Dungeness Wastewater Treatment Feasibility Study

Prepared for

Clallam County
223 E. 4th Street, Suite 14
Port Angeles, WA 98362

Prepared by

Parametrix
4660 Kitsap Way, Suite A
Bremerton, WA 98312-2357
T. 360.377.0014 F. 360.479.5961
www.parametrix.com

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CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

Prepared by Damon G. McAlister, P.E.

Prepared by Jenifer A. Ramsey, P.E.

Checked by Jan E. Rosholt, P.E.

Approved by Michael T. Ollivant, P.E.

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KEY TERMS

ATU	Aerobic Treatment Unit
Bay	Dungeness Bay
BEACH	Beach Environmental Assessment, Communication & Health
BOD	biochemical oxygen demand
CAC	Critical Areas Code
CARA	critical aquifer recharge area
CDBG	Department of Commerce, Community Development Block Grants
Centennial	Centennial Program
cfs	cubic feet per second
COD	chemical oxygen demand
County	Clallam County
CWA	Clean Water Act
DAHP	Department of Archaeology and Historic Preservation
DNS	determination of non-significance
DOH	Washington State Department of Health
DRMT	Dungeness River Management Team
E/One	Environment One
EA	environmental assessment
Ecology	Washington State Department of Ecology
EHS	Clallam County Environmental Health Services
EIS	environmental impact statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FONSI	finding of no significant impact
ft^2	square feet
GMA	Growth Management Act
gpd	gallons per day
gpd/ft^2	gallons per square foot per day
HDPE	high density polyethylene
HPA	Hydrualic Project Approval
HUD	U.S. Department of Housing and Urban Development
I/I	Infiltration and inflow
LAMIRD	Limited Area of More Intense Rural Development
MRA	Marine Recovery Area

KEY TERMS (CONTINUED)

MBR	Membrane Bioreactor
mi^2	square miles
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
OSS	on-site septic systems
psi	pounds per square inch
PVC	Polyvinyl chloride
RCW	Revised Code of Washington
Revolving Fund	Washington State Water Pollution Control Revolving Fund Program
RV	rural village
RV2	rural village low zoning
SBR	sequential batch reactors
SDPR	Sequim Dungeness Planning Region
SEPA	State Environmental Policy Act
SMA	Shoreline Management Act
SMP	Shoreline Master Program
STEP	Septic Tank Effluent Pump
THM	trihalomethane
TMDLs	Total Maximum Daily Loads
TSS	total suspended solids
UGA	Urban Growth Area
ULID	Utility Local Improvement District
USDA	U.S. Department of Agriculture
WAC	Washington Administrative Code
WRF	Water Reclamation Facility
WRIA	Water Resource Inventory Area
WWTP	wastewater treatment plant

EXECUTIVE SUMMARY

The lower Dungeness Watershed's Marine Recovery Area (MRA) has water quality issues relating to bacteria (fecal coliform) and nutrients (nitrogen) that are partially human-derived most likely from on-site septic systems (OSS). The lower reaches of the Dungeness River and nearby creeks are referenced in water quality reports as sources of fecal coliform to Dungeness Bay (Bay). Shellfish harvesting in the Bay has been compromised since 2000 because of high fecal coliform concentrations.

The study area is 313 acres in size and consists of the shoreline and adjacent upland areas between the mouth of the Dungeness River and the mouth of Cassalery Creek, including the Three Crabs, Seashore Land, and Dungeness Village areas. The study area lies within the 93,000-acre Dungeness Marine Recovery Area.

Many OSS in the study area are at risk of failure due to system age, poor soils, high groundwater, and coastal flooding. Repair is often problematic and expensive due to these issues, and many lots are not large enough to accommodate repairs.

The intent and objective of this feasibility study was to identify wastewater treatment capital improvement options that would address the study area community's aging or non-compliant OSS, long-term wastewater management needs, and protect infrastructure and private property.

To address the current concerns in the study area, four different wastewater management alternatives were evaluated regarding water quality, sea level changes, and system compliance:

1. Individual on-site septic systems,
2. A clustered (neighborhood) system,
3. A centralized (community-wide) system, and
4. A centralized collection system that conveys wastewater to Sequim's treatment facility.

These options differed in costs, ease of implementation, and ability to treat wastewater over 20 years.

Continuing to operate and maintain individual OSS within the study area was the selected alternative based on public input gathered from an extensive public process and County staff and management evaluation. In general, it was felt that the County's current OSS operation and maintenance program had not been given sufficient time to progress and be evaluated for its effectiveness. Implementation strategies to help strengthen this program include continuing many current efforts including increasing public education and awareness, conducting studies and assessments, strengthening enforcement and regulatory compliance within the study area, and providing stable funding for these activities.

As Clallam County takes specific actions implementing this alternative, these actions should be continuously reviewed by both the public and County staff to verify the actions are effective and improve performance and longevity of individual on-site septic systems where possible. This study is the first step in the rural development funding process. If at any time it is determined that the individual OSS program cannot provide adequate treatment to meet water quality standards for shellfish growing or other long-term measures, one of the other three alternatives reviewed in this Feasibility Study should be revisited.

1. PROJECT BACKGROUND

The lower Dungeness Watershed has water quality issues relating to bacteria (fecal coliform) and nutrients (nitrogen) that are partially human-derived. Human-derived fecal coliform is a concern since it also indicates human pathogens could be present and cause illness. The lower reaches of the Dungeness River and nearby creeks are referenced in water quality reports as sources of fecal coliform to Dungeness Bay (Bay). Shellfish harvesting in the Bay has been compromised since 2000 because of high fecal coliform concentrations.

Solving the water quality issues within the lower Dungeness Watershed will require multiple projects and methods. The general area currently uses on-site septic systems (OSS) for wastewater treatment. Existing systems are at risk of failing due to their age, poor soils, high groundwater, or coastal flooding, and repair is often problematic and therefore expensive due to these same issues or inadequate lot sizes.

The intent of this study is to identify capital improvement options that will address the community’s long-term wastewater management needs and protect infrastructure and private property, as well as develop a strategy for Clallam County (County) to advance an implementation plan to permanently address water quality and public health issues.

1.1 GOALS AND OBJECTIVES

In 2012 the County Department of Health & Human Services Environmental Health Division received grant funding for a feasibility study to develop wastewater treatment options for the unincorporated Dungeness- and Three Crabs-area shoreline neighborhoods, specifically Three Crabs, Golden Sands, Dungeness, and Seashore (see Figure 1). This feasibility study is one piece of the overall goal to develop a plan protecting and improving the water quality of Dungeness Bay watershed, and the overall health and viability of the community. Specific issues for consideration for this project include:

- Private on-site septic systems in the unincorporated Dungeness- and nearby Three Crabs-area shoreline neighborhoods are sometimes failing or problematic and may be contributing to environmental and water quality degradation.
- A shallow water table is likely to become shallower and storm erosion is likely to increase due to rising sea levels, making long-term viability for septic systems in this area a concern.
- More frequent septic system inspections may uncover hidden or unapparent problems requiring immediate owner resolution, for which the owner may not be prepared.
- Recent microbial source tracking in the Dungeness Bay shellfish growing area adjacent to this community (portions of which are closed for commercial harvest) shows that human waste is a contributor to water quality degradation.
- The cost of not addressing problems with existing on-site septic systems could lead to lower property values in the long term.

The objective of this feasibility study is to assess the general feasibility of treatment and disposal alternatives to these aging or non-compliant OSS systems and provide direction as to how to proceed. Each alternative is reviewed in terms of costs and benefits for technical, environmental, regulatory, and financial considerations, as well as quality of life impacts to the community. While much information is given for each alternative, full development of each alternative is beyond the scope of this study. The focus of this study is to provide information to allow the public and the County to select a feasible alternative that would warrant further action.

1.2 PROJECT STUDY AREA

The project study area consists of the shoreline and adjacent upland areas between the mouth of the Dungeness River and the mouth of Cassalery Creek, and lies within the Dungeness Marine Recovery Area. The study area is approximately 313 acres in size, with 46 percent of the area being residential and commercial lots, and 54 percent being wetlands, streams, and open areas. Streams and sloughs within the study area drain directly to Dungeness Bay. These include Meadowbrook Creek and Meadowbrook Slough, Golden Sands Slough, Cooper Creek, and the mouth of Cassalery Creek. In addition to these creeks, there are approximately 1.7 miles of Dungeness Bay shoreline along the eastern edge of the project area.

The study area has been divided into four neighborhoods (see Figure 1). Each neighborhood has its own special characteristics (home density, groundwater table, soil types, agricultural, etc.), allowing for different wastewater treatment options. For example, a neighborhood that has existing state-of-the-art mound type systems may only need minor repair or replacement actions, whereas a neighborhood located near open agricultural land with acceptable soils may be suitable for community treatment and land disposal via irrigation. On the other hand, wastewater from a neighborhood located in a high water table area with poor soils does not receive adequate treatment and may need to be collected and conveyed to another location. The specific concerns for each neighborhood are:

- Three Crabs – high water table, near beach (erosion and flooding), near wetlands, small lots (no drainfield replacement area), poor soil, high density, failing systems;
- Golden Sands – high water table, wetlands area, very poor soils from past fill, high density, failing systems;
- Dungeness –high density (often served by individual shallow water wells), failing systems, but the area does have potential land disposal; and
- Seashore – high water table, near beach (erosion and flooding), wetlands area; however, the area has newer and possibly adequate systems and low density.

