Comparative Environmental and Social Review
Saanich East-North Oak Bay
Wastewater Treatment Facility Sites

Prepared for:

CRD
Making a difference...together

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Prepared by:

WESTLAND
RESOURCE GROUP

SUMMARY

As part of the Capital Regional District's (CRD's) wastewater treatment program, a treatment facility would be required in the Saanich East-North Oak Bay area. The facility is needed to reduce wastewater flows in downstream portions of the core area wastewater treatment system, and also to create opportunities to provide reclaimed water and energy for use in the surrounding community.

The CRD's Core Area Liquid Waste Management Committee (CALWMC) authorized preparation of an Environmental and Social Review (ESR) of the sites being considered for a treatment plant. In the Saanich East-North Oak Bay area, three candidate sites were identified through a scientific Geographic Information System (GIS) analysis. Using criteria that consider the technical aspects of wastewater treatment facility construction and operation, public concerns and priorities, and input from the CALWMC, the analysis identified lands that have the fewest constraints to siting a treatment facility. The three candidate sites under study are:

- Finnerty-Arbutus,
- Cedar Hill Corner, and
- UVic Fields.

Figure S-1 shows the locations of the three candidate sites. Other figures showing the candidate sites and conceptual facility layouts are presented in Figures 3-4 to 3-9.

A treatment facility would be built at the preferred site selected by the CALWMC. The information contained in this ESR will support the committee's site selection decisions and will aid in refining design of the treatment and ancillary facilities on the preferred site.

For each of the candidate sites, the comparative ESR examines the following topics as they relate to construction and operation of a wastewater treatment facility:

- Landforms, geology, and soils,
- Hydrology and water quality,
- Vegetation,
- Wildlife,
- Archaeology and heritage
- Community use,
- Noise, vibration, and lighting,
- Dust and air emissions,
- Odour,
- Traffic,
- Health and safety, and
- Visual aesthetics.

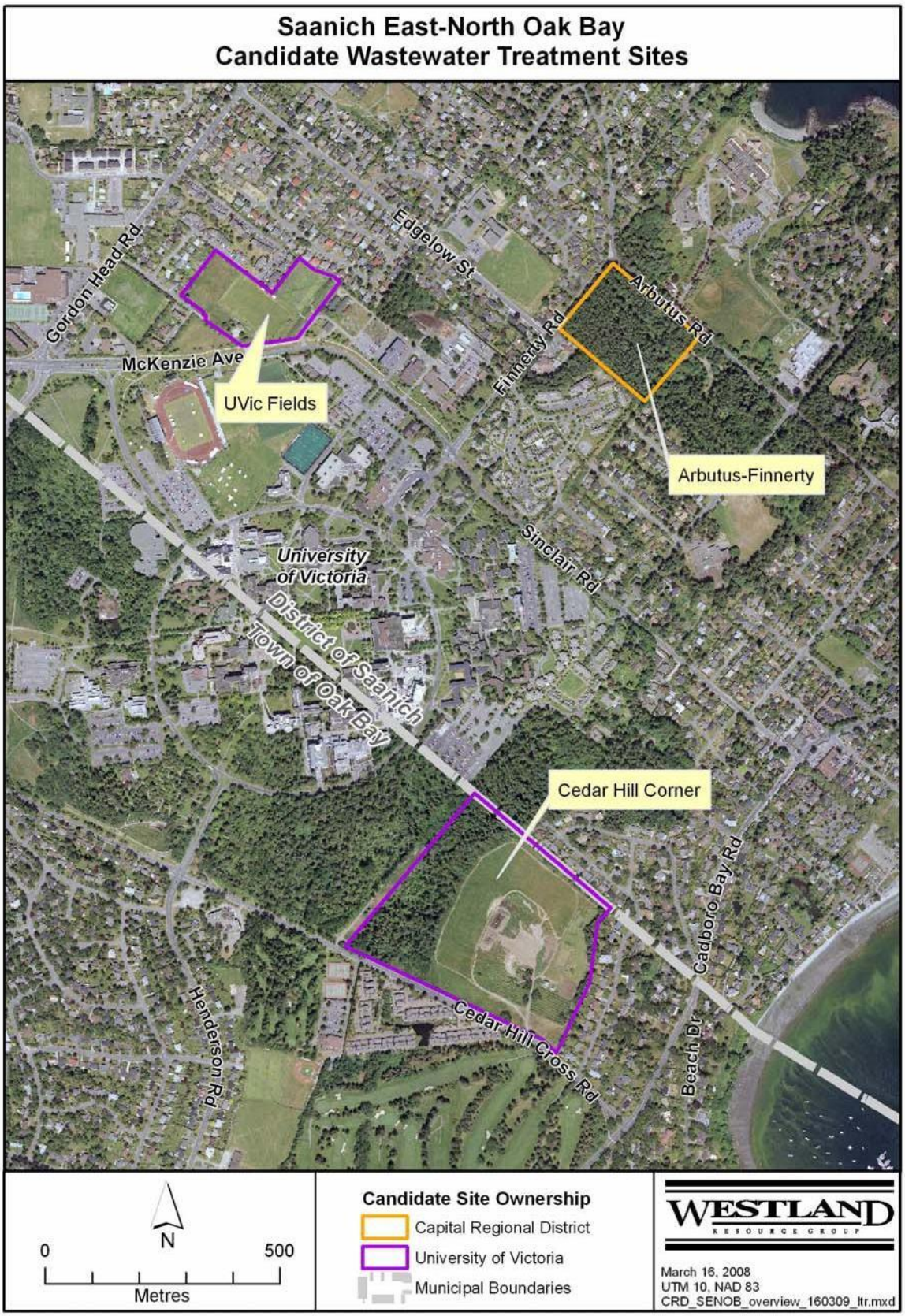

Figure S-1 Facility Location Overview

Potential impacts were identified for both the treatment facility, and for ancillary facilities required for the operation of the facility, including gravity mains, forcemains, a small diameter pressurized pipe, and a pump station. No pump station would be needed if the Finnerty-Arbutus site is selected.

The methods applied in conducting the study are described more fully elsewhere in the ESR, but in general terms, the ESR is based on:

- a review of available literature on wastewater facility construction and operation,
- field inspections of the candidate sites and surrounding areas,
- comments received from the public through surveys and discussions at open houses and dialogue sessions,
- analysis of plans and reports prepared by municipalities and major institutions covering land use, environmental, and other topics,
- discussions with staff of local governments and major land-owning institutions, and direction provided by the CALWMC.

The facility to be located in SENOB would provide "liquids only" treatment, conveying solids for further treatment downstream. Table S-1 summarizes the treatment activities and standards associated with the SENOB facility.

Table S-1 SENOB Facility Treatment Activities and Effluent Quality

Flow Range	Treatment Steps	Treatment level
0 to 2 times Average Dry Weather Flow (ADWF)	• Influent pumping • Screening and grit removal • Primary treatment • Secondary and tertiary treatment (membrane – bioreactors - MBR) • Disinfection (ultra violet)	• Meets standards for effluent reuse and exceeds standards for discharge to a marine environment
Greater than 2 to 4 times ADWF	• Influent pumping • Screening and grit removal • Chemically assisted primary settling	• Meets standards for flows that exceed >2 times ADWF for discharge to a marine environment
Greater than 4 times ADWF	• Influent pumping • Screening and grit removal	• Blended flows meet effluent criteria for discharge to a marine environment

The SENOB facility would produce reclaimed water of sufficiently high quality to be used for non-potable purposes. The facility also would allow energy to be recovered from effluent, for use in suitable structures nearby. The distribution and use of reclaimed water and recovered energy are not included in this ESR.

Construction impacts were examined separately from impacts of operating a wastewater treatment facility. Construction includes site grading, excavation, foundation work, building construction, equipment installation and testing, commissioning of the facility, and landscaping or site restoration. Clearing and grubbing would be required for the Finnerty-Arbutus site. Operations include day-to-day functioning of the treatment facility and ancillary facilities, including routine maintenance.

Impacts identified in the ESR are described according to their:

- spatial extent (area affected),
- temporal extent (duration),
- reversibility,
- magnitude, and
- significance.

The impact assessment first examines the effects of "unmitigated" effects of construction and operation of treatment and ancillary facilities. These ratings reflect project effects if the actions outlined in the project description are taken, and represent the use of standard operating procedures for construction and operation of wastewater facilities. "Mitigated" impacts include measures recommended by the consultant that are not contained in the project description, and that are presented for consideration by the CRD.

Tables S-2, S-3, and S-4 summarize the significance of impacts identified in the ESR for each site. The ratings are provided for unmitigated and mitigated impacts on each of the topics considered. The text of the ESR explains the basis for the ratings assigned, and describes the mitigation measures needed to reduce impacts to less than significant levels. Definitions of the terms used in significance ratings can be found in Table 1-1.

Table S-2 Finnerty-Arbutus site – Significance of impacts

Impact on:	Impact significance							
	Treatment facility				Ancillary facilities			
	Construction		Operation		Construction		Operation	
	Unmitigated	Mitigated	Unmitigated	Mitigated	Unmitigated	Mitigated	Unmitigated	Mitigated
Landforms, geology, and soils	L	L	L	L	L	L	L	L
Hydrology and water quality	L	L	L	L	L	L	L	L
Vegetation	S	S	L	L	L	L	L	L
Wildlife	S	S	L	L	L	L	L	L
Archaeology and heritage	TBD	TBD	L	L	TBD	TBD	L	L
Community use	S	S	L	L	L	L	L	L
Noise, vibration, and lighting	L	L	L	L	L	L	NA	N/A
Dust and air emissions	L	L	N/A	N/A	L	L	N/A	N/A
Odour	N/A	N/A	S	L	N/A	N/A	N/A	N/A
Traffic	L	L	L	L	L	L	L	L
Public health and safety	L	L	L	L	L	L	L	L
Visual aesthetics	S	S	S	L	L	L	L	L

S =	Significant	The identified effect would have a combination of characteristics that render it unacceptable to the public, regulators, other interests, or that exceeds standards or contravenes legal requirements.
L =	Less than significant	All other effects that are not considered significant.
N/A =	Not applicable	
TBD =	To be determined.	Following site selection, an Archaeological Impact Assessment will be completed on the site and ancillary facility sites to evaluate significance.

Table S-3 Cedar Hill Corner site – Significance of impacts

Impact on:	Impact significance							
	Treatment facility				Ancillary facilities			
	Construction		Operation		Construction		Operation	
	Unmitigated	Mitigated	Unmitigated	Mitigated	Unmitigated	Mitigated	Unmitigated	Mitigated
Landforms, geology, and soils	L	L	L	L	S	L	L	L
Hydrology and water quality	L	L	L	L	S	L	L	L
Vegetation	L	L	L	L	S	S	L	L
Wildlife	L	L	L	L	S	S	L	L
Archaeology and heritage	TBD	TBD	L	L	TBD	TBD	L	L
Community use	S	S	L	L	S	S	L	L
Noise, vibration, and lighting	L	L	L	L	L	L	L	L
Dust and air emissions	L	L	N/A	N/A	L	L	N/A	N/A
Odour	N/A	N/A	S	L	N/A	N/A	L	L
Traffic	L	L	L	L	L	L	L	L
Public health and safety	L	L	L	L	L	L	L	L
Visual aesthetics	L	L	L	L	S	L	L	L

S =	Significant	The identified effect would have a combination of characteristics that render it unacceptable to the public, regulators, other interests, or that exceeds standards or contravenes legal requirements.
L =	Less than significant	All other effects that are not considered significant.
N/A =	Not applicable	
TBD =	To be determined.	Following site selection, an Archaeological Impact Assessment will be completed on the site and ancillary facility sites to evaluate significance.

Table S-4 UVic Fields site – Significance of impacts

Impact on:	Impact significance							
	Treatment facility				Ancillary facilities			
	Construction		Operation		Construction		Operation	
	Unmitigated	Mitigated	Unmitigated	Mitigated	Unmitigated	Mitigated	Unmitigated	Mitigated
Landforms, geology, and soils	L	L	L	L	L	L	L	L
Hydrology and water quality	L	L	L	L	L	L	L	L
Vegetation	L	L	L	L	S	S	L	L
Wildlife	L	L			S	S		
Archaeology and heritage	TBD	TBD	L	L	TBD	TBD	L	L
Community use	S	S	L	L	S	S	L	L
Noise, vibration, and lighting	S	S	S	S	L	L	L	L
Dust and air emissions	S	S	N/A	N/A	L	L	N/A	N/A
Odour	N/A	N/A	S	L	N/A	N/A	L	L
Traffic	L	L	L	L	L	L	L	L
Public health and safety	L	L	L	L	L	L	L	L
Visual aesthetics	S	S	S	L	S	L	L	L

S =	Significant	The identified effect would have a combination of characteristics that render it unacceptable to the public, regulators, other interests, or that exceeds standards or contravenes legal requirements.
L =	Less than significant	All other effects that are not considered significant.
N/A =	Not applicable	
TBD =	To be determined.	Following site selection, an Archaeological Impact Assessment will be completed on the site and ancillary facility sites to evaluate significance.

The following points highlight the results shown in the significance summary tables.

- Treatment facility operation has the potential to occasionally release odours under the existing project design. Augmenting the levels of treatment and ensuring backup systems are installed would reduce odour impacts to less than significant levels at all times.
- Visual aesthetic impacts can be reduced to less than significant levels by improving design quality of the treatment facility, and minimizing viewshed effects from surrounding properties. Once screening vegetation matures, the significance of visual impacts is reduced.
- On the Finnerty-Arbutus site, construction of the treatment facility would result in significant impacts to vegetation, wildlife, community use, and visual aesthetics. Mitigation would reduce all of these impacts to less than significant levels during facility operation.
- Ancillary facilities include gravity mains, forcemains, and (for Cedar Hill Corner and UVic Fields) a pump station. Construction of these facilities could create substantial nuisance effects for nearby residents unless mitigation is implemented that includes limiting hours of work, street sweeping, dust control, and effective traffic management.
- Under the present design, the forcemain and gravity main route to the Cedar Hill Corner facility crosses Upper Hobbs Creek drainage. This crossing would cause significant impacts on soils, hydrology, vegetation, wildlife, community use, and visual aesthetics. The soils and hydrology impacts can be mitigated through construction techniques, but reducing the vegetation, wildlife, and visual aesthetics impacts would require relocation of the pipe route.
- The only site where noise, vibration, and lighting impacts are expected to be significant is the UVic Fields site. The proximity of residences constrains the ability to mitigate these effects. Only relocation of the facility to another portion of the site would reduce these impacts to less than significant levels (though relocation could affect community use of Wallace Field). Though residents noted noise concerns at Cedar Hill Corner, the substantial separation distance between the treatment facility and houses would allow noise impacts to be effectively controlled.
- Disruption of public access from McCoy Road to UVic, and loss of planned recreational opportunities on the UVic Fields site are considered to be unmitigable significant impacts of construction. The impacts can be mitigated to less than significant levels during facility operation.
- The Cedar Hill Corner and UVic Fields sites would require construction of a pump station on the Finnerty-Arbutus site. The vegetation, wildlife, and community use impacts of constructing the ancillary pump station are considered significant and unmitigable.
- Archaeology impacts cannot be determined until an Archaeological Impact Assessment (AIA) is conducted on the selected site. Under British Columbia legislation, a proponent is required to mitigate a project's impacts on identified

archaeological features. This requirement means that operational impacts must be less than significant.

- For all sites, application of standard design, construction, and operational practices would limit impacts on traffic and roads, dust and air emissions, and health and safety to less than significant levels.

Construction and operation of treatment and ancillary facilities would result in environmental and social impacts, nearly all of which can be mitigated. The nature of the impacts and recommended mitigation measures are described in the ESR.

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1.0 INTRODUCTION

This section describes the context, scope, and general methods used to prepare the following Environmental and Social Review (ESR) for the Saanich East-North Oak Bay (SENOB) wastewater treatment facility, which is part of the Capital Regional District's (CRD's) wastewater treatment program.

1.1 Context and background

The CRD has provided wastewater treatment services for communities throughout the region for decades, including secondary treatment facilities on Salt Spring Island and on the Saanich Peninsula. Operating under permit from the British Columbia Ministry of Environment, the CRD discharges screened wastewater from core area municipalities into the deep marine waters of the Strait of Juan de Fuca.

In 2006, the British Columbia Minister of Environment directed the CRD to begin planning to provide a higher level of wastewater treatment for the core area municipalities. Subsequently, the province requested the CRD to consider resource recovery as part of its wastewater treatment program. The Core Area Liquid Waste Management Committee (CALWMC) has authorized staff and consultants to undertake a variety of planning studies associated with wastewater treatment technology, resource recovery and reuse, and facility siting.

This Environmental and Social Review (ESR) was authorized by the CALWMC as part of the site selection and evaluation component of the core area liquid waste management program. This comparative ESR is intended to:

- describe the characteristics of candidate treatment facility sites in the SENOB area,
- assess potential environmental and social effects of constructing and operating facilities on the candidate sites,
- identify the magnitude and significance of the impacts, and potential mitigation measures associated with the impacts,
- consider comments received from the public during recent open houses in the SENOB area, and
- provide information to support the selection of a preferred site by the CALWMC,
- support future design and construction decisions in ways that minimize impacts.

The comparative ESR fulfills a component of the CALWMC's Terms of Reference for the conduct of site selection and evaluation studies, issued in 2007.

1.2 Regulatory context

This ESR is part of a CRD-driven process of wastewater treatment facility site selection and evaluation. The content of the ESR was developed through discussions between the CRD and the consultant retained to prepare the ESR, and responds to comments received from the public and other interested parties.

The ESR is linked to several other environmental assessment and planning processes associated with the wastewater program:

- A triple bottom line (TBL) assessment and comparison of the three candidate wastewater treatment sites in SENOB will be provided to the CALWMC as part of the site selection decision process.
- An Environmental Impact Study (EIS) is required by the British Columbia Ministry of Environment as part of the Liquid Waste Management Plan review and approval process. An EIS is required for the entire CRD Wastewater Treatment Program, not just the SENOB facility, and examines both the marine and terrestrial environments. The CRD plans to conduct the EIS during 2009. The terrestrial EIS will rely in large measure on data collected in support of the ESR. A Stage 1 EIS has been conducted for the two marine areas where outfalls may be located. New data to support the Stage 2 marine assessment is presently being collected.
- An assessment under the *Canadian Environmental Assessment Act* (CEAA) may be required for all or some of the core area wastewater facilities. At the time that this ESR was prepared, the CRD was engaged in discussions with the Canadian Environmental Assessment Agency to determine whether an assessment would be required for the SENOB site. If a *Canadian Environmental Assessment Act* assessment is required, it would rely on much of the information collected to support the ESR.

1.3 Scope of the study

Section 2 of this report provides information on how the candidate sites were identified and selected. Section 3 describes how a wastewater treatment facility in Saanich East-North Oak Bay would be constructed and operated. Subsequent sections of the ESR examine environmental and social effects of the wastewater treatment facility and the ancillary facilities required for facility operation (mainly pipes and a pump station). The intent of the ESR is to provide comparable levels of assessment for each of the three identified candidate sites. After review of the ESR, input from the public, and other available sources of information, the CALWMC will select one preferred site for construction of a wastewater treatment facility.

The "study area" for the ESR includes the lands east of Gordon Head Road, south of Finnerty Cove, west of Cadboro Bay, and the northern portion of Oak Bay (Figure 1-1). The scope of analysis conducted varies for each of the topic areas included in this ESR. For instance, land use effects are expected to occur where the treatment facility and ancillary facilities will be built, and

adjacent properties. Traffic effects may be experienced more broadly, so the assessment examines potential traffic issues at some distance from the proposed facility. Regional environmental implications of constructing a facility in SENOB are reviewed for relevant topics, and the cumulative effects assessment emphasizes sub-regional conditions.

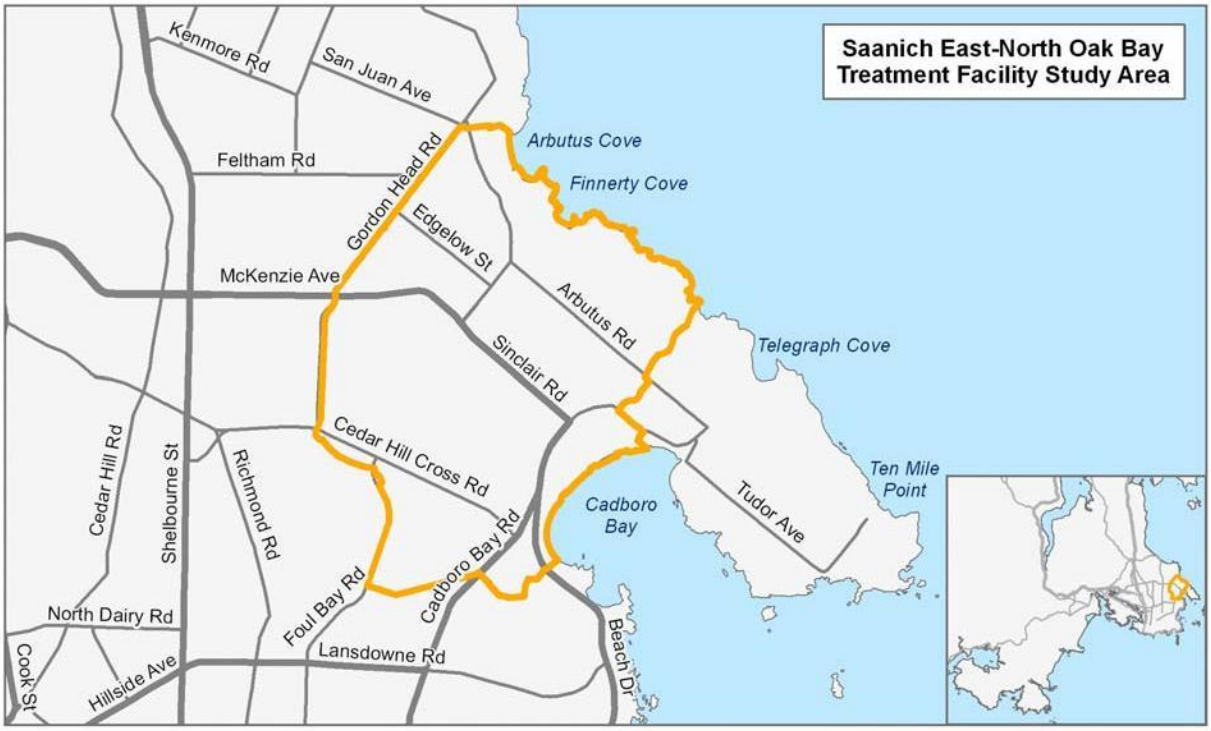

Figure 1-1 Saanich East-North Oak Bay Treatment Facility Study Area

The topics examined in the ESR are relevant to the nature of construction and operation of wastewater facilities, and are based on:

- experience of CRD staff in delivery of wastewater treatment services,
- input from the CALWMC during review of the ESR design,
- comments received from the public on factors considered important in siting a wastewater facility, and
- consulting team experience in conducting siting and wastewater studies.

In 2007, the CRD conducted a public telephone survey of 907 residents to identify topics considered important in wastewater facility siting. The results of that survey helped to develop and refine the criteria used to select the candidate sites and the topics included in the ESR. Input received during the 2009 public involvement program aided the refinement of topics under study. Additional topics have been added in response to comments received from the CALWMC on the design of the ESR.

1.4 Approach to the study

The methods applied in conducting the study are described more fully elsewhere in the ESR, but in general terms, the ESR is based on:

- a review of available literature on wastewater facility construction and operation,
- field inspections of the candidate sites and surrounding areas,
- comments received from the public through surveys and discussions at open houses and dialogue sessions,
- analysis of plans and reports prepared by municipalities and major institutions covering land use, environmental, and other topics,
- discussions with staff of local governments and major land-owning institutions, and
- direction provided by the CALWMC.

Information used in the preparing the ESR includes government maps and reports, aerial photographs, geographic information system data and subsequent analysis, and design information on wastewater facility equipment, staffing, and other operational details.

In preparing to conduct the ESR, conceptual locations of wastewater facilities were prepared for each of the three candidate sites. Engineering staff of the CRD and their consultants were involved in developing the conceptual facility footprints.

It is important to recognize that the locations of structures shown on maps in this ESR can be changed to avoid or reduce impacts that are identified through the assessment and public review processes. Hence, although the conceptual locations are considered to be practical and would allow for construction and operation of the facility, the actual location and layout of structures that will be built on the selected site may vary from the conceptual designs used to support this assessment.

The ESR assesses the construction and operation of a membrane bioreactor (MBR) wastewater treatment facility on one of the three candidate sites. As more detailed engineering studies are conducted, other treatment technologies could be considered and eventually selected. Nonetheless, for the purposes of the ESR, MBR technology, which allows for a small facility footprint and high quality effluent, was assumed to be the technology of choice.

1.5 Impact ratings used for the Environmental and Social Review

Table 1-1 presents the assessment criteria applied in the ESR. The criteria cover such topics as the spatial context of project impacts, temporal context, reversibility, magnitude, and significance of potential effects of project construction and operation.

The criteria applied in this study are based on industry standards for impact assessment, adapted for use in the SENOB wastewater assessment. The rating of impacts under these headings focuses on the mitigated impact identified in the ESR. The mitigation is based on standard construction and operating procedures contained in the project description (Section 3). Hence, significance is assigned to mitigated project effects. If additional mitigation is recommended by the consulting team (over and above that described in the project description), those additional measures are described in the text of the ESR. These additional measures would be intended to further reduce identified project impacts.

Table 1-1 Assessment criteria used in assessing project effects

Assessment Criteria		Definition
SPATIAL CONTEXT location of effect		
Treatment Facility Footprint		The Facility Footprint for the Project is the land area permanently occupied by the treatment facility including buildings, parking, and access.
Ancillary Facility Footprint		The Ancillary Facility Footprint for the Project is the land area temporarily or permanently occupied by wastewater trunks, gravity mains, forcemains, pump stations, and other associated facilities.
Workspace		Areas temporarily used during construction, including equipment and material storage or vehicle access.
Local Area		The lands within 250 m of the candidate site.
Regional Area		The Regional Study Area (RSA) is the area in the Core Area municipalities.
TEMPORAL CONTEXT of effect		
Duration (interval of the event causing the residual effect)	Short-term	Event duration is less than or equal to one year.
	Medium-term	Event duration is longer than one year but less than or equal to five years.
	Long-term	Event duration extends longer than five years.
Frequency (how often would the event that caused the residual effect is anticipated to occur)	Occasional	Event occurs intermittently.
	Periodic	Event occurs intermittently but repeatedly over the construction and operations period.
	Continuous	Event occurs continually over the assessment period.
Reversibility (period of time over which the residual effect extends)	Yes	The potential effect can be reversed.
	No	The potential effect cannot be reversed, despite efforts to mitigate.
MAGNITUDE of the effect		
Negligible		Potential effect is barely detectable.
Low		Potential effect is well below established or derived environmental standards or thresholds.
Moderate		Potential effect is detectable but meets established or derived environmental or regulatory standards or thresholds.
High		Potential effect exceeds established or derived environmental standards or thresholds.

Assessment Criteria	Definition
BENEFICIAL or ADVERSE effect	
Beneficial	The resource or topic under study would be improved as a result of project effects.
Adverse	The resource or topic under study would be worsened as a result of project effect.
SIGNIFICANCE of the effect	
Significant	The identified effect would have a combination of characteristics that render it unacceptable to the public, regulators, other interests, or that exceeds standards or contravenes legal requirements.
Less than significant	All other effects that are not considered significant.

1.6 Project team

The ESR was prepared by Westland Resource Group and affiliated consultants, with the involvement of CRD personnel. The study team was headed by senior planners and environmental scientists at Westland, a Victoria-based environmental consulting firm. Expertise was provided in the following areas:

- land use planning and analysis,
- biology (vegetation and wildlife),
- hydrology and water quality,
- community effects (noise, odour, light and glare),
- archaeology and heritage, and
- Geographic Information System-based mapping and spatial analysis.

Additional consultants involved in the project include:

- Bunt & Associates Engineering (BC) Ltd. (traffic and roads),
- Dayton & Knight Ltd. (facility design, construction, and operation),
- Genesis Engineering Inc. (odour dispersion modelling),
- C.N. Ryzuk & Associates Ltd. (geotechnical analysis),
- Decision Economics Consulting Group (property values),
- Bjorn Simonsen (archaeology), and
- Stanton Tuller (meteorology).

All of these consultants have professional registrations in their various fields and are experienced in conducting studies of this type. Westland was selected to conduct the ESR after a competitive proposal process conducted by the CRD.

2.0 SELECTION OF CANDIDATE SITES

Selection of a short list of candidate treatment facility sites applied a science-based approach, using a Geographical Information System (GIS) to "overlay" various site selection criteria . The identification of candidate sites in the Saanich East-North Oak Bay area involved the following series of steps to determine the characteristics of the study area, and to assign compatibility ratings to particular parcels to accommodate a treatment facility:

1. Prepare draft site selection criteria
2. Criteria reviewed by the public, CRD committees and staff, First Nations, municipal staff and managers of major institutions
3. Revise site selection criteria
4. Collect and analyze information
5. Apply criteria to evaluate the suitability of areas for wastewater treatment facilities
6. Contact owners of potential sites
7. Identify candidate sites
8. Public Review of candidate sites
9. Prepare an Environmental and Social Review of short-listed sites.

The GIS analysis included the following topics, criteria and indicators (Table 2-1):

Table 2-1 Categories considered in GIS site selection process

Topics	Criteria	Indicators
Biological features	Ecological disturbance and ecological features	Level of past disturbance
		Sensitive Ecosystem Inventory
	Major streams	Proximity to major streams
Community	Odour	Potential for nuisance odour
	Land use	Compatibility with planned land uses
Archaeology and heritage	Archaeology	Archaeological potential
	Heritage structures	Presence of registered heritage structures
Geotechnical	Geotechnical development constraints	Surficial material, seismic and liquefaction risk and site drainage constraints
	Slope	Site steepness
	Site stability	Slope stability
Energy conservation	Reduced need for pumping	Gravity flow potential

The GIS analysis rated lands in the Saanich East-North Oak Bay study according to their suitability for a treatment facility. The owners of properties deemed to have the fewest constraints to locating a treatment facility were contacted by CRD staff and consultants. These property owners were the Queen Alexandra Foundation for Children and the University of Victoria. Following these meetings, three candidate sites were identified for further study and analysis in this ESR. The following candidate sites were presented to the CALWMC in April 2008, and approved for further investigation:

- Finnerty-Arbutus property,
- UVic Fields and
- Cedar Hill Corner.

Participants in the public involvement process identified several additional sites for consideration. Some of these sites were previously investigated, and others were not. A separate report will describe these sites, and reasons for further examination or exclusion from further study, as appropriate.

The University of Victoria has taken no position on the use of their lands for a treatment facility. If a university-owned site is chosen after the site analysis, public review, and selection process is complete, the university has invited the CRD to discuss how to proceed. No guarantees have been provided that University of Victoria-owned land would be available for the treatment facility.

3.0 DESCRIPTION OF THE WASTEWATER TREATMENT FACILITIES AND OPERATION

This section provides a description of the Saanich East-North Oak Bay (SENOB) wastewater treatment facilities. The description is based on a typical modern secondary treatment facility. Detailed design information, such as the orientation of the various components of the treatment facility on the site and exterior building finishes, have not been determined. These design details will be developed following public input and the selection of one of the three candidate sites.

3.1 Wastewater Conveyance and Treatment

The Ministry of Environment identified the following six objectives for wastewater treatment in a letter to the CRD dated December, 2007. The CRD provided a plan on how these objectives will be met.

- *Objective 1: Meet regulatory standards*
- *Objective 2: Minimize total project cost to taxpayers*
- *Objective 3: Optimize the distribution of infrastructure*
- *Objective 4: Reduce greenhouse gas emissions*
- *Objective 5: Optimize smart growth strategies*
- *Objective 6: Examine opportunities for public-private partnerships.*

The CRD adopted a series of goals and accompanying strategies for wastewater management (CRD, June 2008). The three goals are:

- *protect public health and the environment,*
- *manage wastewater in a sustainable manner, and*
- *provide cost effective wastewater management.*

Wastewater Treatment for Saanich East-North Oak Bay

A wastewater treatment facility in Saanich East-North Oak Bay will allow wastewater to be treated nearer to its source. The SENOB treatment facility will function as a decentralized wastewater treatment facility to reduce flows to existing CRD wastewater treatment facilities at Clover Point and Macaulay Point. The SENOB treatment facility provides opportunities for energy and water recovery.

The wastewater flow to the new SENOB facility would come from the existing Arbutus catchment area (Gordon Head) and would also take flow from the existing Penrhyn catchment area (Ten Mile Point and Cadboro Bay) (Figure 3-1).

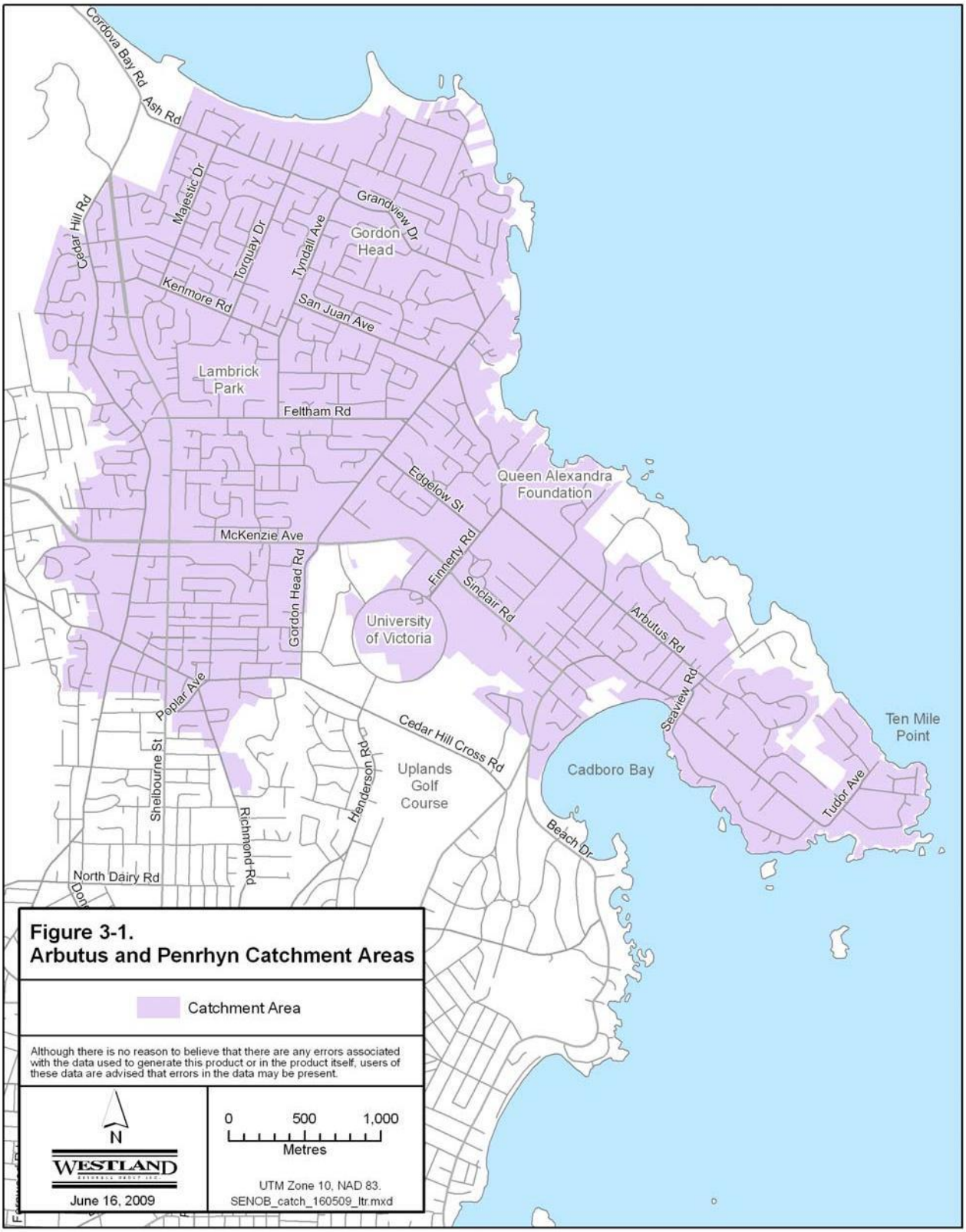

Figure 3-1 Arbutus and Penrhyn Catchment Areas

The SENOB facility would be a "liquid stream only" wastewater treatment facility. Dilute sludge from the secondary treatment process at the SENOB treatment facility would be discharged into the existing CRD sewer system for further treatment at downstream facilities.

The SENOB facility would provide the following levels of treatment for wastewater flow and meet the stated quality standards for treated effluent.

Table 3-1 SENOB Facility Treatment Activities and Effluent Quality

Flow Range	Treatment Steps	Treatment level
0 to 2 times Average Dry Weather Flow (ADWF)	• Influent pumping • Screening and grit removal • Primary treatment • Secondary and tertiary treatment (membrane – bioreactors - MBR) • Disinfection (ultra violet)	• Meets standards for effluent reuse and exceeds standards for discharge to a marine environment
Greater than 2 to 4 times ADWF	• Influent pumping • Screening and grit removal • Chemically assisted primary settling	• Meets standards for flows that exceed >2 times ADWF for discharge to a marine environment
Greater than 4 times ADWF	• Influent pumping • Screening and grit removal	• Blended flows meet effluent criteria for discharge to a marine environment

Treatment units are assumed to be designed to achieve, for unrestricted use, the following standards (per Schedule 2 and Schedule 5 Table 3 BC Reg. 321/2004 and 305/2007):

- Biological oxygen demand (BOD5) <10 mg/L
- Naphelometric turbidity units (NTU) < 2.

Standby facilities are required to meet reliability requirements for the SENOB facility because facility shutdowns must be avoided. The proposed SENOB facility would be designed to:

- provide treatment works to produce a reclaimed water, or
- allow discharge of effluent to water or land that could be permanently or unacceptably damaged by a discharge of untreated wastewater for even a few hours.

The treated effluent that would be discharged to the marine environment through the Finnerty Cove outfall may not always meet reuse quality standards because it would be discharged into the strong currents of Haro Strait. All effluent slated for water reuse would meet high quality standards. The Environmental Impact Study (EIS) prepared for the SENOB project will provide further clarification on disinfection criteria for a marine discharge.

The equipment and treatment units to be installed in the SENOB treatment facility must comply with the process reliability standards set out in the British Columbia Municipal Sewage Regulations.

The treatment facility is proposed to be constructed in two stages. Stage 1 would be built between 2010 and 2012, and would see 75% of the ultimate capacity constructed. The remaining 25% would be constructed in about 2030 (CRD, Mar 2007). Secondary and tertiary treatment capacity for reclamation is to be provided for up to two times the ADWF or 38 ML/d for the year 2065. Primary treatment would be provided for flows to about 63 ML/d. Treated effluent not required for reclamation would be discharged through the existing Finnerty Cove outfall. This outfall would be extended to move the discharge point further off-shore, pending results of marine studies presently underway. The outfall extension is a component of the SENOB project, but cannot be assessed in this ESR because the discharge location has not been determined.

The facility design is to be low profile and architecturally designed to fit with the surrounding neighbourhood. Components of the facility would be arranged and configured to suit the site.

A schematic diagram of the wastewater treatment process is presented in Figure 3-2.

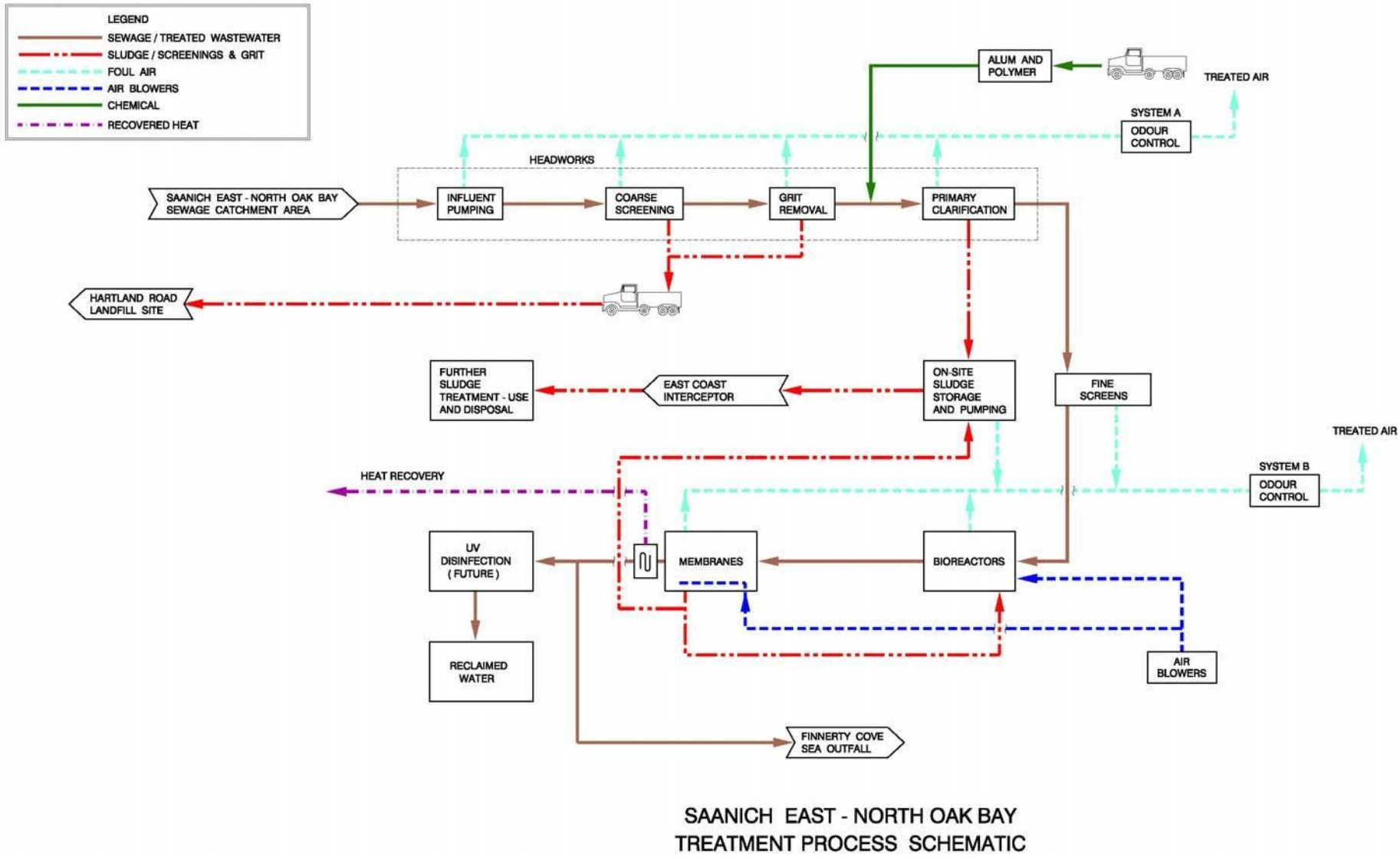

Figure 3-2 Saanich East-North Oak Bay treatment process schematic

Steps in the Wastewater Treatment Process

Wastewater treatment at the SENOB facility would involve:

- an influent pumping station (>63 ML/d),
- screening and grit removal of all wastewater flows (>63 ML/d),
- chemically-enhanced primary treatment for flows exceeding two times average dry weather flows (ADWF), (38 ML/d),
- secondary and tertiary treatment using Membrane Bioreactor (MBR) technology of wastewater volumes up to two times ADWF, or 38 ML/d,
- sludge (3.5-6.8 tons/day [5.2 tons/day] average) discharge and conveyance in existing trunk sewers for downstream treatment, and
- unused treated effluent released to marine waters near Finnerty Cove via an upgraded and extended existing or replaced outfall.

