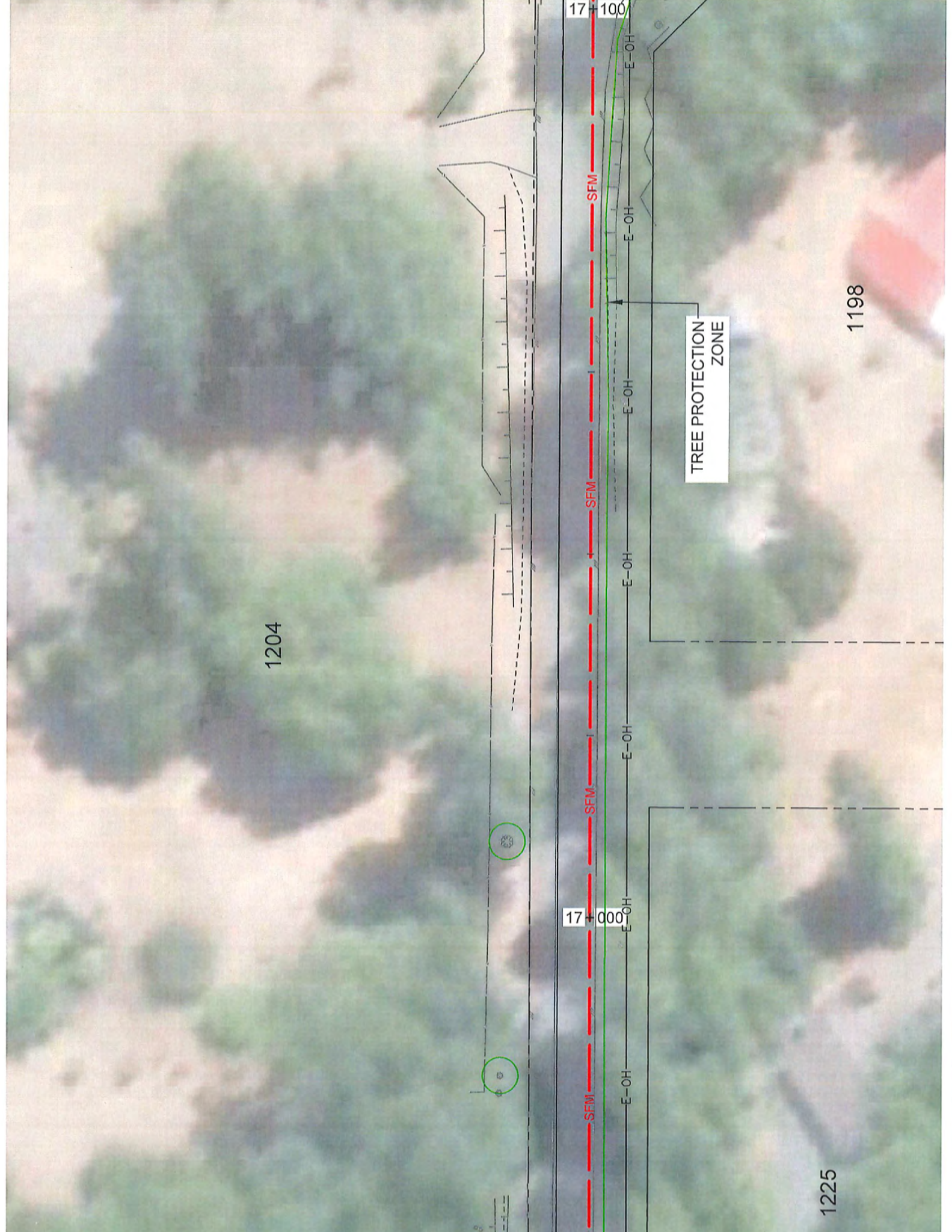
E-OH

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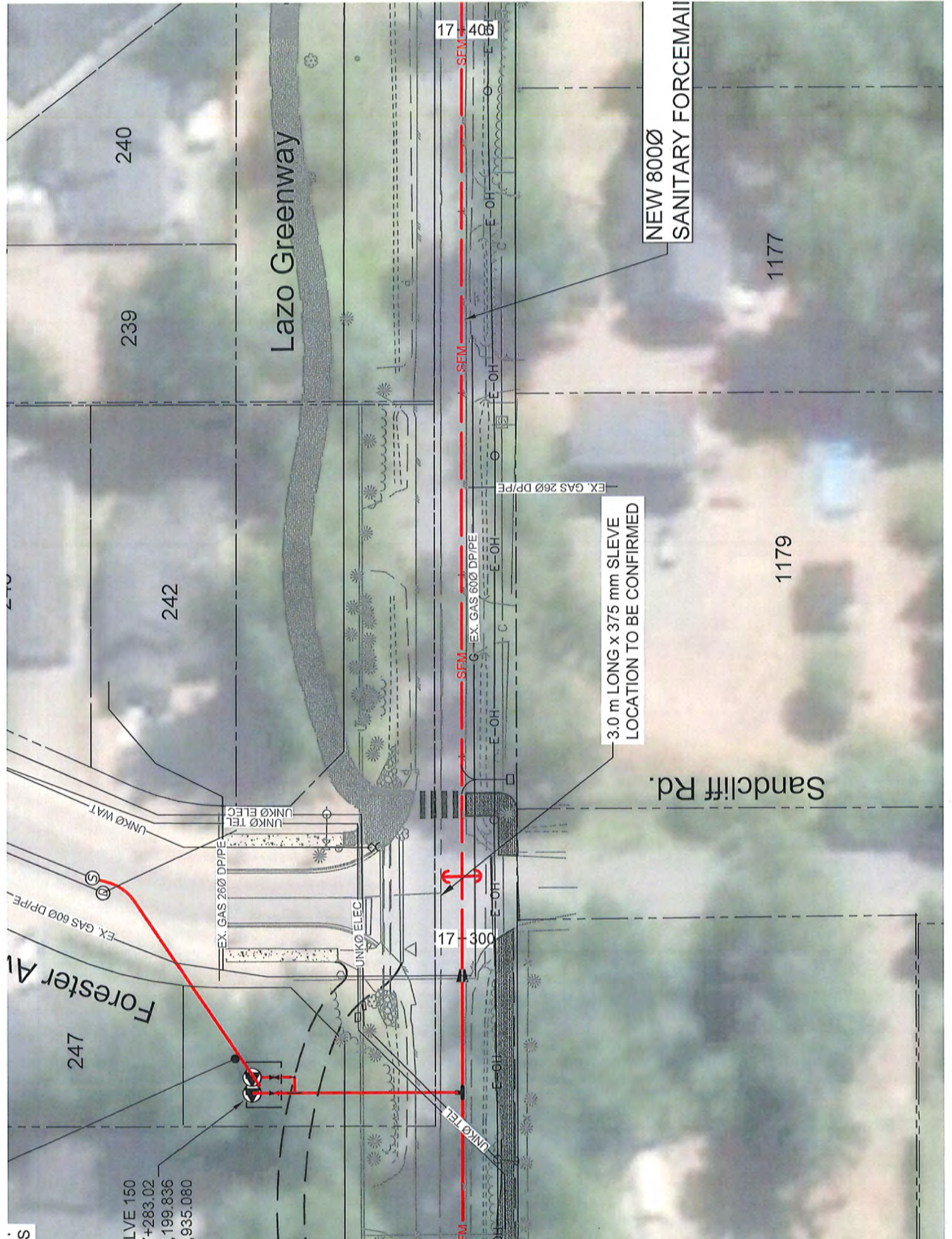
E-OH

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TREE PROTECTION ZONE







240

239

242

247

Forester Av

Lazo Greenway

NEW 800Ø  
SANITARY FORCEMAIN

1177

1179

Sandcliff Rd.

LVE 150  
+283.02  
199.836  