A complete description of the study area may be found in Chapter 2, Study Area Description.

1.3 PREVIOUS STUDIES AND WATER QUALITY DOCUMENTATION

The water quality issues in the lower Dungeness Watershed have been a focus of many studies since 2000. The following recent reports (Table 1-1) provided the majority of background information on the water quality issues in the project area used in this document (see Chapter 10, References, for complete citation).

Figure 1. Vicinity Map and Project Area

Table 1-1. Recent Water Quality Report Information

Clallam County On-Site Septic System Management Plan, June 12, 2007 (Clallam County Environmental Health Services)	• High fecal coliform counts in Dungeness Bay resulting in shellfish closures since 2000. • Tests confirmed human sources of fecal coliform bacteria detected at test sites in the area, creating a link between the pollution and septic systems.
"Three Crabs" Area Assessment, March 2009 (Clallam Conservation District)	• Entire project area is served by on-site septic disposal systems. • Hydric soils indicative of wetlands dominate the area. • Current regulations would require installation of very sophisticated on-site septic systems in these soils, if not prohibit them for new proposals. • Development is at or near urban densities in some areas. • Inadequate sewage treatment is an area-wide water quality concern. • Sea level rise and climate change will likely increase the intensity and potentially destructive nature of severe storm events. • Shallow aquifer. Seasonal high water table from October to June that is within 6–24 inches of the surface. Periodic flooding and drainfield or septic tank inundation can be a potential source of pollution.
Clallam County Code 27.16 establishing a shellfish protection district and 41.20.170 (2) establishing the Marine Recovery Area	• The project area is included in a sensitive area named the Sequim Bay Dungeness Watershed Clean Water District. • It is also located within an MRA (Marine Recovery Area).
TMDL Water Cleanup Plan (Ecology 2008)	• 303d-listed water bodies for fecal coliform including several in the project area (details below)

Safe shellfish harvesting in Dungeness Bay is one of the main concerns of area residents, and it relates directly to water quality. Prior to 2000, Dungeness Bay had been certified by Washington State Department of Health (DOH) as approved for commercial shellfish harvest. However, bacterial pollution problems in the Bay and the lower Dungeness River watershed emerged during the 1990s leading to a downgrade of the shellfish area. In 2000, year-round shellfish harvesting was prohibited because fecal coliform levels in the Bay did not meet National Shellfish Sanitation Program requirements for water quality in commercial shellfish harvesting areas.

The shellfish downgrade required Clallam County to form a shellfish protection district pursuant to RCW 90.72 to address water quality problems. On October 11, 2000, a recommendation was made by the Dungeness River Management Team (DRMT) to the Board of Clallam County Commissioners to call the new shellfish protection district a "Clean Water District" and to have its boundaries be the same as the broad management area of the DRMT. The DRMT management area includes the Dungeness Watershed and those waters influenced by it through the irrigation system, and the Sequim Bay watershed, totaling approximately 93,000 acres. The Sequim-Dungeness Clean Water District was formally established by Clallam County in 2001, at least in part to address issues such as insufficient monitoring of septic systems (Clallam County, 2008-2012a).

Through comprehensive reviews of pollution conditions and water quality data by DOH and years of cleanup actions, monitoring, and public outreach by members of the Clean Water District work group (Clallam County, Clallam Conservation District, the Jamestown S'Klallam Tribe, and others), 500 acres of Dungeness Bay was upgraded in April 2011 to Conditionally Approved for commercial shellfish harvest, with some seasonal restrictions.

While this is an improvement, the tidelands surrounding the mouth of the Dungeness River are still closed to shellfish harvest year-round due to water quality issues from the Dungeness River and Meadowbrook Creek (Clallam County, 2008-2012a).

The federal Clean Water Act of 1972 requires states to set water quality standards to protect beneficial uses of water bodies, list waters not meeting those standards as "impaired," and then develop water quality plans, or Total Maximum Daily Loads (TMDLs) to correct the pollution. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. States comply with this requirement per Section 303(d) of the Clean Water Act, so waters that are pollution impaired are "303(d)-listed."

Once the shellfish harvesting area was downgraded in 2000, the Washington State Department of Ecology (Ecology) conducted a TMDL study for fecal coliform bacteria in the lower Dungeness River and its tributaries in 2002, followed in 2004 by a TMDL study for Dungeness Bay and its tributaries.

In the project area, several streams are 303(d)-listed for fecal coliform bacteria, dissolved oxygen, and pH; some have TMDLs, listed below. Fecal coliform bacteria are bacteria that are known to be associated with sewage from a variety of animals, including humans. They are used by public health agencies as an indicator of potential pathogens present in water.

Areas that do not meet state water quality standards include the following:

- Commercial shellfish growing areas (due to high fecal coliform bacteria) as of May 2011 (Clallam County Health & Human Services, 2008-2013):
    - The mouth of Dungeness River (closed year-round);
    - Inner Dungeness Bay (closed in winter months);
    - Two zones of the Jamestown growing area, at the mouth of Golden Sands Slough and Cassalery Creek (closed year-round); and
- Streams that are 303(d)-listed (some have TMDLs) include:
    - For fecal coliform bacteria: Dungeness River, Meadowbrook Creek, Meadowbrook Slough, Cooper Creek, and Cassalery Creek – Golden Sands Slough is listed as a water body of concern;
    - For dissolved oxygen (levels of dissolved oxygen are too low): Cassalery, Cooper, and Meadowbrook Creeks; and
    - For pH (pH too low or too high): Meadowbrook Creek and Meadowbrook Slough.
- Marine waters that are polluted but are not 303(d)-listed include:
    - For "Fish and Shellfish Habitat" (eelgrass beds) impaired by ulvoid (ulva or "sea lettuce" algae) mats: Dungeness Bay; and
    - For fecal coliform bacteria: Dungeness Bay (TMDL has been developed).

Beneficial use losses of these waters that also may be public health risks are recreational harvest of shellfish in closed zones or during closed seasons, recreational use of streams with water quality issues, and drinking water from individual wells in Dungeness due to proximity of septic systems.

Appendix A includes a list of reference publications related to water quality issues that are available through Ecology.

1.4 COUNTY OSS PROGRAM

Over half of the residents in Clallam County are not served by public sewers, but rely on an on-site septic system for sewage disposal. To protect public health and water quality, Clallam County has developed regulations for on-site septic systems, including design, installation, operation, maintenance, and monitoring requirements.

Recent changes in state statutes and rules have required a number of new OSS management efforts from local health departments. State regulation RCW 70.118A requires the Clallam County Environmental Health Services (EHS) to ensure that all OSS within a Marine Recovery Area (MRA) are functioning properly.

1.4.1 New Code Adopted 2008

In 2005, Washington State developed on-site septic system regulations (WAC 246-272A) which require septic system owners to "assure a complete evaluation of the system components to determine functionality, maintenance needs, and compliance with regulations and any permits." This means homeowners and other septic system owners are required to inspect and maintain their septic system to ensure it is functioning properly.

These State regulations took effect on July 1, 2007. Clallam County code was revised in 2008 to incorporate these operation and maintenance (O&M) requirements as well as recommendations from citizens and industry in the *Clallam County On-Site Septic System Management Plan* adopted by the County Board of Health (EHS, 2007).

Enforcement of WAC requirements is covered under RCW 43.20.050 (5):

> All local boards of health, health authorities and officials, officers of state institutions, police officers, sheriffs, constables, and all other officers and employees of the state, or any county, city, or township thereof, shall enforce all rules adopted by the state board of health.

In areas that are more sensitive to environmental impacts from on-site sewage systems, septic system owners must have a recent inspection performed by a professional licensed inspector (Clallam County Code 41.20.170). County EHS lacks capacity to conduct extensive enforcement of O&M regulations due to current economic budgetary restrictions. Currently, when a septic system fails, the County must use enforcement measures to ensure that the property owner repairs or replaces it. The County discovers failing systems through either:

- Homeowners notify EHS that their system is failing;
- OSS industry professionals notify EHS;
- Citizen complaints are filed with EHS; or
- An inspection at the time of sale or transfer of ownership reveals a failure and EHS is notified.

Enforcement can also occur when a homeowner applies for a development permit, such as a building permit for an addition to a home. At that time, EHS requires the OSS to be inspected and can withhold the permit until repairs or O&M occur.

Currently, Clallam County is not actively enforcing the inspection requirement until there is adequate capacity in EHS and the septic system industry to meet this new demand for service. The County is working with both the industry and other jurisdictions in the region to build capacity for needed services, including homeowner education programs.