The SENOB wastewater treatment facility is planned to be constructed in two stages:

- Stage 1 construction (2010) to 75% of ultimate capacity
- Stage 2 (2030) to 100% of ultimate capacity

Wastewater Treatment Sites

The SENOB wastewater treatment facility layouts and site infrastructure for the three candidate sites that are presented in Figures 3-4 to 3-9 reflect the ultimate size of the facility in the year 2065.

1. **Finnerty-Arbutus property**

   The proposed site on the corner of Finnerty Road and Arbutus Road is shown on Figure 3-3. The site is close to the existing Finnerty Cove outfall. The wastewater would be diverted into the treatment facility at the Finnerty-Arbutus site from the existing trunk sewer through a 20 m-long pipe, depending on the final location of the inlet structure of the treatment facility (Figure 3-4). The treated (unused) effluent would be discharged to the proposed outfall through a 1,200 m-long gravity main and outfall. The screenings and grit would be transferred by enclosed truck to the Hartland Landfill site, which is approximately 16 km northwest of the Finnerty-Arbutus site. The sludge would be pumped or discharged by gravity to the East Coast Interceptor. Wastewater from the Penrhyn pump station would be pumped to the Finnerty-Arbutus intake by a small diameter forcemain that is 1,500 m long.

2. Cedar Hill Corner

The proposed Cedar Hill Corner site is north of Cedar Hill Cross Road and east of Haro Road as shown on Figure 3-5. The wastewater would be pumped to the treatment facility site at Cedar Hill Corner from the Arbutus Road Pump Station through a 1,750 m long forcemain (Figure 3-6). Moreover, a 850 m long forcemain has to be installed to divert the wastewater from the Garnet Pump Station forcemain along Sinclair Road. Wastewater from Penrhyn pump station would be pumped to the Arbutus Road pump station by a small diameter of 1,500 m long forcemain. The Arbutus Road pump station is a new pump station with all additional forcemain components. The treated (unused) effluent would be discharged to the Finnerty Cove outfall through a 2,550 m long gravity main and outfall. The screenings and grits are transferred by ground transportation to the Hartland Landfill site, approximately 17 km away from the proposed Cedar Hill Corner site. Sludge is pumped or gravity discharged to the East Coast Interceptor.

3. UVic Fields

The proposed UVic Fields site is north of McKenzie Avenue and southeast of Gordon Head Road, the site is shown on Figure 3-7. The wastewater would be pumped to the treatment facility site at UVic Fields from the Arbutus Road Pump Station through a 1,350 m long forcemain (Figure 3-8). The treated (unused) effluent would be discharged to the Finnerty Cove outfall through a 2,150 m long gravity main and outfall. The screenings and grits are transferred to the Hartland Landfill site, approximately 16 km away from the proposed UVic Fields site. Sludge is pumped or gravity discharged to the East Coast Interceptor. A new pump station at Arbutus Road with connecting sewer main are needed if the UVic Fields site is selected. Wastewater from the Penrhyn pump station would be pumped to the Arbutus Road pump station by a small diameter of 1,500 m long forcemain.

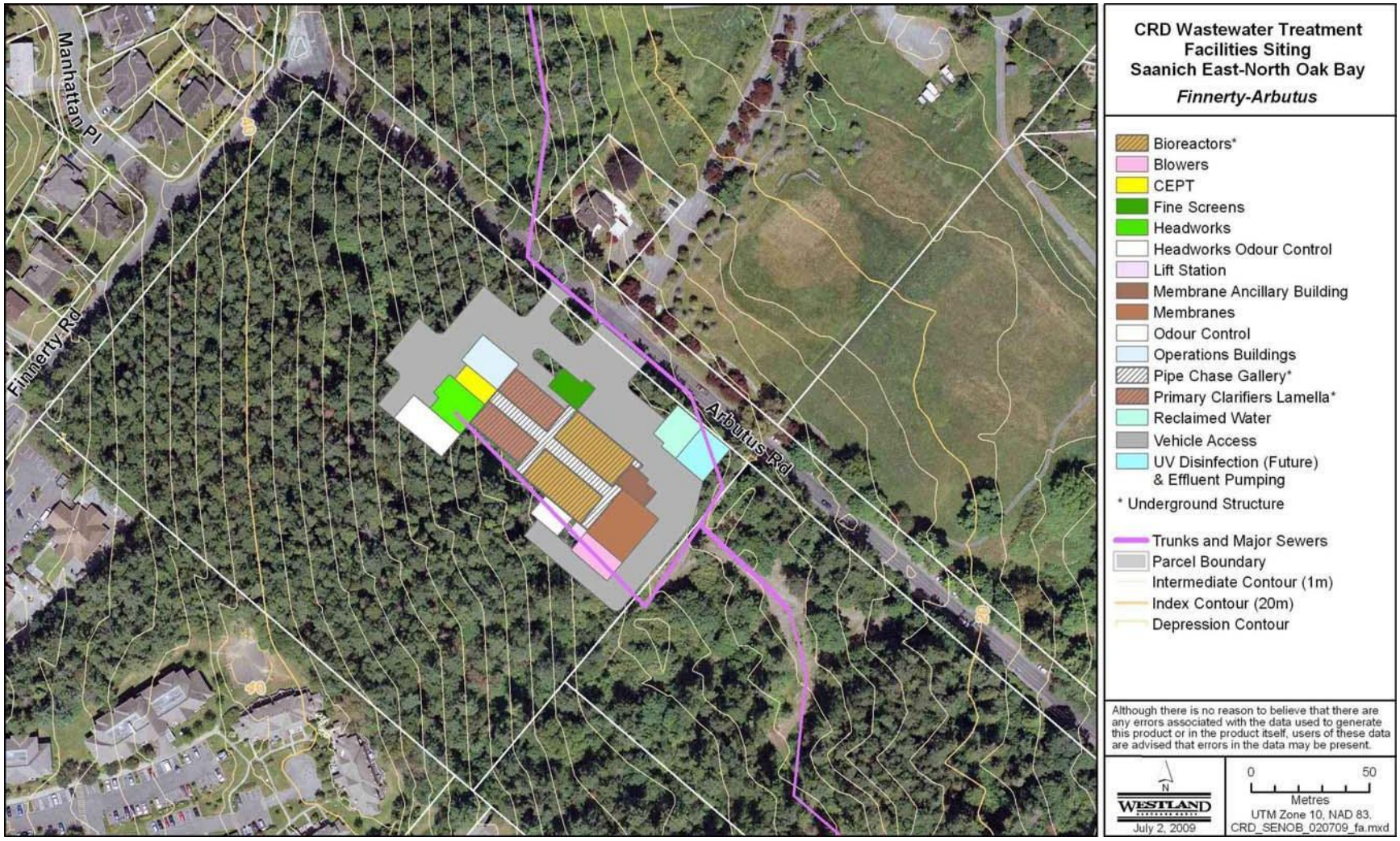

Figure 3-3 Finnerty-Arbutus facility conceptual layout

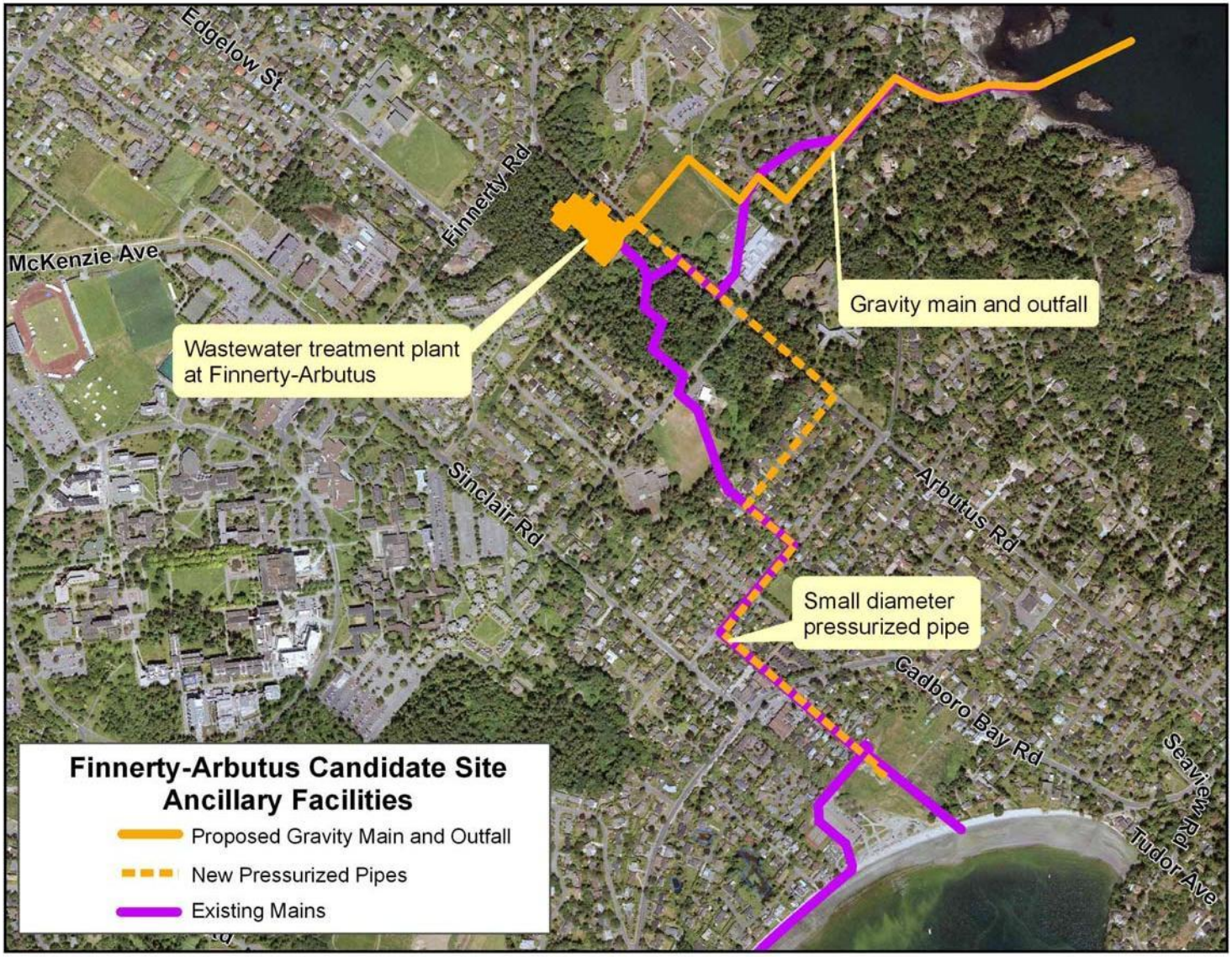

Figure 3-4 Finnerty-Arbutus candidate site infrastructure

Figure 3-5 Cedar Hill Corner facility conceptual layout

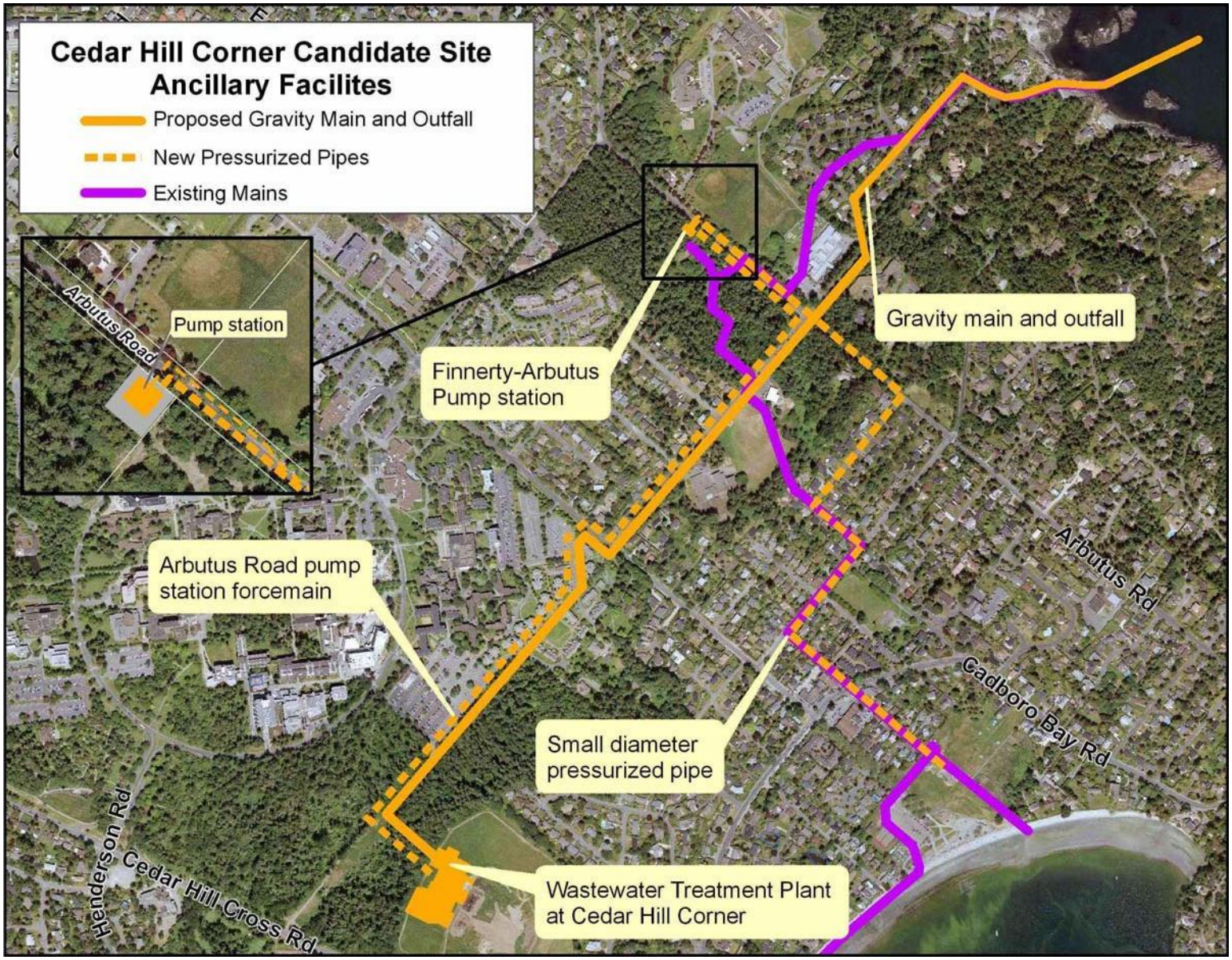

Figure 3-6 Cedar Hill Corner candidate site infrastructure

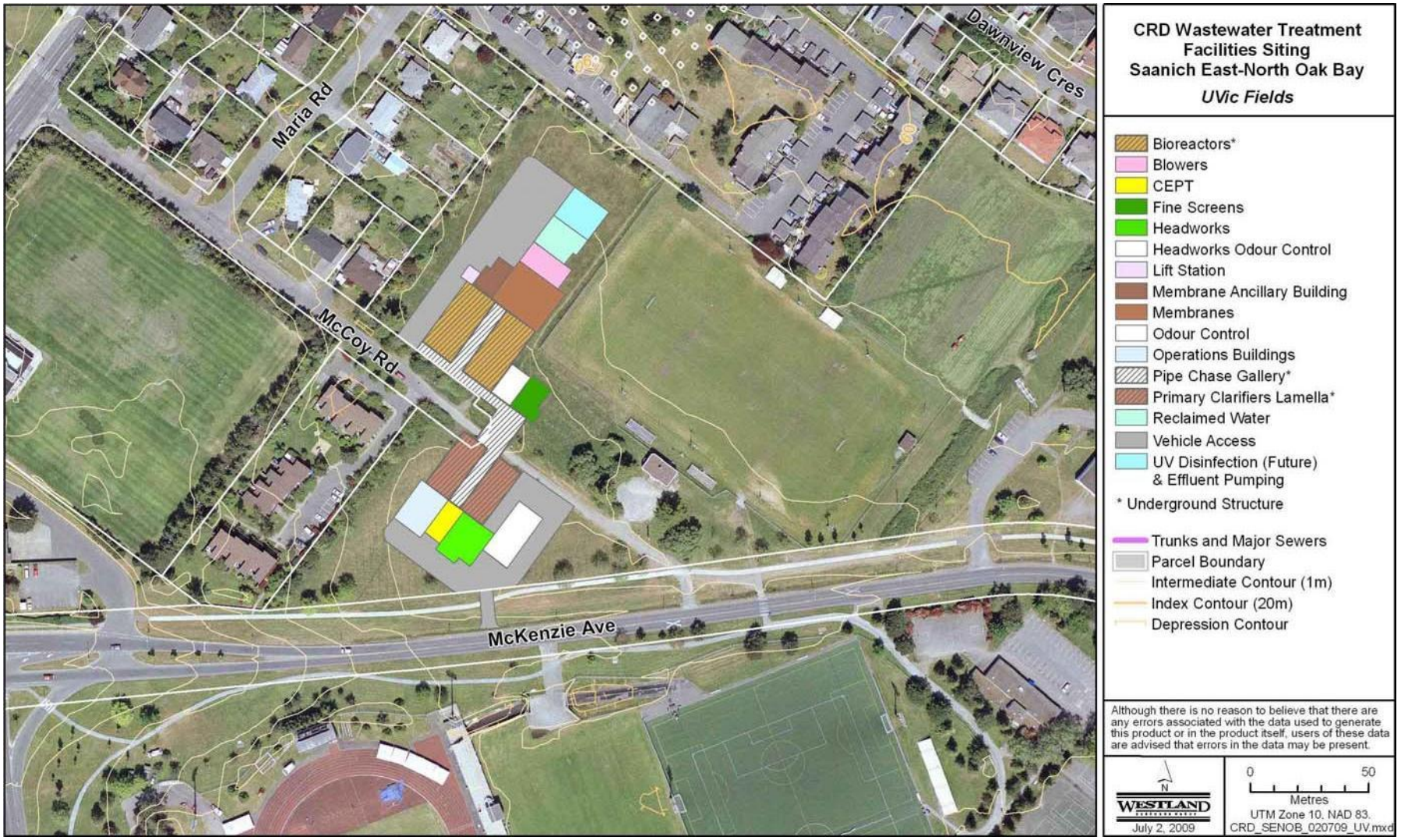

Figure 3-7 UVic Fields facility conceptual layout

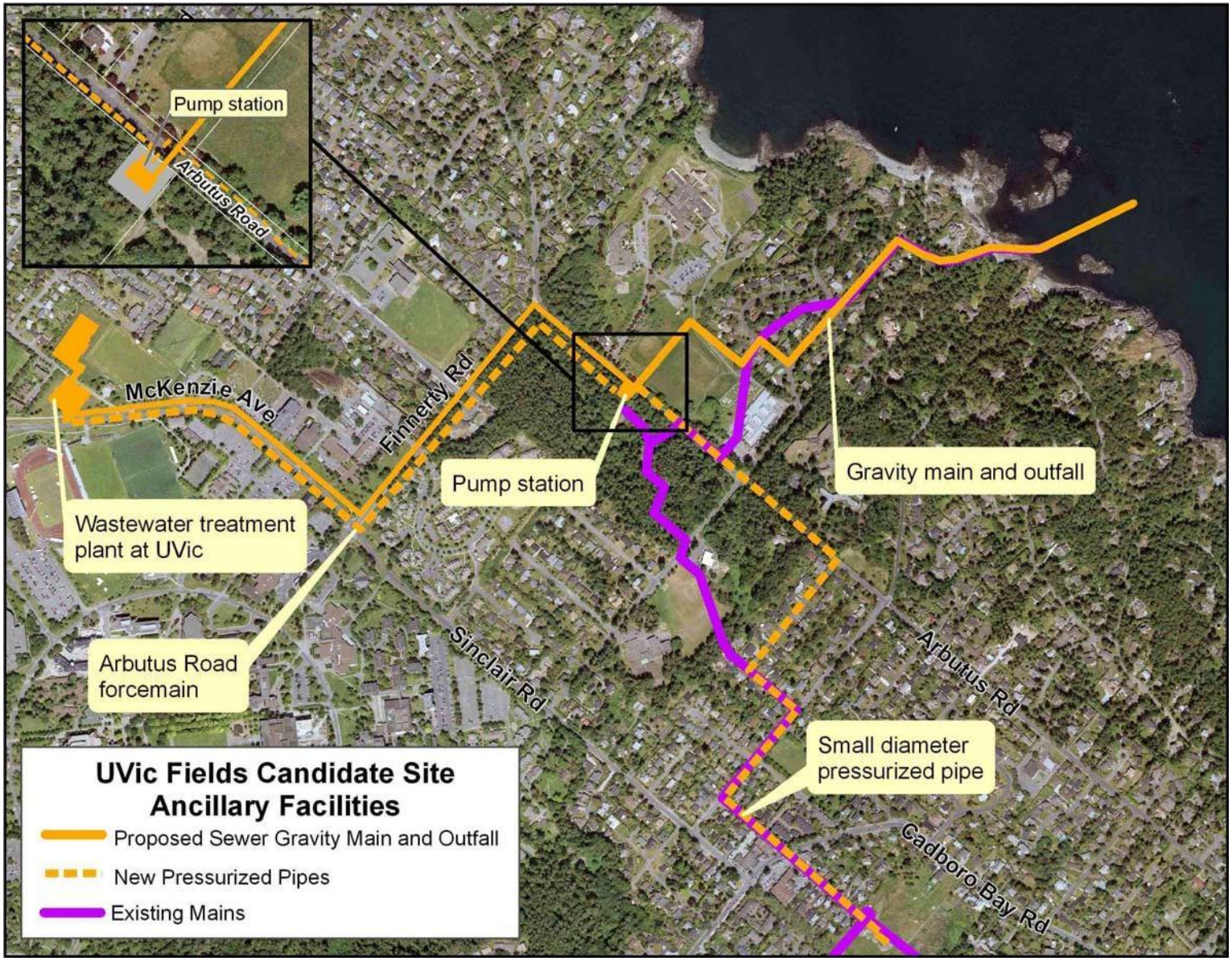

Figure 3-8 UVic Fields candidate site infrastructure

3.2 Operations

Operations of the treatment facility include day-to-day activities at the treatment facility and pump stations, and routine maintenance of all facilities.

This section provides information on transportation and traffic, and estimated noise and odour and electricity consumption for facilities at the site options.

Screenings and Grit Removal

Transporting screenings and grit to Hartland landfill would require one truck every five to six days. This estimate is based on the following assumptions:

- 2 mm screen,
- 10.5 m^3 screenings per 100 ML treated, or 2 m^3 of screenings per day,
- Grit 1.5 m^3 of grit per 100 ML treated, or 0.3 m^3 of grit per day,
- Trucks have a capacity of 13 m^3.

Chemicals

Chemicals used in the treatment process would be largely inorganic materials such as acids, caustics, oxidizing chemical agents (alum, polymer), or compounds (mild acids) for cleaning the membranes. These chemicals would be delivered on weekly or less frequent basis in small to medium sized shipments (10-20 m^3) and stored at the treatment facility in secured, covered structures with containment features.

An estimated 200 to 400 mg/L of aluminum sulfate would be needed for chemically assisted primary treatment, requiring 5 to 11 trucks per year (4,500 L per truck).

Operational Traffic

Table 3-2 summarizes the number of trucks required for screenings and chemicals for year 2020 and 2065 designs.

Table 3-2 Operational Traffic for Year 2020 and 2065 Design

Material	Direction	2010-2030 Operation	2030-2065 Operation
Screenings and grits transferred to the Hartland Landfill site	Out	1.5+0.2 m^3/day (1 truck per 7 to 8 days)	2+0.3 m^3/day (1 truck per 5 to 6 days)
Chemicals Alum	In	37.1 m^3/year (8.3 trucks per year for alum)	49.5 m^3/year (11 trucks per year for alum)

Note: A 13 m^3 closed box truck is assumed for screening and grit transporting. A 4,500 L container is assumed for Alum.

Servicing for the remote pump stations would include scheduled site visits on a weekly basis and annual cleaning except for unscheduled emergency attention. Sewers commonly require flushing on a rotational basis, which may be every 5 years or more.

Sewer and Outfall Connections Energy Use

Due to the variations in each site's elevation and distance from the trunk, the facilities would have different influent and effluent system configurations. These differences can be measured and compared in terms of electrical energy use. The energy requirements for a wastewater treatment facility would be the same regardless of site, and are estimated at 4×10^6 kWh/yr for an Average Dry Weather Flow (ADWF) of 17 ML/d. The energy use is high because of aeration needs and membrane operation.

1. **Inflow Connection to Sites**

   Wastewater from Penrhyn pump station would be pumped to either the Finnerty-Arbutus site intake or, for the other alternative sites, to a new Arbutus pump station through a 1,500 m forcemain. Assuming 60 m elevation difference and hydraulic loss, the power requirement is about 50 kW.

   Additional sewer forcemain and pumping requirements for each candidate site is summarized below:

   - *Finnerty-Arbutus site:* Only a lift pump is required to divert wastewater to the Finnerty-Arbutus facility site. The wastewater would be diverted by pumping into the treatment facility at the site from the existing trunk sewer. Assuming a 4 m lift, the average power requirement is about 15 kW. Maximum power requirement for Peak Wet Weather Flow (PWWF) is about 60 kW. The additional energy requirements are about 150,000 kWh/yr.

   - *UVic Fields site:* The wastewater would be pumped to the treatment facility site at UVic Fields from the Arbutus Road Pump Station through a 1,350 m long forcemain (the forcemain is assumed to be 1,500 mm diameter to manage Peak Wet Weather Flows (PWWF)). Assuming 35 m of lift and hydraulic loss for average flow, the power requirement is about 130 kW. The power requirement is during PWWF, however, is much larger due to the line losses and would be approximately 520 kW, which is equivalent to about 1,140,000 kWh/yr.

   - *Cedar Hill Corner site:* The wastewater would be pumped to the treatment facility site at Cedar Hill Corner from the Arbutus Road Pump Station through a 1,750 m long forcemain with 35m of lift. Additionally, an 850 m long forcemain would be installed to divert the wastewater from the Garnet Pump Station forcemain along Sinclair Road. Power requirements would be slightly greater than for the UVic Fields

site at approximately 135 kW. The annual energy requirements are about 1,180,000 kWh/yr.

2. Discharge from Sites

Treated effluent discharge pipe lengths are different for each candidate site. The marine outfall length should likely be the same; however, the outfall would need to be confirmed through diffuser modeling studies in conjunction with a future Environmental Impact Study (EIS):

- *Finnerty-Arbutus site:* The treated unused effluent would be discharged by gravity to the outfall through a 1,200 m forcemain and outfall.
- *UVic Fields site:* The treated unused effluent would be discharged by gravity to the outfall through a 2,150 m forcemain and outfall.
- *Cedar Hill Corner site:* The treated unused effluent would be discharged by gravity to the outfall through a 2,550 m forcemain and outfall.

The elevations of the sites above sea level are 25 m at Finnerty-Arbutus and 55 m at UVic Fields and Cedar Hill Corner. These elevations are anticipated provide sufficient head for gravity flow outfalls and no pumping will be required.

3. Sludge Discharge

The biological sludge produced during secondary and tertiary treatment at the treatment facility would be about 0.8 to 1.0% solids concentration, while the sludge from primary clarifiers could be about 2 to 6% solids concentration. The combined sludge concentration could be around 1.5 to 2%. In this case, transferring the sludge by gravity from the on-site storage tanks in the treatment facility to the East Coast Interceptor at Haro Road could be problematic at least for the UVic Fields and Cedar Hill Corner sites. Dilution of the combined sludge with the backwash water from the secondary and tertiary facility could be a preferred alternative for pumping the sludge to the interceptor. If needed, the pumping requirements should be about one-tenth of the influent pumping power requirement.

The approximate pumping distances between the candidate sites and the East Coast Interceptor at Haro Road are:

- Finnerty-Arbutus site – 350 m
- UVic Fields site – 1,750 m
- Cedar Hill Corner site – 1,410 m

4. Summary

The estimated energy requirement to bring wastewater into the facility is lowest at the Finnerty-Arbutus site by a factor of three (3). Discharging sludge and from Finnerty-Arbutus also requires the least energy, by a factor of 8. Table 3-3 summarizes the estimated electrical energy use at each site.

Table 3-3 Estimated power requirements for each candidate site

Power Requirements (kW)	Candidate Sites		
	Finnerty-Arbutus	Cedar Hill Corner	UVic Fields
Penrhyn Pump Station to Finnerty-Arbutus facility or Finnerty-Arbutus pump station	50	50	50
Bringing gravity flow wastewater to facility	15	135	130
Power required for treatment (figures from CRD Discussion Paper 038-DP-1)	453	453	453
Sludge pumping (one-tenth of influent pumping)	1.5	13.5	13
Total Power required for all pumping	66.5	198.5	193
Total power requirement (treatment plus pumping)	519.5	651.5	646
Total number of kWh per year	4,550,820	5,707,140	5,658,960
Total annual energy cost (@ $0.07/kWh)	$318,557	$399,500	$396,127
Annual energy cost of pumping (@ $0.07/kWh)	$40,778	$121,720	$118,348

Noise, Vibration and Light

1. Noise

Operation of the wastewater treatment facility would generate noise from the following equipment on site:

- air-driven pumps,
- compressors,
- fans and blowers,
- diesel driven pumps, and
- standby diesel power generators.

Noise at the property line of the treatment facility is not to exceed 45 dB (evening) and 55 dB (daytime), and must also comply with zoning regulations. Sound attenuation would be installed in the buildings housing the units and on diesel engines exhaust to ensure that decibel levels remained below 45 dB at the property line, to meet the local municipal bylaw requirement, and to meet WCB/OSHA criteria for worker safety. All noise-generating equipment would be installed in soundproof rooms to meet these requirements.

2. Vibration

All installed vibrating equipment would be contained in isolated structures that meet vibration limits acceptable to the residential community. Since the wastewater systems to be used at the treatment facilities do not include excessive vibrating equipment and are typical of current operating systems found elsewhere, vibration issues are not anticipated and if present can be fixed.

The CRD as an employer for the treatment facility would meet the requirements of the *Occupational Health and Safety Regulation of Workers Compensation Act* (BC).

3. Lighting

The lighting plan for the SENOB facility is expected to include normal post top sodium vapour lighting standards similar to those on residential streets. If night work is required, higher intensity lamps may be needed. All lighting would be directed downward and would have shields installed to prevent lighting of the night sky.

In accordance with corporate activities for environmental sustainability, facility planning would incorporate energy efficiency and BC Hydro "Power Smart" initiatives and the applicable Leadership in Energy and Environmental Design (LEED™) standards for green buildings. For example, LED lighting that uses little energy and emits low UV light could be specified.

Sources of Odour and Odour Control

1. Odour Sources

The following odour sources in the treatment facility and the two odour containment process areas are given in Table 3-4.

Table 3-4 Odour Sources in the treatment facility

Source	Untreated Potential Odour
System A Source (the untreated wastewater recovery area)	
Headworks	Strong to Very Strong
CEPT	Light to Moderate (chemical)
Primary Clarifier*	Very Strong
Headworks Odour control	Light to Moderate (chemical)
System B Source (the treated effluent area)	
Pipe Chase Gallery	Nil to Light
Fine Screen	Very Strong
Bioreactors*	Strong (musty)
Membranes*	Strong (musty)

Source	Untreated Potential Odour
Membrane Ancillary Building	Very light
Lift Station and Sludge Pumping Station	Strong to Very Strong
Reclaimed water storage	Nil to Light
UV Disinfection (Future) and Effluent Pumping**	Nil to Very Light
Odour Control	Light to Moderate (chemical)
Blowers Building	Nil to Very Light

*Notes: * 75% of the units would be constructed for 2010-2030*

*** UV Disinfection units to be installed in future within the existing building*

2. Odour Control in Wastewater Treatment Facilities

The facility design needs to include best practice solutions for minimizing release of odour, especially from untreated wastewater and sludge. With proper attention to design details during the detailed design stage, routine release of odours from the treatment facility processes can be minimized by:

- the use of submerged inlets and weirs,
- eliminating turbulence in influent piping and channels,
- the elimination of physical conditions leading to the formation of turbulence,
- proper process loadings,
- containment of odour sources,
- off-gas treatment,
- good house keeping, and
- keeping access doors and buildings closed.

Treatment System A and likely System B would be a three stage wet chemical scrubber with final polish step of activated carbon and odours will be scrubbed from the treatment facility's ventilation air before this air is discharged via one or more roof fans to the atmosphere.

State of the art odour scrubbing is commonly accomplished using a multistage chemical scrubber that may be followed, if necessary, by an activated carbon polishing step. Air emissions from the treatment facility roof fan(s) would be emitted into the atmosphere at high velocity.

Odour discharges are expressed in terms of Odour Units per hour, which is simply the odour concentration (Odour Units) in the ventilation air times the ventilation airflow rate (m^3 per hour). An Odour Unit (OU) is a measure of odour concentration and is defined

as the amount of dilution with clean air required to bring the odour down to a non-detectable level.

3. Acceptable Odour Concentration

The design of the facility would ensure that odour at the facility property line does not exceed 5 odour units (OU) per m^3, as an hourly average 98 percentile based on a 15 minute rolling average (Project Description, Mar 2009). During routine annual maintenance of odour control equipment, emissions could reach 15 odour units for a few hours. Unless such maintenance occurs during still air conditions, even odours generated during routine maintenance are unlikely to be considered objectionable by nearby residents. Table 3-5 compares various odour magnitudes.

Table 3-5 Odour Intensity Versus Ambient Odour Concentration

		Estimated Odour Concentration (OU) (Detection Threshold)	Typical Description of Odour
No odour (usual limit of public acceptability)	Odorant present in the air, which activates the sense of smell but the characteristics may not be distinguishable.	≤ 5	None
Very Light	Odorant present in the air, which activates the sense of smell and is distinguishable and definite but not necessarily objectionable in short durations but not may be objectionable in longer durations.	> 5 – 15	Earthy, stale, musty, chemical
Light		>15 – 50	Earthy, garbage, soil, chemical
Moderate	Odorant present in the air, which easily activates the sense of smell, is very distinct and clearly distinguishable and may tend to be objectionable and/or irritating.	>50 – 150	Sewer, sour, solvent, chemical
Strong	Odorant present in the air, which would be objectionable and cause a person to attempt to avoid it completely, could indicate a tendency to possibly produce physiological effects during prolonged exposure.	>150 – 1,500	Offensive, sewer, garbage
Very strong	Odorant present which is so strong it is overpowering and intolerable for any length of time and could tend to easily produce some physiological effects	>1,500	Offensive, chemical, putrid, rotten, sewer, urine, septic

Source: Adopted from Manual of Practise No. 25, Control of Odours and Emissions From Wastewater Treatment Plants, Wat. Env. Fed., 2004, and fit to real data from WWTP

For the SENOB treatment facility project, the ambient odour guideline is 5 OU, not to be exceeded under the worst-case meteorological conditions. The effectiveness of the treatment facility ventilation air scrubbing would be chosen so that this guideline is not exceeded during normal operation and all meteorological conditions. It is expected that there would occasionally be short periods of time when the scrubbers are being maintained and odour emissions would exceed their design values. These "upset" conditions could lead to higher ambient odour levels, perhaps 15 odour units, especially if the emissions coincide with unfavourable meteorological conditions, such as evening inversions.

4. **Security**

   Once the treatment facility is constructed, the operational staff would work daily at the facility. Access to the site would be controlled at all times. The building doors and main gates would be remotely alarmed by the CRD's supervisory control and data acquisition (SCADA) monitoring system. A combination of sturdy, but attractive, materials for fencing, lighting and landscaping would be incorporated into the design to discourage vandalism at the treatment facility site.

Drainage Management

Current principles for low impact development and stormwater management would be employed in facility planning. Uncontaminated storm runoff from roofs of structures would be directed to infiltration facilities where site conditions allow. Parking areas and other on-grade surfaces would be constructed using permeable pavers, or the runoff from these areas would be directed to biofiltration swales or similar facilities. In general, disturbance of the natural hydrology of the site would be minimized as far as practical. Landscaping would incorporate pervious soils and vegetation to minimize increases in site runoff caused by the facilities. Native vegetation would be used in landscaping to reduce irrigation demand.

A credit for stormwater management towards LEED™ certification is available if disruption of natural water flows by minimizing stormwater runoff is limited or on-site infiltration increased and contaminants reduced.

3.3 Construction

Safety, Security, and Effects on Surrounding Properties

Construction is anticipated to start in late summer or fall, 2010 with the SENOB treatment facility taking up to 2.5 years to complete.

Peak construction activity would occur in the first nine months during excavation and pouring concrete. After this, the work would be similar to construction of utility or industrial buildings.

1. **Safety**

   The noise exposure to construction workers could be a safety issue during construction and normal operating activities if proper safety procedures are not observed. Construction activities may post safety risks to the public if safety is not properly managed by the contractor and administered by the CRD.

   The construction activities would comply with safety criteria established by OSHA, WCBBC, and NFPA. The safety manuals and instructions should be followed. Workers should be trained during the construction and operation period and residents should be informed during construction. Temporary safety fencing and warning signs would be installed around the construction site.

   A traffic management plan would address traffic disruptions, truck traffic, and access maintenance to nearby institutions, and residences during construction. Flag persons would direct vehicles and pedestrians around the construction site. Construction drivers will observe speed limits and exercise caution near the school or hospitals.

2. **Noise**

   Construction activities that take place in the District of Saanich or District of Oak Bay must comply with the relevant municipal noise bylaws for hours of work and noise levels. Work is allowed to occur on weekdays from 7 am to 5 pm with no work on Sundays or holidays (except in an emergency).

   Construction activities such as running excavation vehicles, truck deliveries, and using chainsaws, compressors, water pumps, concrete pouring pumps, rock breakers, and blasting and blasting signals could be a noise source for nearby residents. Generally all potential noise sources that operate on a permanent or semi-permanent basis can be designed or controlled to meet the adjoining property line standard.

3. **Vibration**

   Potential sources of vibration during the construction phase of the treatment facility include heavy equipment movement, blasting, compactors, and paving equipment.

   Nearby residents may be affected by vibration (due to construction activity such as blasting) when vibration is only slightly in excess of perception levels. Activities causing vibration should occur only between 8 am and 7 pm Monday to Saturday. The residents should be informed and advised regarding work periods that may contain abnormal vibration conditions. The equipment in the treatment facility building is designed to

ensure vibration is dampened or held within acceptable operating limits for protection of the equipment and operational staff.

The Contractor must ensure that workers are not exposed to vibration in excess of the limits specified in the Occupational Health and Safety regulation.

4. **Dust and Mud**

Construction may result in short-term localized dust generation air quality impacts. Air pollutants generated during construction are generally fugitive dust and equipment exhaust emissions. Trucks will have box covers when hauling granular materials that could create dust nuisances.

The CRD Code of Practice for "Construction and Development Activities" would be used to mitigate dust and mud impacts. Erosion and sediment control plans would be prepared and implemented during construction. Authorities may require additional dust control plan submissions to all relevant agencies prior to construction.

During wet weather, mud from excavated areas could be spread off site through truck hauling. Tracking of mud offsite is not expected to be significant since the area is contained and trucks are unlikely to be located where tracking would be a problem.

Once the facility is operational, no dust or mud related problems are anticipated since the site would be paved and vegetated to prevent formation of either.

Construction Activities

The SENOB wastewater treatment facility needed to serve the population from 2010 to 2030 is roughly 75% of the size of the facility needed to serve the region in 2065. Construction work would therefore be undertaken in two stages. The construction period for the year 2030 design for a 17 ML per day (ADWF) facility would begin in 2010 and would be completed in 2.5 years by the year 2013. Whether the work is delivered in a design-build or design-bid-build construction contracts, the time frame for construction activity would be roughly the same. Facility capacity is anticipated to be expanded by 2030, with construction work starting in 2027 and completed in less than 2 years.

The maximum construction activity would see a peak monthly labour component of 30 to 40 workers during the concrete pouring stage. Most of the time, about 10 to 15 workers would be onsite on a daily basis. This pattern would repeat for the 2027 construction.

The construction would be done in the following stages:

1. Clearing and grubbing for the portion of the site in the facilities footprint. This work could be completed in three to four months.

2. Rough grading, road construction, site servicing, excavation and filling to prepare the site. This stage of construction would likely be undertaken in the later part of the first year and would also include installation of foundations.
3. Slabs, structures, and site facilities would then be constructed, and equipment would be installed.
4. Equipment would be delivered during the last one and half years of the construction period, and installed in accordance with the project management scheduling.

The land and marine sections of the outfall and other ancillary facilities would be constructed during the 2.5 year interval when the treatment facility is being built. The ancillary forcemains, marine outfall, and pump stations would need to be completed before the SENOB facility begins functioning.

The CRD or Contractor should secure a staging area to provide enough space for stock piling of materials. The Contractor has to manage delivery of concrete and other construction materials to be able to fit in the staging area.

Site Preparation

The area requirements for individual process components are summarized in Table 3-6 for the SENOB wastewater treatment facility. Stage I would see 75% of the ultimate capacity constructed. It is assumed that 75% of primary clarifier, bioreactors, and membranes would be constructed and the rest of the units and buildings would be constructed to accommodate installation of Stage II equipment.

Table 3-6 Area Requirement for the SENOB treatment facility Components

	Facility Area (m^2)	
	2010–2030	**2030–2065**
Pipe Chase Gallery	520	520
Headworks	300	300
Fine Screen	180	180
CEPT	120	120
Primary Clarifier	450*	600
Bioreactors	630*	840
Membranes	345*	460
Membrane Ancillary Building	150	150
Lift Station + Sludge Pumping Station	80	80
Reclaimed water storage	240	240
UV Disinfection (Future) & Effluent Pumping	260	260
Operations Building	300	300
Headworks Odour Control	300	300
Odour Control	130	130

	Facility Area (m^2)	
	2010–2030	**2030–2065**
Blowers Building	200	200
Road and Parking	5,665	5,190
Total (m2)	9,870	9,870

Notes: ** 75% of units would be constructed for 2010 – 2030.*
The 2030 area includes the 2010 facilities.

Regardless of the site, about 1 ha plus buffer allowance would be prepared during Stage I to meet the total needs shown for 2065 construction.

Construction Methods and Scheduling

The quality of a completed treatment facility can be affected by the skill and knowledge of the contractor and its staff, their attention to the environment, and their choices of construction and inspection methods at each stage of construction. As in the development of appropriate alternatives for facility design, choices of appropriate technology and methods for construction are critical ingredients in the success of the project.