935.080

17-405

17-300

3.0 m LONG x 375 mm SLEAVE  
LOCATION TO BE CONFIRMED

EX. GAS 260 DP/PE

UNKNØ ELEC

UNKNØ ELEC

UNKNØ TEL

EX. GAS 600 DP/PE

EX. GAS 260 DP/PE

SEM

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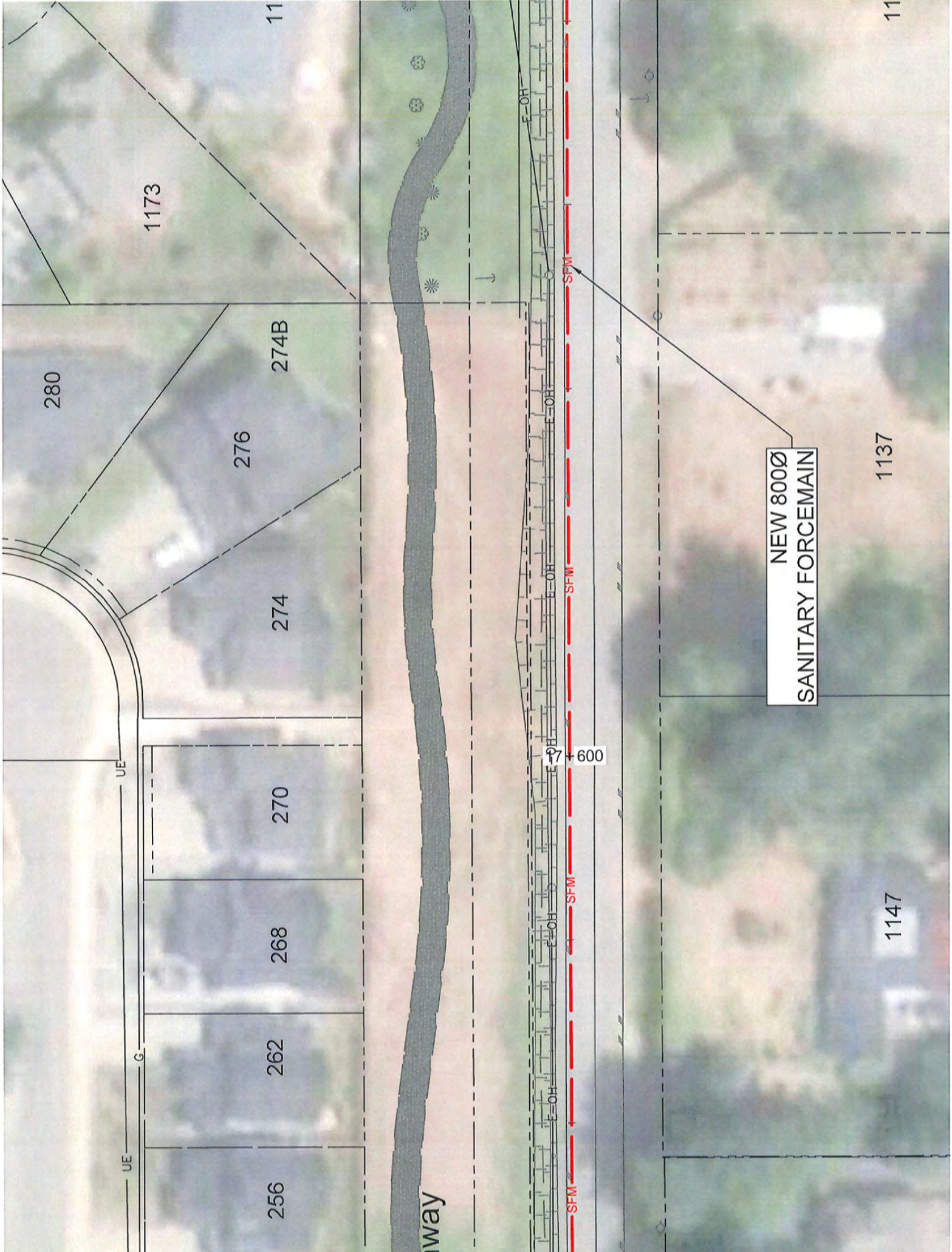
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NEW 8000  
SANITARY FORCEMAIN