1.4.2 Marine Recovery Area (MRA) Designation

In 2006, the Washington State Legislature enacted a new law (RCW 70.118A) that required creating a management area to provide protection to marine waters from human-influenced nutrients coming from on-site septic systems. This law authorizes local programs (Clallam County EHS) to inventory, locate, require inspection, develop an electronic database, and monitor on-site sewage disposal systems to ensure they are working properly in order to protect public health and Puget Sound water quality. These management areas or Marine Recovery Areas (MRAs) are established in places where additional requirements for existing OSS "may be necessary to reduce potential failing systems or minimize negative impacts." Areas of concern identified in the law include:

- Shellfish growing areas that have been threatened or downgraded under chapter 69.30 RCW;
- Marine waters listed on the federal Clean Water Act 303(d) list for exceeding water quality pollution limits for low oxygen or fecal bacteria; and
- Marine waters where local programs have identified nitrogen as a contaminant of concern.

Once an area has been designated an MRA, local agencies must develop a strategy for identifying, assessing, and recording all OSS within the MRA boundaries. The *Clallam County On-Site Septic System Management Plan* (EHS, 2007) provided this strategy in compliance with the state law.

Clallam County designated an MRA roughly equivalent to the Dungeness Clean Water District, approximately 93,000 acres in size. Septic system owners within the area are required to have OSS inspections, with the initial professional inspection providing accurate drawings and a completed checklist for the County's database if none currently exist.

This MRA was established because parts of Dungeness Bay are currently closed for commercial and recreational shellfish gathering, and bacterial pollution problems are present in streams that empty into the Bay and the Strait of Juan de Fuca. Human waste, most likely from poorly functioning or failing septic systems, is a contributing factor to these pollution issues based on recent research that identified bacterial sources.

1.4.3 Red-to-Green Program

The Red-to-Green program was established by Clallam County as part of the MRA requirements. The goal of the Red-to-Green program is to address water quality in the lower Dungeness Watershed by identifying on-site septic systems that could be pollution sources. The County received an Ecology grant to investigate OSS systems that do not have a permit record. When no records are available, the County visits these lots to verify there is no surfacing sewage or discharge leaving the lot, and to determine system configuration.

Parcels are designated "red" if no information is available for the septic system. A parcel receives a "yellow" coding if the system has been located, but does not have a current inspection on file. A "green" parcel is one where the located system is current with its inspection. To be current, an inspection is required every 3 years for gravity (conventional) systems and every year for advanced systems. Many systems coded green at the start of the project were coded yellow by the end because they had not kept up with the required frequency.

Currently the County is focused on bringing parcels within the MRA into compliance through voluntary inspection and repair. An updated enforcement ordinance for systems not in compliance is being developed for implementation in 2013.

1.5 PUBLIC INVOLVEMENT

From the time this feasibility study of wastewater alternatives was conceived, the County knew it had the potential to impact many individuals and organizations. Therefore, the project was carefully planned to solicit opinions, expectations, and concerns from the community as well as tribal representatives and public officials regarding possible solutions. Public meetings are a way to provide individuals with accurate and timely information pertaining to the water quality issues and possible treatment solutions for the area. The public input and comments received have been integrated into work products and influenced the final selection of the selected options.

The following public involvement objectives for this Feasibility Study were agreed upon at the start of the project:

- To educate the affected public about the project, and involve them in the decision-making process by sharing input received on perceived needs, prioritization of those needs, and how they might be funded.
- To facilitate an exchange of information amongst the project team, the general public, and community stakeholders.
- To work with, and build upon, ongoing public participation efforts in the community outreach efforts.
- To actively promote and encourage participation from the general public and stakeholders, through direct involvement in the planning process.

Community meeting/workshop series are used as forums for the exchange of information and to solicit input from interested parties and the general public. The meetings are designed to be progressive and each meeting will build upon the information obtained at the prior meeting, providing multiple opportunities for input into the selection of a wastewater management alternative and funding options.

Two meetings were held to exchange information with the community on the issues surrounding the problems, as seen by the County, and the goal of this project in May and June 2012. At these meetings issues and concerns from the community related to water quality and on-site septic systems were gathered to assist in the development and consideration of potential options.

A questionnaire distributed at the meetings showed that there is strong concern about safe shellfish harvesting and water quality issues in the streams, wetlands, bay, and drinking water. Eel grass beds and storm surge erosion are also strong concerns. Issues such as on-site septic system function, inspections, and lack of a drainfield area had mixed reactions, with some very concerned and others not concerned. Respondents have a strong interest in a community drainfield, although it is unclear if this is in favor of a community drainfield or concern that one may be constructed.

Questions from the audience at the public meetings were generally regarding:

- Are owners of functioning septic systems required to help pay for costs for non-functioning systems?
- How would a community system be funded?

- How would any wastewater treatment and disposal option be financed?
- County enforcement issues.
- Economic impact of pollution and closures on the shellfish industry.

Specific questions included impacts of recreational vehicle lots on water quality, possible excessive use of OSS attached to vacation homes, seaweed nuisance (ulva), and the ability of using some undeveloped lots for community drainfields. A full list of the comments, responses to comments, and questionnaire results from these first two meetings appears in Appendix B.

A community workshop held March 9, 2013, shared with the community the first draft of this Feasibility Study (dated February 2013), which had been developed based on research and public feedback. The draft provided detailed information on specific areas of interest, discussed options to address the problem of wastewater treatment in general, and discussed the constraints to implementation of various solutions.

Chapter 7 of this report describes the results from the March 9 workshop, including public comments and how the final alternative was selected with consideration to the public input received. This study was presented to stakeholders who could be impacted by any decisions that were made as a result of the study or had a strong interest in the subject, and they were encouraged to provide comments. These stakeholders included the Dungeness River Management Team (DRMT) and the Clallam County Planning Commission, Board of Health, and Board of Commissioners. The full summary of all public comments and public meetings and responses from the County are in Appendix I, Public Comment Responsiveness Summary.

2. STUDY AREA DESCRIPTION

This section provides an overview of the other issues present in the project and surrounding areas. These include land zoning, natural resources, and critical areas. Land use zoning, climate, soils, surface water and groundwater, and critical areas all affect where OSS systems can be located in order to function properly.

The project study area has a long history of development since the mid-1800s. The mild maritime climate of the region, relative flatness of the land, and rich marine environment has made the area a very desirable place to live. However, the area also contains many environmentally fragile areas that are susceptible to degradation from development activities. These include shoreline and marine habitats, river and stream habitats, and wetland areas, as well as groundwater aquifers. Understanding these issues and concerns provides part of the framework within which the project alternatives were evaluated.

2.1 HISTORY OF AREA

The project area was historically occupied by the Jamestown S'Klallam Tribe. The first European settlers came to the Dungeness area around 1850. The area provided fertile farmlands and for many decades small farms and dairy farms were located here. Forest clearing, river diking and channelizing, flow diversion, land clearing and wetland draining occurred throughout the lower watershed to develop arable land for farming. The early 1900s brought more urbanization. Residential development has occurred over several decades.

The historic community of Dungeness was platted in 1892 for development supporting marine trade. Building sites were small, where wastewater disposal and domestic water supplies were often crowded onto the same lot. Adjacent to Dungeness, and on the east side of Dungeness River mouth, is the mile-long Three Crabs neighborhood. This area is characterized as a linear sand dune between outer Dungeness Bay and wetlands. It was platted in the mid-1900s for seashore vacation housing. Currently the area has shoreline lots with full-size, full-time residences, which have added fill to offset normal erosion, tidal action, and high groundwater levels (Clallam Conservation District, 2009). On the wetlands side of this shoreline, a canal system was excavated for a 90-lot subdivision which discharges to the Bay.

2.2 LAND-USE AND ZONING

There are 318 parcels of land on about 313 acres in the project study area (see Figure 2). There are 231 parcels which are developed and occupied, while 62 parcels are undeveloped. The remaining 25 parcels are designated as currently unbuildable due to either their designation as open space or the lot is unsuitable for an OSS, and therefore unbuildable since no other sewage disposal is available. In the project area, only a few parcels such as the larger business lots can be further subdivided.

The project area is zoned as R5, or Rural Low except for the Dungeness Village Limited Area of More Intense Rural Development (LAMIRD), as shown in Figure 2. Typical land uses for R5 zones include, but are not limited to agricultural activities, bed and breakfast inns, duplexes, home enterprises, single family homes, and timber harvesting. Conditional uses generally include, but are not limited to, cemeteries, churches, and private campgrounds. Prohibited uses generally include, but are not limited to airports, business parks, retail stores, gas stations, motels, multiple family dwellings, and planned unit developments. Of the total parcels within the project study area, 238 parcels are located in this zone. Current R5 zoning designation allows for one dwelling unit per 4.8 acres, with a minimum lot size of one acre.

The Dungeness Village LAMIRD is zoned as approximately 50 percent Rural Village, 50 percent Rural Village Low. Approximately 80 parcels are within the LAMIRD. A LAMIRD area allows for higher residential densities, commercial uses, and services in pre-established (pre-1990) moderate to high density residential and commercial areas where they would be discouraged or prohibited by the Growth Management Act (GMA). Rural Village zoning allows one dwelling unit per 12,500 feet (approximately 0.29 acres) with a minimum lot size of 12,500 feet, while Rural Village Low zoning allows one dwelling unit per 1 acre with a minimum lot size of 1/2 acre. Typical uses for the Rural Village zones include, but are not limited to, retail stores, single-family homes, motels, planned unit developments, and agricultural activities. Conditional uses include, but are not limited to, business parks and multiple-family residences. Prohibited uses include, but are not limited to, airports, mobile home parks, and asphalt plants.