Before construction begins, the CRD may consider requesting the contractor to propose alternative building methods. These methods would be intended to improve the cost, time, and reliability performance of construction.

1. **Treatment Facility Construction Schedule**

   Expected timing for construction works could be as follows:

   2010 — Site clearing, excavation, construction of tanks and buildings, installation of major pipes.

   2011 — Complete buildings, backfill structures, install mechanical and electrical systems (pumps, piping and ducts).

   2012 — Complete final site grading, complete equipment installation, start up and test equipment, and complete landscaping.

2. **Gravity Sewer to Outfall**

   The gravity main alignment from the treatment facility to the outfall will be analyzed and selected after marine studies are completed later this year, identifying the optimum offshore location for effluent discharge. This alignment could primarily follow the existing right-of-way or could follow a new route. The alignment selected will seek to minimize environmental and community impacts.

   The gravity main to the outfall could be installed by open trench or trenchless methods that use boring or tunnelling techniques. For the purposes of this ESR, the analysis will

be based on installing a new gravity main that follows much of the existing right-of-way using open trench construction methods.

3. Outfall

The marine portion of the outfall would be installed by pre-construction of pipe and sinking it in place on the water. Some prior excavation of the sea bottom may be required. This work would be done from barges and on the water except for the connection to the land portion. Dispersion modeling and the Ministry of Environment criteria would be used to determine outfall length.

4. Sludge line to the East Cost Interceptor at Haro Road

Waste solids from the treatment facility would be conveyed to other facilities for further treatment transferred by gravity sewer line. The approximate length of sewer lines for each site would be as follows:

- Finnerty-Arbutus site – 350 m
- UVic Fields site – 1,710 m
- Cedar Hill Corner site – 1,410 m

These sewer line connections have to be completed prior to completion of the overall facility construction.

5. Sewer Forcemain and Arbutus Road Pump Station for UVic Fields and Cedar Hill Corner Candidate Sites

Additional sewer forcemain and a pumping station at Arbutus Road are required for the UVic Fields and Cedar Hill Corner candidate sites as follows:

- UVic Fields site – 1,350 m forcemain
- Cedar Hill Corner site – 2,600 m forcemain (1,750 m long between the Arbutus Road Pump Station and the Cedar Hill Corner site; 850 m long forcemain diverted Garnet Pump Station forcemain along Sinclair Road).

Construction of sanitary sewer lines and its appurtenances are generally tendered separately from the wastewater treatment facility construction contracts. Additional sewer line construction means additional soil disturbance due to excavation and backfilling, and might cause temporary traffic delays along the roadways during the construction period.

6. **Sewer Forcemain (small diameter) for All Candidate Sites**

   Sewer from the Penrhyn pump station would be pumped to the Finnerty-Arbutus intake for the Finnerty-Arbutus site; and to the Arbutus Pump Station for the UVic and the Cedar Hill Corner sites by a small diameter of 1,500 m long forcemain.

Construction Traffic

Construction traffic would include delivery of equipment and supplies. For the 2010 to 2013 construction period, material and equipment deliveries would include 12 m^3 concrete trucks and trucks delivering reinforcing steel, major equipment, and general service materials.

The estimated truck traffic for concrete, steel, excavated material, soil and fill transport during construction for the 2030 and 2065 facilities are shown in Table 3-7. Cut and fill volumes required for site preparations were estimated from the facilities plans shown on Figure 3-3, Figure 3-7, and Figure 3-5.

The assumptions in estimating the cut and fill volumes for each site include:

- the cut and fill work needed for the construction of the 2030 facility would be conducted in 2010, so no major site disturbing options would be needed in 2030,
- a minimum 0.5 m cut depth for clearing and grubbing was assumed over the portion required for construction of facilities for each site,
- cut materials on site would be used as fill and materials from clearing and grubbing and contaminated soils would not be reused, and
- a layer of gravel 0.3 m deep would be required to cover the cleared site.

If rock outcrops are encountered, all of the rock would be cut to level the site and crushed to be reused as fill. Peak activity is about 10 trucks per day.

Concrete volumes were estimated assuming building height for all unit processes at 4 m. A 300 mm slab was assumed for all unit processes. Peak activity is about 11 trucks per day during concrete-pouring activities.

Vehicle types would include flatbed trucks, tandems, small to large delivery vehicles, cranes, excavators, and related equipment.

Table 3-7 Construction Truck Traffic

	Concrete	Reinforcing Steel		
Number of truck loads Phase 1 construction (2010)	2,100 per 9 month	40 per 9 months	625 per 3 months	1,200 per 7 months
	11* per day	1 per week	10 per day	8 per day
Number of truck loads Phase 2 construction (2027)	690 per 4 months	15 per 4 months	100 per 1 month	360 per 3 months
	8-9 per day	1 per week	5 per day	6 per day

Note: A volume of 10 m^3 is assumed for cut and fill dump truck, 12 m^3 for concrete truck and 20 ton for steel trucks in the estimates. A 25% adjustment factor is used to allow for contingency.

**21 working days per month*

The concrete is assumed to not use a batch facility on site.

Labour Force during Construction

Construction activities could be undertaken in parallel with several crews working. The Contractors and the CRD could minimize the effects of construction activities by informing the public on schedules and traffic routing.

1. **Wastewater Treatment Facility**

   Construction of the wastewater treatment facility would require approximately 2,400 workers per year of site labour over 2.5 years. This estimate assumes a peak of 30 to 50 workers per day on site during the concrete work, and averages about 10 to 15 workers per day during the rest of the construction period. (The work would occur coincidentally and not additionally.)

2. **Sewers**

   The influent forcemain installation crew could be composed of 6 to 8 workers per day. The construction periods for the forcemains at the candidate site for an assumed nominal pipe installation of 20 m/day are as follows:

   - UVic Fields site – 3 to 4 months (1,350 m)
   - Cedar Hill Corner – 6 to 7 months (2,600 m)

   The effluent pipe installation crew could also be composed of 6 to 8 workers per day. The length of the land section to the marine outfall varies among the candidate sites, therefore (assuming 20 m/day nominal installation), the expected construction periods vary as follows:

- Finnerty-Arbutus site – 3 months (1,200 m)
- UVic Fields site – 5½ months (2,150 m)
- Cedar Hill Corner – 6½ months (2,550 m)

Sewer line (for sludge transfer) construction crew could be composed of 5 to 7 workers per day. Assuming 20 m/day nominal pipe installation, the expected construction periods for the candidate sites are as follows:

- Finnerty-Arbutus site – 1 month (350 m)
- UVic Fields site – 4-4½ months (1,710 m)
- Cedar Hill Corner site – 3½ months (1,410 m)

Small diameter pressure pipe for the small offsite pump station (Penrhyn) is similarly estimated as follows:

- Finnerty-Arbutus site – 3-4 months (1,500 m)
- UVic Field site – 3-4 months (1,500 m)
- Cedar Hill Corner site – 3-4 months (1,500 m)

3. Arbutus Road Pump Station

A new pump station is required for the UVic and Cedar Hill cross candidate sites to divert wastewater to the treatment facility sites. The construction activities related to the new pump station may take 10-12 months.

4.0 FIRST NATIONS INTERESTS

4.1 Traditional territories

The Saanich East-North Oak Bay area is in the overlapping traditional territories of the Esquimalt First Nation, the Songhees Nation, and the Tsawout First Nation. No specific information for the Esquimalt First Nation was made available for this report; therefore the traditional territory and traditional uses specific to the Esquimalt First Nation are not presented.

The Songhees Nation (also known as *Lekwungen* people) has occupied their traditional territory since long before European contact. The Songhees people are part of a larger Straits Salish cultural group, who occupy traditional territory north of the Strait of Juan de Fuca, in southern Vancouver Island and the southern Gulf Islands (Suttles 1951). Early ethnographers of the Straits Salish people are Wayne Suttles (1951), Homer Barnett (1938-39), Diamond Jenness (n.d.), and later Wilson Duff (1969). Franz Boas (1891) and Charles Hill-Tout (1907) also mention the Straits Salish in their research.

Suttles (1951) described the traditional territory of the Songhees (or *Songish*):

> The territory of the *Songish* included both shores of the southern entrance of Haro Strait. On the western shore of the strait it extended from Cordova Bay (on the north) to Parry Bay (on the south) on Vancouver Island, and on the eastern shore from Open Bay on Henry Island to Eagle Cove on San Juan Island. The winter villages of the Songish were perhaps a dozen in number and stood in every bay from Cordova Head (Cowichan Head in Cordova Bay) to William Head on (southern) Vancouver Island.

Boas (1891) names and describes locations of 12 Songhees village sites in the project Study Area, including sites at Cadboro Bay, Oak Bay (Willow's Beach), Discovery Island, Victoria Harbour, Esquimalt Harbour, and Beecher Bay. Hill-Tout (1905) names and describes 11 pre-contact Songhees village sites in similar locations. When the Fort Victoria Treaties were signed with the Lekwungen people and Governor James Douglas, 11 different autonomous household groups signed onto the treaties (Duff 1969). These household groups occupied different areas of Songhees Nation traditional territory in the Capital Regional District. Keddie (2003) provides additional information on early Songhees history in the Study Area, including notes on village sites on the Gorge waterway, the Metchosin shoreline, and other locations. Bernick (2001) produced a report on the status of archaeological sites in the Study Area, which includes information on resource use associated with some of the village sites.

4.2 Traditional use

Suttles (1951) provides detailed information on the Songhees use of the food resources of the sea, foreshore, and uplands, including methods of harvest of fish, shellfish, birds, sea and land

mammals and plants. The open grassy meadowlands of what is now the University of Victoria were maintained by regular use of fire by the Songhees people to promote the growth and harvest of camas bulbs, a major source of carbohydrates (Beckwith 2005).

Reef-netting in shallow near-shore locations was of paramount importance in the aboriginal economy of the Straits Salish people. Because of the relative scarcity of good salmon rivers on the east coast of Vancouver Island, reef-netting of migrating salmon was a common practice along the shores of the Study Area. Fluctuations in sea levels over the past 3,000 years may have altered some of the near-shore reef-net sites (Keddie, *pers. comm*.). Some reef-net sites in the Victoria area were in use until the 1920s.

Several recent Traditional Use Study (TUS) reports contain detailed information on Songhees Nation traditional use, gathered from interviews of living informants. English (1996) conducted interviews with 13 Elders in 1995, in research related to the construction of the Vancouver Island Highway. All major Songhees families were represented in the interviews. Report information remains confidential to the Songhees Nation and to the authors (English 1996).
The Te'Mexw Treaty Association conducted a Traditional Use Study in 2003 (TTA 2003). LGL Limited of Sidney prepared the data for the Te'mexw mapping project. Data were gathered from five communities: Lekwungen (Songhees), Malahat, Scia'new (Beecher Bay), Snaw-naw-as (Nanoose) and T'sou-ke (Sooke). Elders were interviewed and asked about their harvesting practices and about other traditional harvesting knowledge they may have from their ancestors. Relevant to this report, from the Songhees Nation, 10 Elders were interviewed. Results of the interviews were mapped, and composite maps were produced of harvest of land and sea resources.

From interview data gathered by Te'mexw Treaty Association, there appears to be more TUS information associated with use of shellfish, fish, and resources from the sea than for food resources on land. Little cultural use information was provided, possibly due to concerns for confidentiality. A preference for food resources from the sea may result in First Nation concerns about discharge of treated effluent from outfalls into Haro Strait.

4.3 Relationship of First Nations to CRD and wastewater project

The Capital Regional District's (CRD) approach to working with First Nations on the Core Area Wastewater Management Program is to create a clear understanding of roles, responsibilities, and expectations at the front end of the program to ensure the potential of a strong working relationship throughout its completion. As a result, the CRD has entered into a protocol with the province to form a partnership on consultation and engagement by outlining those issues which are the responsibility of the CRD, and those that ultimately lie with senior governments.

Within that agreement, the province retains overall responsibility for consultation with First Nations including outlining which First Nations need to be engaged and to what extent. The CRD is taking the "on the ground" responsibility for making sure First Nations are well informed about the project, have real opportunities to provide input, and can see how that input is being used, where practical, in the design and construction of the project. If issues remain, it will then be the provincial or federal government's responsibility to respond to, and, where appropriate accommodate assertions concerning potential impacts on a First Nation's existing aboriginal or treaty rights.

In addition to the protocol with the provincial government, the CRD has taken the following steps to engage First Nations on the wastewater management program:

- The CRD has renewed its secondment of a senior official from the Province with a strong background in aboriginal relations to help work with First Nations on these issues.
- The CRD and the province have signed tripartite protocols (attached) with the Songhees, Esquimalt, and Beecher Bay Nations laying out a common understanding of the consultation/engagement process (the Esquimalt protocol is awaiting provincial ratification).
- The CRD is also trying to address other issues with these First Nations which have the potential to affect progress on a good working relationship on this project.
- The Province has provided initial capacity funding to the Songhees, Beecher Bay, and Esquimalt Nations to support the consultation process.
- The CRD has met with federal agencies to ensure a common understanding with regard to consultation duties with First Nations if federal decisions are required to complete the project.
- The CRD has entered into the information sharing process in earnest with Songhees, Esquimalt and Beecher Bay Nations on project design and siting work recording interests and providing these records to MOE officials (summary of interests on next page).
- At the request of the Tsawout First Nation, the CRD has provided an overview of the wastewater treatment project to that First Nation and will be providing a formal briefing to Tsawout Chief and Council when scheduling permits. The CRD will work with Ministry of Environment officials to determine whether a more formal consultation process should be entered into with the Tsawout.
- The CRD has provided information packages to the Tseycum, Tsartlip, and Pauquachin Nations to keep them informed on the project even though provincial officials have not advised that consultation should be pursued with these communities.

Table 4-1 summarizes the CRD's First Nations engagement to date.

Table 4-1 First Nation Engagement Chart

First Nation	Status	Interests Identified to Date	Engagement on other Issues	Next Steps
Songhees	Consultation MOU signed	• Use of federal Crown land • Impacts to the foreshore • Protection of natural resources • Any outfall located near Chatham and Discovery Islands • Affects on marine species • Affects on archaeological sites • Adequate sewage capacity for Songhees lands including future Treaty Settlement Land	• Regional Growth Strategy • E&N rail trail	Continue meeting to gather interests. Next meeting early July
Esquimalt	Consultation MOU signed by Esquimalt and CRD, awaiting BC ratification	• Meaningful participation in the project and concerns about the timelines for input • Impacts on the environment including the foreshore and marine species	• Sewer infrastructure • Regional Growth Strategy • E&N rail trail	Continue meeting to discuss the project and examine Esquimalt participation Next meeting early July
Beecher Bay	Consultation MOU signed	• Location of any outfall near Albert Head • Use of Crown land for sewage treatment in the Western Communities	• Sea to sea greenbelt • Beecher Bay sewage treatment plant	Continue meeting to gather interests. Next meeting July
Tsawout	Information package provided	• May have concerns about the extension of the Finnerty Cove outfall affect on fishing and marine species • Affects of discharges into inland water bodies	• Expansion of service agreement • Partnering on foreshore restoration • Tsawout sewage treatment plant	Briefing with Chief and Council on wastewater project this summer
Saanich Tribes • Tsartlip • Tseycum • Pauquachin	Information package provided			Continue to forward information packages and be prepared to provide information

Goals for the remainder of 2009

- Continue to provide information to First Nations on project design, gather interests and feedback, and use that information where possible in project design. Resolve issues, as possible, and refer those not resolvable within the CRD legislative mandate to the provincial or federal government.
- Provide information to other interested First Nations not directly affected by the program.
- Continue to use the wastewater management program as a vehicle to address other relationship issues between the CRD and First Nations.

The CRD recognizes that consultation and engagement with First Nations is not an endeavour that can be accomplished by simply setting a deadline. Given the complexities of the wastewater management program, the legal requirement and genuine desire to engage and consult with First Nations in a meaningful way, and the number of other important endeavours taxing these First Nation's capacity, this pursuit can be expected to require more effort and possibly more time than was envisioned at the inception of the project.

5.0 SUMMARY OF PUBLIC INVOLVEMENT AND COMMENTS RELEVANT TO THE ESR

Public meetings give the Capital Regional District (CRD) a chance to share important information on the site selection and impact assessment processes and to describe technical details about wastewater treatment with the public. Public involvement also provides opportunities for the public to share their specific concerns and ideas. The content and analyses in this Environmental and Social Review (ESR) have been influenced by the concerns and priorities expressed by the public.

Since 2004, the CRD has conducted a variety of public involvement activities on the wastewater program. With regard to the siting process, in the fall of 2007, the CRD sought public comment on the site selection criteria for wastewater treatment facilities through advertisements, web input, and a random telephone survey of core area residents. In 2008, site selection analysis, engineering studies, and reports to the Ministry of Environment were prepared, refining the elements of the wastewater program.

In 2009, open houses and workshops were scheduled to provide opportunities for the public to obtain information and to comment on the wastewater treatment program and the site selection process (Table 5-1).

Table 5-1 Neighbourhood open houses and workshops on facility siting

Date	Time	Location
Open House: Tuesday, June 16, 2009	3:00-8:00 pm	*Gordon Head Neighbourhood* Gordon Head United Church 4201 Tyndall Avenue
Open House: Wednesday, June 17, 2009	3:00-8:00 pm	*Cadboro Bay Neighbourhood* Cadboro Bay United Church 2625 Arbutus Road
Open House: Friday, June 19, 2009	3:00-8:00 pm	*Oak Bay Neighbourhood* Emmanuel Baptist Church 2121 Cedar Hill Cross Road
Meeting-Workshop: June 22, 2009	6:30-9:00 pm	Queenswood Centre at 2494 Arbutus Road
Meeting-Workshop: July 7, 2009	6:30-9:00 pm	Emmanuel Baptist Church 2121 Cedar Hill Cross Road
Meeting-Workshop: July 9, 2009	6:30-9:00 pm	Queenswood Centre at 2494 Arbutus Road

Attendees of the open houses could discuss the project with CRD staff and consultants, and had opportunities to complete comment forms that contained six open-ended questions. The questions could also be answered online at the CRD's website, http://www.wastewatermadeclear.ca/.

The workshops provided a forum for input and feedback on the candidate sites through facilitated discussions and large group questions and answers. Key points from those discussions were recorded on flipcharts. The remainder of this report summarizes common themes that were collated from the dialogue notes of the workshop and input received at the open houses.

Community Impacts

The Saanich East-North Oak Bay areas has several long-established communites where residents maintain a strong social and environmental connection and an appreciation of the area's special sense of place. In this context, participants of the public meetings expressed concerns about potential impacts of the treatment facility on the quality of life in their community, including unpleasant odours, increased noise, increased truck traffic during construction and operation, and loss of high-use outdoor recreational spaces. Respondents expressed a sense that the treatment facility represented an industrial type of land use that would adversely affect their community character and quality of life. Comments and questions were posed about site design, such as extent of natural screening and how much of the facility would be constructed above-grade or below-grade. The candidate sites that could provide a natural buffer between the treatment facility and homes were generally deemed more suitable and were considered to have fewer impacts on property values.

Respondents identified potential diminished residential property values as a major concern. Residents want to be assured that their property values would not be reduced by the treatment facility, and want the CRD to develop a strategy to effectively address the issue. Participants also wanted to know the effect of the wastewater program on property taxes.

Public safety

Strongly linked to the residential values of this area, participants expressed concerns about the safety of people in this community. In particular, questions were raised about the safety of children in childcare facilities, elementary schools, Queen Alexandra medical facilities, parks, and natural play areas that are in the study area. Comments were made on risks associated with a seismic fault at the Finnerty-Arbutus site.

Environmental impacts

Common concerns pertaining to the environmental impacts include the potential for degraded air quality, overall size of the facility footprint (including pipes, pump stations, *etc.*), the possible

contamination of soil and groundwater, and the energy required to operate the treatment facility and pump stations, and associated GHG emissions. Participants noted concerns that a treatment facility in the Finnerty-Arbutus site would result in adverse impacts to the forested natural area where children play. The Haro Woods area holds considerable environmental and community value. Environmental concerns unique to the UVic Cedar Hill Corner site focused on potential impacts to the adjacent old growth forest in the Upper Hobbs Creek drainage. Participants suggested examining each of the sites in greater detail and then siting the facility in the areas having the greatest previous disturbance.

Transparency of decisions

Some respondents suggested that there has been insufficient communication between the CRD and the public about the wastewater project. Questions were raised about the extent of UVic's engagement in the siting process and a lack of transparency in UVic's response to siting a treatment facility on their land. Some comments suggested that the site selection and facility design decisions be based on scientific and technical considerations, minimizing political influence.

Many respondents questioned the scientific basis of the decision to proceed with wastewater treatment in the region. The decision to site a facility in Saanich East-North Oak Bay was often criticized.

Opportunities

Public forum participants identified the following specific opportunities or benefits for each candidate site:

Finnerty-Arbutus site

Respondents stated that this site could provide opportunities for a natural buffer between the treatment facility and nearby homes, particularly if the surrounding green space is designated as parkland or a /protected natural area. The ability to operate a treatment facility here without pumps and associated environmental impacts and financial costs also was noted.

UVic Cedar Hill Corner site

The key opportunities that were identified for this site include the potential to use reclaimed water for golf course irrigation; the site is already affected by human uses and it is an area already identified for potential future development by UVic. Because the site is large, a buffer could be provided between the treatment facility and residences. This site could also provide research opportunities for UVic students, faculty, and the community.

UVic Fields site

Benefits identified by the public included the opportunity for UVic to use the heat, energy, or treated water from the treatment facility. Respondents also noted that the site is already disturbed by human uses, thus minimizing disturbance to sensitive environmental areas; it is close to major transportation routes for ease of access during construction and operation; the facility could provide on-campus research opportunities for UVic students, faculty, and the broader community; and the facility would be well suited to UVic's existing institutional appearance.

Effect of public comments on the ESR

The comments received from the public through the various involvement opportunities have influenced the content of the ESR. The site selection criteria were based topics identified by the public as being important to locating a treatment facility. The recent round of open houses and meetings has generated results that have helped to refine the issues under study, and the determination of impact magnitude and significance. Though some public comments raise issues beyond the scope of the ESR (particularly questions about the need for wastewater treatment in the region), the assessment of project effects has considered public concerns to the extent technically feasible.

6.0 STUDY METHODS AND INFORMATION OVERVIEW

This section of the ESR report outlines the data collection and assessment methods used by the study team.

Sections 8 (Finnerty-Arbutus), 9 (Cedar Hill Corner), and 10 (UVic Fields) describe the existing conditions of the three candidate wastewater treatment facility sites and the ancillary facilities (*e.g.* pumps and sewer lines) connecting the treatment facility to the Finnerty Cove marine outfall. An impact assessment for each site and ancillary facilities is presented in each section for the following disciplines:

- Landforms, geology, and soils,
- Hydrology and water quality,
- Vegetation,
- Wildlife,
- Odour,
- Traffic,
- Visual aesthetics,
- Community,
- Property values,
- Archaeology and heritage, and
- Public health and safety.

6.1 Landforms, geology, and soils

Investigation of the geotechnical conditions at the sites consisted of collection and review of available information for the study area, including most notably the BC Ministry of Energy and Mines Quaternary Geology mapping of Greater Victoria (Monahan and Levson, 2000). Published information was supplemented by interpretation of current and historical Provincial and Federal Government aerial photographs based on, knowledge of local conditions, their engineering properties, and construction implications provided by C.N. Ryzuk and Associates, and an engineering site reconnaissance on April 8, 2009.

6.2 Hydrology and water quality

The assessment of hydrologic and water quality conditions in the study area was based on:

- Review of topographic maps and orthophotos,

- On-site field inspections conducted in several seasons,
- Examination of reports prepared by municipalities and institutions.

The University of Victoria's Integrated Watershed Management Plan (http://web.uvic.ca/fmgt/assets/pdfs/SWMP/SWMP.htm) provided information on water and drainage near the Cedar Hill Corner site, and on the lands upslope from the Finnerty-Arbutus site. Storm drain information was obtained by field inspection and from maps produced by the District of Saanich and the Capital Regional District. No published information was available on water quality in potentially affected surface or ground water.

Field inspections included observation of streams and slopes on the candidate sites. Slope angles were measured at several locations using a hand-held clinometer. Evidence of slope instability was sought. The potential relationship between drainage courses and adjacent trails was examined, as was the effect of vegetation on surface soil conditions and water quality. The locations of storm drains discharging into natural drainage courses were noted, as were the effects of these discharges on flows and erosion features.

6.3 Vegetation

A review of existing information, literature, and other data was completed before initiating field work. This office-based review included the examination of aerial photographs, existing reports about the vegetation of the SENOB study area, and sensitive ecosystem inventory mapping of the three candidate sites. The work was conducted to determine the extent of natural vegetation on the sites and the variability in vegetation composition.

Information about rare and endangered plant species and plant communities was obtained from the Conservation Data Centre (CDC) online database (BC CDC, 2008). This information and an Element Occurrence Report (EOR) for each candidate site were reviewed to determine whether rare plants or rare plant communities have been recorded on the candidate sites or their ancillary facilities. Interviews with local naturalists were conducted and plant information provided by these individuals was used as part of the baseline data collection work completed in May 2009.

Field visits were conducted to determine vegetation composition and distribution of the existing vegetation features of the three candidate sites and the associated ancillary facilities. This work was done in late April and early May 2009 to ensure early spring plant species present at the candidate sites were documented.

The following information was collected at each site:

- canopy cover (dominant tree species),
- shrub cover (dominant tall and low shrubs), and

- groundcover (dominant herbaceous species).

A 'Site Inventory and Conservation Evaluation' was completed for each site and associated ancillary facilities using standard "Develop With Care" checklists (MOE 2006). During the site visit, all categories outlined in the protocol were assessed, but only topics relevant to the study sites are presented in this ESR.

6.4 Wildlife

Existing information was compiled about wildlife use and habitats at each candidate site and associated ancillary facilities. Existing information sources consulted include CDC element occurrences, Sensitive Ecosystem Inventory (SEI), Victoria Natural History Society database of important wildlife habitats, other literature, and conversations with local knowledgeable naturalists. The candidate sites were characterized using aerial photography, topographic data, and SEI mapping before field work was conducted.

Field visits were conducted at each candidate site and associated ancillary facilities to document wildlife use, evaluate habitat conditions, and record wildlife habitat features. A 'Site Inventory and Conservation Evaluation' was completed for each site and its ancillary facilities using standard "Develop with Care" checklists (MOE 2006).

6.5 Archaeology and heritage

An Archaeological Overview Assessment (AOA) was conducted for the purpose of identifying and assessing archaeological resource potential in a specified study area. A field reconnaissance was completed as part of the AOA to verify the location of known or potential sites or features, and to conduct an overview assessment of their condition.

The AOA study for the SENOB wastewater treatment program followed the methodology and process described in the *British Columbia Archaeological Assessment Guidelines*. The AOA included the following tasks and activities:

- A comprehensive review of archaeological reports and Archaeological Site Registry database information for the CRD, with a special emphasis on the potential wastewater treatment facility study area (Saanich East-North Oak Bay),
- Acquisition and analysis of archaeological site inventory records for the study area, followed by the production of ortho-maps showing the location and extent of identified archaeological site locations,
- Review of maps and aerial photographs to analyze landscape features and other physical characteristics for the purpose of determining areas with archaeological site potential,

- Review of archaeological potential mapping for the CRD (Millennia Research Ltd. 2008),
- Review of the CRD Natural Areas Atlas and Harbours Ecological Inventory and Rating (HEIR) mapping,
- Meetings and consultation sessions with the Songhees Nation and Esquimalt First Nation to solicit information from these First Nations that might be beneficial to the study. In the course of these meetings, arrangements were made to include a member of each First Nation in the field reconnaissance component of the study, and
- Completion of a comprehensive field reconnaissance of candidate treatment facility sites. Note: the field visits included archaeological personnel from Westland Resource Group and representatives from the Songhees Nation and Esquimalt, First Nation).

Letters of introduction were sent to the Chief and Councils of Songhees Nation and Esquimalt First Nation. The letters described the siting study and requested meetings to discuss First Nations' perspectives on the project and the availability of traditional use (TUS) information. Meetings were held with Songhees Nation political and legal representatives, and permission was obtained for use of previously prepared TUS reports. The Esquimalt First Nation chose not to provide TUS information for the purposes of this ESR.

The heritage structures were taken from the Provincial Designated Sites Registry, a list of formally "Designated" (and thereby protected) provincial and local municipal heritage designations, maintained by the Heritage Branch. Buildings and sites only listed in municipal heritage registers were not included in this analysis, as there is no formal protection of these types of sites.

Archaeology and heritage information overview

There are more than 800 archaeological sites in the Capital Regional District, most of which are protected under the terms of the Heritage Conservation Act. A review of archaeological potential mapping by Millennia Research Ltd. (2008) showed that archaeological sites in the CRD are typically found near water features such as streams, lakes, and small wetlands, and terrain features such as relatively flat tops of small knolls or ridges, and coastline areas.

Recorded archaeological and heritage sites located in the CRD are included in a Provincial Archaeological Registry database that is maintained by the Archaeology Branch of the Ministry of Tourism, Sport, and Culture. The following archaeological sites are recorded in the SENOB study area:

- a prehistoric winter village of Songhees people (called Snyeqa' in Sencoten language), on southeast corner of Cadboro Bay, now mostly destroyed by shoreline residential development;

- several pockets of shoreline shell midden, in disturbed condition, located east of Finnerty Cove along rocky headlands;
- an isolated find of a prehistoric artifact on Finnerty Beach, in the intertidal zone, in front of property owned by Queen Alexandra Centre for Children's Health;
- two culturally modified trees located at north and south ends of Arbutus Cove, north of Finnerty Cove on the Gordon Head shoreline; and
- Goward House, a registered heritage building and property, also designated as a Municipal Heritage Site by the District of Saanich.

None of the recorded archaeological sites located in the SENOB study area occur in the candidate sites under consideration for the treatment facility or ancillary facilities.

6.6 Community

The community section of this ESR builds on information collected for the siting analysis, which included a review of existing planning documents, site visits, and discussions with representatives of the District of Saanich, District of Oak Bay, Capital Regional District, University of Victoria, and the Queen Alexandra Foundation for Children to understand existing and planned land uses.

The preparation of this ESR involved a review of the latest versions of the District of Saanich Official Community Plan, District of Oak Bay Official Community Plan, Cadboro Bay Local Area Plan, University of Victoria Campus Plan, draft University of Victoria Sustainability Action Plan, and zoning bylaws. News articles, media releases, letters to the editor, and information on other community initiatives were also reviewed to understand the regional and local context.

Discussions were held with municipal and regional planners, and representatives from the Queen Alexandra Foundation and the University of Victoria to understand concerns and development plans. Attendance at three public open houses enabled a better understanding of community concerns, potential impacts, and appropriate mitigation measures.

Colour ortho photography was reviewed and visits to the three sites were conducted to confirm existing land uses in the community. These visits were undertaken numerous times and during various seasons through the siting analysis and ESR preparation phase. The most recent visits occurred during June 2009. The proposed routing for the ancillary facilities was reviewed in ortho photos and site visits to accessible areas.

Community context overview

The Saanich East-North Oak Bay study area is an urban area primarily composed of established residential neighbourhoods, the University of Victoria campus, and other large institutional land holdings, such as schools and health facilities.

Most of residences in the SENOB study area are detached dwellings, with some attached residences on and near the UVic campus. The primary access routes to the area are along McKenzie Avenue, Arbutus Road, and Cedar Hill Cross Road.

6.7 Odour

Odour modelling was conducted to estimate the maximum off-site odour concentrations that may occur as a result of adverse meteorological conditions. Two meteorological-input scenarios were modeled using the EPA ISC-PRIME atmospheric dispersion model. The first approach used two years of meteorological data from the University of Victoria and the ISC-PRIME complex terrain option to estimate plume elevated-terrain interactions. The second scenario modeled evening temperature inversions when little or no winds are present, allowing cool surface air to flow ("drain") downhill. These drainage winds normally give rise to the maximum odour concentrations off-site from an odour source. Although the ISC-PRIME model is not sophisticated enough to automatically generate these drainage wind fields directly from digital terrain data, the winds can be simulated by manually creating a short-term meteorological data file consisting of light, down-slope winds and a strong temperature inversion, and then using the ISC-PRIME flat-terrain option.

6.8 Traffic and roads

The study methods used for the traffic impact analysis were as follows:

- Determine the existing conditions with respect to vehicular volumes on preferred routings for the candidate sites, including accident histories and bus service on the various links;
- Identify an order of magnitude current pedestrian and bicycle traffic in the transportation corridors of the preferred routings;
- Forecast the type and amount of traffic that would be generated by the project for both the construction and operation time frames, and identify relevant transportation and traffic related issues;
- Determine the impact of providing the supporting infrastructure of pipes under the road surface for the various options;
- Review current and future roadway cross-section data on preferred access routings;
- Assess the level of impact on affected neighbourhoods and road users; and

- Identify mitigation measures to reduce or avoid traffic impacts.

6.9 Public health and safety

Health. Wastewater treatment is one of the great public health advances of modern times. The liveability of our cities depends in large measure on the effectiveness of wastewater treatment and effluent management. However, wastewater management is not without some health risks.

Recent health research reports indicate that microbial aerosols released from wastewater treatment facilities may constitute health risks for treatment facility workers, but there is no conclusive evidence of risk to nearby residents (Carducci et al. 2000; Heinonen-Tanski et al. 2009; Fracchia, et al. 2006; Lee et al. 2006; Brandi, et al. 2000; Health Canada 2009). This research indicates that the level of risk depends on work practices, worker hygiene, wastewater treatment processes, facility design, and environmental factors. More specifically, health risks depend on the exposure pathways (e.g., equipment failure or emissions of gas, liquids, or solid waste) and the kind of potential risk factor (e.g., gases, chemicals, bacteria, odours). Inhalation of aerosols originating from wastewater has been reported to be the primary source of worker exposure (Brown 1997).

Health Canada (2009) indicates that the probability of exposure to health risks associated with the construction and operation of wastewater treatment facilities ranges from very rare to moderate to unknown. Health Canada lists potential health impacts on urban areas and recreational users adjacent to wastewater treatment facilities (Table 6-1).

Table 6-1 Potential health impacts associated with wastewater treatment facility construction and operation

Exposure	Nature of exposure	Effects on health	Population at risk	Probability of occurrence	Biological-Environmental monitoring indicators
Gas emissions or emissions to air	Nitrogen oxide ($NO_{x)}$	Irritation of respiratory tract	Urban and suburban areas	Rare to moderate	Ambient air measurements
	Dioxins, furans	Some carcinogenic compounds	Unknown	Rare or unknown	Ambient air measurements; epidemiological studies
	Polycyclic Aromatic Hydrocarbons (PAHs)	Some carcinogenic compounds	Workers and local population	Unknown	Ambient air sampling; beno[a]pyrene and other PAH concentrations
Nuisances	Odours	Quality of life	Vicinity	Rare to moderate	Complaints, perception

Source: Health Canada. Canadian Handbook on Health Impact Assessment – Volume 4: Health Impacts by Industry Sector. Chapter 8 Wastewater and Sludge Management.

The physical design of traditional wastewater treatment facilities can include open settlement tanks, aeration basins, sludge handling processes, and areas of mechanical agitation of waste material. Such layouts are typically not designed to prevent the dispersion of wastewater aerosols, (Brown 1997) and may release localized airborne microbes and fungi that are measurable within 20 m of the facility (Heinonen-Tanski 2009 and Brandi et al. 2000).

Research on health risks to wastewater treatment workers indicates that the workers have an increased risk of exposure to bacteria, funguses, parasites, and viruses that can cause intestinal and lung infections (Center for Construction Research and Training 2004). These illnesses, sometimes referred to as "sewage worker's syndrome," include infections of the airway, gastrointestinal system, central nervous system, and joint pain (Thorn et al. 2002 and Carducci et al. 2000). The researchers call for clinical investigations to determine exact causes of reported symptoms.

The proposed SENOB wastewater treatment facility would be entirely enclosed, and would include advanced odour control and air filtration systems. This enclosed design would eliminate the exposure microbial aerosol releases outside the treatment facility. The ventilation system would filter air vented from the interior of the facility to the outside. This ventilation system would not be connected to the odour control system in the facility.

The odour control units would include absorption, adsorption, filtration, entrapment, and chemical conversion systems that remove disease-causing organisms to varying degrees of efficiency. The odour control systems for high odour sources in the SENOB facility involve a three stage chemical scrubber followed by activated carbon treatment. Chemical scrubbers typically use an acid followed by hypochlorite and water to removed amine and reduced sulphur compounds; sometimes a caustic is also used. This system provides a barrier to most viruses and bacteria. Next, the activated carbon filter absorbs residual molecular organic compounds not completely oxidized by the scrubber. It is unlikely that disease organisms would pass through the odour treatment system and pose a risk to nearby residents (H. Kelly, pers. comm., June 23, 2009).

Potential biological vectors of disease transfer from traditional wastewater facilities may include birds, rodents, and insects. Because the SENOB facility would be enclosed, however, the risk of disease transfer by birds, rodents, or insects is negligible.

Safety. Safety risks associated with the wastewater facility would occur primarily during construction. The movement of heavy equipment and the presence of open excavations can cause a risk to the unwary public. An increase in traffic, however slight, would increase the probability of vehicular collisions. Operational traffic volumes would be low, and unlikely to contribute to public safety risks. Storage of chemicals used in the wastewater treatment and odour control processes would be stored in secure facilities, where they would not pose a risk to the public.

6.10 Visual aesthetics

The visual assessment entails a subjective assessment of the changes in the attractiveness of a location as a result of construction of a wastewater treatment facility. The assessment considers the degree of landscape modification, and the compatibility of the structures with surrounding landscape features. Modifications can include the removal of existing trees and shrubs, changes to slopes, and the addition of roads, buildings, lighting, and other utility structures.

Two field visits were made to each of the candidate treatment facility sites. The initial visit was made in early March prior to deciduous foliage growth, and a second visit made in mid-May after summer foliage was established. Photographs were taken at each of the sites to record and interpret potential visual impacts from a number of vantage points. These photos were used in combination with aerial photography to assess the visual impact of a treatment facility at each of the three sites.

To gain a comprehensive understanding of the visual impact of the treatment facility, and the potential effectiveness of mitigation, 3-D digital models were developed for each of the three facilities using typical design features and layouts for a treatment facility. The models were also superimposed on photos taken from key viewpoints to provide an artist's rendering of a facility at each of the three sites.

Due to the short-term nature of construction, visual mitigation options are generally considered only for the operational phase of a project. When considering visual impacts due to construction activities, the impact is deemed irreversible only if it cannot be mitigated or removed in a reasonable period of time, typically less than two years.

6.11 Property values

Project effects on property values

The effect of siting and operating a wastewater treatment facility on residential property values is a common concern expressed by residents of neighbourhoods where the facility could be sited. Many questions about property value effects were asked during the CRD public involvement sessions in June 2009, and in letters and emails received by the CRD. These concerns are understandable, as houses represent a substantial investment by many people, and changes in existing land uses are often viewed in light of potential effects on that investment. These public concerns apply not only to wastewater treatment, but also to other kinds of land use change that depart from existing patterns in a neighbourhood.

Substantial research effort was devoted to assessing the effects of a wastewater facility on residential property values as part of this ESR. This section of the report summarizes the results of that research, presenting examples from other cities and identifying the kinds of factors that

can reduce property value. The implications of these results for assessing property value effects of siting a wastewater facility in the study also are explained.

Methods

A thorough search of the literature and telephone conversations with CRD staff indicate that no studies have been conducted on the impacts of wastewater treatment facilities or similar land uses in the CRD. In the absence of locally relevant research, case studies from other locations were sought.

Case studies are assumed to be most reliable when information is the studied site and the area where a facility is proposed are similar in terms of factors such as:

- neighbourhood characteristics (housing quality, location, and population);
- the environment and potential project impacts are similar for the two sites; and
- the original valuation study was carefully conducted and used sound valuation techniques.

There are, however, issues and limitations with this technique:

- results may be useful only for making gross estimates of values, unless the sites share all of the site, location, and user specific characteristics,
- reliable studies for the policy or issue in question may not be available (it may be difficult to obtain appropriate studies, because many are not published), and
- adequacy and accuracy of existing studies may be difficult to assess, and
- extrapolation beyond the range of characteristics of the initial study is not recommended (Ecosystem Valuation website, May 2009)

Review of the available literature did not identify studies of land values where circumstances are similar to those in Saanich East-North Oak Bay. For example, the personal preferences and real estate markets of Saanich and Oak Bay are likely to differ from those in such studied locations as Dallas and Indianapolis.

Factors affecting property value

Many characteristics of a residential dwelling may affect its value. Recent studies have found that "slanted versus flat roof, sprinkler system, garden bath, separate shower stall, double oven and gated community positively affect selling price while not having attic space, living in an earthquake zone, proximity to a hog farm, proximity to a landfill, proximity to high voltage lines" negatively affect selling price (Sirmans *et al.* 2005).

Other factors also may influence property values, "for example, two houses that are otherwise similar in terms of age, square footage, number of bedrooms, etc., can have divergent market values if one of those houses is located proximate to an amenity (such as a park, greenway, golf course or beach). Such amenities are generally valued by residents and capitalized into the market value of the house" (Campbell *et al*. 2007).

A waste water treatment facility may be considered by some residents to be a "locally unwanted land use" (LULU) that may cause negative property value impacts" (Delacy 2004). Little research was found that specifically assesses the property value effects of siting a treatment facility. The only recent reference to this topic compared the effects on suburban property values of landfills, sewage treatment plants, a regional airport, high traffic roads, mushroom production facilities, and large-scale animal production operations. The report concluded that "no significant impact was found for sewage treatment plants" (Ready and Adballa 2003).

In the case of a siting a wastewater treatment facility in Saanich East-North Oak Bay, property values could be affected by the following factors.

- Construction—including nuisance effects such as noise, dust, visual impacts, and traffic disruptions during construction of the treatment and ancillary facilities. If they occur at all, construction effects on property values would be temporary and entirely reversible;
- Visual aesthetics– the diminution of views from affected properties either through loss of view of something considered positive (ocean, parks, hills, trees, open spaces) or through intrusion of the treatment facility into the previous view from a property. These changes are generally considered long-term (i.e. post-construction);
- Odour – taken to mean that noxious odours from a treatment facility may be sensed. This impact would be occasional and long-term;
- The stigma effect– "Stigma reflects any discounts by the marketplace as a result of a detrimental condition - an adverse public perception regarding a property...which extracts a penalty on the marketability of the property and hence its value. Diminution in value tends to be greatest immediately after the loss or damage is identified, before the nature and extent of the difficulty is fully known. Scientific conclusions about the presence or absence of impacts do not necessarily correlate with the marketplace's conclusion about the duration of economic impact on real estate. Thus anticipating the future impact of a LULU has as much to do with attendant publicity as with the event itself. While so-called "sensory cues" are key to impacts, (i.e., what can be seen, smelled or heard) the concept of stigma has much more to do with reputation and the intangible components of human desire that influence 'marketability.' Marketability is defined by appraisers as the state of being saleable" (Bell 2008);

- Loss of public parks – Evidence exists that public parks are a positive amenity for a home and are capitalized into its price. A recent study in Portland, Oregon found a 1 to 3 % increase in the value of homes within 1,500 feet (461 m) of public parks. A Dallas, Texas study suggests that approximately 85% of an urban park's positive property value impact occurs within 800 feet (246 m) of its edge (Nicholls 2004). Each of the three candidate sites in Saanich East-North Oak Bay are on or near parks or open space and a change in land use might reduce nearby property values.
- Loss of greenways – Research indicates that loss of greenways or access to them may adversely affect property values. In Indianapolis, Indiana, location within one-half mile (812 m) of a conservation corridor had a positive effect on property values of 2%. In Austin, Texas two neighbourhoods adjoining a greenway showed that statistically significant 6 percent and 12 percent increases in value occurred for properties directly adjacent to the amenity (Nicholls 2004).