SFM

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E-OH

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600

Creekway

UE

G

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11

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1173

280

274B

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274

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268

262

256

1137

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Lazo Greenway

350

356

360

366

370

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380

386

EX. LINKED STORAGE

E-OH

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NEW 8000  
SANITARY MAIN





1048

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1052

1056

1160

1165

EX. L

EX. UNKØ TEL

EX. UNKØ ELEC

16 G DP/PE

26 G DP/PE

SFM

SFM

42 G DP/PE

42 G DP/PE

3000 DI W

3500 DI W

BC: 18+285.73

18+300

W

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SFM

Lazo Rd.

Park

R=199.00  
L=104.32  
Δ=30°02'11"

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550

Lazo Rd.

2000 HDPE STUB AND VALVE TO COLBY PUMP STATION, PROVISION FOR FUTURE CONNECTION

EC: 18+629.12

EX7500 STM

SFM

8+600

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8+700

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3000 DI W

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3000 DI W

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3000 DI W

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3000 DI W

R=300.00  
L=94.37  
 $\Delta=18^{\circ}01'21''$

VEC: DITCH CONNECTED TO LAZO MARSH (REFER TO CEMP)

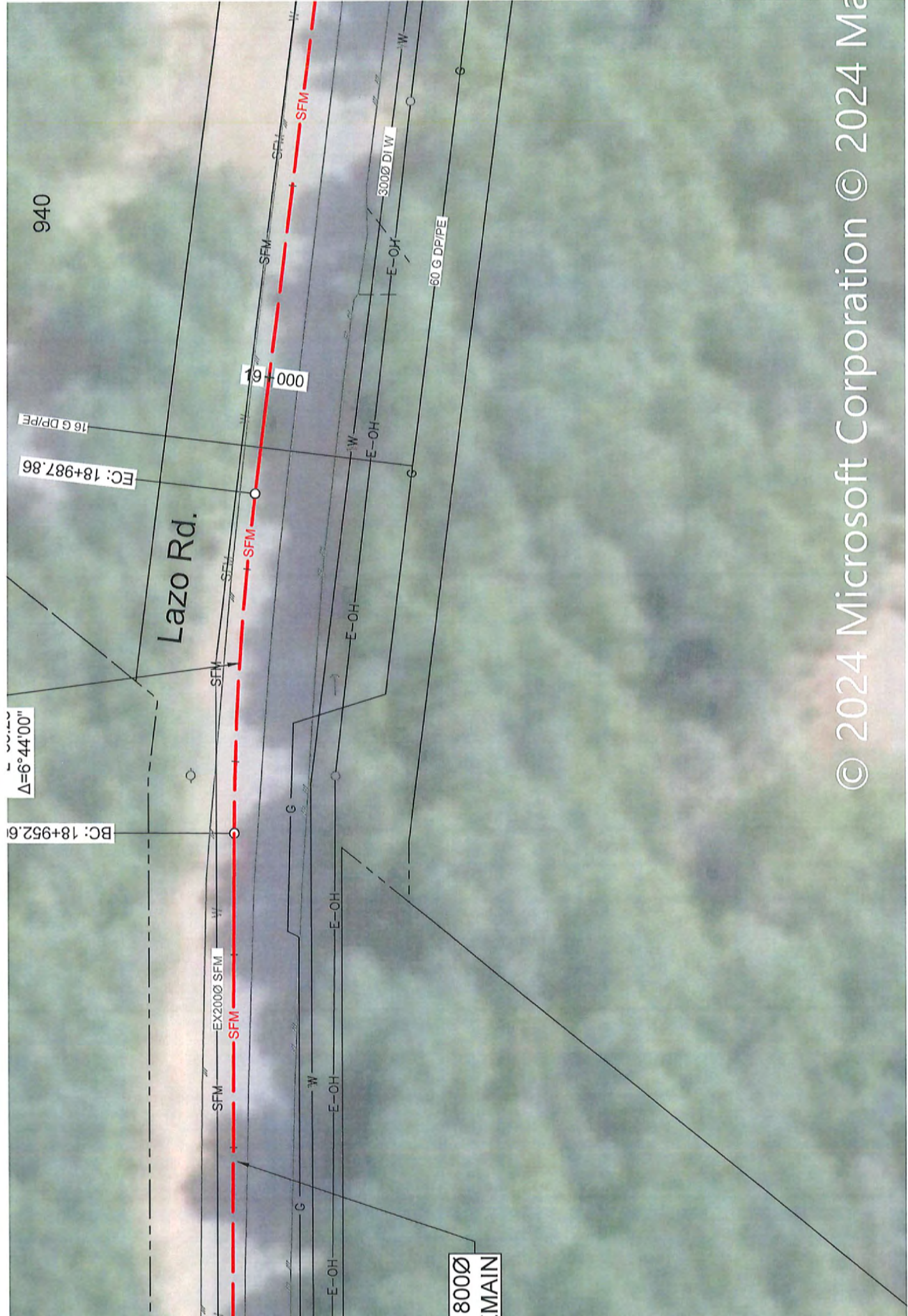
16 G DP/PE

1023

8000 PRIMARY FORCEMAIN

PLAN  
Scale 1:500





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**PLAN**

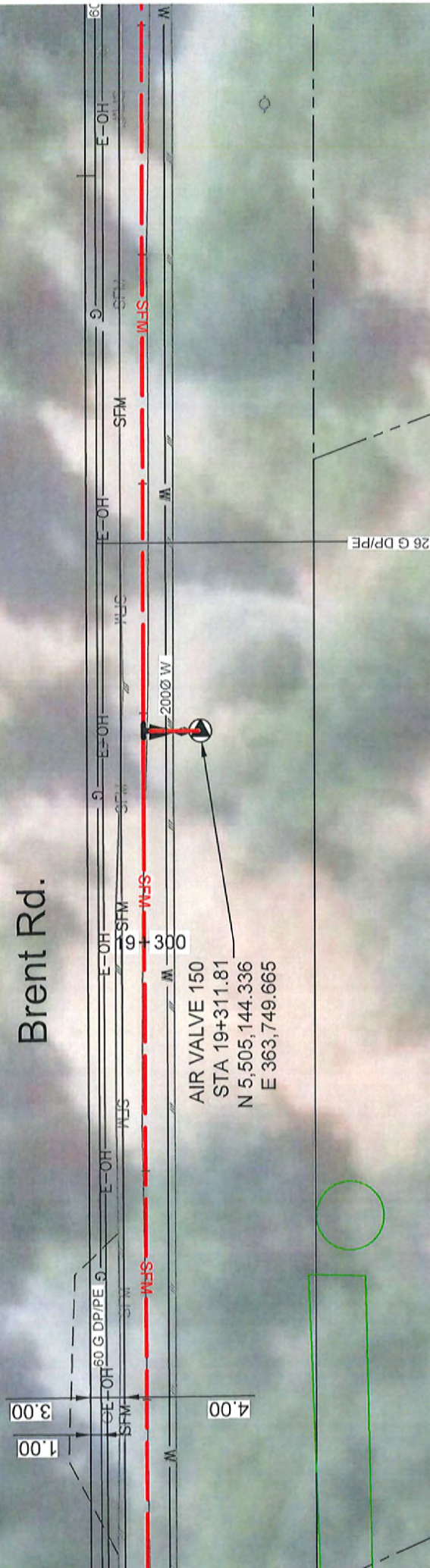
Scale 1:500



560-540

540

# Brent Rd.

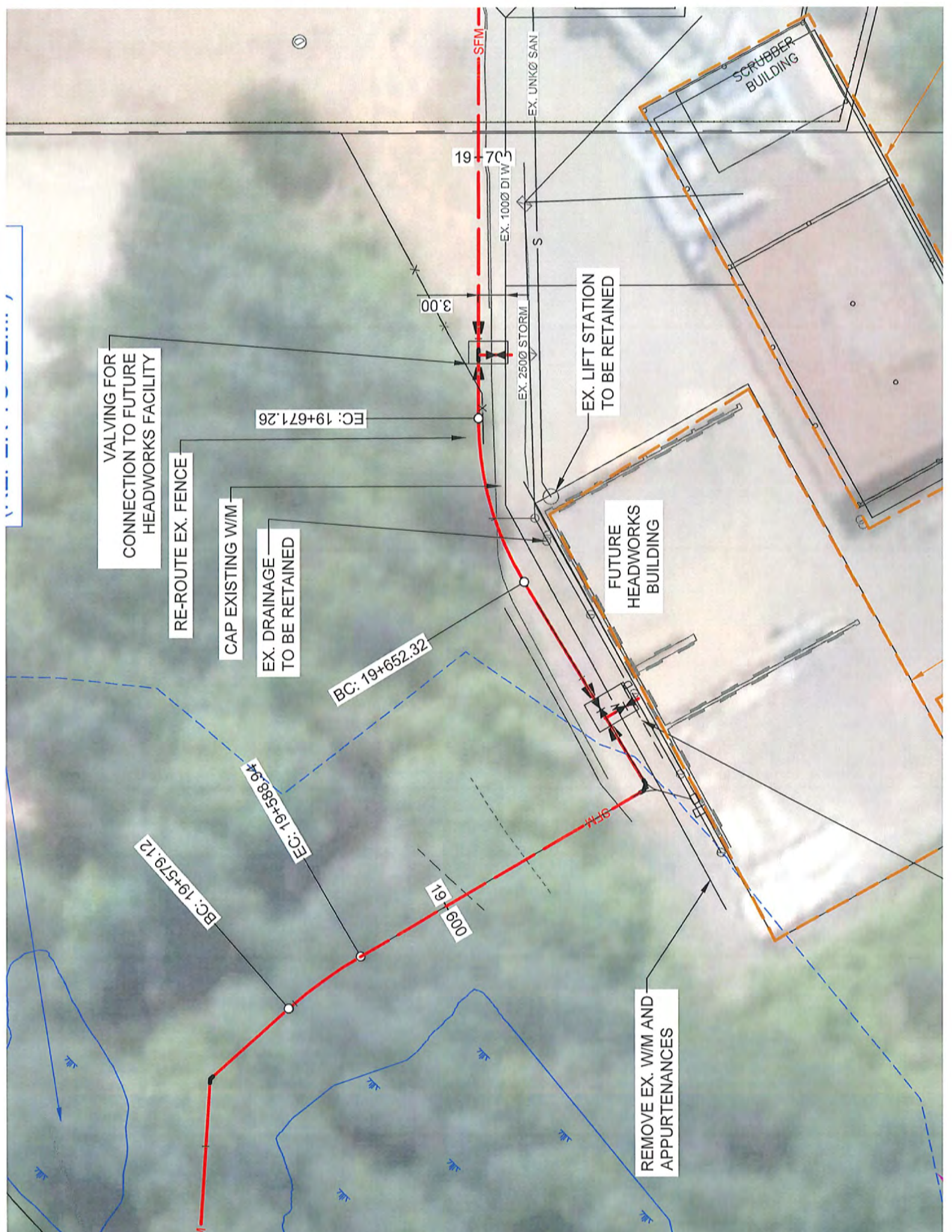


CONTRACTOR TO RELOCATE  
WM IF REQUIRED TO INSTALL  
FORCE MAIN ADJACENT EXISTING

579

FORCE MAIN





VALVING FOR CONNECTION TO FUTURE HEADWORKS FACILITY

RE-ROUTE EX. FENCE

CAP EXISTING W/M

EX. DRAINAGE TO BE RETAINED

EX. LIFT STATION TO BE RETAINED

FUTURE HEADWORKS BUILDING

REMOVE EX. W/M AND APPURTENANCES

SCRUBBER BUILDING

BC: 19+579.12

EC: 19+588.94