Much of the development within the project study area occurred before these zoning regulations were in effect. Most lots are undersized or do not meet the current density requirements (the density is too high). Golden Sands is an example of this. The Golden Sands plat, approved by the County in 1966, has 71 lots ranging in size from 0.15 to 0.5 acres. This plat would not be approved today per the current zoning code.

2.3 CLIMATE

The climate of Clallam County is maritime, with prevailing winds coming through the Strait of Juan de Fuca from the west. Wind storms typically occur from the southeast through the Hood Canal. During the dry summer months and occasionally during winter wind storms, winds will come across the Strait from the northeast (Clallam Conservation District, 2009). Temperatures in the lowlands near the shoreline typically range from 68 degrees F in the summer to 31 degrees F in the winter.

In general, the County has unusual variations in precipitation due to the wide range of elevations occurring in the central part of the County and the resulting rain shadows from the Olympic Mountains. Precipitation can range from about 15 inches annually due to the rain shadowing in the eastern portion of the County (including the project area) to well over 200 inches annually in the higher elevations in the more central, mountainous areas.

Rainfall in the project area mostly occurs during a six month period from October to March (winter). During this time, low pressure winter storms, high tides, and strong winds often combine to create localized flooding.

Changes in global climate conditions and an anticipated rise in sea level are likely to increase the intensity and possibly destructive nature of storms as well as raise groundwater levels. This would increase the risk of flooding in the project area and decrease the effectiveness of wastewater treatment from OSS in shallow soils and water tables. Increased erosion from storms with higher storm surges could damage property, including drainfields and OSS tanks. Properties located along the shoreline would be most vulnerable (Ecology, 2012).

2.4 SOILS

The soils in the study area are of particular concern for on-site wastewater treatment and disposal. On-site septic systems (OSS) depend on the soils to provide much of the treatment. Ideal soils for OSS have organics that filter pathogens and are well-drained, meaning the soils do not pond water or stay “muddy” wet. Coarse sand soils can be excessively-drained and do not provide physical filtering before the wastewater contacts groundwater.

The Custom Soil Resource Report for Clallam County Area Washington (NRCS, 2011), describes most soils in the project area as unacceptable for a drainfield (the soils report is included in Appendix A).

Figure 2. Land Use and Zoning

Table 2-1. Soil Conditions

Soil Type	Drainage Characteristics	Acceptable for a Drainfield
Beaches	N/A	No
Lummi Silt Loam	Poorly drained	No
Mukilteo muck	Very poorly drained	No
Puget silt loam	Poorly drained	No

Poor soil conditions make OSS repairs very expensive and sometimes unworkable, since the size of a drainfield is based on the rate the soils will drain or infiltrate.

The majority of the project area is composed of Lummi Silt Loam. The Lummi series consists of very deep and poorly drained soils. These soils formed in marine sediment and alluvium. The National Resources Conservation Service's Clallam County Soil Survey states that "the use of the [Lummi Silt Loam] soil for septic tank absorption fields is limited by wetness. The soil is not suited to conventional septic tank absorption fields. Septic tank absorption fields do not function properly during rainy periods. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high."

The other two soil types, Mukilteo muck and Puget silt loam have similar characteristics and concerns for OSS as the Lummi Silt Loam.

The beaches consist of sand with usually very few fines. These soils often infiltrate too rapidly and lack organic material in the soil, both of which limit or prevent soil microbes from treating the effluent (septic system discharge). If OSS systems are located in these areas, often they need pre-treatment or more advanced systems to reduce the amount of pathogens and nutrients in the effluent before it enters the drainfield.

2.5 SURFACE WATER

The project area is the shoreline and adjacent upland area between the mouth of the Dungeness River and the mouth of Cassalery Creek (see Figure 1). Three streams and two sloughs are included in this area, all of which drain to Dungeness Bay. These streams are small, low elevation streams. The total area for the project is approximately 2 square miles (1,300 acres), with approximately 3.75 lineal miles of streams and sloughs, and 1.7 miles of marine shoreline.

The project area is located within the lowest portions of the Dungeness River watershed (eastern portion of Water Resource Inventory Area [WRIA] 18). In the upper portions of the river's watershed, the river originates at elevations around 6,000 feet, and emerges from the mountains about 10 miles from Dungeness Bay. Most of this upper area is within National Park and National Forest lands, including its Gray Wolf River tributary.

Once the Gray Wolf River joins the Dungeness, the river channel's slope begins to flatten, changing from around 3 percent (dropping 180 feet per mile) in the mountains to 1 percent (dropping 60 feet per mile) once it emerges from the mountains. The land continues to flatten as the river flows closer to the Bay, comprising the lower watershed.

In the lower watershed, the river waters meander within the river channel and flood plain. Marine tides can affect water levels in the Dungeness River up to almost a mile upstream of the river's mouth, which is approximately to Schoolhouse Bridge (Clallam Conservation District, 2009).

The Dungeness River drains an area of approximately 99,840 acres or 156 square miles (mi^2). Yearly flow rates for the river are typically between 171 cubic feet per second (cfs) and 701 cfs, with an annual average of 383 cfs. Lowest flows tend to occur in early fall (September/October) and highest flows during the spring runoff in May, June, and July. In extreme flooding conditions, such as in January 2002, the flow rate can be as high as 7,610 cfs. The lowest flow rate measured was 61 cfs in November 1993 (USGS, 2012).

The main streams and sloughs within the project area are Meadowbrook Creek and Slough, Golden Sands Slough, Cooper Creek, and a small portion of Cassalery Creek. These streams discharge directly to outer Dungeness Bay with average flow rates of 1-5 cfs.

Meadowbrook Creek is a small stream with a low gradient. It falls less than 50 feet over its 2.4 mile length. Currently, Meadowbrook Creek joins Meadowbrook Slough less than 500 feet from where the combined channels enter Dungeness Bay. Two irrigation tailwater ditches drain to Meadowbrook Creek. Its drainage area is approximately 800 acres (1.2 mi^2) (Clallam Conservation District, 2009).

Cassalery Creek is approximately 4 miles in length and has a drainage area of 1,500 acres (2.3 mi^2). The stream is also very low gradient (Clallam Conservation District, 2009).

Cooper Creek is a small, low-gradient stream that is approximately 1 mile in length, draining an area of approximately 340 acres. The drainage area is significantly affected by human alterations related to agricultural uses and residential development (Clallam Conservation District, 2009).

Golden Sands Slough is a series of canals that was excavated into estuarine wetlands off Three Crabs Road as part of an abandoned recreational component of the original Golden Sands development. The canal system is connected to Dungeness Bay via a 250-foot long concrete flume under Three Crabs Road (Clallam Conservation District, 2009).

2.5.1 Classifications for Surface Water

The Department of Ecology has classifications for waters of the State based on water quality standards, ranging from Class AA to Class C. These classifications are standards each water body will be held to when determining if that water body is polluted or not. In other words, to say a body of water is polluted, there must be a definition of what “polluted” means. These classifications set the standards, or water quality limits, that the pollution level of each water body is measured against.

Class AA waters are “extraordinary,” meaning the highest level of water quality standards are applied due to the benefits these waters provide (fish habitat, drinking water, etc.). Class C waters are “fair” and have the least stringent water quality standards applied. Note these classifications are not an indication of how polluted a water body is, but how stringent the water quality standards are for that water body based on how the water is used.

Dungeness River is considered a Class A freshwater stream (the second-most stringent standard). Meadowbrook Creek and Slough are Class AA freshwaters, whereas the mouth of these water bodies are Class AA marine for all parameters but fecal coliform. For fecal coliform requirements, these water bodies are Class AA freshwater. Cooper Creek is considered Class AA marine for all parameters except for fecal coliform requirements, which is Class AA freshwater. Golden Sands Slough is Class AA marine water, as is Dungeness Bay (Washington State Department of Ecology, 2002).

These high classifications show that water bodies within the project area are considered to be very valuable in terms of the benefits they provide; therefore, they are held to very high water quality measurement standards.

2.6 GROUNDWATER

Wells in the Dungeness community have water levels between 2 and 7 feet below ground surface, as measured in a 2010 study by the County. The water table is very shallow with very low-gradient flow in this low-elevation area where wetlands and springs are prevalent. Well logs show multiple clay layers within the upper 50 feet, creating semi-confined conditions for groundwater tapped by these wells. Tidal pressure likely adds to the dynamic nature of groundwater flow in uppermost portions of the aquifer system. Because of these complications, groundwater flow direction has not been determined for the project area even though the shallow zones are expected to be flowing generally north-northeastward, discharging into streams, wetlands, and the nearshore marine environment. Rainy-season rises in the water table contribute to flooding of roads, private property, and OSS drainfields.

The County performed groundwater water quality studies in 2010 on residential wells in the project area. All wells tested were very shallow, typical of most private wells in the community, with about three dozen feet of clay between the ground and the first well opening. Water quality results showed that seven of seven wells tested for nitrates were below the regional background level of 1 part per million (ppm). Three of five wells tested for ammonia had undetectable or at-detection levels. The highest ammonia concentration (0.515 ppm) found was in a well adjacent to the Golden Sands canals, which also have high ammonia levels relative to other surface water sites reported in Woodruff et. al. (2009).