No evidence could be found in the literature that to suggest that the construction and operation of wastewater treatment facilities directly affect values of nearby properties. Indeed, anecdotal information suggests that wastewater treatment facilities may have little effect on the construction and sale of residential properties near such facilities. For example, in Bedford, Nova Scotia a secondary treatment facility did not affect the ability of property developers to construct and sell high-end condominiums on a property 50 m from the facility (T. Tam, personal communication, June 25, 2009). It is possible, however, that these condominiums could have yielded higher prices in the absence of the treatment facility.

In Calgary, Alberta, housing was built within 300 m of an existing wastewater treatment facility. Since moving into the housing, some residents have reportedly complained to the City of Calgary about unpleasant odours from the facility and a disrupted view of the Bow River, located on the far side of the facility (K. McDonald, personal communication, June 25, 2009). Whether odour led to an adverse impact on property values in this area has not been determined.

It should be noted that the characteristics of wastewater facilities vary substantially. The effects on neighbouring properties of large wastewater plants with open clarifiers and basic odour control would be quite different from the small, enclosed, high-tech facilities being considered for Saanich East-North Oak Bay. Modern wastewater facilities are often seen as amenities for neighbourhoods, supporting community gatherings, education, and recreation, as in Vancouver, Washington's Marine Park wastewater facility. This variation in the kinds and effects of impacts of wastewater facilities compounds the challenge of forecasting project effects on nearby properties.

Property value effects in Saanich East-North Oak Bay

In the absence of clear evidence of property value effects of wastewater facilities, it is not possible to specify how locating a treatment facility in Saanich East-North Oak Bay would affect property values. Even the significance of such effects cannot be stated with confidence.

Nonetheless, it may be possible to identify site characteristics that could affect property values, and measures that could mitigate those effects.

Finnerty –Arbutus site. The nearest residence is more than 100 m away from the planned location for a facility on the Finnerty-Arbutus site. If the treatment facility is built and operated in a way that complies with project description specifications, the nearest homes would neither see, hear, nor smell the facility once it is constructed. Nuisance effects of facility construction would be noticed, but these impacts are less likely to affect property value than long-term operational effects. Some "stigma" effect is possible, but in the absence of actual physical impact, it is probable that no property value reductions would result from construction on the Finnerty-Arbutus site.

Cedar Hill Corner site. The distance between the Cedar Hill Corner facility footprint and its nearest residential neighbour is 115 m. Vegetation around the margins of the site provides a visual screen, as would landscaping of the treatment facility. Once the construction-related disturbance of nearby residents ends, it is unlikely that the operation of the facility would affect residential properties or their values.

UVic Fields site. Unlike the other two candidate sites, the UVic Fields site provides limited space to buffer the treatment facility from nearby housing. The conceptual facility footprint is only 18 m from the nearest residential property line, and several homes are less than 50 m from the planned facility. Although the treatment facility would be designed to operate without noise, vibration, or odour effects at the property line, a buffer would provide extra assurance that adjacent properties would not be affected. Adjacent residents could see the treatment facility across their back fences, so the presence of buildings—even if attractively designed—would be noticeable. Because of the proximity of the treatment facility, the potential for property value effects on adjacent homes is likely greater for the UVic fields site than others. Nonetheless, whether a measurable effect would occur is unknown, as is the potential magnitude of the effect.

Conclusion

Although it may be suggested that the potential for effect is greater at one site than another, there is no basis in research or experience for estimating the amount of property value change or the likelihood that an effect would result. Hence, the ESR does not contain an estimate of property value effects of the facility on residences near the candidate sites.

7.0 FINNERTY-ARBUTUS SITE DESCRIPTION AND IMPACT ASSESSMENT

7.1 General site description

The Finnerty-Arbutus site is a 4.4 ha forested area located in the District of Saanich, between the University of Victoria campus and Haro Strait (Figure 3-3). The property is owned by the Capital Regional District (CRD), and was previously owned by the Queen Alexandra Foundation.

The property and surrounding wooded lands are often referred to as Haro Woods by members of the public. The wooded area is comprised of three parcels, owned by the CRD, the District of Saanich, and the University of Victoria.

The Finnerty-Arbutus property is bounded by Arbutus Road to the north and Finnerty Road to the west. Forested land, medical facilities, and fields owned by the Queen Alexandra Foundation for Children are located across Arbutus Road. Other adjacent land uses include forested parcels owned by the District of Saanich and University of Victoria to the east, detached dwellings across Finnerty Road to the west, and University of Victoria student accommodation and a child care centre located to the south of the Finnerty-Arbutus property.

The site is part of an urban green space that is used by community members for walking, running, dog walking, orienteering, environmental study, and BMX biking. A network of informal trails has been developed on the site. This public use of the site, although common, is not a permitted use. The site is private property that was posted for no trespassing by the previous owner.

7.2 Ancillary facilities site description

Ancillary facilities associated with a treatment facility at the Finnerty-Arbutus site include a gravity main, which would carry effluent to the ocean outfall, and a small diameter pressurized pipe, which would convey wastewater to the treatment facility from the existing Penrhyn pump station in Cadboro Bay (Figure 3-4).

The gravity main would be constructed in existing and new rights-of-way. The main would be located underground across a field on the Queen Alexandra Foundation property and in an existing right-of-way across a residential property. It would then be installed beneath the roadway of Alpine Crescent, Haro Road, and Monarch Place. The gravity main would be installed in an existing right-of-way across four residential properties before reaching the existing outfall location in Finnerty Cove.

The small diameter pressurized pipe would be constructed from the Penrhyn pump station, in Cadboro Bay, to the Finnerty-Arbutus site entirely under existing roads, including, Penrhyn Street, Hobbs Street, Maynard Street, Rowley Street, and Arbutus Road.

7.3 Finnerty-Arbutus impact assessment

Landforms, geology, and soils

Treatment facility site conditions

The ground surface of the Finnerty-Arbutus site slopes gently eastward to a maximum elevation change on the site is 8 to 9 m. Site observations corroborate historical photographs, and indicate the ground surface has not been modified significantly by excavation or fill placement. Ground disturbing activities related to creating BMX bike jumps and drainage ditches were observed. The site appears to be reasonably well-drained.

The soil stratigraphy at the Finnerty-Arbutus site consists of a relatively thin veneer of surficial topsoil, overlying a morainal deposit of hard or very dense gravelly sandy silt or silty sand till. The till stratum is expected to be at least a few metres thick, and may be underlain by a pre-glacial marine deposit of dense to very dense silty sand or sandy silt, commonly called the Quadra Sediments. The groundwater table is expected to be within 3 to 4 m of the present ground surface except over the south and southeast areas of the site, where a relatively thin layer of compact to dense sand is present directly atop the glacial till. The sand is believed to be a beach deposit from washing of the upslope till materials during past periods of higher relative sea level.

Given the soil stratigraphy at the site, the natural frequency is expected to be in the range of 10 hertz, with an average shear wave velocity in the upper 30 m in the order of 400 to 500 m/sec, corresponding to a Site Class "B" in the current National Building Code. The site is in an area that could be affected by a Cascadia Subduction event. Information from Natural Resources Canada indicates a peak ground acceleration of 0.61 g and spectral accelerations of 1.22, 0.82, 0.38 and 0.19 g, for respective periods of 0.2, 0.5, 1.0 and 2.0 seconds respectively for a design seismic event of 2% in 50 years (Bednarski, J. pers. comm.). Seismically, these conditions are typical of the area and are unlikely to present substantial development constraints on wastewater treatment facility design.

The public raised concerns about faults in the area, particularly on the Finnerty-Arbutus site. In response, the consultant conducted further investigations into the seismic risk. This information is applicable to all sites in the SENOB study area. The United States Geological Survey (USGS) as part of their Earthquake Hazards Program has undertaken subsea investigations and released information in 2008 that confirms the presence of two newly-identified faults in a fault system in the Strait of Juan de Fuca that transects towards southern Vancouver Island. One of these faults,

on termed the Devils Mountain Fault (or DMF, which itself not one of the new faults), extends from the Cascadia Foothills towards Vancouver Island (more than 125 km) and information indicates the Quaternary Deposits are deformed on both sides of this fault where seismic reflection has been done. The two new faults are more constrained to the Whidbey Island area but are interpreted to be part of a complex system involving the DMF. It is postulated that the DMF continues west of the USGS database and passes several kilometres south of Victoria, merging with the Leech River or San Juan Faults to the west. The USGS states that neither the Leech River nor San Juan Faults have been recognized as active or potentially active. Alternatively, they suggest that the DMF may extend more northerly in Haro Strait and pass north of Victoria. This alignment has not been described but it could reasonably pass through the SENOB area. (US Geological Survey 2008)

Subsequent to the publication of the USGS Professional Paper, the CTV ran a news article on April 24, 2008 in which they stated updated seismic maps from USGS showed newly discovered fault lines that ran south of Victoria, which could cause earthquakes that would result in severe damage and potentially costing billions of dollars.

The National Research Council (NRC) in 2009 issued a Program Outcome following their Reducing Risk from Natural Hazards Program that states the Leach River Fault is an extension of the DMF, acknowledging that two damaging paleoearthquakes have been identified by LIDAR about 40 km east of Victoria in Washington State. They indicate they have undertaken 310 km^2 of LIDAR (radar) investigations, but have only analyzed 71 km^2. In summary, they state "No evidence of historic earthquakes has yet been found in the Victoria area by this or any other study. So far, current models of seismic hazard for the Victoria area do not need revision, but more needs to be done to exercise due diligence and determine if the Leach River Fault Zone has been active in geologically recent times" (National Research Council 2009).

In summary, even if one of these faults could give rise to a 1 in 1,000 year earthquake event, the current building code requires design for a 1 in 2,000 year event (except in the case of slope stability, where a 1 in 500 year event is considered, which does not apply to the candidate sites). The most recent research notes that current models of seismic hazard for the Victoria area do not need revision, and the seismic risk information applied to the SENOB candidate sites is based on the best available science.

Impacts and mitigation measures

Treatment facility construction. Landform recontouring would occur during the construction phase. Approximately one hectare of the presently undisturbed site would be cleared and levelled. A retaining wall or earth bank 5 to 10 m high would be constructed at the southwestern corner of the footprint. Excavation instability, or settlement associated with fill placement are not expected. The native soils at the site are relatively competent materials to support the anticipated load associated with a wastewater treatment facility, and no unique or unusual

geotechnical concerns are anticipated. Although the groundwater table could be relatively high, it is expected that it could be depressed quite readily with ditching or conventional drainage installations. Associated seepage values are not expected to be excessive. The construction of a treatment facility at this site would require significant excavation and fill placement because of the sloped terrain. Native mineral soils excavated from the site could be reused for subgrade fill and the surface sands and gravels could be used for select granular fill. Seismically, the accelerations noted correspond to a Site Class "C", and depending on the spectral acceleration considered, and the period of the various facilities, some adjustments to facility design may be necessary.

Mitigation measures. Further study of the site is required to refine the Seismic Site Class assessment before preparing detailed construction designs. Topsoil removed during excavation could be stored onsite for later use landscaping the property. Protecting the soil against erosion or contamination by chemicals or noxious weeds would improve its value when spread on the site following construction. Erosion and sedimentation risk can be reduced further by taking the following actions:

- Prepare and implement a sediment control plan prior to any construction
- Cover any stockpiles with tarps if heavy rain is expected
- Use sediment fences, straw bales, *etc.* during soil stripping and site levelling activities, to prevent sediments leaving the site.
- Ensure the full reuse of stockpiled soils during site landscaping
- Use an "avoid and control" approach to preventing erosion and sedimentation rather than a reactive approach, and
- Have an environmental monitor onsite during soil stripping, stockpiling, and extensive land levelling activities. The monitor should inform construction staff about erosion and sediment control, and stock pile a supply of erosion control materials onsite.

Impacts associated with soils, geology, and landforms during construction are considered to be local in extent and reversible. Erosion and sedimentation effects would be short-term, and re-grading would be a long-term effect. The mitigation measures outlined above would further reduce the magnitude of any construction impacts on landforms, geology, and soils. The magnitude is considered to be low and the impact **less than significant.**

Treatment facility operation. After construction is completed and operation of the treatment facility begins, no additional impacts on the landforms or geology of the site are anticipated. Heavy rainfall on exposed soils can increase erosion and sedimentation risk. This risk is greatly reduced under established vegetative cover. Under typical facility design and construction practices, the area of exposed soils subject to erosion during operation is considered to be

relatively small. The period of such risk would be highest during the interval between the end of construction and establishment of vegetation.

Mitigation measures. To ensure that operational erosion and sedimentation impacts remain less than significant, the following actions could be taken,

- Minimize areas of steep fill around the facility where soils are exposed to rainfall
- Hydroseed or use dense plantings of native vegetation to ensure good coverage of bare soils, so reducing erosion risk.

Erosion and sedimentation from operations are considered to be local in extent and reversible. The magnitude is considered to be low and the impact **less than significant**.

Ancillary facility construction. The route of the gravity main access to the outfall follows existing pipe rights-of-way and roads. No impacts on soils, landforms, or geology are anticipated, so impacts can be considered **less than significant**.

The location and geologic condition of the outfall route are subjects of separate study, and are not considered in this ESR.

Ancillary facility operation. Operation of the gravity main and outfall are not considered to affect geology, landforms, or soils. Impacts are considered **less than significant.**

Hydrology and water quality

Treatment facility site conditions

The Finnerty-Arbutus site slopes from west to east. The steepest parts of the property are along the western and southwestern boundaries, where it abuts Finnerty Road and University of Victoria housing and daycare facilities. Slopes here are in the 12-15% range. Most of the remainder of the property is gently sloping, with slopes of 5% or less.

The only defined drainage course on the site crosses the centre of the Finnerty-Arbutus property from west to east. This depression has become an erosion feature in recent years as a result of development of the area near Finnerty and Sinclair. The drainage is dry through most of the year, flowing only after rainfall events. The source of water is an area called “Lam Circle Ravine” in the University of Victoria *Integrated Stormwater Management Plan*. Development of University of Victoria housing and the daycare centre on the margins of the “ravine” likely increased the rates of runoff in this area. A storm drain discharges water from the housing complex to the drainage at the border of the CRD-owned property.

The drainage follows a walking path along most of its length; the path could have provided water with a preferential path across the Finnerty-Arbutus property. Throughout most of its length, the drainage has downcut only a few centimetres, suggesting that it is of recent origin. In the central portion of the Finnerty-Arbutus site, the defined channel disappears, and the drainage water percolates into the soil. Several small depressions carry storm water to the stormwater ditch along Arbutus Road. One depression discharges near the bus stop, and another near the eastern edge of the Finnerty-Arbutus parcel. This latter drainage follows the course of a walking path and a wastewater main.

As part of its Draft Terms of Reference for the Cadboro Bay Institutional Property Action Plan, the District of Saanich has included mapping of the Finnerty-Arbutus property. A map shows a feature called "Finnerty Creek" that crosses the parcel. A thorough site inspection has revealed mapping inaccuracies. The defined channel crosses only the southeastern portion of the site; it is not continuous. The feature is not a creek, but a result of recent runoff channelization from upslope development.

Many paths used by walkers and mountain bikers crisscross the Finnerty-Arbutus site. These paths and the rights-of-way for sewer lines intercept surface flow and channelize runoff during rainfall events. Where these routes reach Arbutus Road, they discharge runoff into the roadside ditch.

The sandy and loamy character of soil on the Finnerty-Arbutus property, combined with the extensive tree cover and understory vegetation, indicate that most rainfall infiltrates into the soil of the site. Only where pathways interrupt this subsurface flow, or where stormdrains concentrate runoff from upslope, is there a surface expression of water.

The quality of the water on the site is suspect, as it flows from urban areas and roadways to the south and west. No water quality sampling was conducted as part of this study.

Ancillary facility conditions

The only ancillary facilities associated with the Finnerty-Arbutus facility are the gravity main and outfall. The gravity main would cross the Queen Alexandra fields, a relatively flat area north of Arbutus Road. The roadside ditch along Arbutus Road is the only drainage feature affected by the gravity main. Most of the length of the gravity main would be located in roadways (such as Alpine Crescent and Monarch Place). The outfall would cross the rocky foreshore. Runoff is primarily overland flow directly into Haro Strait.

Impacts and mitigation measures

Treatment facility construction. Excavation associated with construction of a wastewater facility on the Finnerty-Arbutus property would result in changes to the site's hydrology. Shallow

subsurface flow of groundwater would be intercepted by excavation, as would small surface drainages. This water would need to be infiltrated elsewhere on the site, or conveyed to the roadside ditch along Arbutus Road. The ephemeral drainages that carry runoff from the University of Victoria property to the south would need to be re-routed.

During the two-year construction period, excavations would need to be dewatered to maintain safe working conditions. This pumped water would be discharged to ground or to the roadside ditch. Such water from construction excavations often contains suspended sediment. There are no sensitive downstream receptors that would be affected by short-term increases in sediment loads.

> Mitigation measures. A Qualified Environmental Professional should be retained to refine and revise the Streamside Protection and Enhancement Area shown in the District of Saanich documents.
>
> Settlement ponds or filtration basins should be provided to reduce suspended sediments in construction drainage. A water management plan should be prepared to minimize on-site and off-site effects of groundwater and surface water changes associated with the project. Onsite infiltration of runoff would be included in project design.

Construction-related changes to hydrology would begin with site grading and continue in the long-term. Water quality effects would begin during grading and decline following site restoration. Drainage effects would be local, confined to the facility footprint. If onsite infiltration is successful, then no downslope effects of increased rates of runoff are expected. Impacts on water quality are reversible following construction. The magnitude of potential construction impact on water quality and hydrology is considered low, resulting in a rating of **less than significant.**

Treatment facility operation. Operation of the facility would see runoff handled through onsite management and infiltration. The conceptual location of the facility at the lowest point on the Finnerty-Arbutus property minimizes down-gradient effect on the site, but also limits the amount of runoff reduction that could be accomplished before discharging flows into the ditch on Arbutus Road.

With onsite infiltration, operation of the facility would not result in releases of wastewater to the site or into offsite drainage facilities. Even during high rainfall events, no overflows of wastewater from the facility would occur. Chemicals used in the wastewater treatment process would be stored in secure structures.

> Mitigation measures. Onsite infiltration of runoff from the facility would minimize effects on hydrology or water quality.

Operational effects on hydrology or water quality would be measurable only during high or persistent rainfall events. Such effects would persist in the long-term. The low elevation location of the conceptual layout reduces down-gradient effects on hydrology or water quality. Changes in hydrology and water quality associated with the operation of the facility would be irreversible. The magnitude of these effects would be low, and the impact is considered **less than significant.**

Ancillary facility construction. Clearing and trenching associated with installing the gravity main and outfall could channelize runoff during rainfall events. Dewatering of trenches should be conducted in ways that does not introduce sediments into stormdrains or ditches. Standard construction techniques for handling of stockpiled soils should be sufficient to avoid erosion and sedimentation impacts.

> Mitigation measures. Sediment ponds or filtration should be employed during dewatering of pipe trenches. Stockpiled soil should be covered or otherwise protected from erosion and sedimentation.

Construction impacts of ancillary facilities on hydrology and water quality would be confined to trenches and cleared areas. Any impacts would be short-term and reversible. The magnitude of these effects is low, and **less than significant.**

Ancillary facility operation. Once construction of the gravity main and outfall are complete, revegetation would protect surface soils from erosion. Minor changes in surface flow patterns may occur in the medium-term. No effects on water quality are expected.

> Mitigation measures. Standard site restoration procedures would be sufficient to protect soils from erosion. Monitoring should be conducted to ensure that pipe routes do not channel surface runoff, resulting in erosion.

Project impacts on hydrology limited to unpaved areas crossed by pipes, and effects would be medium-term and reversible. No effects on water quality are expected. The magnitude of effects is low, and the impact is **less than significant**.

Vegetation

Regional Overview

The SENOB study area is located in the Coastal Douglas Fir (CDF) biogeoclimatic zone. This area experiences warm and dry summers and mild and wet winters. The climate extremes in the CDF are less severe than those of other coastal British Columbia regions because of the rain shadow effect created by the Vancouver Island and Olympic mountains (Meidinger and Pojar 1991).

Vegetation in the CDF is primarily forested, although some open Garry Oak woodland and rocky outcrop habitats occur in this biogeoclimatic zone. Forests in the CDF are typically dominated by Coastal Douglas fir (*Pseudotsuga menziesii*), and depending on the microclimate, western redcedar (*Thuja plicata*), arbutus (*Arbutus menziesii*), Garry oak (*Quercus garriana*), and red alder (*Alnus rubra*) commonly occur (Meidinger and Pojar 1991).

The CDF has a large number of rare and endangered plant species. Though many of the region's rare species are at the northern extent of their range, several endemic species, unique to the region also occur. Rare or endangered, and endemic plant species occur in seaside, aquatic, rock outcrop, and forested habitats.

Undisturbed forest habitats in the CDF are increasingly rare, with less than 1% of the entire CDF zone remaining in mature or old forest condition in British Columbia. These forests were logged in the 1900s, and cleared for agriculture and human settlement (Pojar *et al.*, 2004). All plant communities, or natural habitats in the CDF are listed as threatened or endangered (red listed) by the British Columbia Conservation Data Centre.

Treatment facility site conditions

The Finnerty-Arbutus site is located in a stand of mature, second growth Douglas fir forest. The two most dominant plant communities found on the candidate site are Douglas fir/dull Oregon grape (CDFmm/01) and Douglas fir/arbutus (CDFmm/02). These plant communities, like most natural areas on southern Vancouver Island, are red-listed by the BC Conservation Data Centre (CDC).

Local community groups have invested time and effort in enhancing the environmental values of the adjacent forested properties to the south, through a three year invasive plant removal program (Norm Mogenson, pers. comm.), and further restoration efforts are proposed by the community (Kowbel *et al.* 2009). The University of Victoria has protected their section of the adjacent Haro Woods property from development in perpetuity (UVic 2003).

The majority of the proposed site occurs in the Douglas fir/dull Oregon grape plant community, which has a closed canopy of Douglas fir, western redcedar, bigleaf maple (*Acer macrophyllum*), and arbutus. Along the south-eastern extent of the proposed site is a narrow band of Douglas fir/arbutus plant community, with a forest canopy composed primarily of Douglas fir, arbutus, and Garry Oak.

Much of the understory vegetation at the proposed site is dominated by invasive plant species, including English ivy (*Hedera helix*), Scotch broom (*Cytisus scoparius*), spurge daphne (*Daphne laureola*), Himalayan blackberry (*Rubus discolour*), and English holly (*Ilex aquifolium*). These invasive species out-compete many of the native plant species on the site, which include

oceanspray (*Holodiscus discolour*), dull Oregon grape (*Mahonia nervosa*), Nootka rose (*Rosa nutkana*), snowberry (*Symphoricarpus albus*), thimbleberry (*Rubus parviflorus*), sword fern (*Polystichum munitum*), and salal (*Gaultheria shallon*). Areas of the understory are densely vegetated, but the interior of the property has patches of more open understory.

The BC Conservation Data Centre (CDC) has no records of red or blue listed, or COSEWIC listed plant species on the Finnerty-Arbutus site. No rare plant species were noted during the site investigation. A local resident and naturalist has studied the native vegetation in the Haro Woods area, south of the candidate site and has not located any rare plant species. (Judy Spearing, pers. comm.). Much of the native ground cover has been affected by extensive ground disturbance associated with walking trails, bike trails, and jumps. The altered ground cover reduces the likelihood of presence of rare plants.

An ephemeral drainage crosses the property, and may be affected by the footprint of the treatment facility. Regular flow in this drainage feature is restricted to the winter rainy season and other large rain events.

Ancillary facility conditions

The ancillary facilities associated with the Finnerty-Arbutus site would generally be located in existing rights of way. Any new construction work associated with the sewer trunk would occur in non-vegetated areas.

Table 7-1 summarizes the presence of sensitive vegetation elements associated with the Finnerty-Arbutus site and ancillary facilities.

Table 7-1 Sensitive vegetation resources on or near the Finnerty-Arbutus site and associated ancillary facilities

Presence of sensitive vegetation elements	Site	Trunk-Outfall
Terrestrial ecosystems in relatively unmodified state:		
• older forests or mature forests	Yes	No
• second growth forests	Yes	No
• native grasslands/shrub/herb communities	No	No
• Garry oak woodland community	No	No
• coastal bluffs	N/A	No
Presence of ecosystems at risk:		
• ecological communities on Conservation Data Centre Red or Blue lists	Yes	No
• ecosystem types identified by Sensitive Ecosystems Inventory	No	No
• areas identified as environmentally sensitive by local governments	Yes	No
Presence of aquatic or riparian ecosystems:		
• seasonal or permanent watercourses (streams, creeks, rivers, ditches)	Yes	No

Presence of sensitive vegetation elements	Site	Trunk-Outfall
• seasonal or permanent wetlands, seepage areas, or vernal pools	No	No
• riparian ecosystems beside these aquatic ecosystems and vegetated gullies	No	No
Presence of vegetation species at risk and their habitats:		
• species at risk identified by COSEWIC	No	No
• species on provincial Red and Blue lists	No	No
• regionally significant species	Yes	No
• habitats for any of these species	Yes	No

Impacts and mitigation measures

Treatment facility construction. Clearing for construction of the wastewater treatment facility would result in a direct loss of approximately 1 ha of the conifer-dominated woodland of the Finnerty-Arbutus site. Additional forest clearing may be required to meet construction workspace needs and Work Safe BC danger trees requirements. The forest clearing would involve removal of mature Douglas fir, western red cedar, grand fir, arbutus, bigleaf maple, and garry oak trees. Indirect losses of mature trees and shrubs caused by windthrow, soil compaction and project-related changes to site drainage can also be expected. No recorded sensitive ecosystems or rare element occurrences would be affected by the construction or operation of the treatment facility.

It is noteworthy that the property is currently zoned RS-12 and RS-14. If detached housing were built on the property, as permitted under the current zoning, clearing impacts would be considerably greater than the forest cover losses expected for the construction of the treatment facility.

Mitigation measures. No mitigation measures to avoid direct clearing impacts were identified. Project effects on vegetation values could be reduced by relocating the footprint to the southeast. Site disturbance has been substantial on this property to the south, which is owned by the District of Saanich. A small number of Garry oak trees that occur near the south western boundary of the proposed footprint, and can be avoided by re-configuring the facility layout.

As impact avoidance to the forested ecosystem is not possible, compensation measures should be considered by the CRD. These measures could include registering a protective covenant to prevent tree cutting on the remaining forested woodland, aggressive invasive plant management, and restoration of native plant cover.

The clearing of vegetation would affect the treatment facility footprint and workspace. The loss of mature forest is a long-term effect, and is irreversible. The magnitude of the effect is moderate and adverse. As the impacts cannot be mitigated, the effect of constructing the wastewater treatment facility at the Finnerty-Arbutus site on vegetation would be **significant**.

Relocation of the wastewater treatment facility to nearby cleared property with fewer vegetation values could reduce the effects on vegetation to **less than significant** levels.

Treatment facility operation. Operation of the treatment facility does not require additional removal of native vegetation. No effects of treatment facility operation on vegetation are anticipated.

Ancillary facility construction. Construction of the ancillary facilities is not anticipated to require removal of native vegetation, as the ancillary facilities would be built in existing road ways and rights of way. Some domestic trees and shrubs would be removed during construction of the gravity main to the outfall. Potential effects on vegetation from ancillary facility construction are **less than significant**.

Ancillary facility operation. Operation of the ancillary facilities does not require additional removal of native vegetation. No effects of ancillary facility operation on vegetation are anticipated and therefore considered **less than significant**.

Wildlife

Regional context

The project area occurs in the CDF biogeoclimatic zone, on southern Vancouver Island. The climate and island location of this region define the wildlife diversity that occurs. Black-tailed deer are the most abundant large mammal, but occasionally black bear and cougar enter rural green spaces. Southern Vancouver Island hosts a large diversity of birds.

Mature forests are uncommon on southern Vancouver Island, as much of the region was logged during the early 1900s and more recently. Much of the land has been developed for urban and rural uses.

Remaining areas of mature and old forest are important to many species, including Yellow-bellied Sapsucker, Hairy Woodpecker, Northern Flicker, Downy Woodpecker, Steller's Jay, Common Raven, Chestnut-backed Chickadee, Brown Creeper, Winter Wren, and Varied Thrush (Meidinger and Pojar 1991). The nests created by primary cavity excavators, such as Pileated Woodpecker, are important for secondary cavity nesters, such as Northern Saw-whet Owl, Western Screech Owl, and California Myotis.

In urban areas, a greater presence of non-native species occur, including Rock Pigeon, House Sparrow, European Starling, Norway Rat, and House Mouse. Several native wildlife species have, however, adapted to urban habitats, including Herring Gull, Northwestern Crow, raccoon, and Little Brown Myotis (Meidinger and Pojar 1991).

Green spaces and parks located in largely urban environments tend to have a combination of native and introduced wildlife species.

Treatment facility site conditions

The Finnerty-Arbutus site is currently a mature second growth forest that is connected to other forested parcels. The mature second growth forest habitat found on this property is becoming increasingly rare in the CRD. Although the understory plant community has been greatly altered by invasive weeds and ground disturbances, the forest structure provides important attributes for forest-dependent wildlife species.

Wildlife habitat features that occur on the Finnerty-Arbutus site include several wildlife trees; mature, large limbed trees; rotten logs; and other woody debris. Wildlife trees provide potential nesting habitat for woodpeckers and secondary cavity nesters, such as Northern Saw-whet Owl or Western Screech Owl (blue listed). There are also habitat features important to raptors such as Coopers Hawks, including potential nest sites and prey. The downed rotten logs and other woody debris are habitat for invertebrates and small mammals, which are important foods for the birds breeding in the area.

Several wildlife trails occur in the area, and black-tailed deer use this forested area for security and thermal cover, as well as for feeding.

The forest provides breeding habitat for an array of common bird species, such as American Robin, Chestnut-backed Chickadee, Pine Siskin, Winter Wren, House Finch, Dark-eyed Junco, Golden-crowned Kinglet, Spotted Towhee, and Red-breasted Nuthatch (Hocking 2000). During an April 2009 site visit, a Barred Owl was heard vocalizing nearby, and other species noted on the candidate site included Orange-crowned Warbler and Swainson's Thrush.

Ancillary facilities conditions

The ancillary facilities associated with the Finnerty-Arbutus site would occur in existing roads and established rights of way. These areas do not contain important wildlife habitat or habitat features.

Table 7-2 Sensitive wildlife on or near the Finnerty-Arbutus site and associated ancillary facilities

Presence of sensitive wildlife	**Site**	**Trunk-Outfall**
Presence of wildlife species at risk and their habitats:		
• species at risk identified by COSEWIC	No	No
• species on provincial Red and Blue lists	None detected	No
• regionally significant species	Yes	No
• habitats for any of these species	Yes	No
Presence of important wildlife habitat features:		

Presence of sensitive wildlife	Site	Trunk-Outfall
• wildlife trees, snags, mature, large-limbed trees	Yes	No
• rotten logs and other woody debris	Yes	No
• man-made habitat enhancements	No	No
• hedges and shelterbelts	Yes	No
• groundwater springs and seepages	No	No
Evidence of wildlife use:		
• wildlife corridors	Yes	No
• deer habitat	Yes	No
• potential raptor nest site	Yes	No
• nearby presence of protected areas or habitats	No	No

Impacts and mitigation measures

Treatment facility construction. Clearing for construction of the treatment facility would result in a loss of mature second growth forest. The area to be cleared would include the approximately 1.5 ha footprint plus any additional construction-phase temporary workspace. Removal of danger trees, which are often wildlife trees, may be required within 1.5 tree lengths (approximately 45 m) of the candidate site under Work Safe British Columbia regulations.

Removal of forest typically affects wildlife in the following ways:

(a) loss of thermal and security habitat and habitat features (*i.e.*, canopy cover);
(b) loss of reproductive habitat and habitat features (*i.e.*, nest trees);
(c) direct mortality during clearing activities;
(d) sensory disturbances associated with the clearing and construction activities; and
(e) loss of habitat connectivity (movement corridors).

Mitigation measures. The loss of potential reproductive, security, and thermal habitat from this site would be long-term, and cannot be mitigated. To offset the effect, compensation to enhance habitat values in nearby green spaces could be considered. For example, removal of invasive plant species could increase the habitat quality for ground nesting birds and small mammals, which are also important food species for raptors in the area. Installing water retention features on the central drainage of the Finnerty-Arbutus site would benefit wildlife by creating habitat complexity, while also controlling erosion.

Direct mortality and effect of construction related sensory disturbances could be reduced through timing vegetation clearing work to avoid the nesting bird season (March 15 to July 31).

Clearing for treatment facility construction would cause the removal of wildlife habitat and habitat features on the facility footprint and workspace. The loss of mature forest habitat is a

long-term effect, and cannot be reversed. The magnitude of the effect is moderate and adverse. As the impacts cannot be mitigated, the effect of constructing the wastewater treatment facility at the Finnerty-Arbutus site on wildlife would be **significant**. If the wastewater treatment facility were moved to nearby cleared properties having lower habitat values, the effects on wildlife could be reduced to **less than significant** levels.

Treatment facility operation. Operation of the treatment facility would not require additional removal of wildlife habitat. As the site is located in an urban setting, sensory disturbance effects on wildlife are thought to be low. Effects of treatment facility operation on wildlife would be **less than significant**.

Ancillary facility construction. Construction of the ancillary facilities is not anticipated to require removal of wildlife habitat or habitat features, as the ancillary facilities occur in existing road ways and rights of way. Potential effects on wildlife from ancillary facility construction are **less than significant**.

Ancillary facility operation. Operation of the ancillary facilities does not require additional removal of native vegetation. No sensory disturbances effects of ancillary facility operation are anticipated. Potential effects on wildlife from ancillary facility operation are **less than significant**.

Archaeology and heritage

Treatment facility site conditions

The Finnerty-Arbutus property contains no previously recorded archaeological sites. Mapping by Millennia Research Ltd. (2008) shows areas of archaeological potential near the eastern corner of the property.

Although no archaeological material was observed in the course of field examinations, portions of the Finnerty-Arbutus parcel within 30 m of the intermittent drainage were assessed to have a moderate to high potential for containing sub-surface archaeological deposits. The recent disturbance by dirt bikers has lowered the archaeological potential in much of the site. Except for the eastern corner and the drainage, this parcel was deemed to have low archaeological potential.

Ancillary facility conditions

The local area near the Finnerty-Arbutus site, where installation of the ancillary facilities, including piping would occur, has areas of moderate archaeological potential near topographic features, such as knolls and ridges, and the near the shoreline.

Impacts and mitigation measures

Treatment facility construction. Ground and tree-clearing activities associated with the construction of a treatment facility at the Finnerty-Arbutus parcel have the potential to damage, displace, or destroy buried archaeological materials and sites. Land alterations during the construction of the facility may break or displace cultural materials, such as cairns, inland shell middens, or culturally modified trees.

Construction activities that may affect archaeological resources include tree cutting, tree root removal, and grading to prepare the building site, or excavation for installing below ground facility elements. Micro-topographic features, such as terraces, knolls, and ridges where buried archaeological sites are often located, are susceptible to these types of activities. Heavy construction equipment may depress cultural soil horizons and sediments, resulting in the destruction of the context of archaeological artefacts and features (Golder Associates 2008).

> Mitigation measures. If the Finnerty-Arbutus parcel is chosen as a future treatment facility site, an Archaeological Impact Assessment (AIA) should be conducted before ground disturbance begins, focusing on shovel testing in high-potential areas . Based on findings, site specific mitigation planning would be completed.

A detailed assessment of effects of construction on archaeological resources would be completed once a site has been chosen, as part of an AIA. Assessment and mitigation would be comply with the *British Columbia Heritage Conservation Act*. Mitigation would describe reasonable compensation for the removal, loss, disruption, modification, or alteration of archaeological and heritage resources as a result of the project.

Treatment facility operation. The activities that affect archaeological and heritage resources are likely to occur during, and be limited to, the construction phase of the project. It is unlikely that facility operation would affect archaeological or heritage resources and therefore impacts are considered **less than significant**.

Ancillary facility construction. The ground disturbing activities, including excavation and trenching, associated with constructing ancillary facilities have the potential to damage, displace, or destroy buried archaeological materials and sites. The proposed pipe routes mainly follow road rights-of-way, where any existing archaeological remains have likely been disturbed. The greatest risk of encountering archaeological sites during pipe installation is near the shoreline. Construction of ancillary facilities may result in the permanent loss or alteration of archaeological or heritage sites.

> Mitigation measures. If the Finnerty-Arbutus site is chosen as a future treatment facility, an Archaeological Impact Assessment (AIA) should be conducted in areas along the pipe corridor way that have high archaeological potential in advance of ground disturbance

activity. Site specific archaeological mitigation plans would be prepared after completing the AIA.

A detailed assessment of effects of construction on archaeological resources would be completed once a site has been chosen, as part of an AIA. Assessment and mitigation would comply with the *British Columbia Heritage Conservation Act*. Mitigation would include reasonable compensation for the removal, loss, disruption, modification, or alteration of archaeological and heritage resources as a result of the project.

Ancillary facility operation. The activities that affect archaeological and heritage resources are likely to occur during, and be limited to, the construction phase of the project. Facility operation is not expected to affect archaeological or heritage resources and therefore impacts are considered **less than significant**.

Community

Treatment facility site conditions

The Finnerty-Arbutus site is a forested parcel in a residential and institutional area, located between the UVic campus and Haro Strait in Saanich East.

Although the Finnerty-Arbutus property is privately owned and posted for no trespassing. the area is routinely used by the public for recreation. The main uses are walking, running, orienteering, environmental study, and BMX biking. A network of informal trails supports these recreational activities, both on the site and on adjoining forested lands, considered as community green spaces by members of the public (Photo 7-1 and Photo 7-2). Various community groups, including the Cadboro Bay Residents Association (CBRA) are advocates for designating the Finnerty-Arbutus site, and the adjacent properties owned by the District of Saanich and University of Victoria, collectively refer to “Haro Woods” as a park.

Photo 7-1 Finnerty-Arbutus Forest

Photo 7-2 Trails on the Finnerty-Arbutus site

Discussions with representatives from the Queen Alexandra Foundation, the former owner of the site, indicated that BMX biking is an illegal, but popular pursuit on the Finnerty-Arbutus site. The Queen Alexandra Foundation representative stated that they have removed bike jumps numerous times for public safety and liability reasons. Site visits confirm the continued presence of these jumps (Photo 7-3). Construction has involved digging trenches, creating soil mounds up to 2 m high, and reinforcing the structures with timbers cut from the forest. Several of these bike jump complexes are located along trails in the Finnerty-Arbutus site.

Photo 7-3. BMX bike jumps on Finnerty-Arbutus site

Existing underground sewer pipes cross the Finnerty-Arbutus property. Both 450 and 600 mm pipes are identified in the online GIS system provided by the District of Saanich (Saanich Online Mapping System 2009).

Adjacent land uses

Institutional uses are prominent near the Finnerty-Arbutus site. The Lam Family Student Housing Complex on the UVic campus is located 115 m south from the facility footprint (Figure 7-1). The complex provides housing for 181 families in two- and three-bedroom townhouses and apartments (University of Victoria website). The UVic Child Care Complex is located northwest of the Lam family housing, approximately 125 m from the proposed facility.

Complex A of the UVic Child Care facility provides services for 66 children aged 18 months to five years through three child care programs for different age groups (University of Victoria website). Complex B houses the Out of School Care Program and the Summer Fun Program, which provide child care through the summer months for 50 children.

The Finnerty-Arbutus site is adjacent to lands owned by the District of Saanich and the University of Victoria. The adjacent District of Saanich parcel is identified as Haro Woods in the Cadboro Bay Local Area Plan (LAP), and is designated as "public wild woodland". This designation recognizes the neighbourhood's desire to preserve the parcel in its natural state. Nonetheless, the parcel is zoned to permit detached dwellings, but has covenant requiring a public hearing before considering development on the site (Stanley, pers comm.) In reference to the District of Saanich property, the LAP states, "the property was acquired as a site for a potential wastewater treatment facility, but a plant is no longer required in this location."

The University of Victoria owns a 1.1 ha parcel south of the District of Saanich property. The University of Victoria Campus Plan (2003) identifies the forested area as "protected from development in perpetuity" to preserve habitat for local flora and fauna. This designation is similar to the terms of a restrictive covenant registered on the UVic property.

The Finnerty-Arbutus site is located across Arbutus Road from the Queen Alexandra Centre for Children's Health. The Queen Alexandra Foundation for Children owns the property at 2400 Arbutus Road, and leases the land to Vancouver Island Health Authority (VIHA). On this site, VIHA provides child and family rehabilitation, mental health, and prosthetic services to children, youth, and adults.

Children's health services previously offered on the site involved overnight and ongoing visitation by patients. Currently, most children's health services do not include overnight stays (VIHA representative, pers. comm.). However, in-patient mental health care is offered at the Ledger House through three service units, including the Children's Unit, Youth Unit, and Special Care Unit. The length of stay for patients is determined on the basis of individual client need. The Finnerty-Arbutus treatment facility would be approximately 130 m south of the Ledger House.

A baseball field and a large open space are located just north of Arbutus Road (Figure 7-1). A former detached residence on Arbutus Road that currently serves as a Queen Alexandra Foundation for Children administrative building is 25 m from the facility footprint. The G.R. Pearkes daycare facility is located 160 m from the facility footprint, north of Arbutus Road.