BC: 19+652.32

19+600

19+700

EC: 19+671.26

3.00

EX. 2500 STORM

EX. 1000 DI W

EX. UNKØ SAN

①



**CONSTRUCTION**

**LIMIT OF**

BEAUFORT AVE

1707

JANE PLACE

96  
88

2000 DR11 PVC  
BLOWDOWN DRAIN  
(FULLY RESTRAINED)

452Ø (OD) DR17  
HDPE FORCEMAIN

85

**CONSTRUCTION**

3-75Ø ELEC  
CONC ENCASED

EX. 500  
WAT

UNKØ TEL  
1-75Ø ELEC

**LIMIT OF**

77

000 ±0

EX. UNKØ WAT

EX. UNKØ WAT

0-100

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SFM

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## **Appendix D Invasive Species Council of BC Factsheets**

Eric Coombs, Oregon Department  
of Agriculture, Bugwod.org



Invasive Species  
Council of BC

**FACTSHEET**  
APRIL 2019

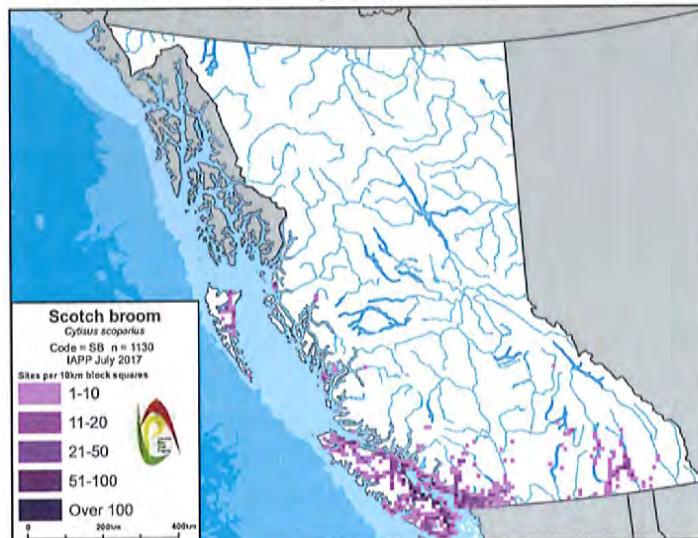
# Scotch Broom *Cytisus scoparius*

## About Scotch Broom

Native to the Mediterranean areas of Europe, Scotch broom was introduced to BC's Vancouver Island in the mid-19th century as an ornamental plant. Its spread continued following widespread planting as a bank stabilizer during road development, and as discarded crate packing materials for gold camps along the west coast.