The dissolved oxygen in the seven tested wells was very low for groundwater (median 2.4 ppm), conditions not conducive to nitrification. This means that if there is a source of nitrogen contamination it is more likely that ammonia will be found than nitrates (EHS, 2011).

2.7 CRITICAL/SENSITIVE AREAS

"Critical areas" are those land areas that are important to the protection and conservation of environmental attributes of Clallam County that add to the quality of life for both county and state residents as well as avoid potential loss of life and damage to property due to landslides, subsidence, erosion, or flooding. There are five types of critical areas used to describe these environmentally-sensitive areas. They are wetlands, fish and wildlife habitat conservation areas, geologically hazardous areas, frequently flooded areas, and areas with a critical recharging effect on groundwater aquifers used for potable (drinking) water. Figure 3 shows the critical areas within the project study area.

Clallam County updated its code to protect designated critical areas in 1992 (Ord. No. 471). Development that existed in critical areas before the code was adopted is allowed to continue and be maintained as a "pre-existing use." However, new development proposals in proximity to these areas must meet these code requirements.

Archaeological, historical, and cultural resources are also important to protect. While these areas are not considered part of the five critical area subcategories, they are considered "sensitive" areas, and have regulations requiring their protection and preservation.

The following sections discuss critical and sensitive areas in a general sense and the specific attributes of each for the project area. Figure 3 is a map showing County-designated critical areas.

2.7.1 Wetlands

Most if not all of the project area is surrounded by or contains wetlands. While wetlands can be a sign of poorly draining soils, they provide numerous benefits to a watershed, including wildlife and fish habitat, groundwater recharge, nutrient removal, and preventing seawater intrusion (seawater moving inland underground into a fresh water aquifer).

The main wetland area within the project boundary is bordered by Meadowbrook Creek to the west and Three Crabs Road to the east, and is considered a Category I wetland. Category I wetlands are described as those wetlands that are a unique or rare wetland type, very sensitive to disturbance, would be impossible to replace in a human lifetime if lost, or provide a high degree of functions (habitat, flood control, etc.). These are considered to be highly valuable wetlands within an ecosystem and would be very difficult, if not impossible, to replace.

Wetlands are categorized based on a site inspection and scored based on plants and animals present and relative performance of different wetland functions. Wetlands scoring 70 points or more (out of 100 total points) are considered Category I (Hruby, 2004).)

Other wetlands in the project area have not been categorized.

2.7.2 Fish and Wildlife Habitat Conservation Areas

There are no areas specifically set aside for fish and wildlife habitat within the project area; however, the streams that occur within the project area are tributaries to the Dungeness River, which does have salmon populations (WDFW, 1997-2013).

Habitat values of streams in the project area are limited, since the streams tend to be short, low-flow, and low-gradient (slow moving). Stream estuaries, or the mouth area of the stream that mixes with the marine water, can be rearing habitat for Chinook salmon. However, estuarine function is limited due to land-use alterations such as channelization and drainage ditches, or access to the upper reaches of the stream is restricted due to outlet structures or natural blockages at the stream mouths. Many of the streams lack native riparian vegetation and are populated by less favorable invasive species, such as canary grass and Himalayan blackberry (Clallam Conservation District, 2009).

The project area also has approximately 1.7 miles of marine shoreline, measured from the mouth of Meadowbrook Creek to Cassalery Creek. A little over half a mile of this shoreline is armored to protect against erosion. Hard armoring can detrimentally affect beach habitat by limiting spawning habitat for forage fish such as sand lance and surf smelt (Clallam Conservation District, 2009).

Beach habitat is also affected by macroalgae apparently displacing eelgrass, a known habitat for juvenile salmon. “Ulvoid blooms” are documented to be linked to nutrient loading (Shaffer 2001). The seasonal growth and decay of ulvoids is a nuisance and a major concern for shoreline landowners as reported at community meetings for this project in May-June 2012.

The Dungeness National Wildlife Refuge (Refuge) is located near the project area. It includes Dungeness Spit, Graveyard Spit, and portions of Dungeness Bay and harbor. The Refuge encompasses approximately 631 acres and is used by 250 species of birds, 41 species of land mammals, and 8 species of marine mammals. Threatened or endangered species which use the refuge include Bald Eagles, Western Snowy Plovers, Peregrine Falcons, Harlequin Ducks, and Marbled Murrelet (Dungeness Communications, Inc., 2013).

Figure 3. Critical Areas

Regarding the Dungeness River, in 2000 the DRMT requested that a work group of fisheries biologists and planners (River Restoration Work Group) undertake a land protection study as a component of both salmon recovery and flood protection efforts. In June 2003, the work group produced "Recommended Land Protection Strategies for the Dungeness Riparian Area." Its purpose is to detail the biological value of lands along the river for maintaining and improving salmonid habitat. The strategy recommends methods to protect high quality river habitat, as well as allowing for needed restoration on others (Hansi Hals and Dungeness River Restoration Work Group, 2003).

2.7.3 Geologically Hazardous Areas

Geologically hazardous areas can be areas of landslide hazards, erosion hazards, or seismic hazards. Landslide and erosion hazard areas often occur where there are steep slopes (15 percent or steeper). These hazards are associated with a loss of soil, such as a slope failure during a rainstorm. Seismic hazard areas are soils that could fail during an earthquake, such as through liquefaction (soil becomes "liquid" during earthquake shaking).

All areas of the project area are characterized as seismic hazard area since their soil types are beaches, Mukilteo muck, and Lummi silt loam. No landslide or erosion hazard critical areas are present in the project area due to the flat topography. Note however, that beach erosion has been a significant problem for shoreline landowners – resulting in armoring with various levels of success (discussed in Section 2.7.2, Fish and Wildlife Habitat Conservation Areas).

2.7.4 Frequently Flooded Areas

A majority of the project area lies within the 100 year floodplain of the Dungeness River or is subject to coastal flooding from Dungeness Bay, with the exception of the Dungeness Village LAMIRD as it is surrounded by, but not within, the flooding areas.

Coastal flooding within the project area often occurs at the mouth of each stream due to blockage or high tides. Cooper and Cassalery Creeks have structures at their outlets which can clog. Natural blockages of sand, gravel, and marine debris occur at the mouth of Meadowbrook Creek. Flooding from these blockage events tends to last only a few hours. Extreme high tides and easterly winds occasionally drive waves over the beach in low places, causing localized flooding and damage from woody debris.

Property damage from flooding is normally limited to landscaping and open areas; however, storm severity is predicted to increase over time due to climate change and associated sea level rise. The primary concern with flooding relative to this study is inundation of on-site septic systems and well contamination.

2.7.5 Critical Aquifer Recharge Areas (CARA)

The entire project area lies within the designated critical aquifer recharge area. A critical aquifer recharge area (CARA) is where the groundwater aquifer is used for drinking water and is susceptible to contamination that could affect the quality of the water. It can also be an area where the geology is favorable for infiltrating water (rainwater, snowmelt, etc.) that will replenish aquifer supplies.

In the project area, there is a relatively high potential for contamination of water used for drinking due to the shallow water table, shallow wells, and the susceptibility of individual wells to flooding. Therefore, the County code requires on-site sewage disposal systems larger than 14,000 gallons per day (gpd) to treat the effluent to state Class A reclaimed water standards prior to discharge.

2.7.6 Archaeological, Historical, and Cultural Resources

Research indicates that there are archaeological discoveries found in the project area. One shell midden site has been documented in the Three Crabs Neighborhood indicating there is archaeological potential within the area. The Department of Archaeology and Historic Preservation (DAHP) also lists the old Dungeness Wharf as an archaeological site. From a preliminary design standpoint for this feasibility study, neither of these sites is of high concern; however, it is recommended that a more detailed investigation be performed by a licensed archaeologist for any future design work in the project area. This would include a detailed consultation with DAHP and the local Native American Tribes to determine if any field investigative work is warranted.

2.8 EXISTING WATER SYSTEMS AND WELLS

Domestic water (potable water) is supplied to the project area via public water systems or individual private wells. Eight public water systems serve the area. Most of the population is served by Group A water systems. Group A water systems are public water systems that have 15 connections or more, or serve 25 or more people per day for 60 or more days per year. These systems are regulated by the Washington State Department of Health and are required to have their water tested monthly for coliform bacteria and annually for nitrates (and on a regular basis for other contaminants).

The Seashore neighborhood and a subdivision in the Dungeness Village LAMIRD are served by Group B water systems. A Group B water system is a public water system that serves less than 15 connections and less than 25 people per day, or has 25 or more people per day during fewer than 60 days per year. These systems must test their water annually for coliform bacteria and every three years for nitrates.

It is unknown how many individual wells are used within the project area, but is estimated to be around 70. These wells are unregulated and can be a potential source of groundwater contamination if they were not constructed properly when installed with an adequate surface seal. In areas of flooding and close proximity to septic systems, such as the project area, the potential for drinking water contamination is greater.