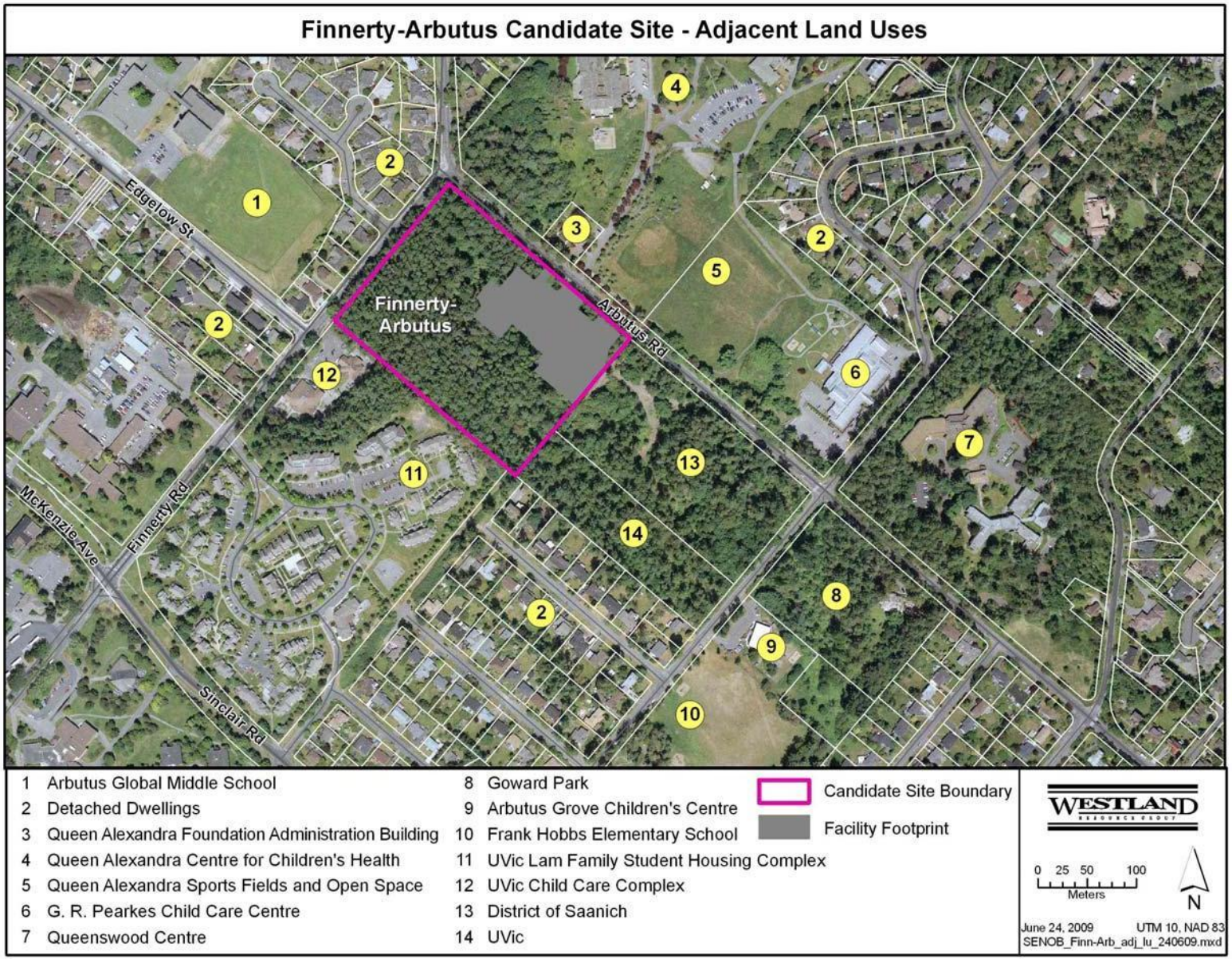

Figure 7-1 Finnerty-Arbutus Candidate Site – Adjacent Land Uses

Photo 7-4 Queen Alexandra Foundation grass field north of Arbutus Road

Property owned by the Sisters of Saint Ann is located across Arbutus Road, 260 m from the facility footprint. A portion of the property is used to support the activities of the Queenswood retreat centre. According to the Queenswood centre website, "Queenswood has recently become a non-profit organization governed by a board of long-time supporters of Queenswood. The non-profit society has a license agreement for use of the facility. We share the 14-acre property with a retirement home for Sisters of St. Ann" (Queenswood Centre website).

An elementary and middle school are located southeast and east of the Finnerty-Arbutus property. Frank Hobbs elementary school is located 360 m southeast of the proposed facility footprint. The school had 285 students in 13 classes from kindergarten to grade 5 during the 2008-2009 school year (Greater Victoria School District website). The Arbutus Grove Children's Centre is located 290 m east of the facility footprint. Buildings associated with the Arbutus Global Middle School are located 310 m southwest. The school had 357 students during the 2008-2009 school year (Greater Victoria School District website).

The District of Saanich's Goward Park is located 260 m southeast of the facility footprint. Goward House is 360 m from the facility footprint, and serves as an activity centre for adults. The facility is operated by the non-profit Goward House Society, in conjunction with a full-time co-ordinator and volunteers (Goward House website).

Detached residences are located 110 m northwest of the facility footprint on Finnerty Road, 190 m northwest on Alpine Crescent, and 100 m southeast on Sutton Road, south of the UVic forested parcel.

Consistency With Planned Land Uses

The District of Saanich Official Community Plan (OCP) identifies the Finnerty-Arbutus site as "Institutional", consistent with the former ownership of the site by the Queen Alexandra Foundation for Children. The Finnerty-Arbutus site is zoned RS-12 and RS-14, both Single Family Dwelling designations, under District of Saanich Zoning Bylaw. A portion of the site, around "Finnerty Creek", is identified as a Development Permit Area due to an identified floodplain and riparian area.

The Cadboro Bay Local Area Plan (LAP) identifies the Finnerty-Arbutus site as "General Residential". The LAP states that several large land parcels in the plan area are undeveloped or underdeveloped, including the subject property, and that an action plan would be developed "to address the future opportunities and implications of these properties in Cadboro Bay, Gordon Head and Saanich" (Corporation of the District of Saanich 2002). Terms of reference have been developed and were approved by Council in June 2009.

The LAP identifies Arbutus Road as a designated bikeway, and an area of community mobility concern as a result of "motor vehicle speed sight lines at cross streets". The plan identifies a proposed trail or walkway from Hobbs Street, along Maynard Street, and on the field at Frank Hobbs elementary school, Saanich's Haro Woods property, and the Finnerty-Arbutus property. The proposed trail is identified as a "potential local greenway".

Ancillary facility conditions

A gravity main and a small diameter pressurized pipe would be required to operate the treatment facility at the Finnerty-Arbutus site. The gravity main would be constructed in existing and new rights-of-way across the Queen Alexandra Foundation field, in an existing right-of-way across a residential property, under Alpine Crescent, Haro Road, Monarch Place, and in an existing right-of-way across four detached residential properties.

The small diameter pressurized pipe would be constructed from the Penrhyn pump station to the Finnerty-Arbutus site entirely under existing roads, including, Penrhyn, Hobbs, Maynard, Rowley Streets, and Arbutus Road. Land uses near this route are predominately detached residential.

Impacts and Mitigation Measures

Treatment facility construction

Community use. During the treatment facility construction phase, community use would be restricted in and around the active construction area. Until recently, the site was owned by the Queen Alexandra Foundation, which placed no trespassing signs at the entrances to the property to deter use. However, a pattern of community use has developed, which includes walking, running, dog walking, orienteering, environmental study, and biking.

> Mitigation measures. Opportunities for recreation activities may exist on the portions of the Finnerty-Arbutus site outside of the treatment facility footprint and workspace during the construction of the facility. Similar recreational activities to those currently undertaken on Finnerty-Arbutus site are also available on the adjacent District of Saanich and UVic properties. Signage and newspaper advertisements would be used to inform community users of the construction schedule and portions of the site that would have access restrictions.

Community use of the facility footprint and workspace portion of the site would be restricted during the construction period, resulting in a medium-term impact. The facility footprint would be a long-term alteration to an area where recreational use is not permitted, but occurs, so the impacts are not reversible. Further discussion is provided in the treatment facility operation section. The construction work space would only be used during the construction period, representing a medium-term, reversible impact. The availability of nearby recreational opportunities would help to reduce some of the community impacts during the construction phase. Recreation is not encouraged on the site, but restricted access to an area considered public green space may result in high magnitude impacts, that are considered **significant.**

Noise, vibration, and lighting. Construction of the facility would involve the use of heavy machinery, compressors, pumps, concrete pouring equipment, and other equipment to prepare the site and build the treatment facility. During the construction period, noise and vibration impacts could affect neighbouring residents and institutional uses. Especially sensitive receptors in proximity to the proposed treatment facility footprint are users of the Queen Alexandra facility and UVic daycare. Peak construction activity would occur in the first 9 months during excavation and concrete pouring phase. The project is expected to take 18- to 24 months to complete. After the 9-month peak construction activity has occurred, the construction activities would be similar to the construction of utility or industrial buildings. Construction activities would comply with the applicable municipal bylaws for hours of works and noise levels. Work would usually occur on weekdays from 7 am to 5 pm with no work on Saturdays, Sundays, or holidays (except in an emergency or where a critical piece of work must be completed in a specified work window). If required, lighting would be oriented to reduce effects on residents and institutional users.

Mitigation measures. Discussions will be undertaken with the Queen Alexandra Foundation, Vancouver Island Health Authority, UVic, neighbouring residents, and other institutional users during project planning and prior to construction to confirm noise mitigation measures, and construction hours.

Noise and vibration impacts would mainly occur during the 9-month site preparation period, but may occur occasionally at other times during the construction phase. As a result, the impact is considered to be medium-term. Noise and vibration effects could affect the local area. Generally, the noise and vibration effects would be moderate in magnitude, but could be higher for patients at the Ledger House and UVic daycare due to sensitive receptors at those two facilities. The noise and vibration effects are reversible once construction is complete. With adherence to the mitigation measures discussed with the Queen Alexandra Foundation, Vancouver Island Health Authority, and UVic representatives, noise and vibration impacts are considered to be **less than significant**.

Dust and air emissions. Construction of the facility would result in medium-term localized air quality impacts, including dust and exhaust emissions from machinery.

Mitigation measures. The treatment facility footprint is surrounded by a forested buffer, and is not directly adjacent to residences or institutional users. When transporting soil that could create dust nuisances, trucks would have box covers. The CRD Code of Practice for "Construction and Development Activities" would be used to mitigate dust and air emission impacts. Additional dust control plans may be required, and would be developed as required.

Dust and air emission impacts at the Finnerty-Arbutus site are expected to occur during the medium-term construction period, and are reversible once construction is complete. Through the use of mitigation measures, the impact is considered low in magnitude, and **less than significant.**

Traffic. The construction of the treatment facility would require the delivery of equipment and supplies, and the movement of workers to the site along McKenzie Avenue, a designated truck route, and residential streets, including Finnerty and Arbutus roads (refer to Traffic and roads section for more detail). During the construction period, material and equipment deliveries could include trucks delivering concrete, steel, equipment, and general service materials.

Mitigation measures. A traffic management plan would be prepared to address traffic disruptions, truck traffic, and access to nearby institutions, and residences during construction. Flag persons would direct vehicles and pedestrians around the construction site. Construction drivers would observe speed limits and exercise extreme caution in areas such as residential neighbourhoods or near schools and hospitals. Ongoing communication with District of Saanich, UVic, Queen Alexandra Foundation, and other

representatives would be undertaken to minimize effects on residents, institutional users, and other community members.

Traffic effects may occur throughout the entire treatment facility construction phase, but specific phases would have higher truck volumes. The effect is considered to be low in magnitude, and would occur in the local area, primarily on Finnerty and Arbutus roads. Traffic effects are reversible once construction is complete. With the development and implementation of a traffic management plan to reduce effects on local residents and institutional uses, traffic effects are expected to be **less than significant.**

Treatment facility operation

Community use. Operation of the facility would alter existing land use on a portion of the Finnerty-Arbutus site resulting from the conversion from a forested site to utility use. In the facility footprint, the existing forest recreation opportunities would no longer exist. To date, the CRD has not prepared a long-term management plan for the remainder of the site.

Mitigation measures. The facility would be constructed on only a portion of the Finnerty-Arbutus site. Community input, regarding the desired future land use for the remaining property, would be encouraged.

The conversion of a forested area to a utility use on the treatment facility footprint would be a long-term impact, and not reversible. The impact would be considered high in magnitude for some members of the community due to the loss of a portion of a site used as urban green space. However, until recently, the site was privately held and recreational use was not encouraged, but still occurred. The impacts are considered **less than significant.**

Odour. Operation of a treatment facility in a developed residential and institutional area could generate odours that would be noticeable by local residents and institutional users. The treatment facility would be designed to minimize operational odour, using the 3-stage system and other processes described in the project description. Typical operation of the treatment facility would result in no detectable odour at the treatment facility boundary.

Annual maintenance would be conducted in during breezy weather, minimizing risk of odour impacts, however, odour could be detectable in some instances.

In rare cases of equipment malfunction, odours impacts of unknown magnitude and duration could affect the local area. The season and prevailing winds direction patterns at the time would determine the potential effects.

Mitigation measures. The odours released during facility operation could be reduced by ensuring that a backup system is installed. Backup treatment could be provided during

routine maintenance or in response to mechanical failure. This mitigation would reduce the magnitude of impact of maintenance or breakdowns to low under all circumstances.

Under normal facility operations, odours would not be detectable beyond the project footprint. As previously discussed, some detectable odour could occur during annual maintenance or if equipment malfunctions. The impact is considered long-term, even though individual events would be short-term, perhaps measured in hours or days. If odour impacts do occur, they are most likely to affect the local area near to the facility, and would be reversible, high magnitude, and **significant** . With the application of a backup capability using the 3-stage odour control system, the odour impacts could be reduced to low magnitude, reversible, and would be **less than significant**.

Noise, vibration, and lighting. Operation of the treatment facility would generate noise, vibration, and lighting issues. Noise generating equipment would include:

- air-driven pumps,
- compressors,
- fans and blowers,
- diesel driven pumps, and
- standby diesel power generators.

The nearest residence to the treatment facility would be located 100 m southeast of the treatment facility. A house converted to a Queen Alexandra Foundation administrative building is located approximately 25 m from the footprint.

The treatment facility would be designed not to exceed 45 dB and 55 dB at the edge of the facility footprint, during the evening and day respectively. Sound attenuation would be installed in the buildings housing the units and on diesel engine exhaust to ensure that decibel levels remained below 45 dB at the property line, to meet the local municipal bylaw requirement, and to meet WCB/OSHA criteria for worker safety. All noise-generating equipment would be installed in soundproof rooms to meet these requirements.

All installed vibrating equipment would be contained in isolated structures that meet vibration limits acceptable to the residential community. Since the wastewater systems to be used at the treatment facilities do not include excessive vibrating equipment and are typical of current operating systems found elsewhere, vibration issues are not anticipated and if present can be mitigated.

The lighting plan for the Finnerty-Arbutus facility is expected to include normal post top sodium vapour lighting standards similar to those on residential streets. All lighting would be directed downward and would have shields installed to prevent lighting of the night sky.

In accordance with corporate activities for environmental sustainability, facility planning would incorporate energy efficiency and BC Hydro power smart initiatives and the applicable Leadership in Energy and Environmental Design (LEED™) standards for green buildings. For example, LED lighting that uses low energy and emits low UV light could be specified.

> Mitigation measures. No specific mitigation measures are needed, aside from the specified design measures.

Noise, vibration, and lighting impacts would be long-term in duration and local in spatial extent. With appropriate design and maintenance, noise, vibration, and lighting impacts are considered to be low magnitude. The operation of the facility would result in changes to the existing conditions that are not reversible, but are **less than significant.**

Traffic. Operation of the treatment facility would require the removal of screenings and grit from the site by truck. Transporting screenings and grit to Hartland landfill would require one truck every five to six days. Truck movements would be timed to avoid sensitive time periods, such as weekends. Trucks would be enclosed to limit odour impacts.

> Mitigation measures. No special mitigation measures are needed as long as normal operating procedures are followed.

The removal of screenings and grit would be a long-term impact, that is not reversible, but is considered low in magnitude due to the low volume of operational truck traffic. The impact is **less than significant.**

Ancillary facility construction

An expanded network of pipes would be required to support the operation of the treatment facility, including a gravity main and outfall, and a small diameter pressurized pipe from the Penrhyn pump station.

Noise, vibration, dust, and community use. The construction of the gravity main would introduce noise, vibration, and dust impacts for residents and institutional users near the construction area. Land disturbance would occur on five properties where existing rights-of-way exist.

The small diameter pressurized pipe would be constructed from the existing Penrhyn pump station to the Finnerty-Arbutus site under Penrhyn, Hobbs, Maynard, Rowley Streets, and Arbutus Roads.

Mitigation measures. Discussions with potentially affected home owners and institutional users prior to construction would help to ensure mitigation measures are appropriate to minimize potential risk to children and other users, and to minimize disturbance. CRD representatives will work with UVic, District of Saanich, and District of Oak Bay representatives and community groups to minimize impacts of constructing the ancillary through residential neighbourhoods. Site restoration plans would be developed with property owners.

The Queen Alexandra Foundation field that is crossed by the gravity main can be restored for use as a field. CRD representatives will work with Queen Alexandra Foundation representatives to secure a new right-of-way and to minimize impacts of constructing the pipe route in the existing right-of-way. Pipe construction would be conducted in accordance with local municipal bylaws to minimize disturbance. Dust control measures, including the use of box covers on trucks, the application of CRD codes of practice, and a dust management plan would be used to reduce effects on residents and land users.

With the application of approved mitigation measures, the impacts are considered short-term in duration and reversible. For the ancillary facilities constructed under roads, the construction would be similar to other public road projects. Even with the application of mitigation measures, the magnitude of noise, vibration, and dust impacts near the ancillary facility construction area would be moderate over the short-term. The landscapes on five residential properties with existing rights-of-way crossed by the project would be altered, but impacts would be reduced through discussions with property owners and site restoration plans, resulting in a medium-term impact, that is reversible, and moderate in magnitude. The impacts of ancillary facility construction would be **less than significant.** Impacts of the gravity main on residential properties could be avoided by relocating the main and outfall to another route. The outfall discharge location is presently under study. Once these studies are complete, outfall and gravity main decisions will be made.

Traffic. Impacts during the ancillary facility construction phase would include delays, detours, and temporary changes in traffic volumes through residential neighbourhoods.

Mitigation measures. A traffic management plan will be developed for the construction period. CRD representatives will work with municipal planners, land owners, and community groups to inform them of the project schedule.

The development and implementation of a traffic management plan would help to reduce traffic effects of the project. The impacts are considered to be local, short-term, reversible, low to moderate in magnitude, and **less than significant.**

Ancillary facility operation

Community use. The types of land use activities that would permitted in rights-of-way is limited. Generally, the construction of permanent structures are not be permitted in a right-of-way.

> Mitigation measures. Where new rights-of-way are required, the CRD will seek an agreement with the land owner, mitigating future land development limitations in the right-of-way. The CRD will communicate with property owners whose land would be crossed in existing rights-of-way to reduce potential impacts. Route alternatives will be assessed in an effort to avoid effects on residential property.

With easement agreements established between the CRD and property owners, and communication with property owners whose lands would be crossed by the ancillary facilities, the long-term impact would be local, long-term, moderate in magnitude, not reversible, and **less than significant.**

Traffic and roads

Treatment facility site conditions

The Finnerty-Arbutus site is located southeast of the Finnerty Road–Arbutus Road intersection in the District of Saanich. Truck routes and other roads in the vicinity of the candidate sites are outlined in Figure 7-2.

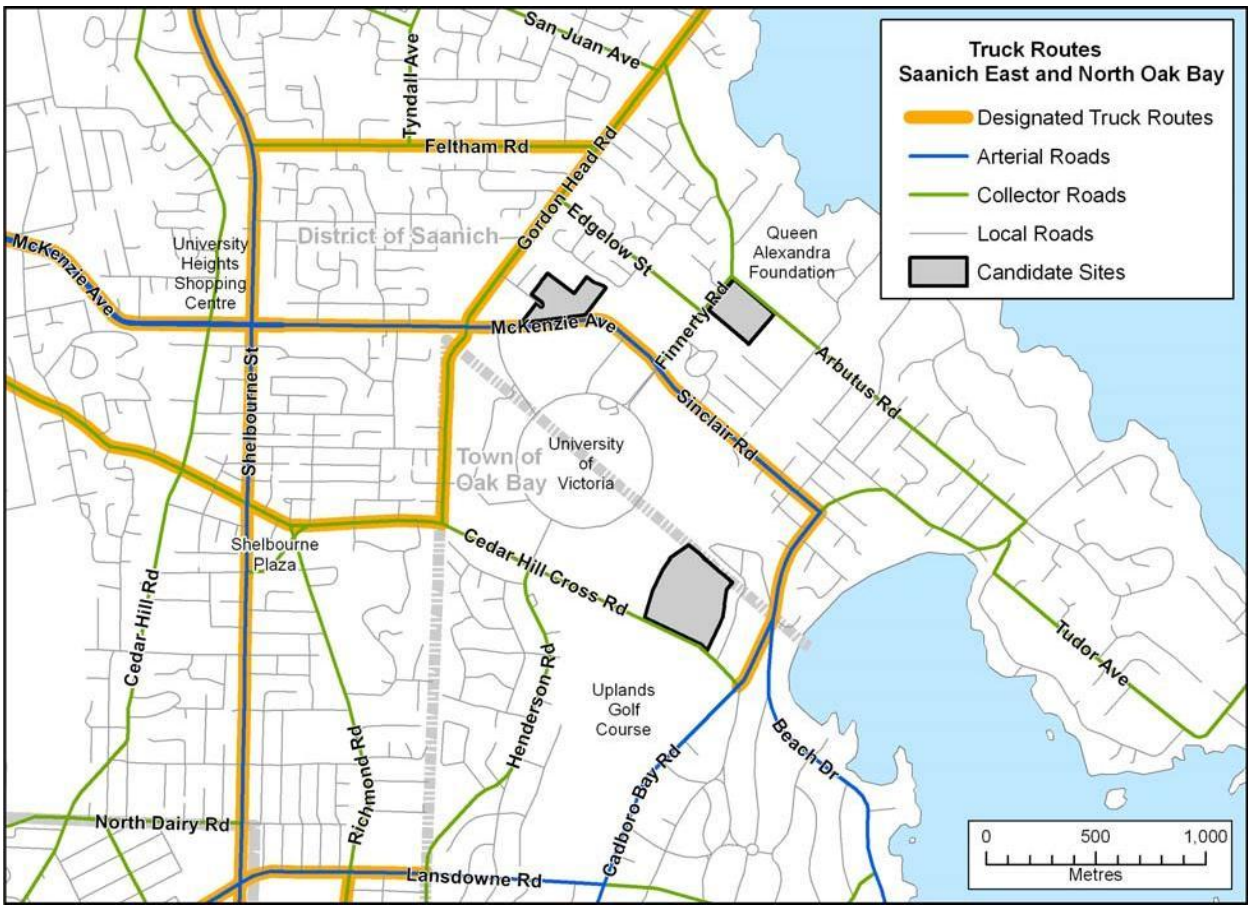

Figure 7-2 Truck routes and other roads in Saanich East-North Oak Bay

The initial traffic impact assessment for this project examines the volumes and types of vehicular traffic; road classification; proximity to designated truck routes; alternative modes of transportation; accident history; transit service; and impact on existing traffic from construction and installation of pipes underneath existing road surfaces.

These factors are considered for following time frames for this project:

- 2009 Present Conditions,
- 2010 – 2012 Construction of Phase 1 facility,
- 2030 Operation at full capacity of Phase 1 facility,
- 2030 – 2032 Construction of Phase 2 or expanded facility, and
- 2065 Operation at full capacity of expanded facility.

When considering the potential routing(s) to and from the site, designated truck routes are used where possible as well as the shortest route to designated truck routes. The Finnerty-Arbutus site would be accessed from Arbutus Road, Finnerty Road, and McKenzie Avenue. Arbutus Road and Finnerty Road have a municipal functional classification of collector roads. McKenzie Avenue has a functional classification as an arterial road and is also the nearest designated truck route.

Ancillary facility conditions

The gravity main and outfall are the only ancillary facilities associated with the Finnerty-Arbutus site. Most of the length of these two facilities would be located under roadways such as Alpine Crescent and Monarch Place (Figure 3-4).

Impacts and mitigation measures

Data were obtained from the District of Saanich and the Capital Regional District. The existing volumes on the road links to the facility are illustrated in Table 7-3. This table shows the current traffic volumes in vehicles per day (vpd) and vehicles per hour (vph) for the PM Peak Hour period for each road link. An assumed growth rate of 1% per annum was used to forecast these traffic volumes to 2030, when the second phase of construction is scheduled to begin. Traffic volumes for 2065 were not forecast as there are too many uncertainties related to future transportation technologies, infrastructure, travel modes, and modal shares.

Table 7-3 Daily and PM peak hour traffic volumes for the access route to the Finnerty-Arbutus site

Road Name	Characteristic	Units	2009	Volumes	2030	Source
McKenzie Ave	Traffic - vehicular volumes	Vehicles per day (vpd)	12,495	vpd	15,399	Municipal, CRD
		Vehicles per hour (vph) - PM Peak	1,312	vph	1,617	
Finnerty Road	Traffic - vehicular volumes	Vehicles per day (vpd)	9,734	vpd	11,996	
		Vehicles per hour (vph) - PM Peak	1,023	vph	1,261	
Arbutus Road	Traffic - vehicular volumes	Vehicles per day (vpd)	4,905	vpd	6,045	
		Vehicles per hour (vph) - PM Peak	515	vph	635	

As arterial roads are expected to carry traffic volumes in the range of 10,000 to 30,000 vpd, and major collectors from 5,000 to 20,000 vpd, the road links on the preferred routing have no capacity limitations for the forecast growth in background traffic.

Treatment facility construction. The forecast trips for the construction of the candidate site for Phases 1 (2010 construction) and 2 (2030 construction) are shown in Table 7-4 as average trip rates per day (vpd) with an assumed 240 workdays per annum.

The construction of Phase 1 in 2010 to 2012 is forecast to generate approximately 75 two-way vpd for the candidate site and approximately 45 two-way vpd for Phase 2 construction in 2030 to 2032.

Table 7-4 Forecast vehicular volumes for Phases 1 and 2 construction of the Finnerty-Arbutus facility

CONSTRUCTION TRAFFIC			
YEAR 2010		**Duration**	**Average two-way trips (vpd)**
Actvities	Clearing/Grubbing/Aggregates	3 months	10 trucks
	Excavations	7 months	8 trucks
	Concrete	9 months	5 - 6 trucks
	Steel	9 months	1 truck / week
	Equipment, materials	24 months	1 truck / week
	Workers	24 months	50 cars
YEAR 2030			**Average two-way trips (vpd)**
Actvities	Clearing/Grubbing/Aggregates	1 month	5 trucks
	Excavations	3 months	6 trucks
	Concrete	4 months	4 - 5 trucks
	Steel	4 months	1 truck / week
	Equipment, materials	24 months	1 truck / week
	Workers	24 months	30 cars

Mitigation measures. Construction traffic safety mitigation measures are presented in the Public Health and Safety section of this ESR. An important traffic issue would be the parking requirement for construction workers driving to and from the site. If the clearing and grubbing stage can create enough parking on-site for all construction workers then there would be negligible impact. If there is not enough space to accommodate all the parking on-site, it is recommended that van-pooling, ride-sharing and park and ride programs be developed to reduce the number of trips or that additional parking be developed elsewhere.

The Phase 1 construction traffic of 75 vpd represents an increase of traffic of 0.60%, 0.77%, and 1.53% on McKenzie Avenue, Finnerty Road, and Arbutus Road respectively over current volumes. Increases in the range of 1% are considered negligible while the impact on Arbutus Road would be low. The 45 vpd construction trips associated with Phase 2 construction are all well below 1% and as such are also considered negligible. The spatial impact would be local and of medium-term duration. While the traffic would be continuous over the construction period, it can be reduced by creating parking areas elsewhere and there is no residual effect resulting in a rating of **less than significant**.

Treatment facility operation. As shown in Table 7-5, the number of site-generated trips for the operation of the candidate site is quite small and when compared to the existing and forecasted vehicular trips on the road links in the preferred routing, these trips would have a negligible impact. The preferred routing is identified due to the truck traffic involved with the construction stages of the project and the need to used designated truck routes. Because operations staff will

live in various parts of the region, they will not be constrained to a particular travel route. Staff's distributed travel network would reduce the impact even further.

Table 7-5 Forecast vehicular volumes for Phases 1 and 2 operation of the Finnerty-Arbutus facility

OPERATIONAL TRAFFIC			
YEAR 2030			**Average two-way trips (vpd)**
Activities	Truck Loads		
		Screenings / Grit	1 truck / week
		Chemical	8 - 9 trucks / year
	Employees		12 cars
YEAR 2065			**Average two-way trips (vpd)**
Activities	Truck Loads		
		Screenings / Grit	1-2 trucks / week
		Chemical	1 truck / month
	Employees		15 cars

Mitigation measures. No mitigation measures are required.

Although traffic effects would be continuous, the magnitude of the effect is low, and the resulting rating is **less than significant**.

Ancillary facility construction. Ancillary facility pipes would be buried in the road corridor, most probably underneath the travel lanes, using cut and cover methods.

Construction would disrupt vehicular traffic on affected routes. The extent and severity of disruption would be a function of the traffic volumes and available opportunities to keep some lanes open or to reroute traffic. All the roads potentially effected by the construction of ancillary facilities are two-lane, so it is assumed that one lane could remain open and alternating directions of traffic utilize the remaining lane.

Mitigation measures. Standard procedures for managing vehicular traffic in a construction zone would be implemented, which would result in one lane remaining open to alternating directions of traffic. Construction could be restricted to single blocks at a time and scheduled outside of peak periods of vehicular activity.

The impact would be local, of short-term duration, and continuous during the construction period. Considering volumes of traffic affected, the result is a low impact on the local and collector routes. One-way alternating traffic would be permitted and there would be no residual impact, resulting in a rating of **less than significant**.

Ancillary facility operation. There would be no impact from the operation of the ancillary facilities, because all of the pipes would be underground.

> Mitigation measures. Road surfaces would be restored to operational standards and no additional mitigation measures would be required.

Although the impact would be local in nature and continuous, there would be no measurable residual effect and as such the rating is **less than significant**.

Public health and safety

Treatment facility construction. Health risks during construction are limited to exposure to dust and noise. Dust control measures would be implemented if dust is generated during construction. The forested character of the site would limit wind transport of dust to nearby residential areas.

Members of the public stated that autistic children living near the Finnerty-Arbutus site or that are present in the Queen Alexandra Ledger House could be upset by the noise of construction activity. The homes and facilities housing autistic children are more than 100 m from the construction site. It is not certain that the generally moderate level of site grading and foundation noise over a period of six to twelve months, punctuated by intermittent louder noises, would constitute a serious mental health risk. The facility construction following completing of the foundation stage would be relatively quiet.

During construction, the greatest safety risk would result from vehicles on roads and heavy equipment operation on the site. With the use of flaggers and signage, the risk to the public from vehicle movement is greatly reduced. The construction site would be fenced to prevent access by walkers, mountain bikers, or other members of the public. Flaggers would be present during school hours to ensure that students, particularly those walking to elementary or junior secondary schools, do not gain access to the site.

> Mitigation measures. Nearby residents are typically notified in advance of disruptive construction activities. The project contractor would communicate regularly with managers of the Queen Alexandra facility to discuss construction activities and ways to avoid the potential disruption of health centre activities. Efforts would be made to avoid dust or loud noise during periods deemed sensitive by the Queen Alexandra facility managers.
>
> For safety mitigation, no special access or traffic control measures are needed, beyond those that are applied as part of standard construction practices for projects of this nature.

The potential health and safety effects of construction would be temporally limited to the construction interval, and are considered medium-term. Spatially, the greatest health and safety risks would occur immediately adjacent to the construction worksite, with the risk diminishing with distance from the site. These impacts are reversible. Public safety impacts are considered to be of low magnitude. Health effects are considered to be of moderate magnitude because of the proximity of the Queen Alexandra facilities. With appropriate controls of construction activities, public safety and health effects are considered **less than significant**.

Treatment facility operation. Few public safety risks would be associated with treatment facility operation. The facility would be fenced to minimize public entry, and the equipment at the facility is enclosed. Health risks would be limited to treatment facility workers who may come into contact with untreated wastewater or microbial aerosols. The enclosed facility would prevent direct transmission of disease organisms to residents. The three-stage odour control system reduces the risk of viruses, bacteria, or other contaminants being discharged by air from the facility. The distance between the treatment facility and other residences or institutions (more than 100 m) further reduces public health risks.

Public safety risks are limited to the slight increase in vehicle traffic associated with the project.

> Mitigation measures. No measures are needed to protect public health and safety during facility operation beyond those included in facility design specifications and standard operating procedures.

The spatial extent of public health impacts are limited to the wastewater facility itself. Public safety effects would be limited to traffic related risks. The temporal extent is local, and any impacts would be reversible. The magnitude of public health and safety impacts are negligible, and are considered **less than significant**.

Ancillary facility construction. Public safety issues associated with installing pipes in roadways and along rights-of-way are primarily associated with operation of heavy equipment and the presence of open trenches. Flaggers would be available during the day to manage vehicles and pedestrians near the worksite. Barriers or flagging is typically erected to alert people to the presence of open trenches. No public health effects would be associated with ancillary facility construction.

> Mitigation measures. Standard construction procedures would be followed to minimize safety risks during pipe construction.

The public safety risk of ancillary facility construction would be limited to the period of construction (short- to medium-term) and to the area where active construction is occurring. The impacts would be reversible. Magnitude of this impact considered low, and **less than significant**.

Ancillary facility operation. Once the pipes are in service, no public health or safety impacts would occur.

Visual aesthetics

Treatment facility site conditions

The Finnerty-Arbutus site is forested and on a moderately sloping hillside adjacent to Arbutus Road. The parcel, and neighbouring forested parcels are used for informal recreation by the local community and contain a network of paths dominated by BMX jumps (Photo 7-5). The forest understory varies from open areas lacking vegetation, to areas of dense ocean spray and big-leafed maple. The surrounding area is forested to the south, west and north of the site. To the northeast and east, on the north side of Arbutus Road, there is an open grassy slope. The closest neighbouring structure is a residential style office building at the entry to the Queen Alexandra facility. The nearest dwellings are east of the site, and largely screened by existing vegetation and break of slope. Visibility from roads is restricted to Arbutus Road, a two-lane collector road with no sidewalks (Photo 7-6). Traffic volumes are low to moderate, and it is not a truck route. There are two bus stops, one on either side of Arbutus road adjacent to the facility, from which people could view the site.

Photo 7-5 Existing forest interior of site showing understory vegetation and BMX bike jump

Photo 7-6 **Existing conditions looking northwest along Arbutus Road towards candidate site (forest at left side of road near the car)**

Ancillary facility conditions

The viewsheds of the ancillary facilities are roadways, the Queen Alexandra fields, and detached residences in the Queenswood neighbourhood.

Impacts and mitigation measures

Treatment facility construction. The visual character of the site would be altered by construction of the treatment facility. Constructing the facility requires clearing and levelling of approximately 1 ha of the 4.4 ha parcel and would result in approximately 25% of the site being converted from forest to utility structure, parking, and other paved and landscaped areas. Little alteration would be made to the remainder of the site. Informal users of the site (it is private property with no authorized public access) would have views of the construction through the forest. Construction site lighting during winter months would intrude into the forest.

Visual impacts of construction on the site from outside the parcel would be screened by forest vegetation from all directions except east, northeast, and Arbutus Road. Across Arbutus Road a dispersed line of deciduous trees and a minor break of slope partially screen the site from the nearest residential area 200 m to the east, and the Queen Alexandra buildings to the northeast (200 m) and southeast (250 m). Unobstructed views of the facility would only be obtained from Arbutus Road and the residential style office directly opposite and 30 m from the site.

Mitigation measures. During construction, no mitigation of visual impacts is feasible.

Based on this analysis, the visual impact of the treatment facility construction is considered to be short-term and irreversible, and of high magnitude due to the loss of forest landscape. For this reason the visual impact on the Finnerty-Arbutus site is considered to be **significant**.

Treatment facility operation. Operation of a treatment facility on the site would transform a forested viewscape to one of forested background with utility structures in the foreground. The structures would be visible from Arbutus Road and from vantages to the east, northeast, and southeast. Existing trees and terrain would substantially screen the facility from those viewpoints, with the exception of Arbutus Road and the adjacent office building. During the hours of darkness, facility lighting would introduce artificial illumination into the area.

> Mitigation measures. Careful building design incorporating analogous woodland colours could reduce the visual impact of the building against a forest backdrop. Planted shrubs and naturally regenerating forest edge vegetation would largely screen views of the facility through the forest. Careful positioning and use of lighting would minimize artificial illumination in the forest. The addition of vegetative screening and landscaping along Arbutus Road , and control of lighting would substantially mitigate the impact of the facility from Arbutus Road, and other areas in visual range. Photo 7-7 and Photo 7-8 illustrate post-construction views of the facility from the office on Arbutus Road looking south and from the grassy area through a row of trees looking east.

Based on this analysis, the visual impact of the treatment facility on the site is considered to be long-term and irreversible, and of moderate magnitude due to the loss in forested landscape. For this reason the visual impact on the Finnerty-Arbutus site is considered to be **significant**. It is noted that relocating the site further into the forest would effectively screen the facility from external viewers, but would consequently increase the visual impact on informal users of the site. Such relocation would, on balance, reduce the visual impact to **less than significant** levels.

Figure 7-3 Overview of Finnerty-Arbutus candidate facility

Photo 7-7 Rendered view of candidate facility looking southeast across Arbutus Road

Photo 7-8 Rendered view of candidate facility looking southwest across Arbutus Road

Ancillary construction. Construction on ancillary sewer pipes would result in approximately 2,700 m of pipe being laid along the suburban streetscapes of Queenswood and Cadboro Bay. Views of construction equipment and construction traffic would be localized and of moderate duration (up to two years). These impacts are short-term, reversible, of low magnitude, and considered to be **less than significant**.

Ancillary operation. All ancillary infrastructure associated with this site are underground, so considered to have no visual impact, and therefore, **less than significant**.

8.0 CEDAR HILL CORNER SITE DESCRIPTION AND IMPACT ASSESSMENT

8.1 General site description

The Cedar Hill Corner property is an undeveloped 11.3 ha grassy area, often referred to as the "Henderson dog walking area" or the "CJVI property" by local residents (Figure 3-5). The property is owned by the University of Victoria, but separated from the main university campus by South Woods and the Upper Hobbs Creek drainage. The site was once used as a family farm, and has an estimated 250 fruit trees on the site. The centre of the site, now used as a soil storage area by UVic, was previously used for the CJVI radio transmitter until 1964. The Cedar Hill Corner Property is bounded by Cedar Hill Cross Road, South Woods and the Upper Hobbs Creek drainage, and residential areas to the north and east.

The UVic Campus Plan (2003) states that the "university purchased the property from Island Broadcasting Co. Ltd. in 1964. The site has remained undeveloped since that time". The plan also states that the Cedar Hill Corner property is reserved for future UVic development. Interest has been expressed by community members and UVic students in conducting some form of agricultural activity on the site.

Currently, the site is a very popular dog walking area for local residents, BMX bike riding, and stockpiling fill material by UVic also occur on the site. A fence has recently been constructed around the soil piles on the site, which was the area used by BMX mountain bikers.

8.2 Ancillary facilities site description

Ancillary facilities required to operate a treatment facility on the Cedar Hill Corner site include a gravity main, a forcemain, a pump station at the Finnerty-Arbutus property, and a small diameter pressurized pipe.

Wastewater would be pumped to the Cedar Hill Corner treatment facility via an underground forcemain from a newly constructed pump station on the Finnerty-Arbutus site, approximately 0.16 ha in size. The pump station would receive wastewater from the East Coast Interceptor (ECI), and a small diameter pressurized pipe, which conveys wastewater from the Penrhyn pump station in Cadboro Bay. The small diameter pressurized pipe would be constructed from the Penrhyn pump station to the Finnerty-Arbutus site entirely under existing roads, including, Penrhyn Street, Hobbs Street, Maynard Street, Rowley Street, and Arbutus Road.

From the Cedar Hill Corner treatment facility, the gravity main would cross Upper Hobbs Creek drainage to join the Haro Road right-of-way, owned by the District of Oak Bay. After leaving the right-of-way, the pipe would be located adjacent to a University of Victoria parking lot,

university residences, and in the road rights-of-way of Haro Road and Monarch Place before reaching the ocean outfall via an existing right-of-way across four residential properties.

The forcemain would pump wastewater from a pump station at the Finnerty-Arbutus site to the Cedar Hill Corner site in a similar alignment to that of the gravity main. The forcemain would be located under Arbutus Road, and then south under Haro Road, adjacent to university residences and parking lot, and in the District of Oak Bay right-of-way, before crossing Upper Hobbs Creek drainage.

8.3 Cedar Hill Corner impact assessment

Landforms, geology, and soils

Treatment facility site conditions

The Cedar Hill Corner site is grassed, with a uniform surface sloping slightly westward, and appears to be well-drained. Information from the interpretation of historical aerial photographs indicates the site conditions have not been modified by significant excavation or by fill placement, aside from the stockpiles of fill materials near the centre of the site. No watercourses are present on the site.

The soil stratigraphy at the site consists of a surficial veneer of topsoil overlying 4 to 5 m of stiff to very stiff brown silty clay, up to 3 m of firm grey silty clay and then a morainal deposit of hard, dense gravelly sandy silt, sand, and glacial till. The till deposit may be underlain at depth by a pre-glacial marine deposit of dense to very dense silty sand, or sandy silt, commonly referred to as the Quadra Sediments. The groundwater level at the site is expected to be within 3 to 4 m of the present ground surface.

The near surface clay materials at the site are believed to be of marine origin with the consistency of the upper layers to be stiff to very stiff material, the result of consolidation by desiccation during periods of lower relative sea levels. The underlying firm material is near normally consolidated, and would compress in response to a significant increase in surface loading conditions, resulting in some subsidence.

Based on the soil stratigraphy at the site, the natural frequency is expected to be in the range of 4 to 7 hertz, with an average shear wave velocity in the upper 30 m varying from 300 to 400 m/sec, corresponding to a Site Class “B/C” as per the current National Building Code. The site is in an area that could be affected by a Cascadia Subduction event. Information from Natural Resources Canada, indicates a peak ground acceleration of 0.61 g and spectral accelerations of 1.22, 0.82, 0.38 and 0.19 g, for respective periods of 0.2, 0.5, 1.0 and 2.0 seconds respectively for a design seismic event of 2% in 50 years. The accelerations noted relate to a site with soil conditions corresponding to a Site Class “C.” As the estimated Vs30 is near the boundary between Site

Classes "B" and "C," some adjustments may be necessary depending on the spectral accelerations considered, and the period of the various wastewater treatment facilities. Seismically these conditions are not unusual for the area and present no substantial constraints on development of a wastewater treatment facility.

Impacts and mitigation measures

Treatment facility construction. Due to the relatively level nature of the site only slight landform recontouring would be needed. Topsoil would be removed and stored for later use onsite, and minor grading (cutting and filling of less than 2 m) is anticipated. As noted, there may exist a substratum of compressible clay, which could consolidate in response to a significant increase in surface loading conditions, resulting in long-term, time dependent subsidence of the ground surface.

Based on the anticipated soil conditions, relatively light loading associated with the proposed wastewater treatment facilities, and local experience, no unusual geotechnical concerns are expected during development at this site. There may be settlement associated with increased loading because of a possible substratum of compressible clay. The native clay soils at the site are relatively impermeable, and no significant seepage is anticipated from excavation that may penetrate the groundwater table. However, perched water table conditions could result in localized high water table and surface water ponding, particularly during periods of heavy or prolonged precipitation.