## Legal Status

Invasive Plants Regulation, Forest and Range Practices Act;  
Community Charter, Spheres of Concurrent Jurisdiction -  
Environment And Wildlife Regulation.



## Distribution

Currently distributed on the Pacific and Atlantic coasts of North America. It is common west of the Coast-Cascade Mountains in southwest BC and is concentrated at the southern end of Vancouver Island. It has also been reported on the Queen Charlotte Islands and in parts of the Kootenays and North Okanagan-Shuswap areas.

## Identification

**Flowers:** Yellow and pea-like; may have a red marking in the middle.

**Stems:** Woody and 5-angled; 1-3 m tall shrub.

**Leaves:** Stalked lower leaves are composed of three leaflets; un-stalked upper leaves are simple.



**Fruits:** Flat, hairy seedpods that are initially green, turn brown to black in color.

**Similar Species:** Spanish broom (*Spartium junceum*), a non-native species, has flowers that grow at the tips of stems (crowning the plant), whereas Scotch broom flowers grow along stems.

## Ecological Characteristics

**Habitat:** This escaped garden ornamental invades exposed, well-drained mineral soil and is shade-intolerant.

**Reproduction:** Perennial species that reproduces by seed and lateral bud growth. Mature plants can produce up to 3500 pods, each containing 5-12 seeds.

**Dispersal:** As seedpods dry they split and spiral, expelling the contained seeds up to 5 metres. The plant can also spread to new disturbed areas through seed transport by vehicles and machinery. Due to its affinity for light dominated, disturbed areas, any disturbance activity such as road construction near infested areas, can enhance spread.



© The Illustrated Flora of BC



## Impacts

**Economic:** Invades rangeland, replacing forage plants, and can be a serious competitor to conifer seedlings. Douglas fir plantation failures in Oregon and Washington have been credited to infestations by this plant. High density infestations can: (i) increase wildfire fuel loads, thereby escalating wildfire intensity; and (ii) obstruct sight lines on roads, resulting in increased maintenance costs for removal.

**Ecological:** Can produce dense, impenetrable thickets that may be impacting Garry oak woodlands in southwestern BC and limiting the movement of large animals, wild or domestic. Possesses photosynthetic stems to enable year round growth, leading to displacement of native plant species.

## Integrated Pest Management

*IPM is a decision-making process that includes identification and inventory of invasive plant populations, assessment of the risks that they pose, development of well-informed control options that may include a number of methods, site treatments, and monitoring.*

### Prevention

- » Minimize soil disturbance in areas directly adjacent to existing infestations and contain or localize seed spread.
- » Remove broom before it flowers (late winter, early spring) to prevent seed maturation.
- » After mechanical treatment, promptly re-vegetate with an appropriate seed mix, followed by an application of phosphorous-rich fertilizer and wood mulch. Contact local seed suppliers to determine an appropriate seed mix.
- » Promptly establish competitive shrubbery, including snowberry, salmonberry, thimbleberry, and Oregon grape, as well as red alder trees for shading and competition for nitrogen, to reduce broom growth.

### Mechanical Control

- » Minimizing soil disturbance, cut larger plants below ground level before flowering and seed set. Plants with stems less than 1.5 cm in diameter may be hand pulled, preferably in late spring when the plant is directing its energy into flower and seed production.
- » Due to enormous 'seed banking' and re-sprouting potential (stumps and roots), mechanical treatments may need to be repeated over a 3 to 5 year period.
- » Mechanical control is most effective if all of the plant is removed, no seeds are dropped and soil disturbance is minimized.
- » Hand pulling may encourage broom growth due to the high level of soil disturbance. If pulling will result in soil disturbance, plants can be cut as close to the ground as possible.
- » Burning is not an effective control method as broom seeds germinate following a burn.

### Biocontrol

- » There are currently no approved biocontrol agents for BC; however, seed-feeding beetles released in Washington State have moved north adventitiously, and two other agents released in the US are close to our border and suspected to have arrived in BC. Further surveys will seek to confirm their existence.
- » Grazing by goats and consumption of seeds by chickens have been shown to reduce broom infestations.

### Chemical Control

Herbicide recommendations and use must consider site characteristics and be prescribed based on site goals and objectives. Herbicide labels and other sources of information must be reviewed before selecting and applying herbicides.

- » Triclopyr or glyphosate application treatments include: foliar, low-volume thinline, basal cut stump, cut stump, and basal bark. (Refer to labels for specific instructions and rates)
- » Selective spot spraying, basal stem injection, or cut surface application methods are recommended to minimize non-target damage.
- » Triclopyr mixed with aminopyralid or 2,4-D applied foliar provides good control.
- » Picloram alone as a foliar application provides good control but is not recommended in coastal, high rainfall areas due to persistence and mobility of the herbicide.
- » Application of pesticides on Crown land must be carried out following a confirmed Pest Management Plan (Integrated Pest Management Act) and under the supervision of a certified pesticide applicator. <https://www2.gov.bc.ca/gov/content/environment/pesticides-pest-management>