2.9 EXISTING ON-SITE SEPTIC SYSTEMS (OSS)

Clallam County EHS maintains a database to store and query permit information, including OSS data. EHS records the type of OSS for each parcel in its database and uses 21 different categories to do so. All OSS records and data generated since 1987 have been entered into the database as part of the permitting process. EHS has paper records for OSS permitted before 1987, and received a grant from the Department of Ecology that supports its work to enter these paper records into the database. This is an on-going project. The County has used this database to identify all “known” OSS in the MRA (EHS, 2007).

At the time of this report, there are no OSS presently failing in the project area. Eleven properties are categorized “unknown,” meaning no permit information is on file. Approximately half of all known systems in the database are “advanced” (designed to provide more treatment than a conventional septic system). Most of the known systems did not have current inspections on file with the County.

Table 2-2 on the following page is a summary of known OSS in the project area as of April 2012.

Table 2-2. Project Area On-Site Septic System Summary

Three Crabs Neighborhood									
132 Total Lots					System Type (Developed Lots)			OSS Condition[c]	
Residential	Business	Vacant	Non-buildable[a]	% Developed	Conventional	Advanced	No Information[b]	Inspection Current	Inspection Not Current
104	1	17	10	86	54	47	5	28	73
Golden Sands Neighborhood									
71 Total Lots					System Type (Developed Lots)			OSS Condition[c]	
Residential	Business	Vacant	Non-buildable[a]	% Developed	Conventional	Advanced	No Information[b]	Inspection Current	Inspection Not Current
38	0	20	13	66	5	11	22	4	12
Dungeness									
101 Total Lots					System Type (Developed Lots)			OSS Condition[c]	
Residential	Business	Vacant	Non-buildable[a]	% Developed	Conventional	Advanced	No Information[b]	Inspection Current	Inspection Not Current
67	7	25	2	75	46	22	6	13	55
Seashore									
14 Total Lots					System Type (Developed Lots)			OSS Condition[c]	
Residential	Business	Vacant	Non-buildable[a]	% Developed	Conventional	Advanced	No Information[b]	Inspection Current	Inspection Not Current
14	0	0	0	100	1	13	0	5	9
TOTAL STUDY AREA SUMMARY									
318 Total Lots					System Type (Developed Lots)			OSS Condition[c]	
Residential	Business	Vacant	Non-buildable[a]	% Developed	Conventional	Advanced	No Information[b]	Inspection Current	Inspection Not Current
223	8	62	25	79%	106	93	34	50	149

a For the purposes of only this report, "non-buildable" describes those lots that are designated as open space, unsuitable for septic, or otherwise cannot be currently developed.

b "No Information" describes those lots that either have unknown septic systems or specific parcel information was not available (as of April 2012).

c Condition of known systems on developed lots only.

Notes:

Information is current as of April 2012; as of March 2013, the total number of "no information" system types has dropped from 34 (as shown in table above) to 9, but the percent of systems current on their inspection is the same (approximately 25%).

Database source: Clallam County Environmental Health Services and aerial photos of area from Bing maps (2012).

3. EXISTING AND FUTURE WASTEWATER FLOWS

To determine the required size and components of various wastewater treatment options, the amount of wastewater generated must be estimated. Current population numbers are used to form estimates of current wastewater flows, while projected population growth and future development (build out) estimates are used to determine the future increase in wastewater flows.

3.1 EXISTING AND FUTURE POPULATION ESTIMATES

Clallam County's current population is approximately 71,400 based on 2010 census data. The total population in the County increased by 10.7 percent from 2000 to 2010, as compared to the 14.2 percent overall population increase for Washington State. The average projected increase in population for the County from 2010 to 2040 is approximately 7 percent, to 76,300 (Washington State Office of Financial Management, 2012).

There are a total of 320 parcels in the project area based on April 2012 Clallam County GIS data. All parcels are subdivided and no further densification will occur. Of the total parcels, 231 have been developed and are occupied; 62 parcels are undeveloped. The remaining 25 parcels are designated as currently unbuildable, or not otherwise available for development. For this study, we are going to assume full build out of all 293 currently buildable parcels. Unbuildable parcels comprise approximately 9 percent of the total lots within the study area, and if some were to become developed it would not significantly alter the assumptions used in this report.

Since there are four distinct neighborhoods which could potentially have their own community treatment system, the flow estimates have been developed separately. If a regional facility is proposed, then the flows from the four communities could be combined and conveyed to the facility. The four areas are:

1. Three Crabs Neighborhood;
2. Golden Sands Neighborhood;
3. Dungeness Neighborhood (includes seven small businesses); and
4. Seashore Neighborhood.

3.2 EXISTING AND FUTURE WASTEWATER FLOWS

Existing wastewater flows for each neighborhood are based on design criteria prescribed in WAC 246-272B-06150, where the peak flow (highest flow possible) value is used for designing wastewater treatment facilities. For residential developments (includes single-family homes, multi-family dwellings, and mobile home parks) with total estimated flows greater than 14,500 gallons of wastewater per day, the flows used for designing the system shall be 270 gallons per day (gpd) per dwelling. For systems with total flows of less than 14,500 gpd of wastewater, minimum design flows are 120 gpd per bedroom or 240 gpd for existing dwellings and 360 gpd for new dwellings. For purposes of designing alternatives for this feasibility study, it is assumed that a single home (or developed lot) generates 270 gallons of wastewater per day since the total flow for each neighborhood will generally exceed 14,500 gpd in wastewater flows. While the Seashore neighborhood would not have wastewater flows over 14,500 gpd and is already fully built out, 270 gpd was used as its flow rate to stay consistent with the other neighborhoods for the purposes of this study only.

Restaurants, schools, churches, and other businesses' wastewater flows are computed based on different criteria. These design flows are generally determined based on flow rates accounting for customer/public use (such as flow rate per seats for a restaurant) and/or the number of employees (such as for a business). Restaurants are assumed to have typical flow rates of around 50 gallons of wastewater generated per day per seat. Employees at businesses are assumed to typically generate 25 gallons of wastewater per person per day.

3.2.1 Existing Wastewater Design Flows

For the four neighborhoods, residential flows were estimated using an average of 270 gallons per lot. Non-residential flow rates were estimated based on the number of employees or customers (seats) served.

The largest non-residential flow was the Three Crabs Restaurant, located in the Three Crabs Neighborhood. However, this property was purchased by Washington State Department of Fish & Wildlife in 2012 for public beach access. No public restroom facility is planned for beach access, so no new wastewater flow will be created by the purchase.

The only other non-residential flows occur in the Dungeness community. Seven small businesses are located there and include the following:

- Nash's Farm Store.
- Fire Station.
- Groveland Cottage B & B.
- Cockburn Landscaping.
- Dungeness Kayaking.
- Two convenience stores, currently closed.

The businesses are assumed to have four employees each at 25 gpd per person (100 gpd per business). Therefore, the six businesses combined generate 600 gpd. The Groveland Cottage B & B is assumed to be equivalent to four homes (1,000 gpd). The total business flow is therefore 1,600 gpd.

The current wastewater design flows for each neighborhood are as follows:

Table 3-1. Existing Wastewater Design Flow by Neighborhood

Neighborhood	Occupied Lots	Vacant Lots	Total Buildable Lots	Peak Day Flow[a] (gpd)
Three Crabs	105	17	122	28,350
Golden Sands	38	20	58	10,260
Dungeness[b]	74	25	99	19,980
Seashore	14	0	14	3,780
TOTAL:	**231**	**63**	**293**	**62,370**

[a] Flow computed by multiplying number of occupied lots by 270 gpd for residential lots.

[b] Includes seven business lots with a total flow of 1,600 gpd.

3.2.2 Future Wastewater Design Flows

Wastewater flows increase with growth in an area; this information is used to determine the size of the wastewater treatment system to be built. Growth continues until build-out occurs, or all buildable parcels are developed. While true full build-out (100 percent of all parcels developed) seldom occurs in any area, this study assumes all buildable lots are developed into residential lots since the study area is currently at approximately 80 percent occupancy. For this report, it was assumed that no additional businesses with flows greater than a typical residential lot will occur within any of the neighborhoods.

Most lots are designated by Clallam County as non-dividable under current zoning. Several lots, especially those within the Dungeness neighborhood, can be subdivided. Subdividing of only a few parcels is anticipated. Also, this study does not account for any changes in businesses (number or type). The assumption of full build-out accounts for both of these possibilities.

Neighborhood	Total Lots (Build Out)	Build-Out Flows (gpd)[a]
Three Crabs	122	32,940
Golden Sands	58	15,660
Dungeness[b]	99	26,730
Seashore	14	3,780
TOTAL:	**293**	**79,110**

a Flow computed by multiplying number of total build out lots by 270 gpd.

b Includes 7 business lots with a total flow of 1,600 gpd.

Estimated total wastewater flow at full build out is 79,110 gpd.

4. WASTEWATER MANAGEMENT ALTERNATIVES

This section presents the various alternatives for collecting, treating, and disposing of the solids and the effluent for the project area community. There are four options for collection, treatment, and disposal of wastewater based on the size of the area under consideration:

- Maintenance of individual on-site septic systems (currently used).
- Clustered larger on-site systems which handle a single neighborhood.
- A community-wide treatment and disposal system.
- Conveyance of the community wastewater to a nearby established treatment plant for treatment and disposal.