> Mitigation measures. It is expected that any settlement could be easily mitigated by selecting appropriately graded sand or gravel, or by placing a pre-load in advance of construction to settle sensitive soil elements. Landform, geology, and soils effects on the project would be limited to the facility footprint and workspace. Erosion and sedimentation from construction are considered to be local in extent and reversible. The magnitude is considered to be low and the impact **less than significant.**

Treatment facility operation. After construction is completed and operation of the treatment facility begins, no additional impacts on the landforms, geology, or soils of the site are anticipated. Heavy rainfall on exposed soils can increase erosion risk. This risk is greatly reduced under established vegetative cover.

> Mitigation measures. Standard revegetation and landscaping practices would be sufficient to manage operational erosion and sedimentation impacts.

Under typical facility design and construction practices, the area of exposed soils subject to erosion during operation is considered to be relatively small. The period of such risk would be highest during the interval between the end of construction and establishment of vegetation. Erosion and sedimentation from operations would be limited to the project footprint and

workspace and are considered to be medium-term and reversible. The magnitude is considered to be low and the impact **less than significant**.

Ancillary facility construction. From the west side of Upper Hobbs Creek Drainage to Haro Strait, the routes of the forcemain and gravity main follow existing roads and pipe rights-of-way. Impacts on soils, landforms, or geology in this portion of the route are considered to be local, temporary, reversible, and of negligible magnitude. The crossing of Upper Hobbs Creek, however, poses challenges to installation of the gravity main and forcemain. Slopes are steep (30-40%) and show signs of relatively rapid downcutting by Hobbs Creek through sands and silts. Construction in this area could result in erosion or small slope failures.

> Mitigation measures. Additional onsite investigations would be needed to prepare identify appropriate construction methods that would avoid or minimize erosion risks. Special trench stabilization and excavation methods (including end-hauling of excavated material to reduce working space requirements), microtunneling, directional drilling, or even an aerial crossing of the Upper Hobbs Creek drainage may be considered. The technical feasibility and cost of these or other measures, and their effectiveness in avoiding construction impacts, have not been assessed.

Potential geology and soils effects of ancillary facility construction across Upper Hobbs Creek drainage would be local and medium-term. Determination of reversibility would require additional study. The magnitude of potential effects is considered moderate. In the absence of detailed site investigations, construction specifications, and prescription of mitigation measures, the impact is judged to be **significant**.

Although conditions in the Upper Hobbs Creek drainage are challenging, they are not outside the range of conditions encountered during utility installation in the CRD. It can be stated with confidence that additional site investigations would allow identification of construction methods that would avoid or mitigate potential geology and soils impacts. Such construction measures would be designed to reduce the extent and magnitude of potential impacts, and lower the rating to **less than significant**.

The location and geologic condition of the outfall route are subjects of separate study, and are not considered in this ESR.

Ancillary facility operation. Assuming that slopes on Upper Hobbs Creek drainage can be stabilized following construction, operation of the forcemain, gravity main, and outfall are unlikely to affect geology, landforms, or soils. Impacts are considered **less than significant.**

Hydrology and water quality

Treatment facility site conditions

The Cedar Hill Corner site is relatively flat, with slight gradients sloping toward the east and west from a "height" of land near the soil piles in the centre of the parcel. Clay is the most common surface soil, though there are also expressions of loamy and sandy surface soils, which would provide moderate rates of infiltration.

The conceptual location for the treatment facility, on the west-central margin of the cleared portion of the Cedar Hill Corner site, abuts a treed area identified in the University of Victoria *Integrated Stormwater Management Plan* as Upper Hobbs Creek drainage. Much of the precipitation falling on the western half of the Cedar Hill Corner site would make its way via groundwater or overland flow into Upper Hobbs Creek.

Ancillary facility conditions

The main drainage course potentially affected by the ancillary facilities is Hobbs Creek.

Hobbs Creek has been enclosed in Oak Bay on the south side of Cedar Hill Cross Road. An artificial pond in the townhouse development south of the Cedar Hill Corner parcel Upland Estates may represent a remnant of the Hobbs Creek drainage. Runoff from the Uplands Golf Course, the townhouses, Henderson Recreation Centre, and Cedar Hill Cross Road enters upper Hobbs Creek via a culvert beneath Cedar Hill Cross Road. The stream meanders through the upper Hobbs Creek drainage. Low (~30 cm) log weirs have created several small ponds along upper Hobbs Creek. The creek becomes more deeply incised as it flows north through the increasingly sandy soils of Mystic Vale. Downstream of Mystic Vale, Hobbs Creek passes through residential areas on its way to Cadboro Bay. To the east of Cadboro Bay Road, the stream supplies water to several artificial ponds on private property.

The upper Hobbs Creek drainage is laced with footpaths, several of which can be accessed from the Cedar Hill Corner site. An "official" path starts at the top of a stairway 250 m north of Cedar Hill Cross Road. Many of these paths provide preferential drainage routes to the creek.

Upper Hobbs Creek drainage is steep-sided. In southern portions of the drainage, slopes are a moderate 18%. In the central portions of upper Hobbs Creek, the slopes of the east bank (adjacent to the conceptual location of the wastewater facility) are 33%, and 40% on the west bank. Further to the north, near Mystic Vale, the eastern slopes are 38% and the western bank (below UVic Parking Lot #1) has a 50% slope.

Impacts and mitigation measures

Treatment facility construction. Because the Cedar Hill Corner site is nearly flat, excavation associated with construction of the wastewater facility is unlikely to increase erosion and sedimentation risk on the site. It is unlikely that excavation would contribute to changes in hydrology of the Cedar Hill Corner parcel or in Hobbs Creek. Water pumped from excavated areas during wet weather may contain sediments that can affect downstream water quality. The soil piles already located on the parcel do not appear to have affected hydrology or water quality.

Rinse water from cement trucks and from freshly-poured concrete has the potential to affect water quality. Rinse water from concrete pouring activities would not be discharged on the site, and no measurable effect on surface or ground water quality is expected.

> Mitigation measures. Stockpiles of excavated soil should be covered to prevent erosion, and should be stored at least 10 m from the treed area and top of slope east of Hobbs Creek. Water pumped from excavations should be settled or filtered to remove suspended sediment before release. Cement truck rinse water should be removed from site for treatment. Other water used in concrete pouring should be managed to prevent entry into the Hobbs Creek drainage.

Any potential effects would be limited to the facility footprint and disturbed area. Because erosion and sedimentation risks are linked to rainfall events, they are considered occasional and medium-term impacts, occurring only during the construction period (two years). Effects are reversible. The magnitude of construction effects on hydrology and water quality are considered low, and the effects would be **less than significant**.

Treatment facility operation. Once completed, the wastewater facility would increase the impervious surface of the Cedar Hill Corner site. As specified in the project description, roof and perimeter drainage would be re-infiltrated into the ground. Such measures would minimize potential effects on hydrology or water quality.

Operation of the facility would not result in releases of wastewater to the site or Hobbs Creek. Even during high rainfall events, no wastewater overflows from the facility would occur. Chemicals used in the wastewater treatment process would be stored in secure structures.

> Mitigation measures. No additional mitigation measures are needed, aside from standard operating procedures for CRD wastewater treatment facilities.

Operation of the facility is not expected to affect hydrology or water quality. The magnitude of operational effects on hydrology and water quality are considered low, and the effects would be **less than significant**.

Ancillary facility construction. The primary area where effects on hydrology or water quality could occur would be the crossing of Hobbs Creek to the west of the wastewater facility. The slopes of the Hobbs Creek drainage area steep—33% to the east of the stream and 40% to the west. Clearing of the right-of-way and workspace would entail removal of mature trees and understory, exposing the erodible soils to rainfall. Excavation of trenches to install the pipes would require careful soil management to avoid erosion and sedimentation.

> Mitigation measures. Avoiding crossing the steep sections of the upper Hobbs Creek drainage is the preferred mitigation measure. If re-routing is not possible, then ditch plugs should be installed at 20 m intervals on the steep slopes of upper Hobbs Creek drainage. Installing the pipe crossing of Hobbs Creek should be conducted during low flow periods. Measures should be taken to minimize the width of disturbed area needed to install the pipes. The disturbed area should be revegetated immediately following completion of construction.

Construction of the ancillary facilities across Hobbs Creek drainage could lead to increases in erosion and sedimentation on the ancillary facility footprint, affecting stream hydrology and water quality. The spatial extent of this impact is near the pipe trench and workspace, with potential downslope effects on Hobbs Creek. The impact could be medium-term, occurring during rainy seasons over several years, until vegetation is re-established. The impact is occasional, accompanying rainfall events, and is reversible. The magnitude of this potential impact is considered high, and the impact would be **significant.** If the recommended mitigation measures are applied, however, the magnitude of the impact would be moderate or low, reducing the impact to **less than significant** levels.

Ancillary facility operation. Pipe trenches can provide preferential routes for drainage on steep slopes, resulting in erosion or slope destabilization. The pipe routes crossing Upper Hobbs Creek drainage could contribute to such a risk. Elsewhere along the ancillary facility routes, little effect on hydrology or water quality would be expected.

> Mitigation measures. The route of the pipe crossings of Hobbs Creek drainage should be relocated further to the north to avoid steep slopes, even as far north as Cedar Hill Cross Road. If the route cannot be relocated, revegetation of the disturbed area should accompany other erosion control measures. The right-of-way should be monitored regularly for signs of erosion or slope destabilization.

Ancillary facility operation has the potential to affect the Hobbs Creek drainage. Erosion and drainage risk would be an occasional impact, associated with rainfall events. The impacts could begin following construction, and persist in the long-term (more than five years). The effects are considered reversible. The magnitude of the impact is considered moderate, though with mitigation the impact is considered **less than significant.**

Vegetation

Treatment facility site conditions

The Cedar Hill Corner site is located on a previously cleared property that is dominated by non-native grasses. Much of the property's soil has been disturbed by past land use activities, such as farming or soil storage. The area does not support a native plant community, and no plant species at risk were recorded, or are expected to occur at the site.

The northwestern side of the site is adjacent to mature forest, the edge of which is composed of mature Garry oak trees, other native tree species, and old fruit trees. This area is locally referred to as Upper Hobbs Creek or Upper Mystic Vale.

Ancillary facility conditions

The route for the sewer trunk and outfall associated with the Cedar Hill Corner site crosses Upper Hobbs Creek drainage for approximately 120 m between the facility and existing rights of way and roads. A Riparian Areas Regulation assessment would be required for work within 30 m of Hobbs Creek.

Upper Hobbs Creek's plant communities are identified in the Sensitive Ecosystem Inventory as conifer dominated old forest. The dominant plant community is zonal Douglas Fir-Salal (CDFmm/01), which is red-listed by the British Columbia Conservation Data Centre, and is an identified plant community in the provincial Identified Wildlife Management Strategy (Pojar *et al.*, 2004). Old growth representatives of this plant community are occur in less than 1% of its original range, and maintaining or recovering good condition, old growth stands of this plant community is a priority of the provincial strategy (Pojar *et al.*, 2004).

The forest is a moderately open stand of Douglas fir, grand fir, western redcedar, and bigleaf maple. The understory is composed mostly of dull Oregon grape, salal, oceanspray, and trailing blackberry. Common herbaceous plants include broad-leaved starflower, sword fern, and bracken fern. There are two historical records of plant species at risk in the area, dense spike primrose (red-listed, COSEWIC endangered) and Lobb's water buttercup (extirpated), but no evidence of these species was found along the proposed sewer trunk route.

There are noticeable levels of ground disturbance in the Upper Hobbs Creek section of the ancillary facility route, including walking trails, invasive plant species, and erosion, which have reduced the integrity of the shrub and herbaceous components of the plant community.

A pump station would be required for the sewer trunk and outfall, and is proposed to be placed on the Finnerty-Arbutus property. For a detailed description of the vegetation on this property, refer to Vegetation in Section 8.3.

Table 8-1 summarizes the presence of sensitive vegetation resources on the Cedar Hill Corner candidate site and ancillary facilities.

Table 8-1 Sensitive vegetation resources on or near the Cedar Hill Corner site and associated ancillary facilities

Presence of sensitive vegetation resources	Site	Trunk-Outfall	Pump Station
Presence of sensitive ecosystems:			
• older forests or mature forests	No	Yes	Yes
• second growth forests	No	Yes	Yes
• native grasslands/shrub/herb communities	No	No	No
• Garry Oak Woodland	No	No	No
• coastal bluffs	N/A	No	N/A
Presence of ecosystems at risk			
• ecological communities on Conservation Data Centre Red or Blue lists	No	Yes	Yes
• ecosystem types identified by Sensitive Ecosystems Inventory	No	Yes	No
• areas identified as environmentally sensitive by local governments	No	Yes	Yes
Presence of aquatic or riparian ecosystems			
• seasonal or permanent watercourses (streams, creeks, rivers, ditches)	No	Yes	Yes
• seasonal or permanent wetlands, seepage areas, or vernal pools	No	Yes	No
• riparian ecosystems beside these aquatic ecosystems and vegetated gullies	No	Yes	No
Presence of plant species at risk and their habitats			
• species at risk identified by COSEWIC	No	None detected	No
• species on provincial Red and Blue lists	No	None detected	No
• regionally significant species	No	Yes	Yes
• habitats for any of these species	No	Yes	Yes

Impacts and mitigation measures

Treatment facility construction. Construction on the site would not involve clearing native vegetation or rare plant communities, as the site is previously cleared. The site is directly adjacent to mature forest, and Work Safe British Columbia may require some removal of danger trees, if they are located within 1.5 tree lengths (approximately 45 m) of the site.

> Mitigation measures. The potential effect of clearing trees from the edge of the cleared area can be mitigated by locating the site away from the forest edge, to minimize the need to remove "danger trees".

Construction related changes to vegetation would be minimal, unless removal of trees from the edge of the facility is required to reduce safety risks. Effects of such tree removal would be long-term and irreversible. The magnitude of any tree removal would be moderate, resulting in a

rating of **less than significant**. If the facility footprint is designed in a manner that eliminates the need for tree removal, the magnitude of treatment facility construction on vegetation would be negligible.

Treatment facility operation. Operation of the treatment facility does not require removal of vegetation. No effects of treatment facility operation on vegetation are anticipated and therefore impacts are considered **less than significant**.

Ancillary facility construction. Construction of the sewer forcemain and gravity main would involve clearing permanent right-of-way and temporary work space through an old forest community that is provincially red listed, and identified by the regional Sensitive Ecosystems Inventory. The proposed route crosses a steep gully and Hobbs Creek.

Clearing and construction of the pump station associated with the sewer main and outfall would occur at the northeastern corner of the Finnerty-Arbutus site. The total footprint size is approximately 0.16 ha, though additional forest clearing may be required for temporary work space and to meet Work Safe British Columbia rules. The forest clearing would involve removal of mature Douglas fir, arbutus, and bigleaf maple trees. Indirect losses of mature trees and shrubs caused by windthrow, soil compaction and project-related changes to site drainage can also be expected. The clearing would occur in an area where a small ephemeral drainage meets the roadside ditch.

> Mitigation measures. To avoid the magnitude of effects of clearing the old forest community, the sewer trunk could be re-routed to avoid Upper Hobbs Creek, and instead leave the site to the south, follow Cedar Hill Cross Road eastward, and connect with the Haro Road right of way. No new right of way would be created, and clearing for temporary work space would be greatly reduced.
>
> To reduce the potential impact of forest clearing for the construction of the pump station on the Finnerty-Arbutus site, alternate locations for the pump station on previously cleared land could be explored. If relocating the pump station is not possible, compensation measures can be considered by the CRD, such as restricting tree cutting and public disturbance on the remainder of the site, aggressive invasive plant management, and restoration to native plant cover.

Construction of ancillary facilities would require the removal of sensitive vegetation from the upper Hobbs Creek and for the pump station on the Finnerty-Arbutus property. The vegetation clearing would occur in the ancillary facility footprint and associated workspace. The duration of the effects of vegetation clearing are long-term, and not reversible. The magnitude of the effects of vegetation removal are adverse and of high magnitude, resulting in a rating of **significant**.

If the sewer trunk could be re-routed to avoid Upper Hobbs Creek, the magnitude of the effect of installing pipes on vegetation would be reduced to low.

If compensation measures were implemented, the magnitude of constructing a pump station on the Finnerty-Arbutus site could be reduced to moderate. As the impacts of constructing a pump station at the Finnerty-Arbutus site cannot be mitigated, the effect on vegetation would remain **significant**.

Ancillary facility operation. Operation of the ancillary facilities does not require removal of vegetation. Except for the potential of increased tree blowdown risk over the medium-term, only negligible effects of ancillary facility operation on vegetation are anticipated and therefore impacts are considered **less than significant**.

Wildlife

Treatment facility site conditions

The Cedar Hill Corner candidate site occurs in a previously cleared does not contain important wildlife habitat or habitat features.

Ancillary facilities conditions

The proposed route associated with the Cedar Hill Corner candidate site crosses Upper Hobbs Creek for approximately 120 m of its length. This area is identified as old forest by the regional Sensitive Ecosystem Inventory, and the forest structure provides important habitat features for wildlife species.

Upper Hobbs Creek has a number of wildlife trees, mature large-limbed trees, rotten logs and other woody debris that provide roosting and nesting habitat to a variety of forest birds, small mammals, and invertebrates. Many wildlife trees are located on the northwestern side of Upper Hobbs Creek, adjacent to the University of Victoria right of way. These trees are used by primary cavity excavators, such as Northern Flicker, Pileated Woodpecker, Hairy Woodpecker, and Chestnut-backed Chickadee, and secondary cavity nesters, such as Vaux's Swift, Northern Saw-whet Owl, California Myotis, and Little Brown Bat. The area also has a number of downed rotten logs and other woody debris, which is habitat for small mammals, and invertebrates.

A number of nesting boxes appropriate for Western Screech Owl and Northern Saw-whet Owl have been installed in the area, enhancing the nesting habitat values. A Barred Owl was observed in the Upper Hobbs Creek drainage during site inspections for this project.

Hobbs Creek flows through the drainage, providing suitable habitat for amphibians, such as red-legged frogs (Blue-listed, COSEWIC – special concern), and long-toed salamanders.

A pump station would be required for the forcemain and is proposed to be placed on the Finnerty-Arbutus property. For a detailed description of the wildlife and wildlife habitat on this property, refer to Wildlife in Section 8.3.

Table 8-2 summarizes the presence of wildlife and wildlife habitats on the Cedar Hill Corner site and ancillary facilities.

Table 8-2 Environmentally valuable wildlife on or near the Cedar Hill Corner site and associated ancillary facilities

Presence of sensitive wildlife	Site	Trunk-Outfall	Pump Station
Presence of wildlife species at risk and their habitats:			
• species at risk identified by COSEWIC	No	Yes	No
• species on provincial Red and Blue lists	No	Yes	None detected
• regionally significant species	No	Yes	Yes
• habitats for any of these species	No	Yes	Yes
Presence of important wildlife habitat features:			
• wildlife trees, snags, mature, large-limbed trees	No	Yes	Yes
• rotten logs and other woody debris	No	Yes	Yes
• man-made habitat enhancements	No	Yes	No
• hedges and shelterbelts	No	Yes	Yes
• groundwater springs and seepages	No	Yes	No
Evidence of wildlife use:			
• wildlife corridors	No	Yes	Yes
• deer habitat	No	Yes	Yes
• potential raptor nest sites	No	Yes	Yes
Nearby presence of protected areas or habitats	No	Yes	No

Impacts and mitigation measures

Treatment facility construction. Construction on the site would not involve clearing of wildlife habitat or habitat features, as the site is previously cleared. The site abuts mature forest, and Work Safe British Columbia may require removal of danger trees, if they are located within 1.5 tree lengths (approximately 45 m) of the facility footprint. Such danger tree removal would cause a loss in available habitat.

> Mitigation measures. The potential effect of clearing trees from the edge of the cleared area could be mitigated by moving the facility footprint away from the forest edge.

Construction related changes to wildlife would be minimal, unless removal of trees from the edge of the facility are required to reduce safety risks. Effects of such tree removal would be

long-term, and non reversible. The magnitude of tree removal would be moderate, resulting in a rating of potential effects on wildlife of **less than significant**. If the facility footprint is designed in a manner that eliminates the need for tree removal for safety reasons, the magnitude of treatment facility construction on vegetation would be negligible.

Treatment facility operation. No potential effects of treatment facility operation on wildlife or wildlife habitat are anticipated and therefore impacts are considered **less than significant**.

Ancillary facility construction. Clearing for the construction of the sewer main would result in a loss of old forest habitat. Removal of forest typically affects wildlife in the following ways:

(a) loss of thermal and security habitat and habitat features (*i.e.*, canopy cover);
(b) loss of reproductive habitat and habitat features (*i.e.*, nest trees);
(c) direct mortality during clearing activities;
(d) sensory disturbances associated with the clearing and construction activities; and
(e) loss of habitat connectivity and movement corridors.

Mitigation measures. The loss of potential reproductive, security, and thermal habitat can be mitigated only by avoiding the clearing of forested ecosystems in Upper Hobbs Creek drainage. This mitigation would require an alternative route for the sewer mains. To minimize loss of the wildlife trees adjacent to the right of way, instead of removing them, Work Safe British Columbia compliance may be achievable by topping trees to a shorter height that no longer is a safety risk to nearby workers, but maintains some wildlife habitat values.

To reduce the potential impacts on wildlife habitat from building a pump station at the Finnerty-Arbutus site, alternate locations on previously cleared land could be explored. If moving the pump station facility is not possible, compensation to enhance habitat values in nearby green spaces could be considered. For example, removal of invasive plant species could increase the habitat quality for ground nesting birds and small mammals, which are important foods for raptors in the area.

Direct mortality and effect of construction related sensory disturbances during the removal of forest for the sewer trunk and pump station could be reduced through timing work to avoid the nesting bird season (March 15 to July 31).

Construction of ancillary facilities would require the removal of wildlife habitat and habitat features from the footprint and workspace areas of Upper Hobbs Creek and the Finnerty-Arbutus site. The duration of the effects on wildlife habitat are long-term, and not reversible. The magnitude of the adverse effects on wildlife associated with clearing the forested areas is moderate to high, resulting in a rating of **significant**.

If the sewer trunk could be re-routed to avoid Upper Hobbs Creek, the magnitude of the effect of installing pipes on wildlife would be reduced to low.

If compensation measures were implemented, the magnitude of constructing a pump station on the Finnerty-Arbutus site could be reduced to moderate. As the impacts of constructing a pump station at the Finnerty-Arbutus site cannot be mitigated, the effect on wildlife would remain **significant**.

Ancillary facility operation. No potential effects of ancillary facility operation on wildlife or wildlife habitat are anticipated and therefore impacts are considered less than significant.

Archaeology and heritage

Treatment facility site conditions

The Cedar Hill Corner site was deemed to have low potential to contain buried archaeological deposits or features, due to past agricultural activities and deposit of fill materials from off-site. The site has been levelled in the past, leaving no small knolls or ridges on this property, which are often areas with higher archaeological potential.

Shell midden material was noted in stored fill material on site during a site visit. This material originates from off-site construction areas. Although this material is not considered to have much archaeological value due to its highly disturbed condition, the British Columbia Archaeology Branch considers such deposits archaeological sites.

The Cedar Hill Corner property has not been formally documented as a site by the British Columbia Archaeological Site Registry system. There are no previously documented archaeological sites on or adjacent to this property.

Ancillary facility conditions

The Upper Hobbs Creek area is rated as having archaeological potential (Millennia Research Ltd. 2008). During a site visit, no evidence of archaeological deposits or materials was found in the area of the proposed pipe crossing. However, it was deemed that that the lands in upper Hobbs Creek within 30 meters of the stream have a moderate potential for containing sub-surface archaeological deposits. This determination is based on the presence of traditional plant resources of value to local First Nations, and the archaeological potential associated with riparian areas and watercourses in the CRD

This site would also require construction of a pump station at the Finnerty-Arbutus site. There is archaeological potential at the pump station site location (Millennia Research Ltd. 2008).

Impacts and mitigation measures

Treatment facility construction. Construction impacts to archaeological resources could be caused by levelling of building sites, building foundation construction, or digging of trenches to install treatment facility below ground structures.

> Mitigation measures. If the Cedar Hill Corner site is chosen as a future treatment facility, an Archaeological Impact Assessment (AIA) would be conducted out in areas along the pipe corridor that have archaeological potential. The AIA would be completed before ground disturbance begins. Based on any findings, site specific archaeological mitigation planning would be completed.
>
> The extent of shell midden material present in stockpiled soils, and the source of material would be determined and assessed, and its archaeological significance, if this portion of the Cedar Hill Corner parcel is disturbed during construction of the wastewater facility.

The AIA would contain a detailed assessment of effects of construction on archaeological resources. All assessment and mitigation will comply with the *British Columbia Heritage Conservation Act*. Mitigation will provide reasonable compensation for the removal, loss, disruption, modification, or alteration of archaeological and heritage resources as a result of the project.

Treatment facility operation. The activities that affect archaeological and heritage resources are likely to occur during, and be limited to, the construction phase of the project. It is unlikely that there would be any effects of facility operation on archaeological or heritage resources and therefore impacts are considered **less than significant**.

Ancillary facility construction. The ground disturbing activities, including excavation and trenching, associated with constructing ancillary facilities have the potential to damage, displace, or destroy buried archaeological materials and sites. The potential for this effect is greatest in the upper Hobbs Creek area and near the shoreline of Finnerty Cove. Road rights-of-way, where most of the ancillary facility pipes would be installed, are unlikely to contain undisturbed archaeological remains. Ground disturbance also has the potential to affect buried archaeological materials at the Finnerty-Arbutus pump station location. Construction of ancillary facilities may result in the permanent loss or alteration of archaeological or heritage resources.

> Mitigation measures. If the Cedar Hill Corner site is chosen as a future treatment facility, an Archaeological Impact Assessment (AIA) would be conducted in areas along the pipe corridor and pump station site that have high archaeological potential in advance of ground disturbing activity. Archaeological mitigation plans would be based on results of the AIA.

A detailed assessment of effects of construction on archaeological resources would be completed after a site has been chosen, as part of an AIA. Assessments and mitigation would comply with the *British Columbia Heritage Conservation Act*. Mitigation would provide reasonable compensation for the removal, loss, disruption, modification, or alteration of archaeological and heritage resources as a result of the project.

Ancillary facility operation. The activities that affect archaeological and heritage resources are likely to occur during, and be limited to, the construction phase of the project. It is unlikely that facility operations would affect archaeological or heritage resources and therefore impacts are considered **less than significant**.

Community

Treatment facility site conditions

The Cedar Hill Corner property is an expansive grassy area owned by the University of Victoria, located in the District of Oak Bay. The property is separated from the main university campus by South Woods and Upper Hobbs Creek. The Cedar Hill Corner property site is bounded by Cedar Hill Cross Road, South Woods, the Upper Hobbs Creek drainage, and residential areas to the north and east. The site is in the Cadboro Bay neighbourhood.

Photo 8-1 Cedar Hill Corner property

The site was once a family farm. Approximately 250 apple trees remain on the property. The property was purchased by CJVI radio, and then by UVic in 1964. The site has remained undeveloped since that time. A water well is still registered on the site. Other land uses on portions of the site predominantly cleared site include structures associated with the UVic Centre for Forest Biology. The operation is currently inactive.

The Cedar Hill Corner property is a very popular area for dog walkers. Nets associated with a disc golf course are located on the property, but recent information suggests this course is no longer used. Until recently, BMX jumps existed near the centre of the Cedar Hill Corner property, but were levelled and fenced. Access to Upper Hobbs Creek is provided from the Cedar Hill Corner property.

UVic currently uses a portion of the site for soil storage and mixing. In June 2009, a fence was constructed to restrict access to the soil piles.

Photo 8-2 Dog walkers on Cedar Hill Corner property

Photo 8-3 BMX jumps on part of the Cedar Hill Corner property that is now fenced

Adjacent land uses

The proposed treatment facility footprint is approximately 135 m north of the Uplands Estates townhouses, south of Cedar Hill Cross Road, 215 m west of detached residences on Crestview Road, and 115 m south of residences on Chelsea Place Road (Figure 8-1).

The footprint is bounded to the west by a wooded area known as Upper Hobbs Creek, an important green space used by community members. The proposed footprint is 305 m from UVic buildings, 195 m from a UVic parking lot, and 390 m from UVic student housing.

The treatment facility footprint would be approximately 205 m northeast of the Henderson Park Recreation Centre Complex, 225 m northwest of the north end of the Uplands Golf Course, and 390 m from Uplands School.

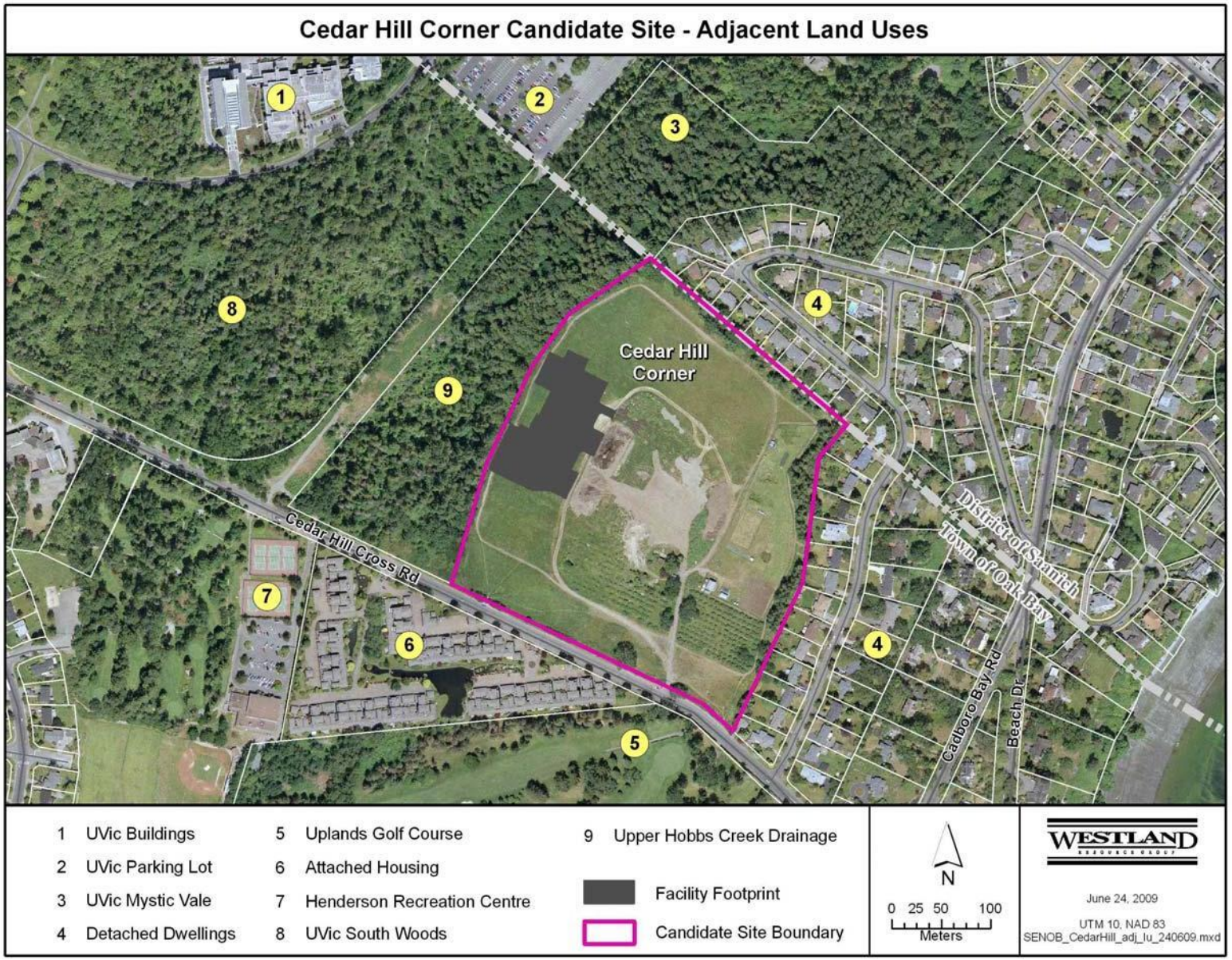

Figure 8-1 Adjacent land uses at Cedar Hill Corner site

Consistency with planned land use

The UVic Campus Plan identifies the Cedar Hill Corner property as an area reserved for future UVic expansion. "The CJVI property has potential for temporary uses and permanent development, including academic expansion, faculty and student housing, sports and recreational facilities, parking, and any special opportunity uses that may arise." Discussions with UVic representatives identified a general need for development lands to support university operations and growth. The 2003 Campus Plan states that a Master Plan for the site will be prepared before development occurs, with the following stipulations:

- "The Master Plan will be guided by the vision and principles of this Campus Plan, as it may be amended from time to time,
- Permanent development will provide landscaping and visual buffering to minimize its impact on nearby neighbours and on the adjoining forested areas of the University, and
- Creative thought must be given to the best way to provide links and connections from these lands to other areas of the campus."

The Campus Plan also states that the Haro Road right-of-way, owned by the District of Oak Bay, will be reviewed in the context of the Cedar Hill Corner Property Master Plan.

Interest has been expressed by students, faculty, and community members in examining alternative uses for the Cedar Hill Corner property, including agricultural use, and identified as the Mystic Vale Farmlands in a 2005 report (Found and M'Gonigle, 2005). The report describes the history of the property, and academic, research, social, and economic opportunities associated with the Cedar Hill Corner property. A recent article confirms interest in agricultural use , stating the land could support "new opportunities for campus agriculture" (Martlet, March 5, 2009).

The second draft of the University of Victoria Sustainability Action Plan describes action items for the period 2009 to 2014 (University of Victoria 2009b). Relevant action items include:

- "develop a management plan for University Cedar Hill Corner that will guide its use in the short-term and the process for master plan preparation"; and
- "investigate the potential for integrated resource recovery, should the CRD proceed with a sewage treatment program in close proximity to the Gordon Head Campus."

The Cedar Hill Corner property is located in the District of Oak Bay. The OCP designates the subject property as "Institutional", and the OCP contains an objective to "work with the University of Victoria and Camosun College to address issues arising out of the presence of these large institutions in the Municipality". Further, the OCP states in cases where either the University of Victoria or Camosun College submits a major development proposal which would be located in close proximity to residential properties in Oak Bay, the Municipal Council should

offer its input to the University with a view of minimizing any negative impact of the development on nearby residents" (Corporation of the District of Oak Bay 1997). The zoning bylaw identifies the site a P1 – General Institutional Use.

Ancillary facility conditions

Ancillary facilities required to operate the treatment facility on the Cedar Hill Corner property include a gravity main, a forcemain, a small diameter pressurized pipe, and a pump station at the Finnerty-Arbutus site.

The gravity main would be routed across an important recreational area, Upper Hobbs Creek, before travelling along a right-of-way owned by Corporation of the District of Oak Bay, adjacent to a UVic parking lot and UVic residences, before moving to road rights of way, including Haro Road and Monarch Place. The gravity main would be located in an existing right-of-way across four residential properties.

A treatment facility on the Cedar Hill Corner property would require the construction of a pump station on the Finnerty-Arbutus site to pump wastewater to the treatment facility.

The forcemain would be in a similar alignment to the gravity main, but constructed from the Finnerty-Arbutus pump station to the Cedar Hill Corner property, under Arbutus Road and Haro Road, adjacent to UVic residences and a UVic parking lot, in the District of Oak Bay right-of-way, and across Upper Hobbs Creek drainage.

The small diameter pressurized pipe would be constructed from the existing Penrhyn pump station to the Finnerty-Arbutus site under existing roads, including Penrhyn, Hobbs, Maynard, Rowley Streets, and Arbutus Road.

Impacts and mitigation measures

Treatment facility construction

Community use. During the treatment facility construction phase, community use would be restricted in and around the active construction area on the Cedar Hill Corner property. Currently, members of the community use the site for dog walking and other informal recreation.

The treatment facility would be built on approximately 1.0 ha of the 16.0 ha site. Construction would temporarily require additional workspace to construct the treatment facility. During construction, some areas on the Cedar Hill Corner property could continue to be available for dog walking.

> Mitigation measures. Signage and newspaper advertisements would be used to inform community members of the construction schedule and portions of the site that may have access restrictions.

Restrictions on community use of the facility footprint and workspace portion of the site during the construction period would result in a medium-term construction impact. The operational effects on community use are discussed in a subsequent section. The construction work space would only be used during the construction period, representing a reversible impact. Portions of the site have recently been fenced, restricting access to these areas. During treatment facility construction, public access to the western portion of the site would be restricted. Access to Upper Hobbs Creek could be maintained. Given the recent fencing of the centre of the property, and the existing fenced UVic forestry centre, the additional access restrictions during the construction period would introduce a high magnitude, local impact, that is reversible after the completion of construction, but considered **significant.**

Noise and vibration. Construction of the facility would involve the use of heavy machinery, compressors, pumps, and concrete pouring equipment to prepare the site and build the treatment facility. During the construction period, noise and vibration impacts could affect neighbouring residents and recreational users. The primary construction period would occur during the first 9 months when excavation and concrete pouring are undertaken. After the 9-month peak site-disturbing activity has occurred, construction would be similar to that of other utility or industrial buildings.

Construction activities would comply with the Town of Oak Bay noise bylaw for hours of work and noise levels. Work would usually occur on weekdays from 7 am to 5 pm with no work on Saturdays, Sundays or holidays (except in an emergency or where a critical piece of work must be completed in a specified work window).

> Mitigation measures. Discussions will be undertaken with UVic and local residents during project planning and prior to construction to discuss potential issues.

Noise and vibration impacts would be concentrated during the 9-month peak construction, but may occur occasionally over the entire construction phase. As a result, the impact is considered to be medium-term in duration. The noise and vibration effects would be moderate in magnitude, and reversible, but could periodically affect recreational users of the Cedar Hill Corner property and Upper Hobbs Creek. With adherence to the mitigation measures outlined in this section, including discussions with UVic representatives and local residents, noise and vibration impacts are considered to be **less than significant.**

Dust and air emissions. Construction of the facility could result in air quality impacts on recreational users and local residents due to dust and exhaust emissions.

The treatment facility would be constructed in a grassy area, with some areas of exposed soil. The treatment facility would not be constructed adjacent to existing residences or institutional structures. The CRD Code of Practice for "Construction and Development Activities" would be used to mitigate dust and air emission impacts during construction of the treatment facility. When transporting soil that could create dust nuisances, trucks would have box covers to reduce releases.

> Mitigation measures. No mitigation measures are required in addition to standard construction best practices.

Dust and air emission impacts from the construction of the treatment facility on the Cedar Hill Corner property are expected to occur during the medium-term construction period, and are reversible. Through the use of standard construction best practices, the impact is considered low in magnitude, and **less than significant.**

Traffic. The construction of the treatment facility would require the delivery of equipment and supplies, and the movement of workers to the site along McKenzie Avenue, Gordon Head Road, and Cedar Hill Cross Road.

> Mitigation measures. A traffic management plan will be prepared to address traffic disruptions, truck traffic, and the continued access to nearby institutions and residences during construction. Flag persons would direct vehicles and pedestrians around the active construction site. Construction drivers will observe speed limits and exercise caution. Ongoing communication with Town of Oak Bay, UVic, and local residents, will be undertaken to minimize traffic impacts.

Traffic effects may occur throughout the entire treatment facility construction phase, but the peak construction period would have higher truck volumes. The impacts would occur in the local area, primarily on Cedar Hill Cross Road and Gordon Head Road and is considered to be low in magnitude, and reversible. With the development and implementation of a traffic management plan, traffic effects are expected **less than significant.**

Treatment facility operation

Community use. The University of Victoria has raised concerns about the potential loss of their developable land. The construction of the treatment facility on the Cedar Hill Corner property would reduce the developable land area available to UVic. Community members have also raised concerns about the loss of dog walking areas.

> Mitigation measures. Discussions between the CRD and the University of Victoria representatives would be undertaken to in order to reach agreement on appropriate mitigation or compensation for the use of developable UVic property. Existing use of the

remainder of the site would be available for dog walking post-construction, subject to UVic's development plans.

With an agreement between UVic and CRD, and continued access by dog walkers to the remainder of the site, land use effects of the treatment facility would be considered moderate in magnitude, permanent, restricted to the treatment facility footprint, not reversible, but **less than significant.**

Odour. Operation of a treatment facility on the Cedar Hill Corner property, under certain conditions could generate odours that would be noticeable by local residents. The treatment facility would be designed to minimize operational odour, using the 2-stage system and other processes described in the project description. Typical operation of the treatment facility would result in no detectable odour at the treatment facility boundary.

Annual maintenance would be conducted in during breezy weather, minimizing risk of odour impacts, however, odour could be detectable in some instances.

In rare cases of equipment malfunction, odours impacts of unknown magnitude and duration could affect the local area. The season and prevailing winds direction patterns at the time would determine the potential effects.

Mitigation measures. The odours released during facility operation could be reduced by ensuring that a backup system is installed. Backup treatment could be provided during routine maintenance or in response to mechanical failure. This mitigation would reduce the magnitude of impact of maintenance or breakdowns to low under all circumstances.

Under normal facility operations, odours would not be detectable beyond the project footprint. As previously discussed, some odour releases could occur during annual maintenance or if equipment malfunctions. The impact is considered long-term, even though individual events would be short-term, perhaps measured in hours or days. If odour impacts do occur, they are most likely to affect the local area near to the facility, and would be reversible, high magnitude, and **significant**. With the installation of backup odour control systems, the odour impacts would be reduced to low magnitude, and would be **less than significant**.

Noise, vibration, and lighting. Operation of the treatment facility could generate noise, vibration, and lighting issues, resulting in effects to site users and local residents. Noise generating equipment would include:

- air-driven pumps,
- compressors,
- fans and blowers,

- diesel driven pumps, and
- standby diesel power generators.

Sound attenuation would be installed in the buildings housing the units and on diesel engine exhaust to ensure that decibel levels remained below 45 dB at the property line, to meet the local municipal bylaw requirement, and to meet WCB/OSHA criteria for worker safety. All noise-generating equipment would be installed in soundproof rooms to meet these requirements. The treatment facility would be designed not to exceed 45 dB and 55 dB at the edge of the facility footprint, during the evening and day respectively.

The treatment facility would be designed with the design parameters outlined in the project description to minimize noise, vibration, and lighting disturbance to residents and site users.

> Mitigation measures. No mitigation is needed beside the design features proposed for the facility. If noise complaints occur following commissioning of the facility, conduct additional land-forming or equipment muffling to eliminate off-site noise transmission.

With the use of best management practices and effective design for noise, vibration, and lighting, the impacts would be considered low in magnitude for the local area, not reversible, and **less than significant.**

Traffic. Operation of the treatment facility would require the removal of screenings and grit from the site by truck. Transporting screenings and grit to Hartland landfill would require one truck every five to six days. Trucks would be enclosed to limit odour impacts.

> Mitigation measures. Truck movements would be timed to avoid sensitive time periods, such as weekends.