## References/Links

- » BC Ministry of Forests, Lands, and Natural Resource Operations, Invasive Alien Plant Program (IAPP). [www.for.gov.bc.ca/hra/Plants/application.htm](http://www.for.gov.bc.ca/hra/Plants/application.htm)
- » E-Flora BC, an Electronic Atlas of the Plants of BC. [www.eflora.bc.ca/](http://www.eflora.bc.ca/)
- » Field Guide to Noxious and Other Selected Weeds of British Columbia. 2014. [https://bcinvasives.ca/documents/Field\\_Guide\\_to\\_Noxious\\_Weeds\\_Final\\_WEB\\_09-25-2014.pdf](https://bcinvasives.ca/documents/Field_Guide_to_Noxious_Weeds_Final_WEB_09-25-2014.pdf)
- » Garry Oak Ecosystem Recovery Team. Best Practices for Invasive Species Management in Garry Oak and Associated Ecosystems: Scotch Broom (*Cytisus scoparius*). [www.goert.ca/documents/Best\\_Practices\\_for\\_Broom\\_revised.pdf](http://www.goert.ca/documents/Best_Practices_for_Broom_revised.pdf)
- » Prasad, Raj. Scotch Broom, *Cytisus scoparius* L. in British Columbia. <http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/31653.pdf>
- » DiTomas, J.M, G.B. Keyser et al. 2013. Weed Control in the Natural Areas of the United States. Weed Research and Information Centre University of California 544pp. [https://wric.ucdavis.edu/information/natural%20areas/wr\\_C/Cytisus.pdf](https://wric.ucdavis.edu/information/natural%20areas/wr_C/Cytisus.pdf)



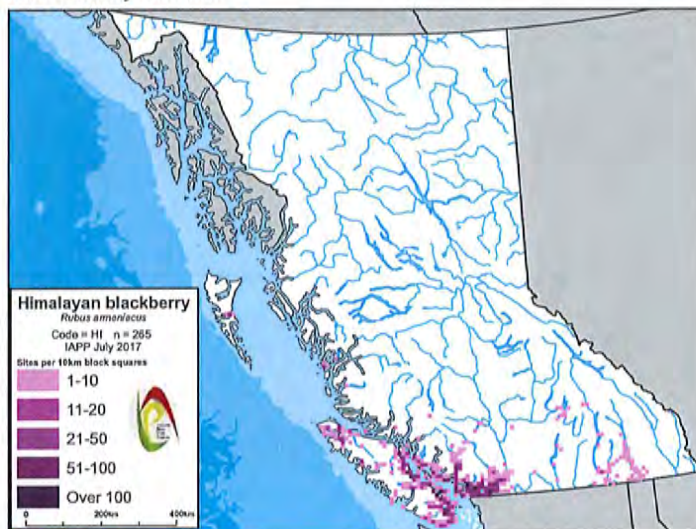
*Thank you to the BC Ministry of Environment and the BC Ministry of Transportation and Infrastructure for providing project funding, and to those who advised the development of these management recommendations*



# Himalayan Blackberry *Rubus armeniacus*

## Legal Status

### Community Charter



## Distribution

Currently in BC in the Lower Mainland, Sunshine Coast, Fraser Valley, Gulf Islands, Central to Southern Vancouver Island.

## Identification

**Flowers:** Small (2.5 cm diameter), white to pinkish, stalked, 5-petaled, arranged in clusters of 5-20; flower stalks are wooly and prickly.

**Stems:** Robust, stiff, 5-angled stems (canes) that support large, flattened, and hooked or straight prickles. Canes grow to 3 m in height and up to 12 m in length.

First year canes produce leaves only and can root at the tips, producing daughter plants. Second year canes grow from the axils of first year canes and produce flowers and fruits.

**Leaves:** Evergreen, predominantly large, rounded or oblong, toothed leaflets radiate from the end of the leaf stem. Leaves are generally grouped in fives on first-year canes and threes on flowering (second-year) canes.



**Fruits:** Fruits (drupelets) are up to 2 cm in diameter, oblong to spherical, black and shiny, and hairless. They form on second year canes and ripen from mid-summer to fall. Each berry produces numerous seeds that have a hard, impermeable coat.

**Similar Native Species:** (i) Trailing blackberry (*Rubus ursinus*) is a smaller and less robust trailing plant with a smaller stem size (0.5 cm), white waxy stem coating, deciduous leaves found in groups of three, and a tendency to lie on the ground; (ii) salmonberry (*Rubus spectabilis*) has smaller zigzagged stems, red-pink flowers, and reddish or yellowish edible berries.

**Similar Non-Native Species:** Cut-leaf or evergreen blackberry (*Rubus laciniatus*) has deeply incised leaflets. Note: Himalayan blackberry is a variable species with several cultivars, thus making identification difficult.

## Ecological Characteristics

**Habitat:** Found on disturbed sites, along roadsides and right-of-ways, in pastures, along river and stream banks, freshwater wetlands, riparian areas, forest edges, and wooded ravines. Prefers rich, well-drained soils, but can grow well on a variety of barren, infertile soil types, a wide range of soil pH and textures, and is tolerant of periodic flooding by brackish or fresh water. Prefers full sunlight, but can survive in varied light conditions.