Individual on-site septic systems (i.e., serving a single property) may need upgrades to their treatment process to reduce nutrient loading to poor soils. It is possible to serve multiple lots with a single drainfield, and these will need a collection system installed to convey the wastewater to a single point for treatment and disposal via the shared drainfield.

Clustered on-site septic systems serving single neighborhoods would utilize larger drainfields for treatment and disposal of wastewater. These neighborhood systems would need to have a collection system along with a treatment system and drainfield. Systems of this size or larger (systems with more than approximately 14 home connections) will require wastewater treatment operators and a financial mechanism for billing customers because they fall under state jurisdiction.

The third option is to have a centralized wastewater collection, treatment, and disposal system that serves the entire project area. This large system would require a very large drainfield. Since the amount of land required is substantial, other effluent disposal options are considered for this option, including wetland or stream discharge. These additional disposal alternatives are considered only for this option since permitting these alternatives can be challenging and require substantial funding.

The fourth option is to collect the wastewater from the entire project area and convey it to a nearby established wastewater treatment facility such as SunLand or City of Sequim. While this option reduces the capital costs of designing and building an entire treatment and disposal system, conveyance costs are significant, and there are land use zoning issues. Utilities infrastructure can connect Urban Growth Areas, but additional connections cannot be made outside of these Urban Growth Areas, as it is considered to be contributing to urban sprawl.

4.1 INDIVIDUAL ON-SITE SEPTIC SYSTEMS (OSS)

Individual OSS are the only systems currently used within the study area. The most common system is the conventional septic tank and a gravity drainfield. These work well in ideal soil conditions within a suitable lot size. Properly functioning drainfields will remove most pathogens, but will remove very little of nutrients such as nitrogen. Drainfields do not function well in poor soils, especially combined with a high water table, or on small lots. Many of these systems are considered to be failing because they do not provide adequate treatment and are releasing untreated effluent. In areas with these problems, more sophisticated treatment systems can be used because they remove more pathogens and nutrients from the wastewater and do not rely on soil treatment in the drainfield as heavily as conventional systems.

Some homes have installed these newer state-of-the-art systems that are functioning well. These Washington State Department of Health-approved "enhanced systems" are of several different designs. Some of the more common systems are described below.

- **Mound System:** A treatment-based system consisting of pressurized drain lines lying in a sand bed mounded above the original soil surface. They require at least 18 inches of permeable soil above a restrictive layer. This system type has allowed construction on sites previously thought unsuitable due to lack of soil depth. The complexity of this system and the situations in which it is used requires periodic maintenance and proper operation to assure continued performance standards are met over time. A mound system provides similar minimal nutrient treatment capabilities as a conventional gravity drainfield.
- **Sand Filter System:** Consists of sand placed in a watertight box built into the soil. Effluent is spread evenly over the surface of the sand via a pressurized pipe network. The sand layer treats the effluent and it is collected in the bottom of the filter box and then pumped to a drainfield. The drainfield in this case is a pressure distribution system, which finishes the treatment process and disposes of the wastewater. It requires at least 18 inches of permeable soil above a restrictive layer. The complexity of this system and the situations in which it is used requires periodic maintenance and proper operation to assure continued performance standards are met. Sand Filter systems provide slightly more nutrient treatment than a conventional gravity drainfield, but if the system is recirculating, it can provide significantly more nutrient treatment than a conventional gravity drainfield.
- **Biofilter:** Consists of different layers of sand and gravel placed in a watertight box built into the soil. Effluent is pumped into the bottom of the filter and allowed to wick itself up through the sand and over the rim of the box into the soil. Several boxes or pods may be used to accommodate varying site conditions and number of bedrooms. A flow splitter along with a timing device is used to assure even flow to all pods. This system can be used in situations where a lot has a minimum of 12 inches of suitable soil. The complexity of this system and the situations in which it is used requires periodic maintenance and proper operation to assure continued performance standards are met over time. Biofilter designs can vary, as can their ability to treat nutrients. These systems can provide some treatment of nutrients if designed properly.
- **Aerobic Treatment Unit (ATU):** Consists of a watertight tank with an aeration chamber where sewage and microorganisms come in contact with each other in the presence of dissolved oxygen. Blowers, compressors, or air pumps supply the air. The treated effluent then flows to a drainfield for final on-site treatment. To meet the highest treatment standards, a disinfection unit must be part of the device to reduce the bacteriological counts. The complexity of this system and the situations in which it is used requires periodic maintenance and proper operation to assure continued performance standards are met over time. These systems are similar to Biofilters in that the designs can vary, as can their ability to treat nutrients.

Drainfields may be required to be pressurized. These consist of a pump tank (additional septic tank with a pump inside) with pressurized drain lines leading to individual trenches. This allows dosing of the drainfield and use of the entire drainfield at once. For comparison, gravity systems can overload the front portions of the drainfield, with the wastewater rarely reaching the farther portions. Pressure distribution drainfields require at least 30 to 36 inches of permeable soil above a restrictive layer. Maintenance is required to assure the orifices (holes in the drain lines) do not plug over time.

Where several neighboring lots have failing systems due to land issues (not enough land, poor soils, or high groundwater), it may be possible to combine the effluent from these lots and dispose of it in a single drainfield. The drainfield is generally adjacent to one of the affected properties. The total daily flow rate would need to be below 3,500 gallons per day (gpd) (approximately 14 homes) to stay under County jurisdiction and not be considered a larger, state-regulated system. Agreements between the lot owners would need to be created to ensure the drainfield was maintained and kept in good repair, and to identify the responsible party for reporting purposes.

4.1.1 Capital Cost Estimate

The typical costs for an enhanced, individual OSS range from approximately $9,300 to $32,300, depending on the system design, soils investigations, and engineering and permitting fees. The costs include connection from the house, septic tank, treatment and disposal system components, and cost to abandon an existing on-site system. Note that actual costs will vary depending on the needs and conditions of individual systems.

Table 4-1. Individual Enhanced OSS Capital Cost Estimate

Item	Cost Range	
Enhanced OSS:	$5,000	$20,000
Abandon Existing System:	$1,000	$1,000
Subtotal:	**$6,000**	**$21,000**
Engineering, Permitting and Construction Administration (25%):	$1,500	$5,300
Sales Tax (8.4%):	$600	$1,800
Contingency (20%):	$1,200	$4,200
TOTAL	**$9,300**	**$32,300**

4.1.2 Operation and Maintenance Requirements

Septic system owners would be individually responsible for ensuring their system was functioning properly, including inspections, and reporting their operational status to the County on a regular basis. All repair or replacement costs of the system in the event of failure would be the owner's responsibility.

Individual OSS operation and maintenance (O&M) costs, including equipment replacement costs, range from $300 to $400 per year, assuming septic tanks are pumped every 3 years.

4.1.3 Permit Requirements

The permit requirements for individual OSS are straightforward and only require approvals from Clallam County. There is typically a grading permit required for the excavation and fill work associated with constructing (or abandoning) an OSS, whether conventional or enhanced. A septic permit is required which includes inspection of the system by EHS.

4.2 CLUSTERED LARGE ON-SITE SEWAGE SYSTEMS (LOSS)

The second option is to have a Large On-Site Sewage System (LOSS) for a single neighborhood. Each neighborhood would be considered separately in regards to need, construction, and servicing. Each clustered LOSS includes a collection system to convey the wastewater to a primary treatment tank and a dosing tank for drainfield disposal.

LOSS systems are over 3,500 gpd but under 100,000 gpd. These systems are regulated by the DOH. The wastewater flow rates for the four neighborhoods identified in the project area range from approximately 3,700 to 33,000 gpd. All LOSS systems being considered for the project area would be regulated by the DOH.

Very stringent design criteria have been established for LOSS systems, and these drainfields can be large, especially in areas of poorer soils. Additional requirements are imposed for LOSS systems that have a design flow in excess of 14,500 gpd, such as requiring an emergency generator for backup power. In addition, since all of the project area is within a designated CARA, these larger LOSS facilities must treat the effluent to a Class A level.

4.2.1 LOSS Collection Alternatives

One of the main considerations for the LOSS alternative is the collection system, or how the wastewater is conveyed to the drainfield. The collection system options are gravity, grinder pump pressure system, Septic Tank Effluent Pump (STEP) pressure system, or a vacuum system.

4.2.1.1 Gravity Collection Systems

As the name implies, a gravity system is all or part of a collection system that carries wastewater to either a pump station or to the treatment facility. To prevent blockage, 8-inch-minimum-diameter pipes are required by Ecology (2008). A minimum design slope must be maintained to provide adequate velocity to keep solid material suspended. For an 8-inch-diameter sewer, a minimum slope of 0.40 percent (a drop of about 5 inches every 100 feet) is recommended by Ecology. When possible, collection lines are routed to take advantage of natural grade. This helps reduce the depth of the trench while maintaining the minimum slope needed to sustain flow. Trench depth is an important factor in determining the cost for gravity sewers, as deeper trenches are more expensive to construct.