The removal of screenings and grit would be a long-term impact that is not reversible, but is considered low in magnitude due to the low volume of operational truck traffic. The impact is **less than significant.**

Ancillary facility construction

Noise, vibration, dust, and community use. An expanded network of pipes and a pump station would be required to support the operation of the treatment facility as described in the project description. Construction of ancillary facilities would introduce noise, vibration, dust, and land impacts.

Construction of the pump station on the Finnerty-Arbutus site would introduce impacts similar to those discussed in the assessment of the Finnerty-Arbutus treatment facility. The pump station footprint would be smaller than a treatment facility, but many of the same issues related to

restrictions on community access, dust, noise, vibration, and traffic would exist. The mitigation measures for constructing the pump station would be similar to those that would be used to construct a treatment facility.

Ancillary facility construction would be conducted in accordance with local municipal bylaws to minimize noise and vibration disturbance. Dust control measures, including the use of box covers on trucks, the application of CRD codes of practice, and a dust management plan would be used to reduce effects on residents.

> Mitigation measures. During the construction period, activity would be limited near the construction area. Discussions with potentially affected home owners and institutional users prior to construction would ensure mitigation measures are appropriate to minimize potential human risk.
>
> CRD representatives would work with UVic, District of Saanich, and District of Oak Bay representatives and community groups to minimize impacts of constructing the ancillary facilities in wooded areas and through residential neighbourhoods.

With the application of approved mitigation measures, the impacts of pipe construction under roads are considered short-term in duration, and reversible, similar to other public road projects. The magnitude of the effect is considered moderate, short-term, of local extent, and **less than significant**.

Construction of the pump station on the Finnerty-Arbutus site would introduce a high magnitude impact on not permitted, but existing community use of the area in the medium-term, that is **significant.**

Construction of ancillary facilities across Upper Hobbs Creek would be considered high magnitude due to the importance of the area to local residents, and **significant**. With a revised alignment designed to avoid crossing Upper Hobbs Creek, the impact could be reduced to **less than significant.**

Traffic. Impacts during the ancillary facility construction phase would be related to delays, detours, and temporary changes in traffic volumes through residential neighbourhoods.

> Mitigation measures. A traffic management plan would be developed for the construction period. CRD representatives would work with municipal planners, land owners, and community groups to inform them of the project schedule.

The development and implementation of a traffic management plan would help to reduce traffic effects of the project. The impacts are considered to be local, short-term, reversible, low to moderate in magnitude, and **less than significant.**

Ancillary facility operation

Community use. Limitations would be placed on the types of development permitted in existing and new rights-of-way and at the Finnerty-Arbutus property, outside of the pump station footprint, as public access would be restricted on the pump station footprint. Generally, the construction of permanent structures by land owners is not permitted in the right-of-way.

> Mitigation measures. Where new rights-of-way are required, CRD will reach an agreement with landowners, mitigating future land development limitations in the right-of-way. The CRD would communicate with property owners whose land would be crossed in existing rights-of-way to reduce potential impacts. Community input, regarding the desired future land use of the remaining portions of the Finnerty-Arbutus site would be encouraged.

With agreements established between the CRD and property owners securing rights-of-way, and communication with property owners whose lands would be crossed by the ancillary facilities, the long-term impact is not reversible, but low in magnitude. Community input as to the future use of the remainder of the Finnerty-Arbutus site would help to offset the potential impacts of constructing a pump station, which are considered long-term, not reversible, and of moderate magnitude, and **less than significant**.

Noise, vibration, and lighting. The operation of treatment facility at the Cedar Hill Corner property would require a pump station on the Finnerty-Arbutus property. The pump station could generate noise and vibration, and could require on-site lighting.

> Mitigation measures. The pump station would be designed to generate limited noise and vibration outside of the pump station building. Lighting on the site would be oriented to minimize disturbance.

With appropriate facility design, focussed on limiting noise, vibration, and lighting effects, the impacts would be considered low magnitude, long-term, not reversible, but **less than significant.**

Odour. The operation of the pump station has the potential to generate odour. However, the pump station would be designed to have no detectable odour at the treatment facility boundary during normal operation.

The potential for odour impacts may exist during annual odour control maintenance or during equipment failure. In rare cases of equipment malfunction, odour impacts of unknown magnitude and duration could affect the local area. The season and prevailing winds direction patterns at the time would determine the potential effects.

Mitigation measures. An odour control back-up system would be designed to avoid odour releases during maintenance and malfunctions.

Under normal facility operations, odours would not be detectable beyond the project footprint. Some odour releases could occur during annual maintenance or if equipment malfunctions, but these effects would be reduced through the use of a back-up system. Potential odour effects are considered long-term, even though individual events would be short-term, perhaps measured in hours. Any impacts are reversible, of low magnitude, and **less than significant**.

Traffic and roads

Treatment facility site conditions

The Cedar Hill site is located southeast north of Cedar Hill Cross Road between Haro Road and Crestview Road in the District of Oak Bay. Access to the site would be from Haro Road (Figure 7-2).

The initial traffic impact assessment for this project examines the volumes and types of vehicular traffic; road classification; proximity to designated truck routes; alternative modes of transportation; accident history; transit service and impact on existing traffic from construction and installation of pipes underneath existing road surfaces.

These factors are considered for the following periods for this project:

- 2009 Present Conditions,
- 2010 – 2012 Construction of Phase 1 facility,
- 2030 Operation at full capacity of Phase 1 facility,
- 2030 – 2032 Construction of Phase 2 or expanded facility, and
- 2065 Operation at full capacity of expanded facility.

When considering the potential routing(s) to and from the site, designated truck routes are used where possible as well as the shortest route to designated truck routes. The Cedar Hill Corner site would be accessed from Haro Road, Cedar Hill Cross Road, Cadboro Bay Road, Sinclair Road, and McKenzie Avenue. Cedar Hill Cross Road, Cadboro Bay Road, Sinclair Road, and McKenzie Avenue are classified as arterial roads while Haro Road is classified as a local road, although at this point it is a right-of-way. In addition, Cadboro Bay Road, Sinclair Road, and McKenzie Avenue are all designated truck routes. The foregoing routing provides access to the closest designated truck route, which is Cadboro Bay Road. However, the shortest route to McKenzie Avenue is via Cedar Hill Cross Road and Gordon Head Road. Cedar Hill Cross Road is an arterial road but is not a designated truck route, and Gordon Head Road is both an arterial road and truck route.

Ancillary facility conditions

The ancillary facilities consist of the gravity main and outfall from the site, the Arbutus Road pump station, and its forcemain. The alignment for the ancillary facilities is along the Haro Road right-of-way and under existing roadways(Figure 3-6).

Impacts and mitigation measures

Data were obtained from the District of Saanich and the Capital Regional District. The existing volumes on the road links to the facility are illustrated in Table 8-3. This table shows the current traffic volumes in vehicles per day (vpd) and vehicles per hour (vph) for the PM Peak Hour period for each road link. An assumed growth rate of 1% per annum was used to forecast these traffic volumes to 2030, when the second phase of construction is scheduled to begin. Traffic volumes for 2065 were not forecast as there are too many uncertainties related to future transportation technologies, infrastructure, travel modes, and modal shares.

Table 8-3 Daily PM peak hour traffic volumes for the access route to the Cedar Hill Corner site

Road Name	Characteristic	Units	2009	Volumes	2030	Source
McKenzie Ave / Sinclair Rd	Traffic - vehicular volumes	Vehicles per day (vpd)	12,500	vpd	15,405	Municipal, CRD
		Vehicles per hour (vph) - PM Peak	1,300	vph	1,602	
Cadboro Bay Road	Traffic - vehicular volumes	Vehicles per day (vpd)	8,838	vpd	10,892	
		Vehicles per hour (vph) - PM Peak	928	vph	1,144	
Cedar Hill X Rd	Traffic - vehicular volumes	Vehicles per day (vpd)	7,143	vpd	8,803	
		Vehicles per hour (vph) - PM Peak	750	vph	924	

As arterial roads are expected to carry traffic volumes in the range of 10,000 to 30,000 vpd, and major collectors from 5,000 to 20,000 vpd, the road links on the preferred routing have no capacity limitations for the forecast growth in background traffic.

Treatment facility construction. The forecast trips for the construction of the candidate site for Phases 1 (2010) and 2 (2030) are shown in Table 8-4. They are provided as average trip rates per day (vpd) with an assumed 240 workdays per annum.

Table 8-4 Forecast vehicular volumes for Phases 1 and 2 construction of the Cedar Hill Corner facility

CONSTRUCTION TRAFFIC			
YEAR 2010		**Duration**	**Average two-way trips (vpd)**
Actvities	Clearing/Grubbing/Aggregates	3 months	10 trucks
	Excavations	7 months	8 trucks
	Concrete	9 months	5 - 6 trucks
	Steel	9 months	1 truck / week
	Equipment, materials	24 months	1 truck / week
	Workers	24 months	50 cars
YEAR 2030			**Average two-way trips (vpd)**
Actvities	Clearing/Grubbing/Aggregates	1 month	5 trucks
	Excavations	3 months	6 trucks
	Concrete	4 months	4 - 5 trucks
	Steel	4 months	1 truck / week
	Equipment, materials	24 months	1 truck / week
	Workers	24 months	30 cars

The construction of Phase 1 in 2010 to 2012, it is forecast to generate approximately 75 two-way vpd for the candidate site and approximately 45 two-way vpd for Phase 2 construction in 2030 to 2032.

Mitigation measures. Construction traffic safety mitigation measures are presented in the Public Health and Safety section of this ESR. Parking would be required for construction workers driving to and from the site. If the clearing and grubbing stage can create enough parking on-site for all construction workers, the magnitude of the parking impact would be low. If there is not enough space to accommodate all the parking on-site, it is recommended that van-pooling, ride-sharing, and park and ride programs be developed to reduce the number of trips to and from the site, or that additional parking be developed elsewhere.

The Phase 1 construction traffic of 75 vpd represents an increase of traffic of 0.60%, 0.85%, and 1.05% on McKenzie Avenue-Sinclair Road, Cadboro Bay Road, and Cedar Hill Cross Road respectively over current volumes. Increases in the range of 1% are considered negligible. The 45 vpd construction trips associated with Phase 2 construction are all well below 1% and as such are considered negligible. The spatial impact would be local and of medium-term duration. While the traffic would be continuous over the construction period, it can be reduced by creating parking areas elsewhere, resulting in a rating of **less than significant**.

Treatment facility operation. As shown in Table 8-5, the number of site-generated trips for the operation of the candidate site is quite small and when compared to the existing and forecasted

vehicular trips on the road links in the preferred routing, these trips would have a negligible impact.

Table 8-5 Forecast vehicular volumes for Phases 1 and 2 operation of the Cedar Hill Corner facility

OPERATIONAL TRAFFIC			
YEAR 2030			**Average two-way trips (vpd)**
Activities	Truck Loads		
		Screenings / Grit	1 truck / week
		Chemical	8 - 9 trucks / year
	Employees		12 cars
YEAR 2065			**Average two-way trips (vpd)**
Activities	Truck Loads		
		Screenings / Grit	1-2 trucks / week
		Chemical	1 truck / month
	Employees		15 cars

The preferred routing is identified to accommodate truck traffic during construction and the need to used designated truck routes. Operations staff would not have to use this particular route, and their distributed travel would reduce the impact even further.

> Mitigation measures. No mitigation measures are required besides standard traffic management practices.

Traffic effects would be continuous over the life of the project, but the magnitude of the effect is negligible and the resulting rating is **less than significant**.

*Ancillary facility construction***.** Ancillary facility pipes would be buried in the road corridor, most probably underneath the travel lanes, using cut and cover methods.

Construction would disrupt vehicular traffic on affected routes. The extent and severity of disruption would be a function of the traffic volumes and available opportunities to keep some lanes open or to reroute traffic. All the roads potentially effected by the construction of ancillary facilities are two-lane, so it is assumed that one lane could remain open and alternating directions of traffic utilize the remaining lane.

> Mitigation measures. Standard procedures for managing vehicular traffic in a construction zone would be implemented which would result in one lane remaining open to alternating directions of traffic. Construction could be restricted to single blocks at a time and scheduled outside of peak periods of vehicular activity.

Also as noted earlier, the alignment would be adjusted to avoid potential impacts on existing ecosystems such as Hobbs Creek. For construction in these areas there would be no impact on existing routes beyond construction traffic utilizing these facilities.

The impact would be local, of short-term duration, and continuous during the construction period. Considering volumes of traffic affected, the result is a low to moderate impact on the local and collector routes. One-way alternating traffic would be permitted and there would be no residual impact resulting in a rating of **less than significant**.

Ancillary facility operation. There would be no impact from the operation of the ancillary facilities, because all of the pipes would be underground.

Mitigation measures. Road surfaces would be restored to operational standards and no additional mitigation measures would be required.

Although the impact would be local in nature and continuous, there would be no measurable residual effect and as such the rating is **less than significant**.

Public health and safety

Impacts and mitigation measures

Treatment facility construction. Dust would be the sole health risk resulting from construction activities on the site. Dust control measures would be initiated if dust generation is likely. The vegetated buffer on three sides of the property would limit wind transport of dust to adjacent residential areas.

During construction, the greatest safety risk would result from vehicles on roads and heavy equipment operation on the site. The use of flaggers and signage would minimize the risk to the public from vehicle movement. The construction site would be fenced to prevent access by dog walkers, students, or other members of the public.

Mitigation measures. Nearby residents would be notified about the construction schedule. The project contractor would communicate regularly with managers of the University of Victoria to discuss construction activities and the potential for disruption of university activities.

No special access or traffic control measures are needed, beyond those that are applied as part of standard construction practice for projects of this nature.

The potential health and safety effects of construction would occur only during construction, and are considered medium-term. Spatially, health risks would be limited to areas immediately next

to the worksite, and traffic safety risks would be limited to roadways. These impacts are reversible. Health and safety impacts are considered to be of low magnitude. With appropriate controls of construction activities, the significance of public safety and health effects are considered **less than significant**.

Treatment facility operation. Few public safety risks would be associated with treatment facility operation, because it would be fenced to minimize unauthorized entry, and the equipment is inside buildings. Health risks would be experienced primarily by workers who come into contact with untreated wastewater or microbial aerosols. Residents would not be exposed to disease organisms. The three-stage odour control system reduces the risk of viruses, bacteria, or other contaminants being discharged by air from the facility. The distance between the treatment facility and residences or institutions further reduces public health risks.

Public safety risks are limited to the slight increase in vehicle traffic associated with the project.

> Mitigation measures. No measures are needed to protect public health and safety during facility operation beyond those included in standard operating procedures.

The spatial extent of public health impacts are limited to the wastewater facility itself, and public safety effects would be limited to roads. The temporal extent is long-term, and any impacts would be reversible. The magnitude of public health and safety impacts are negligible, and are considered **less than significant**.

Ancillary facility construction. Public safety issues associated with installing pipes in roadways and along rights-of-way, and construction of the pump station on Arbutus Road are primarily associated with operation of heavy equipment and the presence of open trenches. Flaggers would be available during the day to manage vehicles and pedestrians near the worksite. Barriers and flagging would be used to prevent people from reaching worksites.

> Mitigation measures. Standard construction procedures would be followed to minimize safety risks during pipe construction.

The public safety risk of ancillary facility construction would be limited to the period of construction (short- to medium-term) and to the area where active construction is occurring. The impacts would be reversible. The magnitude of this impact considered low, and **less than significant**.

Ancillary facility operation. Once the pipes and pump station are in service, public health or safety impacts would be negligible and **less than significant**.

Visual aesthetics

Treatment facility site conditions

The Cedar Hill Corner site is a gently sloped grass area that is part of a predominately flat and open parcel of approximately 16 ha. The parcel is characterized by small orchard trees, managed and unmanaged grass fields, a fenced stockpile of fill material, and a fenced one hectare abandoned forest research facility. The stockpiled fill material creates a negative visual impact in an otherwise semi-rural viewshed. A mixed coniferous deciduous forest provides a striking backdrop to the northwest. Deciduous trees and shrubs border the area on the remaining three sides.

The main viewers of the parcel are drivers and pedestrians on Cedar Hill Cross Road, residents to the north and east, and dog walkers who frequent the property. Portions of the site may be visible from second-story windows of the Uplands Estates townhouses. There are no vehicles regularly accessing the site, and no artificial lighting. Photo 8-4 and Photo 8-5 show the site being used by dog-walkers, vegetative screening beside Cedar Hill Cross Road, and Uplands Estates townhouses overlooking the site.

Photo 8-4 Cedar Hill Corner site looking south towards Uplands Estates

Photo 8-5 Cedar Hill Corner site looking east across stockpiled fill material

Ancillary facility conditions

The visual quality of the ancillary facility pipe routes are primarily suburban streetscapes through Queenswood, Cadboro Bay and north Oak Bay. Two natural viewsheds are affected by ancillary facilities:

- the Finnerty-Arbutus pump station site, and
- the crossing of Upper Hobbs Creek drainage.

Impacts and mitigation measures

Treatment facility construction. The visual character of the Cedar Hill Corner site would be altered by construction of a treatment facility. Approximately 1 hectare of the 16 hectare parcel would have topsoil removed, the site graded, and the grassy area replaced by utility structures. An access road would be constructed from Cedar Hill Cross Road to the facility increasing visibility of the site from the road. Users of the site would have views of construction activities and construction traffic.

Visual impacts of construction on the site from outside the parcel would be experienced by foot and road traffic from Cedar Hill Cross Road (100 m distant), though partially screened through a dispersed row of trees and shrubs. Approximately 12 of the 64 townhouse units on Uplands Estates complex (130 m south of the facility) on Cedar Hill Cross Road would have views of

construction activities from second floor windows. Vegetation, and a 2 m wall adjacent to the road are a visual barrier to ground level views of the site from Uplands Estates. Residential dwellings on Chelsea Road to the northeast (130 m), and Crestview Road to the east (200 m) and southeast (250 m) would have partial views of construction, though trees and shrubs provide dense screening

> Mitigation measures. Construction mitigation options include using the stored fill material and cleared topsoil to create earth screens to shield site users and local residents from the visual impact of construction activities.

Construction of the treatment facility would result in the replacement of a flat grassy area with pavement and buildings, and the creation of an access road bringing traffic into an area that has no formal vehicle access. The overall visual aesthetic impact of construction is considered to be local, of moderate duration (up to two years) and reversible. The magnitude of the impact is considered **less than significant** due to the moderate duration of the construction period.

Treatment facility operation. The presence of the facility would alter the visual aesthetics of the site. The stockpiled fill material detracts from the otherwise semi-rural character of the parcel and a treatment facility would add an additional industrial element. An access road would bring worker and trunk traffic onto the site through the parcel. Security and space lighting would be used to maintain and operate the facility at night. Users of the site would have uninterrupted views of the treatment facility from the north, northeast, south, and southeast. Stored fill, orchard trees, and forest provide screening from other vantage points.

Visual impacts beyond the parcel boundaries would be similar to those encountered during the construction phase. Foot and road traffic from Cedar Hill Cross Road would have partially screened views through a dispersed row of trees and shrubs. Approximately 12 of the 64 townhouse units on Uplands Estates complex (130 m) on Cedar Hill Cross Road would have views of the facility from second floor windows. Residential dwellings to the northeast, east, and southeast would have partial views of the treatment facility, though trees and shrubs provide dense screening.

> Mitigation measures. Mitigation measures should include vegetative or landscaped earth screening to the northeast, east, and southwest of the facility with the purpose of screening the facility from overlooking residential areas. Careful building design, could reduce visual impacts. The backdrop for the facility from most viewing angles is forest, so the use of analogous forest colours for buildings may minimize visual impacts. Control of security and space lighting can be used to minimize glare and artificial light intrusion off-site.

Based on this analysis, the visual impact of the treatment facility on the site is considered to be long-term, and of moderate magnitude due to the addition of a utility structure on a semi-rural

parcel. It should be noted that the future use of this parcel has not been planned by UVic, but is likely to include structures for purposes associated with university functions. The open space visual character of the CHC site should be considered temporary.

The large size of the parcel and the ability to screen the treatment facility by landscaping provide substantial visual mitigation opportunities that could reduce the visual impact of the Cedar Hill Corner site to be **less than significant**. Photo 8-6 and Photo 8-7 illustrate post-construction views of the facility through gaps in the trees and shrubs along Cedar Hill Cross Road. No additional screening or landscaping has been used.

Figure 8-2 Overview of Cedar Hill Corner candidate facility

Photo 8-6 Rendered view of candidate facility looking northeast from Cedar Hill Cross Road

Photo 8-7 Rendered view of candidate facility looking north from Cedar Hill Cross Road

Ancillary facility construction. Construction of ancillary sewer pipes would result in 5,800 m of pipe being laid along the suburban streetscapes of Queenswood, Cadboro Bay, and north Oak Bay, and through 220 m of existing right of way and 80 m of forest. The 16 m wide corridor

through the mature forest at Hobbs Creek, immediately west of the Cedar Hill Corner site would create a visual break in the forest visible from a large portion of the site, and potentially from the residential areas to the east and southeast.

A pump station would be constructed at the forested Finnerty-Arbutus site on a footprint of 43m by 37 m. Construction of the pump station requires clearing and levelling of approximately 0.16 ha of the 4.4 ha parcel and would result in 3.5% of the site being converted from forest to pavement and buildings. Although a relatively small area of the total parcel, the converted landscape would be adjacent to Arbutus Road and visible from the road and from the east, northeast, and southeast.

> Mitigation measures. Consideration should be given to relocating the pipeline corridor to leave the forest backdrop of the facility undisturbed. The pump station footprint and location at Finnerty-Arbutus should be reviewed to determine if the clearing requirement can be reduced, or if the pump station can be relocated further from Arbutus Road to maintain the forested viewscape of the site from Arbutus Road and locations to the east.

Views of construction equipment and construction traffic would be localized and of moderate duration (up to two years). The visual impacts of clearing a corridor in the Upper Hobbs Creek forest and of clearing 0.16 ha of forest at the Finnerty-Arbutus site are considered to be of moderate magnitude and irreversible. Collectively these demonstrably negative aesthetic impacts are considered **significant**, but mitigation options can reduce visual impacts markedly. Re-routing the ancillary sewer pipe would avoid creating a cleared forest corridor, reducing the magnitude of that visual impact to low and less than significant levels. Additionally, reducing or relocating the clearing requirements for the pump station at Finnerty-Arbutus can reduce the magnitude of the overall visual impact to low and **less than significant**.

Ancillary facility operation. All of the ancillary infrastructure would be below ground with the exception of the pump station at the Finnerty-Arbutus site, the pump station would add a utility structure to a forested landscape. A driveway would bring worker and trunk traffic onto the site. Security and space lighting may be used to maintain and operate the pump station at night. Users of the site would have interrupted views of the pump station through the forest. Visual impacts beyond the parcel boundaries would be restricted to views from Arbutus Road and views from the south east and east. Forest provides screening from other vantage points

> Mitigation measures. The relatively small (0.16 ha) footprint of the pump station affords extensive opportunities to screen the pump station from the remainder of the site, and from locations beyond the parcel. Vegetative and earth screening can be used to reduce visual impacts. Careful building design that incorporates the use of forest colours would mute visual impact. Consideration may be given to placing the pump station underground and using off-site parking to reduce the clearing requirement and achieve the lowest level of visual impact.

Based on this analysis, the visual impact of the pump station on the site is considered to be long-term, and of low magnitude due to the small footprint required from the site and the extensive mitigation opportunities that can be used to reduce the visual impact. With extensive mitigation the visual impact of the pump station would create no demonstrably negative aesthetic impact and can be considered **less than significant**.

9.0 UVIC FIELDS SITE DESCRIPTION AND IMPACT ASSESSMENT

9.1 General site description

The 4.6 ha University of Victoria fields site is located on the north side of McKenzie Avenue at the northwestern extent of the UVic campus (Figure 3-7). The UVic Fields site includes Wallace Field, and grassy areas to the west, east, and south. The site is separated from the main UVic field complex by McKenzie Avenue.

Wallace Field is the home pitch for the University of Victoria men's and women's rugby teams. The northwest field and southern grassy area under consideration for the treatment facility are not extensively used for organized recreational activities.

UVic has recently provided conceptual plans for the west, east, and south fields on the UVic Fields site. The plans identify interests in developing a rugby training field, a new grass field, and tennis courts on grassy areas to the northeast, northwest, and southern portions of the study area.

The University of Victoria Fields study area is adjacent to attached and detached dwellings to the west, southwest, and north. A parking lot and UVic buildings are located to the east, and Mackenzie Avenue to the south. Two structures on the Saanich heritage registry are located on the UVic Fields site, but outside of the proposed treatment facility footprint.

9.2 Ancillary facilities site description

Ancillary facilities required to operate the treatment facility on the University of Victoria Fields site include a gravity main, a forcemain, a pump station, and small diameter pressurized pipe.

Wastewater would be pumped to the UVic Fields site via an underground forcemain from a pump station on the Finnerty-Arbutus site, approximately 0.04 ha in size. The pump station would receive wastewater from the East Coast Interceptor (ECI), and a small diameter pressurized pipe, which conveys wastewater from the Penrhyn pump station in Cadboro Bay. The small diameter pressurized pipe would be constructed from the Penrhyn pump station to the Finnerty-Arbutus site entirely under existing roads, including, Penrhyn Street, Hobbs Street, Maynard Street, Rowley Street, and Arbutus Road.

The gravity main would be constructed in existing and new rights-of-way. The pipe would be installed on the north side of McKenzie Avenue and beneath Finnerty Road and Arbutus Road to the Queen Alexandra property, where it would cross the field and follow a right-of-way across an adjacent residential property. The pipe would be buried in the roadway under Alpine Crescent,

Haro Road, and Monarch Place. The pipe would then be installed in an existing right-of-way across four residential properties before reaching the existing outfall pipe.

The forcemain would transport wastewater from the Finnerty-Arbutus pump station, along Arbutus Road, Finnerty Road, and McKenzie Avenue to reach the treatment facility.

9.3 UVic Fields impact assessment

Landforms, geology, and soils

Treatment facility site conditions

The ground surface at UVic Fields site is primarily grassed, with some ornamental trees and shrubs along McCoy Road. The ground surface north of McCoy Road has a slight slope to the southwest. To the south of the eastward extension of McCoy Road, the site is crowned. The site appears well drained with no obvious drainage channels onsite. Site observations and a review of historical aerial photographs indicate that north of McCoy Road the site has been levelled by fill placement, with the thickness of fill increasing toward McCoy Road. The portion of the site south of McCoy Road is crowned and has probably been formed by fill placement.

The subsurface soil stratigraphy consists of mineral fill or topsoil overlying 4 to 5 m of stiff to very stiff brown and grey brown silty clay, up to 3 m of firm grey silty clay, and then a morainal deposit of hard, dense gravelly sandy silty, or silty clay glacial till. The glacial till is expected to extend to a significant depth and may be underlain by a pre-glacial marine deposit of dense to very dense silty sand or sandy silt, commonly referred to as the Quadra Sediments. The groundwater table is expected to rise within 2 to 3 m of the ground surface during the wetter periods of the year.

The fill material at the site is estimated to be 1 to 2 m thick. North of McCoy Road, the fill material increases in thickness southward to a maximum of 1.0 to 1.5 m alongside McCoy Road. South of McCoy Road, the fill material increases toward the centre of the crowned area to a maximum depth of 1.5 to 2.0 m. This fill material is unlikely to be suitable to provide stable, long-term, subgrade support for buildings and ancillary structures.

The near surface clay materials at the site are considered to be of marine origin with the consistency of the upper stiff to very stiff material, the result over-consolidation by desiccation during periods of lower relative sea levels. The underlying firm material is near normally consolidated, and would compress in response to a significant increase of surface loading conditions, resulting in some subsidence.

Considering the soil stratigraphy at the site, a natural frequency is expected in the order of 4 to 7 hertz, with an average shear wave velocity in the upper 30 m (Vs30) varying from 300 to

400 m/sec, corresponding to a Site Class "B/C" as per the current National Building Code. The site is in an area that could be affected by a Cascadia Subduction event. Information from Natural Resources Canada, indicates a peak ground acceleration of 0.61 g and spectral accelerations of 1.22, 0.82, 0.38 and 0.19 g, for respective periods of 0.2, 0.5, 1.0 and 2.0 seconds respectively for a design seismic event of 2% in 50 years. The accelerations noted relate to a site with soil conditions corresponding to a Site Class "C." Seismically, these conditions are not unusual for the area and present no substantial constraints on development of a wastewater treatment facility. However, as the estimated Vs30 is near the boundary between Site Classes "B" and "C," some adjustments to facility design may be necessary depending on the spectral accelerations considered, and the period of the various wastewater treatment facilities.

Impacts and mitigation measures

Treatment facility construction. Due to the gently sloped nature of the site, only slight landform recontouring would be necessary. The topsoil would be removed and stored for later use onsite, and minor grading (cutting and filling of less than 2 m) is anticipated. The native mineral soils at the site are expected to be competent materials to support a wastewater treatment facility. The possible presence of a substratum of compressible clay could cause subsidence.

Based on the anticipated soil conditions, relatively light loading associated with the proposed wastewater treatment facility, and local experience, no unique geotechnical concerns are expected during development of this site. There appears to be fill materials over portions of the site. The native clay soils at the site are relatively impermeable, and no significant seepage is anticipated from excavation that may penetrate the groundwater table. However, perched water table conditions could result in a localized high water table and surface water ponding, particularly during periods of heavy or prolonged precipitation

> Mitigation measures. The possible presence of a compressible clay substratum that could cause subsidence requires further assessment to determine if the stratum exists, and if it, could require additional excavation and placement of new select fill. It is expected that any settlement could be easily mitigated by selecting appropriately graded sand or gravel, or by placing a pre-load in advance of construction to settle sensitive elements. Existing fill materials on the site should be assessed and a determination made on the requirement for additional excavation and placement of new select fill. Protecting the topsoil against erosion or contamination by chemicals or noxious weeds would improve its value when spread on the site following construction

Impacts associated with soils, geology, and landforms during construction are considered to be local in extent and reversible. The magnitude is considered to be low and the impact **less than significant,** the mitigation measures outlined above would further reduce the magnitude of any construction impacts on landforms and soils.

Treatment facility operation. After construction is completed and operation of the treatment facility begins, no additional impacts on the landforms or geology of the site are anticipated. Erosion and sedimentation risk may persist after construction ends, and before vegetation is re-established.

Erosion and sedimentation from operations are considered to be local in extent and reversible. The magnitude is considered to be low and the impact **less than significant**.

Ancillary facility construction. The route of the forcemain and gravity main parallel existing roads and rights-of-way, where geologic and soil conditions are shown to be compatible with construction of roads and installation of pipes. Installing the forcemain and gravity main are not expected to affect soils, landforms, or geology, so impacts are considered **less than significant**.

The location and geologic condition of the outfall route are subjects of separate study, and are not considered in this ESR.

Ancillary facility operation. Operation of the gravity main and outfall are not considered to affect geology, landforms, or soils. Impacts are considered **less than significant.**

Hydrology and water quality

Treatment facility site conditions

The treatment facility site on the UVic Fields is nearly flat, having been graded during construction of a rugby pitch. The lands surrounding the UVic Fields site are served by District of Saanich or University of Victoria storm drains. There are no surface water features or drainages on the UVic Fields site. Rainfall percolates into groundwater or flows into adjacent storm drain facilities.

A nearby resident stated that the UVic Fields site is characterized by poor drainage, and that springs or near-surface water table conditions are found on the site. No field investigations have been conducted to characterize groundwater conditions.

Ancillary facility conditions

The forcemain and gravity main connecting the UVic Fields site to the pump station on Arbutus Road would parallel Saanich roadways. No natural runoff channels are located in this area. A roadside ditch along Arbutus Road collects runoff from adjacent properties and the road itself. The area needed for the pump station would be small (0.16 ha), and would be located near the lowest elevation of the Finnerty-Arbutus site.

Impacts and mitigation measures

Treatment facility construction. Excavation of land to accommodate the treatment facility would cause ponding of groundwater and runoff during wet weather. Such water often has high levels of suspended solids that can contribute to pollution of offsite drainage courses.

If ground water levels are high or if springs are present, pumping would be needed to remove excess water from excavated areas. Infiltration of this drainage water may be infeasible if the ground is saturated.

> Mitigation measures. Settlement ponds or filtration methods should be used to reduce suspended sediment in water removed from treatment facility excavations. Above-ground ponds would be needed if the soil is saturated from springs or high water tables on the site.

The duration of potential construction stage impacts on water quality would be limited to periods of wet weather. This impact is occasional, medium-term, and reversible, and would affect only the area where drainage water would be discharged. The magnitude of the impact is considered low, unless springs are present, in which case the effects could be moderate. The impacts can be mitigated with standard construction practices, the effect on hydrology and water quality would be **less than significant**.

Treatment facility operation. The treatment facility would increase the impervious surface of the UVic Fields site. Infiltration of roof and perimeter drainage would reduce the affect on groundwater and offsite runoff. Few or no effects on water quality are expected.

No discharges of wastewater from the treatment facility to storm drains would occur. Chemicals used in the wastewater treatment process would be stored in secure structures.

> Mitigation measures. No additional mitigation measures are needed aside from stated design specifications and standard operating procedures for CRD wastewater treatment facilities.

Operation of the facility would not affect hydrology or water quality. The magnitude of operational effects on hydrology and water quality is considered low, and the effects would be **less than significant**.

Ancillary facility construction. Construction of the forcemain and gravity main to serve the UVic Fields site would require excavation along the north side of McKenzie Avenue, then down the right-of-way of Finnerty and Arbutus roads. Neither this construction, nor the construction of the pump station at the Finnerty-Arbutus site, nor the gravity main to the outfall are expected to disrupt drainage courses.

During construction, runoff captured by open pipe trenches or the pump station excavations would be managed on or near the disturbed areas. Runoff would be infiltrated or detained in ponds. Suspended sediment in the runoff would be settled out in detention ponds before discharge to District of Saanich storm drains or ditches.

> Mitigation measures. Standard construction management actions of runoff infiltration or storage should be adequate to mitigate the potential hydrology or water quality effects of ancillary facility construction.

Hydrology and runoff effects of ancillary facility construction would affect the project footprint and, potentially, downstream drainages. The duration of potential effects would be short- to medium-term, depending on the length of the construction interval, and would be an occasional effect. Potential effects would be reversible, of low magnitude, and **less than significant**.

Ancillary facility operation. Once the pipes and pump station are constructed, operation of the ancillary facilities should have little effect on hydrology or water quality. Most of the pipes would be beneath road surfaces or in road rights-of-way, and would not contribute to erosion or runoff in the area. The pump station footprint is small and, with onsite infiltration, would not affect hydrology or water quality.

> Mitigation measures. Standard operating procedures should be sufficient to mitigate hydrology or water quality risks associated with the project.

No hydrology or water quality impacts are expected to be associated with ancillary facilities that support a treatment facility at the UVic Fields site. Impacts, therefore, are considered to be of negligible magnitude and to be **less than significant**.

Vegetation

Treatment facility site conditions

The University of Victoria Fields candidate site occurs in a previously disturbed area that is currently a non-native grassy field. The area does not contain sensitive ecosystems, ecosystems at risk, or plant species at risk.

Ancillary facility conditions

The proposed sewer trunk right of way associated with the University of Victoria Fields site follows existing roads and rights of way, and does not require clearing of sensitive ecosystems, ecosystems at risk, or plant species at risk.

A pump station would be required for the sewer trunk and outfall, and is proposed to be placed on the Finnerty-Arbutus property. For a detailed description of the vegetation on this property, refer to Vegetation in Section 8.3.

Table 9-1 summarizes the presence of plants and plant communities on the University of Victoria Fields site and ancillary facilities.

Table 9-1 Sensitive vegetation resources on or near the UVic Fields site and associated ancillary facilities

Presence of sensitive vegetation resources	Site	Trunk-Outfall	Pump Station
Presence of sensitive ecosystems:			
• older forests or mature forests	No	No	Yes
• second growth forests	No	No	Yes
• native grasslands/shrub/herb communities	No	No	No
• Garry Oak Woodland communities	No	No	No
• coastal bluffs	N/A	No	N/A
Presence of ecosystems at risk			
• ecological communities on Conservation Data Centre Red or Blue lists	No	No	Yes
• ecosystem types identified by Sensitive Ecosystems Inventory	No	No	No
• areas identified as environmentally sensitive by local governments	No	No	Yes
Presence of aquatic or riparian ecosystems			
• seasonal or permanent watercourses (streams, creeks, rivers, ditches)	No	No	Yes
• seasonal or permanent wetlands, seepage areas, or vernal pools	No	No	No
• riparian ecosystems beside these aquatic ecosystems and vegetated gullies	No	No	No
Presence of plant species at risk and their habitats			
• species at risk identified by COSEWIC	No	No	No
• species on provincial Red and Blue lists	No	No	No
• regionally significant species	No	No	Yes
• habitats for any of these species	No	No	Yes

Impacts and mitigation measures

Treatment facility construction. Site preparation and construction of the treatment facility on the University of Victoria Fields site would not involve clearing of any sensitive vegetation types, rare plants, or plant communities. No effects on vegetation are anticipated with these activities and therefore impacts are considered **less than significant**.

Treatment facility operation. No effects of treatment facility operation on vegetation are anticipated and therefore impacts are considered **less than significant**.

Ancillary facility construction. No vegetation clearing is anticipated for the construction of the sewer trunks, outfall, and associated piping.

Forest clearing would be required for the construction of the pump station at the north eastern corner of the Finnerty-Arbutus site. The total footprint size is approximately 0.16 ha, though additional forest clearing may be required for temporary work space and to meet Work Safe British Columbia rules. The forest clearing would involve removal of mature Douglas fir, arbutus, and bigleaf maple trees. Indirect losses of mature trees and shrubs caused by windthrow, soil compaction and project-related changes to site drainage can also be expected. The clearing would occur in an area where a small ephemeral drainage meets the roadside ditch.

> Mitigation measures. To reduce the potential impact of forest clearing to accommodate the pump stations, alternate locations for the pump station on previously cleared land could be explored. If relocating the pump station is not possible, compensation measures can be considered by the CRD. These may include restricting the cutting of trees on the remainder of the site via covenant, aggressive invasive plant management, and restoration to native plant cover.

The duration of the effects of vegetation clearing for the construction of a pump station at the Finnerty-Arbutus site are long-term, and not reversible. The magnitude of the adverse effect of vegetation removal is high, resulting in a rating of **significant**.

If compensation measures were implemented, the magnitude of constructing a pump station on the Finnerty-Arbutus site could be reduced to moderate. As the impacts of constructing a pump station at the Finnerty-Arbutus site cannot be mitigated, the effect on vegetation would remain **significant**.

Ancillary facility operation. No effects of ancillary facility operation on vegetation are anticipated and therefore impacts are considered **less than significant**.

Wildlife

Treatment facility site conditions

The University of Victoria Fields site is located on a previously cleared property that is not thought to contain any wildlife species at risk, their habitats, or habitat features.

Ancillary facility conditions

The proposed sewer trunk and outfall associated with the University of Victoria Fields site would be installed in existing road beds and rights of way, which are not thought to contain any wildlife species at risk, their habitats, or habitat features.

A pump station would be required for the sewer trunk and outfall, and is proposed to be placed on the Finnerty-Arbutus property. For a detailed description of the wildlife and wildlife habitat on this property, refer to Wildlife in Section 8.3.

Table 9-2 summarizes the presence of wildlife and wildlife habitat on the University of Victoria Fields site and ancillary facilities.

Table 9-2 Environmentally valuable wildlife on or near the UVic Fields site and associated ancillary facilities

Presence of sensitive wildlife	Site	Trunk-Outfall	Pump Station
Presence of wildlife species at risk and their habitats:			
• species at risk identified by COSEWIC	No	No	No
• species on provincial Red and Blue lists	No	No	None detected
• regionally significant species	No	No	Yes
• habitats for any of these species	No	No	Yes
Presence of important wildlife habitat features:			
• wildlife trees, snags, mature, large-limbed trees	No	No	Yes
• rotten logs and other woody debris	No	No	Yes
• man-made habitat enhancements	No	No	No
• hedges and shelterbelts	No	No	Yes
• groundwater springs and seepages	No	No	No
Evidence of wildlife use:			
• wildlife corridors	No	No	Yes
• deer habitat	No	No	Yes
• potential raptor nest site	No	No	Yes
Nearby presence of protected areas or habitats	No	No	No

Impacts and mitigation measures

Treatment facility construction. Clearing and construction of the University of Victoria Fields site would not disturb any wildlife habitats or habitat features. No impacts are expected, so impacts are considered **less than significant**.

Treatment facility operation. No effects on wildlife of operating a wastewater treatment facility at the University of Victoria Fields site are anticipated, so impacts are considered **less than significant**.

Ancillary facility construction. No clearing of wildlife habitat is anticipated for the construction of the sewer trunks and associated piping.

Habitat disturbance due to the construction of the pump station in the Finnerty-Arbutus site would result in a loss of mature second growth forest. The area to be cleared would include the approximately 0.16 ha footprint of the pump station, plus any additional construction-phase temporary workspace. Removal of danger trees, which are often wildlife trees, may be required within 1.5 tree lengths (approximately 45 m) of the candidate site under Work Safe British Columbia regulations.

Removal of forested habitats typically affects wildlife in the following ways:

(a) incremental loss of thermal and security habitat and habitat features (*i.e.*, canopy cover);
(b) incremental loss of reproductive habitat and habitat features (*i.e.*, nest trees);
(c) direct mortality during clearing activities;
(d) sensory disturbances associated with the clearing and construction activities.

Mitigation measures. To reduce the potential forest clearing impacts and subsequent wildlife habitat losses, alternate locations on previously cleared land across the road could be explored. If moving the pump station facility is not possible, compensation to enhance habitat values in nearby green spaces could be considered. For example, removal of invasive plant species could increase the habitat quality for ground nesting birds and small mammals, which are also important foods for raptors in the area.

Direct mortality and effects of construction related sensory disturbances during the removal of forest could be reduced through timing work to avoid the nesting bird season (March 15 to July 31).

There would be a loss of wildlife habitat and habitat features at the Finnerty-Arbutus site to accommodate the pump station. The effects on wildlife would occur in the pump station footprint and associated workspace. The duration of the effects on wildlife habitat is long-term, and not reversible. The magnitude of the effects on wildlife associated with clearing the forested areas is high, resulting in a rating of **significant**.

If compensation measures were implemented, the magnitude of constructing a pump station on the Finnerty-Arbutus site could be reduced to moderate. As the impacts of constructing a pump station at the Finnerty-Arbutus site cannot be mitigated, the effect on wildlife would remain **significant**.

Ancillary facility operation. No effects on wildlife of operating ancillary facilities associated with the University of Victoria Fields site are anticipated, so impacts are considered **less than significant**.

Archaeology and heritage

Treatment facility site conditions

This property was historically farmed. There are several Second World War army buildings located to the east of the candidate site. Some of these structures, including the Gordon Head Army Camp east of Wallace Field, and the Maritime-Naval Communications Centre, south of Wallace Field, are on the District of Saanich Heritage Register, though they lack protection under the *British Columbia Heritage Conservation Act*.

The area of the playing fields has been extensively disturbed by agricultural and construction activities. Construction or agricultural fill may have been deposited and levelled on the property in the past. Remains of fill piles that line the eastern boundary of the property are now covered with shrubs.