*Rubus discolor*  
© The Illustrated Flora of BC

**Reproduction:** Reproduces by seed and vegetatively by rooting at stem tips to form daughter plants, and sprouts from root buds. Plants begin flowering in spring with fruit ripening in midsummer to late August. Thickets can produce 7,000-13,000 seeds per square meter, and seeds can remain viable in the soil for several years. Fruiting stems generally die back at the end of the season, but non-fruiting stems may persist for several years before producing fruit.

**Dispersal:** Primarily dispersed by root and stem fragments. Birds and omnivorous mammals, such as foxes, bears, and coyotes can consume berries and disperse seeds. Humans also contribute to blackberry spread by purposefully planting canes.



## Impacts

**Ecological:** Outcompetes low growing native vegetation through shading and build-up of leaf litter and dead stems. Can prevent the establishment of shade intolerant trees such as Garry oak and ponderosa pine. Himalayan blackberry forms large, dense, impenetrable thickets that limit the movement of large animals, takes over stream channels and stream banks, and reduces sight lines along right-of-ways. Thickets increase flooding and erosion potential by preventing the establishment of deep-rooted native shrubs that would otherwise provide bank stability.

## Integrated Pest Management

*IPM is a decision-making process that includes identification and inventory of invasive plant populations, assessment of the risks that they pose, development of well-informed control options that may include a number of methods, site treatment, and monitoring.*

### Prevention

- » Monitor for Himalayan blackberry on both disturbed and undisturbed areas.
- » Do not purchase, trade, or grow Himalayan blackberry. Instead, grow regional native plants as they are naturally adapted to the local environment and are non-invasive.
- » Ensure soil, gravel, and other fill material are not contaminated.
- » Avoid unloading, parking, or storing equipment and vehicles in infested areas.
- » Remove plants, plant parts, and seeds from personal gear, clothing, pets, vehicles, and equipment. Wash vehicles, including tires and undercarriage, and equipment at designated cleaning sites before leaving infested areas.
- » Bag or tarp plants, plant parts, and seeds before transporting to a designated disposal site (e.g. landfill).
- » Take special care when controlling Himalayan blackberry near streams or ditch lines, to prevent the movement of plant parts downstream.
- » Maintain or establish healthy plant communities that are resistant to invasion by invasive plants.

### Mechanical Control

- » Mowing, including the use of riding mowers and tractor-mounted mowers, can be very effective, but can also harm desirable species. If roots are not manually removed, mowing several times per year over several years is necessary to exhaust root reserves. If mowing or cutting is only done once per year, it should be done when the plants begin to flower. Do not mow where soil is highly susceptible to compaction or erosion, or where soil is very wet.

- » Persistent cultivation (tillage) or cutting in combination with mowing can be very effective. Because mechanical control can stimulate strong regrowth, follow-up with either spot applications of herbicide or hand digging to remove the entire root system.
- » Grazing by goats has proven effective.
- » Monitor controlled infestations during growing season.
- » Disposal: If plants are cut, all plant material must be collected in bags or tarps and incinerated or bagged and deeply buried at a landfill. Care should be taken to ensure that plant parts are not distributed during transport.

### Biocontrol

- » There are no biocontrol agents for Himalayan blackberry. The release of herbivorous insects has not been undertaken due to the risk these insects may pose to closely related, commercially important *Rubus* species.

### Chemical Control

- Herbicide recommendations and use must consider site characteristics and be prescribed based on site goals and objectives. Herbicide labels and other sources of information must be reviewed before selecting and applying herbicides.
- » Ensure that chemical treatments do not injure or kill susceptible, non-target vegetation.
  - » The following herbicides provide effective control for Himalayan blackberry: dicamba, glyphosate, triclopyr or metsulfuron methyl alone. Triclopyr + aminopyralid is also effective.
  - » Application of pesticides on Crown land must be carried out following a confirmed Pest Management Plan (Integrated Pest Management Act) and under the supervision of a certified pesticide applicator. <https://www2.gov.bc.ca/gov/content/environment/pesticides-pest-management/managing-pests>

## References/Links

- » BC Ministry of Forests, Lands, and Natural Resource Operations, Invasive Alien Plant Program (IAPP). [www.for.gov.bc.ca/hra/Plants/application.htm](http://www.for.gov.bc.ca/hra/Plants/application.htm)
- » Controlling Himalayan Blackberry in the Pacific Northwest. The Nature Conservancy. [www.invasive.org/gist/moredocs/rubarm01.pdf](http://www.invasive.org/gist/moredocs/rubarm01.pdf)
- » E-Flora BC, an Electronic Atlas of the Plants of BC. [www.eflora.bc.ca/](http://www.eflora.bc.ca/)
- » King County Noxious Weed Control Program: Best Management Practices for Himalayan blackberry. King County, Washington. <http://your.kingcounty.gov/dnrp/library/water-and-land/weeds/BMPs/blackberry-control.pdf>
- » Garry Oak Ecosystem Recovery Team: Best Practices for Himalayan Blackberry Management. [www.goert.ca/publications\\_resources/invasive\\_species.php](http://www.goert.ca/publications_resources/invasive_species.php)
- » DiTomas J, M., G.B. Kyser et al. 2013. Weed Control in Natural Areas in Western United States. Weed Research and Information Centre, University of California. 544 pp [https://wric.ucdavis.edu/information/natural%20areas/wr\\_R/Rubus.pdf](https://wric.ucdavis.edu/information/natural%20areas/wr_R/Rubus.pdf)