No evidence of archaeological materials, features, or sites was noted on the property during field reconnaissance. The area is deemed to have low archaeological potential.

Ancillary facility conditions

Most of the wastewater and effluent pipes associated with the University of Victoria Fields site occur in existing road ways or other previous linear disturbances. The archaeological potential of these corridors is low. Archaeological potential exists near small topographic features such as knolls or ridges, and near the shoreline at Finnerty Cove.

This site would also require construction of a pump station at the Finnerty-Arbutus site. Archaeological potential has been identified at the pump station site location (Millennia Research Ltd. 2008).

Impacts and mitigation measures

Treatment facility construction. The University of Victoria Fields site has low potential to contain buried archaeological deposits or features, due to past land altering activities (agriculture) and construction of playing fields. It is unlikely that construction at this site would cause any effects on archaeological or heritage resources.

Treatment facility operation. The activities that affect archaeological and heritage resources are likely to occur during, and be limited to, the construction phase of the project. It is unlikely that facility operation would affect archaeological or heritage resources, so impacts are considered **less than significant**.

Ancillary facility construction. The ground disturbing activities, including excavation and trenching, associated with constructing ancillary facilities have the potential to damage, displace,

or destroy buried archaeological materials and sites. The potential for this effect is greatest in the upper Hobbs Creek area and near the shoreline of Finnerty Cove. Road rights-of-way, where most of the ancillary facility pipes would be installed, are unlikely to contain undisturbed archaeological remains. Ground disturbance also has the potential to affect buried archaeological materials at the Finnerty-Arbutus pump station location. Construction of ancillary facilities may result in the permanent loss or alteration of archaeological or heritage resources.

> Mitigation measures. If the University of Victoria Fields site is chosen as a future treatment facility, an Archaeological Impact Assessment (AIA) would be conducted in areas along the pipe corridor and pump station site that have high archaeological potential in advance of ground disturbing activity. Archaeological mitigation plans would be based on results of the AIA.

A detailed assessment of effects of construction on archaeological resources would be completed after a site has been chosen, as part of an AIA. Assessments and mitigation would comply with the *British Columbia Heritage Conservation Act*. Mitigation would provide reasonable compensation for the removal, loss, disruption, modification, or alteration of archaeological and heritage resources as a result of the project.

Ancillary facility operation. The activities that affect archaeological and heritage resources are likely to occur during, and be limited to, the construction phase of the project. It is unlikely that facility operations would affect archaeological or heritage resources, so impacts are considered **less than significant**.

Community

Treatment facility site conditions

The UVIC fields site includes Wallace Field and three other grassy areas at the northern boundary of the UVic campus, bordered by a residential and institutional area.

Wallace Field is the home field for the University of Victoria men's and women's rugby teams and is used throughout the year. The field is well drained and in excellent condition. The field is used only for varsity rugby.

The northwest and northeast fields (Photo 9-1) are in poor condition, and are not extensively used for formal recreation activities, although used by local area residents. The "south field" is a triangular grassy area with no current use identified. UVic representatives have identified a shortage of field space on the campus and recently released conceptual plans to redevelop the fields for recreational use.

The study area includes two sites identified on the Saanich Heritage Register, including the Gordon Head Army Camp 220 m east of proposed treatment facility footprint, and the Maritime-Naval Communications Centre, 35 m east of the footprint.

Photo 9-1 UVic Fields site

Adjacent Land Uses

Residences are located adjacent to the UVic fields study area in the west, southwest, and north (Figure 9-1). The treatment facility footprint would border residential property with detached dwellings to the west, and attached dwellings to the north and southwest.

The study area is located at the northern extent of the UVic campus, across McKenzie Avenue from UVic's natural grass and artificial turf sports fields. A parking lot and UVic buildings are located east of the study area approximately 200 m from the footprint. The treatment facility footprint is 200 m from Mount Douglas High School.

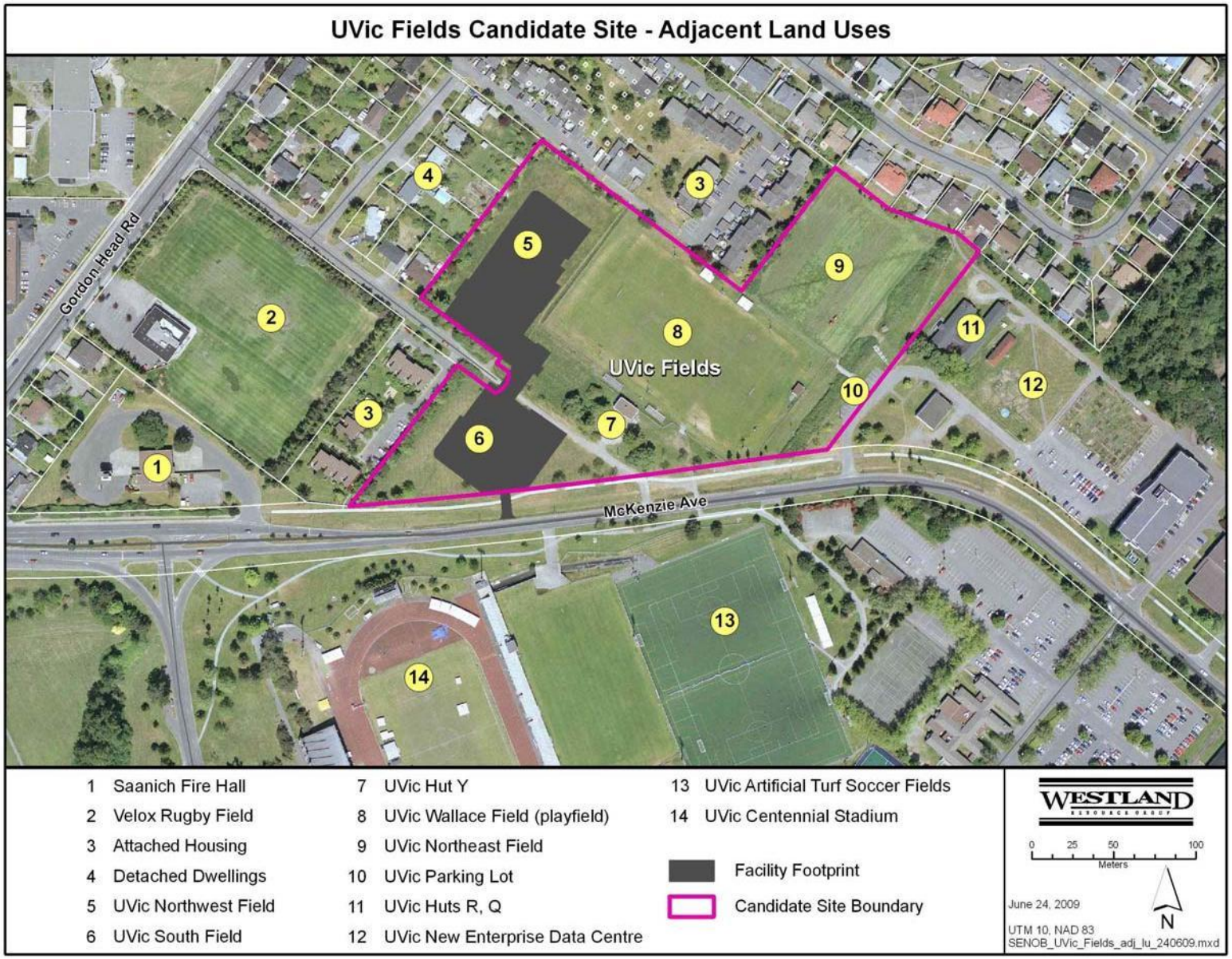

Figure 9-1 Adjacent land uses at UVic Fields site

Compatibility with planned land uses

Construction of the treatment facility on the site would conflict with UVic conceptual plans for the site. UVic representatives have expressed concern about the potential displacement of playfields, at a time when UVic is seeking additional field space for students and faculty.

The UVic Campus Plan states that expanding outdoor recreation opportunities would require "a combination of strategies, including the renovation of Wallace Field, additional land purchases, and possible use of sections of the CJVI property" (University of Victoria, 2003). Discussions with UVic representatives confirmed redevelopment interests in the study area.

According to UVic representatives, the northeast field is in poor condition. The field is 90 m by 70 m and considered just large enough for a soccer field, although the length of 90 m is marginal. Conceptual plans identify the development of a rugby training area on the field The northwest field is approximately 120 m by 65 m. UVic has identified that these dimensions are suitable for a soccer field, although the width is quite narrow.

The "south field" is a triangular grassy area. Conceptual UVic plans identify an interest in developing tennis courts on the site.

The facility footprint is located in the District of Saanich. The OCP designation is "Institutional" and the zoning is P1-U, University Zone.

Ancillary facility conditions

Ancillary facilities required to operate the treatment facility on the UVic Fields site include a gravity main, a forcemain, and a small diameter pressurized pipe. Because the Cedar Hill Corner site is at a higher elevation from the East Coast Interceptor main, a treatment facility on the candidate site would require the construction of a pump station on the Finnerty-Arbutus site to pump wastewater to the facility.

The gravity main would be routed under McKenzie Avenue, Finnerty Road, Arbutus Road, across the Queen Alexandra Foundation field, in an existing right-of-way across a residential property, under Alpine Crescent, Haro Road, Monarch Place, and in an existing right-of-way across four detached residential properties. The forcemain would be in a similar alignment, but constructed from the Finnerty-Arbutus pump station to the UVic Fields site.

The small diameter pressurized pipe would be constructed from the existing Penrhyn pump station to the Finnerty-Arbutus site under existing roads, including, Penrhyn, Hobbs, Maynard, Rowley Streets, and Arbutus Road.

Impacts and mitigation measures

Treatment facility construction

Community use. During the treatment facility construction phase, community use of the northwest and south fields, and in project workspace around the active construction area would be restricted. A heavily used bike path and pedestrian route would be disrupted. Informal recreation use is known to occur on the treatment facility footprint by nearby residents.

> Mitigation measures. Opportunities for recreation activities would exist on the portions of the UVic Fields site outside of the treatment facility footprint and workspace during the construction phase. Play fields are also located across McKenzie Avenue on the UVic campus. Signage and newspaper advertisements would be used to inform community users of the construction schedule and portions of the site that may have access restrictions. A safe alternative route would be sought to provide continued access for pedestrian and bike traffic.

Construction of the treatment facility would occur on the treatment facility footprint and workspace over a 18 to 24 month period. During the construction period, recreational activities would be limited in the active construction area. The construction work space, outside of the treatment facility footprint would only be used during the construction period, representing a reversible impact. Even with alternative areas for community recreation, the proximity of the proposed treatment facility footprint adjacent to residences, and the known informal recreational activities on the site, the impact is considered to be high magnitude over the construction phase, medium-term, local in extent, and **significant.**

Noise and vibration. The treatment facility would be constructed adjacent to residential properties on McCoy, Maria, and Dawnview Roads. Construction of the treatment facility would involve the use of heavy machinery, compressors, pumps, concrete pouring equipment, and other equipment to prepare the site and build the treatment facility. During the construction period, noise and vibration impacts would affect local residents and UVic users. Peak construction activity would occur in the first 9 months during excavation and concrete pouring, however, the project is expected to take 18 to 24 months to complete. After the 9-month peak construction activity has occurred, the construction activities would be similar to the construction of utility or industrial buildings. Construction activities would comply with the District of Saanich noise bylaw for hours of work and noise levels. Work would usually occur on weekdays from 7 am to 5 pm with no work on Saturdays, Sundays or holidays (except in an emergency or where a critical piece of work must be completed in a specified work window).

> Mitigation measures. Discussions would be undertaken with UVic representatives and neighbouring residents during project planning and prior to construction to confirm noise mitigation measures, and construction hours.

Residents would be advised of work periods during which abnormal vibration conditions may occur.

Noise and vibration impacts would be concentrated during the 9-month peak construction, but may occur over the 18 to 24 month construction phase. Therefore impacts are expected to occur in the local area over the medium-term. The proximity of residences to the treatment facility footprint would result in a high magnitude impact, that is reversible post-construction, but is considered **significant.**

Dust and air emissions. Construction of the facility could result in air quality impacts on adjacent residents due to dust and exhaust emissions.

Mitigation measures. The CRD Code of Practice for "Construction and Development Activities" would be used to mitigate dust and air emission impacts during construction of the treatment facility. Additional dust control plans may be required after discussion with local residents. Monitoring would occur throughout the construction period to reduce effects on adjacent property owners. When transporting soil that could create dust nuisances, trucks would have box covers to reduce releases.

Dust and air emission impacts from the construction of the treatment facility on the UVic Fields are expected to occur during the medium-term construction period. The treatment facility would be constructed adjacent to residential properties, and even with the use of mitigation measures the impact is considered high in magnitude, reversible, and **significant.**

Traffic. The construction of the treatment facility would require the delivery of equipment and supplies, and the movement of workers to the site along McKenzie Avenue.

Mitigation measures. A traffic management plan would be prepared to address traffic disruptions, truck traffic, and access maintenance to UVic, and residences during construction. Flag persons would direct vehicles and pedestrians around the active construction site. Construction drivers would observe speed limits and exercise extreme caution near schools and other sensitive areas. Ongoing communication with District of Saanich, UVic, and local residents, would be undertaken to minimize traffic impacts.

Traffic effects may occur throughout the entire treatment facility construction phase, but the peak construction period would have higher truck volumes. McKenzie Avenue is a designated truck route, but the treatment facility would be constructed on a field near to a residential neighbourhood. With the development and implementation of a traffic management plan, traffic effects are expected to be moderate in magnitude, reversible, and **less than significant.**

Treatment facility operation

Community use. Construction of the treatment facility on the UVic Fields site would reduce the field area available for UVic recreation, community use, and conflicts with UVic conceptual redevelopment plans. Construction and operation of the treatment facility would occupy the northwest and south fields, precluding future use as proposed by UVic.

> Mitigation measures. The northeast field would remain available for redevelopment as being considered by UVic. Discussions between UVic and CRD should continue to identify ways to mitigate the loss of field space and reach appropriate accommodation.

With an agreement between UVic and CRD, and alternative areas available for informal recreation, land use effects would be considered moderate in magnitude, local in extent, long-term, not reversible, but **less than significant.**

Odour. Operation of a treatment facility on the UVic Fields site, under certain conditions could generate odours that would be noticeable by local residents. The treatment facility would be designed to minimize operational odour. Typical operation of the treatment facility would result in no detectable odour at the treatment facility boundary.

Annual maintenance would be conducted in during breezy weather, minimizing risk of odour impacts. However, odour could be detectable in some instances.

In rare cases of equipment malfunction, odours impacts of unknown magnitude and duration could affect the local area. The season and prevailing winds direction patterns at the time would determine the potential effects. If a malfunction occurs, odours would be most noticeable during calm weather conditions, when wind would not provide mixing and dispersion of odours.

> Mitigation measures. The odours released during facility operation could be reduced by ensuring that a backup system is installed. Backup treatment could be provided during routine maintenance or in response to mechanical failure. This mitigation would reduce the magnitude of impact of maintenance or malfunctions to low under all circumstances.

Odour effects are considered long-term, even though individual events would be short-term, perhaps measured in hours or days. If odour impacts do occur, they are most likely to affect the local area near to the facility, and would be reversible, high magnitude, and **significant** . With the application of a backup odour control system, the odour impacts could be reduced to low magnitude, reversible, and would be **less than significant**.

Noise, vibration, and lighting. Operation of the treatment facility would generate noise, vibration, and lighting issues. The treatment facility would be located adjacent to residential properties. Noise generating equipment would include:

- air-driven pumps,
- compressors,
- fans and blowers,
- diesel driven pumps, and
- standby diesel power generators.

The treatment facility would be designed not to exceed 45 dB and 55 dB at the edge of the facility footprint, during the evening and day respectively. Operation of the treatment facility would also comply with zoning regulations. Sound attenuation would be installed in the buildings housing the units and on diesel engine exhaust to ensure that decibel levels remained below 45 dB at the property line, to meet the local municipal bylaw requirement, and to meet WCB/OSHA criteria for worker safety. All noise-generating equipment would be installed in soundproof rooms to meet these requirements.

All equipment that could create vibrations would be installed inside structures. Because the wastewater systems to be used at the treatment facilities do not include excessive vibrating equipment and are typical of current operating systems found elsewhere, vibration issues are not anticipated and, if they occur, can be fixed.

The lighting plan for the UVic Fields facility is expected to include normal post top sodium vapour lighting standards similar to those on residential streets. If night work is required, higher intensity lamps may be needed. All lighting would be directed downward and would have shields installed to prevent lighting of the night sky and local residences.

In accordance with corporate activities for environmental sustainability, facility planning would incorporate energy efficiency and BC Hydro power smart initiatives and the applicable Leadership in Energy and Environmental Design (LEED™) standards for green buildings. For example, LED lighting that uses low energy and emits low UV light could be specified.

> Mitigation measures. Appropriate design would be used to reduce noise, vibration, and lighting effects. The proximity of the site to residences would be expected to introduce an impact of moderate impact either continuously or occasionally over the long-term. Such effects may be reversible. The risks of noise, vibration, or lighting effects are considered sufficiently high that the impacts are considered **significant.**

Traffic. Operation of the treatment facility would require the removal of screenings and grit from the site by truck. Transporting screenings and grit to Hartland landfill would require one truck every five to six days. Truck movements would be timed to avoid sensitive time periods, such as weekends. Trucks would be enclosed to limit odour impacts.

Mitigation measures. Standard procedures are sufficient to minimize impacts.

The removal of screenings and grit would be a long-term impact, that is not reversible, but is considered negligible in magnitude due to the low volume of operational truck traffic. The impact is **less than significant.**

Ancillary facility construction

Noise, vibration, dust, and community use. An expanded network of pipes and a pump station would be required to support the operation of the treatment facility, as described in the project description. Construction of ancillary facilities would introduce noise, vibration, dust, and land impacts.

Construction of the pump station on the Finnerty-Arbutus site would introduce impacts similar to those discussed in the assessment of the Finnerty-Arbutus treatment facility. The pump station footprint would be small than a treatment facility, but many of the same issues related to dust, noise, vibration, and traffic would exist. The mitigation measures for constructing the pump station would be similar to those that would be used to construct a treatment facility.

Ancillary facility construction would be conducted in accordance with local municipal bylaws to minimize noise and vibration disturbance. Dust control measures, including the use of box covers on trucks, the application of CRD codes of practice, and a dust management plan would be used to reduce effects on residents and land users.

Mitigation measures. During the construction period, activity would be limited near the active construction area. CRD representatives will work with UVic and District of Saanich, and community groups to minimize impacts of constructing the ancillary facilities through residential neighbourhoods, and along residential streets.

With the application of approved mitigation measures, the impacts of pipe construction under roads are considered short-term in duration, and reversible, similar to other public road projects. The magnitude of the effect is considered moderate, short-term, and of local extent. The impacts of pipe installation can be mitigated and are considered **less than significant**. However, construction of the pump station on the Finnerty-Arbutus site would cause medium-term land disturbance and community use impacts that are considered to be high magnitude. Until recently, the Finnerty-Arbutus site was privately held and recreational use was not encouraged, but still occurs so the impacts are considered **significant.**

Traffic. Impacts during the ancillary facility construction phase would be related to delays, detours, and temporary changes in traffic volumes through residential neighbourhoods.

> Mitigation measures. A traffic management plan would be developed for the construction period. CRD representatives will work with municipal planners, land owners, and community groups to inform them of the project schedule.

The development and implementation of a traffic management plan would help to reduce traffic effects of the project. The impacts are considered to be short-term, reversible, low to moderate in magnitude, and **less than significant.**

Ancillary facility operation

Community use. Limitations would exist over the types of development that are permitted in existing and new rights-of-way and at the Finnerty-Arbutus property, outside of the pump station footprint, and public access would be restricted on the pump station footprint. Generally, the construction of permanent structures by land owners is not permitted in the right-of-way.

> Mitigation measures. Where new rights-of-way are required, CRD will reach an agreement with landowners, mitigating future land development limitations in the right-of-way. The CRD would communicate with property owners whose land would be crossed in existing rights-of-way to reduce potential impacts. Community input, regarding the desired future land use for the remaining portions of the Finnerty-Arbutus site would be encouraged

With agreements established between the CRD and property owners securing rights-of-way, and communication with property owners whose lands would be crossed by the ancillary facilities, the long-term impact is not reversible, but low in magnitude. Community input as to the future use of the remainder of the Finnerty-Arbutus site would help to offset the potential impacts of constructing a pump station, which are considered long-term, not reversible, and of moderate magnitude, and **less than significant**.

Noise, vibration, and lighting. The operation of treatment facility at the UVic Fields would require a pump station on the Finnerty-Arbutus property. The pump station would generate noise and vibration, and could require on-site lighting.

> Mitigation measures. The pump station would be designed to generate limited noise and vibration outside of the pump station building. If required, lighting on the site would be directed to minimize disturbance.

With appropriate facility design, focussed on limiting noise, vibration, and lighting effects, the impacts would be considered low magnitude, long-term, not reversible, but **less than significant.**

Odour. The operation of the pump station has the potential to generate odour. However, the pump station would be designed to have no detectable odour at the treatment facility boundary during normal operation.

The potential for odour impacts may exist during annual odour control maintenance or during equipment failure. In rare cases of equipment malfunction, odour impacts of unknown magnitude and duration could affect the local area. The season and prevailing winds direction patterns at the time would determine the potential effects.

> Mitigation measures. An odour control back-up system would be designed to avoid releases of noticeable odour during maintenance and malfunctions.

Under normal facility operations, odours would not be detectable beyond the project footprint. Some odour releases could occur during annual maintenance or if equipment malfunctions, but these effects would be reduced through the use of a back-up system. Because of the proximity of homes to the conceptual location of a treatment facility on this site, occasional low-magnitude releases of odour may be noticeable. Potential odour effects are considered long-term, even though individual events would be short-term, perhaps measured in hours or less. Impacts are reversible, of low magnitude, and **less than significant**.

Traffic and roads

Treatment facility site conditions

The University of Victoria Fields site is located northeast of the McKenzie Avenue - Gordon Head Road intersection in an area currently used for UVic athletics in the District of Saanich. Access to the site would be via McKenzie Avenue, which is an arterial road and a designated truck route (Figure 7-2).

The initial traffic impact assessment for this project examines the volumes and types of vehicular traffic; road classification; proximity to designated truck routes; alternative modes of transportation; accident history; transit service; and impact on existing traffic from construction and installation of pipes underneath existing road surfaces.

These factors are considered for the following periods for this project:

- 2009 Present Conditions,
- 2010 – 2012 Construction of Phase 1 facility,
- 2030 Operation at full capacity of Phase 1 facility,
- 2030 – 2032 Construction of Phase 2 or expanded facility, and
- 2065 Operation at full capacity of expanded facility.

When considering the potential routing(s) to and from the site, designated truck routes are used where possible as well as the shortest route to designated truck routes. The UVic Fields site would be accessed from McKenzie Avenue. This road is classified as an arterial road and is a designated truck route.

Ancillary facility conditions

The ancillary facilities consist of the gravity main and outfall from the site, the Arbutus Road pump station, and the forcemain between the pump station and site. Most of the length of these facilities would be underneath existing roadways such as McKenzie Avenue, Finnerty Road, Alpine Crescent, and Monarch Place (Figure 3-8).

Impacts and mitigation measures

Data were obtained from the District of Saanich and the Capital Regional District. The existing volumes on the road links to the facility are illustrated in Table 9-3. This table shows the current traffic volumes in vehicles per day (vpd) and vehicles per hour (vph) for the PM Peak Hour period for each road link. An assumed growth rate of 1% per annum was used to forecast these traffic volumes to 2030, when the second phase of construction is scheduled to begin. Traffic volumes for 2065 were not forecast as there are too many uncertainties related to future transportation technologies, infrastructure, travel modes, and modal shares.

Table 9-3 Daily and PM peak hour traffic volumes for the access route to the UVic Fields site

Road Name	Characteristic	Units	2009	Volumes	2030	Source
McKenzie Ave	Traffic - vehicular volumes	Vehicles per day (vpd)	12,500	vpd	15,405	Municipal, CRD
		Vehicles per hour (vph) - PM Peak	1,300	vph	1,602	

As arterial roads are expected to carry traffic volumes in the range of 10,000 to 30,000 vpd, McKenzie Avenue would have no capacity limitations for the forecast growth in background traffic.

Treatment facility construction. The forecast trips for the construction and operation of the candidate site for Phases 1 (2010) and 2 (2030) are shown in Table 9-4 as average trip rates per day (vpd) with an assumed 240 workdays per annum.

Table 9-4 Forecast vehicular volumes for Phases 1 and 2 construction of the UVic Fields facility

CONSTRUCTION TRAFFIC			
YEAR 2010		**Duration**	**Average two-way trips (vpd)**
Actvities	Clearing/Grubbing/Aggregates	3 months	10 trucks
	Excavations	7 months	8 trucks
	Concrete	9 months	5 - 6 trucks
	Steel	9 months	1 truck / week
	Equipment, materials	24 months	1 truck / week
	Workers	24 months	50 cars
YEAR 2030			**Average two-way trips (vpd)**
Actvities	Clearing/Grubbing/Aggregates	1 month	5 trucks
	Excavations	3 months	6 trucks
	Concrete	4 months	4 - 5 trucks
	Steel	4 months	1 truck / week
	Equipment, materials	24 months	1 truck / week
	Workers	24 months	30 cars

The construction of Phase 1 in 2010 to 2012 is forecast to generate approximately 75 two-way vpd for the candidate site decreasing to approximately 45 two-way vpd for Phase 2 construction in 2030 to 2032.

Mitigation measures. Construction traffic safety mitigation measures are presented in the Public Health and Safety section of this ESR. An important traffic issue would be the parking requirement for construction workers driving to and from the site. If the clearing and grubbing stage can create enough parking on-site for all construction workers then there would be negligible impact. If there is not enough space to accommodate all the parking on-site, it is recommended that van-pooling, ride-sharing and park and ride programs be developed to reduce the number of trips or that additional parking be developed elsewhere.

The Phase 1 construction traffic of 75 vpd represents an increase of traffic of 0.60% on McKenzie Avenue respectively over current volumes. Increases in the range of 1% are considered negligible. The 45 vpd construction trips associated with Phase 2 construction are all well below 1% and as such are considered negligible. The spatial impact would be local and of medium-term duration. While the traffic would be continuous over the construction period, it can be reduced by creating parking areas elsewhere, resulting in a rating of **less than significant**.

Treatment facility operation. As shown in Table 9-5, the number of site-generated trips for the operation of the candidate site is quite small and when compared to the existing and forecasted vehicular trips on the road links in the preferred routing, these trips would have a negligible impact. The preferred routing is identified to accommodate truck traffic during construction and

the need to used designated truck routes. Operations staff would not have to use this particular route, and their distributed travel would reduce the impact even further.

Table 9-5 Forecast vehicular volumes for Phases 1 and 2 operation of the UVic Fields facility

OPERATIONAL TRAFFIC			
YEAR 2030			**Average two-way trips (vpd)**
Activities	Truck Loads		
		Screenings / Grit	1 truck / week
		Chemical	8 - 9 trucks / year
	Employees		12 cars
YEAR 2065			**Average two-way trips (vpd)**
Activities	Truck Loads		
		Screenings / Grit	1-2 trucks / week
		Chemical	1 truck / month
	Employees		15 cars

Mitigation measures. No mitigation measures are required.

Staff may be spread over the regional area, and while the event would be continuous, the magnitude of the effect is negligible, has no residual effect and the resulting rating is **less than significant**.

Ancillary facility construction. Ancillary facility pipes would be buried in the road corridor, most probably underneath the travel lanes, using cut and cover methods.

Construction would disrupt vehicular traffic on affected routes. The extent and severity of disruption would be a function of the traffic volumes and available opportunities to keep some lanes open or to reroute traffic. All the roads potentially effected by the construction of ancillary facilities are two-lane, so it is assumed that one lane could remain open and alternating directions of traffic utilize the remaining lane.

Mitigation measures. Standard procedures for managing vehicular traffic in a construction zone would be implemented which would result in one lane remaining open to alternating directions of traffic. Construction could be restricted to single blocks at a time and scheduled outside of peak periods of vehicular activity.

The impact would be local, of short-term duration and continuous during the construction period**.** Considering volumes of traffic affected, the result is a moderate impact on the local, collector, and arterial routes. One-way alternating traffic would be permitted, resulting in a rating of **less than significant**.

Ancillary facility operation. There would be no impact from the operation of the ancillary facilities as all of the piping would be underground.

> Mitigation measures. Road surfaces would be restored to operational standards and no additional mitigation measures are required.

While the impact would be local in nature and continuous, there would be no measurable residual effect and as such the rating is **less than significant**.

Public health and safety

Impacts and mitigation measures

Treatment facility construction. Noise and dust generated during construction could have health effects on adjacent residents. Dust control measures would be employed to limit creation of dust during ground-disturbing activities. Wind transport of dust to adjacent residential properties to the west and north of the site is possible.

During construction, the greatest safety risk would result from vehicles on roads and heavy equipment operation on the site. Automobiles, pedestrians, and cyclists entering and leaving the University of Victoria via McKenzie Avenue may experience delays and an increased safety risk. The McCoy Road bicycle path would probably be closed during construction. With the use of flaggers and signage, the risk to the public from vehicle movement can be minimized. The construction site would be fenced to prevent unauthorized public access. Flaggers would be present during school hours to further limit access to the site and protect travellers from construction traffic.

> Mitigation measures. Nearby residents would be notified before disruptive construction activities occur. The project contractor would communicate regularly with managers of the University of Victoria to discuss construction activities and the potential for disruption of university activities. Dust impacts to nearby residences should be monitored during construction and appropriate actions taken to control dust transport from the construction site.
>
> No special access or traffic control measures are needed, beyond those that are applied as part of standard construction practice for projects of this nature.

The potential health and safety effects of construction would be temporally limited to the construction interval, and are considered medium-term. Spatially, the health and safety risks are greatest at the perimeter of the worksite, and are low elsewhere. These impacts are reversible. Safety impacts are considered to be of low magnitude, and health effects are considered to be of moderate magnitude because of the proximity of residences. With appropriate controls of

construction activities, the significance of public safety and health effects are considered **less than significant**.

Treatment facility operation. Public safety risks are limited to the slight increase in vehicle traffic associated with the facility operation. The facility would be fenced to prevent unauthorized entry, and the equipment at the facility is enclosed. Health risks would be limited workers who come into contact with untreated wastewater or microbial aerosols. The enclosed facility prevents direct transmission of disease organisms to residents, reinforced by the odour control system that limits viruses, bacteria, or other contaminants from being discharged from the facility.

> Mitigation measures. No measures are needed to protect public health and safety during facility operation beyond those included in the specified design and standard operating procedures.

There are negligible public health impacts associated with the wastewater facility. Public safety effects would be limited to traffic-related risks. The temporal extent is long-term, and impacts would be reversible. The magnitude of public health and safety impacts are negligible, and are considered **less than significant**.

Ancillary facility construction. Public safety effects during ancillary facility construction are mainly associated with operation of heavy equipment and the presence of open trenches. Flaggers would be available during the day to manage vehicles and pedestrians near the worksite. Barriers or flagging is typically provided to alert people to the presence of open trenches. Unauthorized access to worksites is strictly limited.

> Mitigation measures. Standard construction procedures would be followed to minimize safety risks during pipe and pump station construction.

The public safety risk of ancillary facility construction would be limited to the period of construction (short- to medium-term) and to the area where active construction is occurring (mostly road rights-of-way and the pump station site) . The impacts would be reversible. Magnitude of this impact is considered low, and **less than significant**.

Ancillary facility operation. Once the pipes and pump station are in service, any public health or safety impacts would be negligible and **less than significant.**

Visual aesthetics

Treatment facility site conditions

The UVic Fields site is an open grassy area crossed by a footpath and bike path. Alongside the path is a row of deciduous trees. Adjacent, and east of the site, is the UVic Wallace rugby field. To the west and north are detached dwellings, a townhouse complex, and the CRD Campus View Housing complex. Deciduous trees and shrubs border the site to the west. McKenzie Avenue is adjacent and parallel to the southern boundary of the site (Photo 9-2 and Photo 9-3). Users of the site or drivers and pedestrians on McKenzie Avenue have views a grassy field, lawn, and ornamental trees.

Photo 9-2 Existing view of UVic Fields site looking north across McKenzie Avenue

Photo 9-3 Existing view of north section of UVic Fields site looking north to townhouse complex

Ancillary facility conditions

The visual qualities of the ancillary facility pipe routes are primarily suburban streetscapes. The semi-natural forested viewshed at the Finnerty-Arbutus pump station site, is affected by construction of a pump station.

Impacts and mitigation measures

Treatment facility construction. Constructing the facility requires removal of approximately six deciduous trees and realignment, or temporary closure of the path that crosses the site. Pavement and buildings would replace a grassy field, lawn, and ornamental trees. Drivers and cyclists on McKenzie Avenue and users of the adjacent footpaths and recreational facilities would have unobstructed views of portions of construction site. Deciduous trees and buildings associated with Wallace Field provide partial screening of the northern portion of the site from the south and east. Approximately four of the units at the CRD townhouse complex at 2249 McCoy Road would have views of the construction (30 m from construction site). Approximately 15-20 units of the 72 units in the townhouse complex at 3987 Gordon Head Road would have views of construction (40 m or more from construction site). Several private dwellings on McCoy and Maria Roads would have views of the construction, though dense summer foliage would obscure views from immediately adjacent dwellings (20 m from construction site). Due to the proximity of the site to the detached dwellings to the east, and townhouses to the southeast and north, construction lighting is likely to contribute to visual impact during the hours of darkness.

Mitigation measures. Due to the proximity of dwellings to the construction site temporary screening and careful use of security and space lighting at night should be used to reduce the visual impact of construction on residents and vehicle and foot traffic on McKenzie Avenue.

The overall visual aesthetic impact of construction is considered to be local and of moderate duration (occasional occurrence for up to two years). The magnitude of the impact is moderate, irreversible, and is considered **significant**.

Treatment facility operation. Operation of the treatment facility on the site would transform the visual character from grass field and lawn with deciduous trees to pavement and buildings. The treatment facility would be near (20-40 m) detached dwellings and housing to the west and north of the site. Players and spectators at Wallace Field to the east would have unobstructed views of the north section of the facility. Drivers, cyclists, and foot traffic on McKenzie Avenue would have unobstructed views of the south section of the facility.

Mitigation measures. Mitigation measures can reduce the visual impacts associated with the operational treatment facility. Vegetative or landscaped earth screening surrounding the facility would provide partial screening. Careful building design, attuned to the surrounding residential and recreational land uses in the area should be employed to minimize the typically industrial look of a treatment facility. Security and space lighting could be positioned to minimize glare and artificial light intrusion off-site. Photo 9-4 and Photo 9-5 illustrate post-construction views of the facility from the south side of McKenzie Ave, no vegetation, or landscape screens or have been added.

Based on this analysis, the visual impact of the treatment facility on the site is considered to be long-term, and of moderate magnitude due to the,

- loss of a grass and lawn area,
- addition of an industrial structure in a recreational and residential area, and
- high visibility of the location to local residents and traffic on McKenzie Avenue.

Collectively these visual impacts would create a demonstrably negative aesthetic impact that is considered **significant**. Mitigation opportunities are available to reduce visual impacts through partially screening the site and through the use of building designs that are complimentary to surrounding land uses. These measures would reduce the visual impact to **less than significant** levels.

Figure 9-2 Overview of UVic Fields and neighbouring properties

Photo 9-4 Rendered view of UVic Fields facility looking north across McKenzie Avenue

Photo 9-5 Rendered view of UVic Fields facility looking northwest across McKenzie Avenue

Ancillary facility construction. Construction of ancillary pipes would result in views of construction equipment and construction traffic in the suburban streetscapes of southeast Gordon Head, Queenswood, and Cadboro Bay. Views of construction and related traffic would be localized, and of moderate duration (up to two years).

A pump station would be constructed at the forested Finnerty-Arbutus site. Construction of the pump station requires clearing and levelling of approximately 0.16 ha of the 4.4 ha parcel, converting 3.5% of the site from forest to utility structure. Although a relatively small portion of the site, it is in a visually prominent location that can be viewed from Arbutus road and locations to the east, northeast, and southeast.

> Mitigation measures. Mitigation measures should consider reducing the facility footprint to minimize clearing, such as reducing on-site parking and consider relocating the pump station to a less visually prominent part of the site to maintain the existing vegetation adjacent to Arbutus Road.

The clearing of a small (0.16 ha) area of forest at the Finnerty-Arbutus site is considered to be of moderate magnitude, due to its prominent visual position within the parcel, which would present views of the cleared area to traffic on Arbutus Road and locations to the east, northeast, and southeast.

Views of construction equipment and construction traffic would be localized and of moderate duration (up to two years). The visual impacts of clearing at the Finnerty-Arbutus site are considered to be of moderate magnitude and irreversible. This demonstrably negative aesthetic impact is considered **significant**. However, implementing mitigation measures will reduce the impact to **less than significant**.

Ancillary facility operation. All of the ancillary infrastructure would be below ground with the exception of the pump station at Finnerty-Arbutus. The pump station would add utility structure to a forested landscape. A driveway would bring worker and truck traffic onto the site. Security and space lighting may be used to maintain and operate the pump station during the hours of darkness. Users of the site would have interrupted views of the pump station through the forest. Visual impacts beyond the parcel boundaries would be restricted to views from Arbutus Road and views from the east, northeast, and southeast. The forest provides screening from other vantage points.

> Mitigation measures. The relatively small footprint of the pump station affords extensive opportunities to screen it from the remainder of the site, and from locations beyond the parcel. Vegetative and landscape screening can be used to reduce visual impacts. Careful building design that incorporates the use of analogous forest colours would mute visual impact. Consideration should be given to placing the pump station underground and using off-site parking to achieve the lowest level of visual impact.

Based on this analysis, the visual impact of the pump station on the site is considered to be long-term, and of low magnitude due to the small footprint required from the site and the extensive mitigation opportunities that can be used to reduce the visual impact. With extensive mitigation the visual impact of the pump station would create no demonstrably negative aesthetic impact and can be considered **less than significant**.

10.0 CUMULATIVE EFFECTS

For the purposes of this ESR, cumulative effects refer to the regional or sub-regional effects of constructing and operating a wastewater treatment facility in combination with the effects of other existing or planned developments.

The area considered in this cumulative effects assessment includes Gordon Head, Mt. Tolmie, and Oak Bay north of Lansdowne Road. Most of this area has been developed for housing, though the University of Victoria, Queen Alexandra Foundation facilities, and numerous public schools constitute a substantial institutional presence. Several large natural areas have been protected in this subregion, including Mount Douglas Park, Mount Tolmie Park, and several ocean waterfront areas in Gordon Head, Cadboro Bay, and Oak Bay. Some residual forest areas remain on lands owned by the University of Victoria and District of Saanich. Virtually all forest lands have been logged at least once; old growth is limited to scattered trees and small residual stands in parks. Few open streams remain; most have been enclosed in storm drains. The natural landscape in this suburban area has been largely replaced by roads, structures, lawns, and other landscaping.

Environmental effects of a wastewater facility

Landforms, geology, soils, hydrology, water quality, vegetation, and wildlife taken together may form the "environment" of the study area. Even without a detailed analysis of the study area, examination of aerial photographs or a cursory field inspection leads to the conclusion that existing development in the study area constitutes a high magnitude, long-term, irreversible impact on the environment that must be considered **significant.**

A treatment facility and its supporting ancillary infrastructure would affect a total of 2 to 3 ha of land. This small footprint makes a slight contributions to the magnitude of cumulative effects in the study area. If the treatment facility is built on previously-disturbed land that has limited environmental value, the contribution to cumulative effects would be further reduced. The kinds of contribution made by the treatment and ancillary facilities to cumulative effects include:

- Increased area of impervious surface, which could alter hydrology. The specified treatment of runoff (infiltrated on site, minimizing runoff), would mitigate this impact.
- Removal of mature trees. This impact would occur on the Finnerty-Arbutus or Cedar Hill Corner sites, and the loss of vegetation is not considered mitigable. With less than 1% of the entire Coastal Douglas fir Zone remaining in mature or old forest condition in British Columbia, any further removal is a cause for concern.
- Loss of wildlife habitat associated with the mature forest. Wildlife habitat has been replaced or severely altered in the study area, and further losses would jeopardize the survival of forest-dependent species.

Offsetting the physical environmental impact of building a treatment facility is the ability to treat wastewater relatively near to its source (the Gordon Head neighbourhood) and to recover water and energy for reuse. The marine environment would benefit from discharge of much cleaner effluent than is the case today, and a longstanding impact on the sea would be mitigated.

In light of the existing significant cumulative effect of development in the study area, the relatively small contribution of the wastewater facility to those impacts, and the offsetting marine benefits of treatment, the contribution of the wastewater facility to cumulative environmental effects is considered **less than significant.** A caveat to this determination is the need to make every effort to avoid removal of mature coastal Douglas fir vegetation communities in siting the wastewater facility.[1]

Social effects

Cumulative effects of development on social phenomena in the study area are less clear than are environmental effects. The effect of development on social topics considered in this ESR—archaeology, heritage, traffic, health, safety, visual aesthetics, odour, noise, vibration, lighting, dust, air emissions, and community use—would be the subject of debate among experts. It is beyond the scope of this ESR to, for example, quantify specific health and safety conditions throughout the cumulative effects study area. Fortunately, such an assessment is not required to understand the following potential contribution of the proposed wastewater treatment facility to the cumulative effects of existing conditions.

- The cumulative effects of existing development on archaeological and heritage resources in the study area can be considered adverse and **significant**. Although it is unlikely that the wastewater facility would contribute to further damage of loss of archaeological or heritage resources, the topic will be investigated in detail after a site is chosen.
- Even during the busy construction period, traffic associated with the wastewater project would constitute less than 2% of vehicles on major roads, and much less during facility operation. Traffic congestion is a serious issue in the study area, but the wastewater facility would not materially contribute to the problem except temporarily during construction.
- Compared with the aggregate impacts of urban form and design of existing development and societal activities in the study area that affect public health, safety, noise, vibration, lighting, dust, and air emission conditions, the wastewater facility's contribution would be negligible,

[1] It bears mention that the study of environmental impacts of the CRD's proposed wastewater project greatly exceeds the level of review of nearly all other existing developments in the study area. Private and public lands continue to be cleared of the scant remaining mature coastal Douglas fir forest for housing, roads, highway interchanges, golf courses, agriculture, utility corridors, other urban development, and even commercial logging. This clearing typically proceeds without mitigation, compensation, or even, in most cases, consideration of its ecological or cumulative effect.

- The visual aesthetics effects of the proposed wastewater facility would be small in comparison with the appearance of other structures throughout the study area,
- Wastewater treatment has the potential to release unpleasant odours that could affect a portion of the study area, but the CRD is committed to a goal of eliminating noticeable odours from the Saanich East-North Oak Bay facility.

The effects of development in the study area on socially-important issues are recognized to be serious and in need of investigation and action. The analysis conducted in this ESR, however, indicates that the contribution of the wastewater facility to the cumulative social effects of development in the study area would be of low or negligible magnitude and **less than significant.**

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