For example, Three Crabs Road is about a mile in length. A gravity line running the full length would drop about 21 feet. The line would begin at 4 feet below the surface (minimum sewer line burial depth per state regulations), bringing the maximum depth to 25 feet. This would be too deep, especially in a high water table area. At least one intermediate pump station would be required in this case.

The project area has two concerns if gravity sewer lines were used. The first concern is the project area is too flat, requiring deep trench excavations for pipe installation and pump stations for lifting wastewater when trenches would be too deep. Adding pump stations eliminates much of the economic value of having a gravity sewer system, since pump stations would need emergency power systems for power outages.

The other concern is infiltration and inflow (I/I) from groundwater entering into the pipe system in saturated areas. I/I into the pipes from high groundwater would add additional wastewater to the treatment and disposal system. If the wastewater system is not sized for this, it could overwhelm the system and cause it to fail. Sizing a wastewater treatment system for I/I is not considered an economical or efficient way to utilize limited construction funds.

Due to these concerns, a gravity sewer collection system is considered to be a poor option for this location and was not developed further.

4.2.1.2 Grinder Pump/Pressure Sewer System

Pressure sewers are a viable alternative to gravity sewers where implementation of conventional gravity sewers is impractical, unfeasible, or uneconomical. A pressure sewer is a small diameter pipeline, shallowly buried. Typical main diameters range from 2 inches to 6 inches. Polyvinyl chloride (PVC) and high density polyethylene (HDPE) are common piping materials.

Each residential or commercial unit uses a small pump in a 100-gallon storage basin located on private property to discharge to the sewer main. This pump may be a grinder pump, which grinds the solids present in the wastewater into slurry similar to a garbage disposal in a kitchen sink. The service line leading from the grinder pump to the force main in the street is usually a 1- to 1-1/2-inch-diameter pipe. A check valve on the service line and a redundant check valve on the pumping unit prevent backflow.

Grinder pump manufacturers provide pre-assembled packages that include the pump, basin, piping, and valves, liquid level sensors, electrical control panel, electrical junction box, and associated equipment. Two manufacturers of these package systems used in western Washington are Environment One (E/One) and Barnes (see Appendix C). Each system has unique features that make it suitable for different applications.

Problems with grinder pumps can be clogging of the grinding blades within the pump and a higher loading of nutrients to the treatment plant, since solids that would have settled out are mixed and suspended within the wastewater.

Capital Cost Estimate

The cost estimate for the grinder collection system includes general contractor costs (mobilization, demobilization, and traffic control); costs for the grinder pump installation on individual properties (basin, pump, valves, piping, and fittings); the low pressure collection pipe (main collector pipe in the street or right-of-way); pavement trenching and restoration for installing the collection pipe; and the cost of the force main pipe to the disposal facility. Engineering includes estimated costs for project design, permitting the project, surveying, and construction management.

Table 4-2. Clustered Grinder Collection System Capital Cost Estimate

Item	Dungeness	Three Crabs	Golden Sands	Seashore	PROJECT TOTAL
Contractor General Costs[a] (10%):	$126,000	$145,000	$70,000	$24,000	
Grinder Pump Assembly:	$684,000	$842,000	$401,000	$97,000	
2” to 4” Low Pressure Collection Piping:	$206,000	$219,000	$96,000	$35,000	
Pavement Trenching/Restoration:	$316,000	$335,000	$147,000	$59,000	
Piping to Disposal Facility:	$52,000	$52,000	$52,000	$52,000	
Subtotal:	**$1,384,000**	**$1,593,000**	**$766,000**	**$262,000**	**$4,005,000**
Engineering[b] (25%):	$346,000	$399,000	$192,000	$66,000	
Sales Tax (8.4%):	$117,000	$134,000	$65,000	$23,000	
Contingency (35%):	$485,000	$558,000	$269,000	$92,000	
TOTAL:	**$2,332,000**	**$2,684,000**	**$1,292,000**	**$443,000**	**$6,751,000**

a Includes mobilization, demobilization, and traffic control.

b Includes project design, permits, surveying, and construction management.

4.2.1.3 STEP/Pressure Sewer System

STEP is an acronym for Septic Tank Effluent Pumps. In a STEP system, wastewater flows from the home (or service connection) into a septic tank located on or near the site (see Appendix C for a typical system). Household connections usually have their own on-site tank. In some cases, multiple homes may share tanks if the tank is large enough to provide adequate storage volume and detention time. A portion of the treatment process occurs on-site since septic tanks act as a primary clarifier. Inside the tank, heavy solids sink to the bottom to form sludges, and lighter materials rise to the top to form a scum layer. A pump inside the tank transports the liquid (effluent) between the sludge and scum layers to a small diameter collection pipeline. The collection pipeline routes the effluent to a centrally located pump station for transmission to the treatment and/or disposal facility.

Since most of the solids remain in the septic tank, smaller diameter lines can be used without concern for clogging. Fewer solids result in a lower biological loading at the treatment/ disposal facility. A pressurized properly-constructed collection system is not subject to excessive I/I of outside water into the collection system (as compared to a gravity collection system). This will reduce the hydraulic loading at the treatment facility.

Benefits of STEP systems can be a reduction of fats, oils, and grease from entering the collection system and clogging key components, like a pump station. Solids which are not easy to treat, such as paint solids or other non-biodegradable items, would stay in each lot's septic tank. Also, since most homeowners already have septic tanks, tanks in good condition could be retrofitted for use as a STEP tank and reduce costs.

STEP systems can have problems with I/I into the septic tank, which can increase flows to the treatment/disposal facility. Areas of high groundwater are more susceptible to I/I flows. Other issues with STEP systems can be odors from the pipes due to the anaerobic nature of the wastewater effluent pumped from the septic tanks.

Capital Cost Estimate

The cost estimate for a STEP/Pressure sewer system is similar to the grinder collection system (Section 4.2.1.2), with the exception that the STEP assembly includes abandoning the existing tank, installing a new septic holding tank, piping, and site restoration for each lot.

Table 4-3. Clustered STEP Collection System Capital Cost Estimate

Item	Dungeness	Three Crabs	Golden Sands	Seashore	PROJECT TOTAL
Contractor General Costs[a] (10%):	$122,000	$112,000	$68,000	$24,000	
STEP Assembly:	$644,000	$793,000	$377,000	$91,000	
2" to 4" Low Pressure Collection Piping:	$206,000	$219,000	$96,000	$35,000	
Pavement Trenching/Restoration:	$316,000	$335,000	$147,000	$54,000	
Piping to Disposal Facility:	$52,000	$52,000	$52,000	$52,000	
Subtotal:	**$1,340,000**	**$1,511,000**	**$740,000**	**$256,000**	**$3,847,000**
Engineering[b] (25%):	$335,000	$378,000	$185,000	$64,000	
Sales Tax (8.4%):	$112,000	$127,000	$63,000	$22,000	
Contingency (35%):	$469,000	$529,000	$259,000	$90,000	
TOTAL:	**$2,256,000**	**$2,545,000**	**$1,247,000**	**$432,000**	**$6,480,000**

a Includes mobilization, demobilization, and traffic control.

b Includes project design, permits, surveying, and construction management.

4.2.1.4 Vacuum Sewer System

Vacuum systems convey sewage through a vacuum pump/tank system placed on private property. When wastewater reaches a particular level in the tank, a valve opens, creating vacuum suction, and the material is transported to the vacuum sewer main (see Appendix C for a typical system).

Due to the large costs associated with the vacuum collection station, it is generally not cost effective to use vacuum sewers in communities of less than 200 connections (WERF, 2010). Because of this concern, the vacuum sewer lines are not considered a feasible collection option for clustered LOSS systems. They are an option for a community-wide system; there is a more detailed description of the vacuum system in Section 4.3.1.

4.2.1.5 Collection System Operation and Maintenance Requirements

The parcel owner may or may not be responsible for maintenance of the collection system equipment located on their property, as this would be dependent on agreements that are made within a LOSS system management plan (see Section 5.2.2.1).

The service line and equipment located in the public right-of-way would be maintained by a management entity, based on final ownership and operation of the conveyance system. Property owners would be responsible for maintenance of the infrastructure.

4.2.2 LOSS Drainfield Disposal System

The LOSS drainfield (e.g., drainfields with flow rates from 3,500 gpd to 100,000 gpd) must be a pressure distribution system with timed dosing of the wastewater per state regulations. The drainfield must be constructed in three segments, two of which are sized to treat the wastewater on a daily basis and the third to be in a resting condition. Each of the three drainfield segments rest on a rotating basis. Additionally, land for an adjacent fourth segment must be held in reserve for construction in the event that one of the segments should fail.

Sizing the drainfield is based on how much effluent is applied per square foot of soil. The application rate is based on the soil type. This report assumes the soil would be Lummi Silt Loam, which is categorized as a Type 5 soil.

Sizing the drainfield for effluent disposal is a function of the infiltration rate of the soil. For example, a Type 5 soil has an infiltration rate of 0.40 gallon per square foot per day (gpd/ft^2). The size of the drainfield must also take into account spacing between pipes and required reserve (see above) and buffer areas. With all of these factors considered, a drainfield in this project area would be 13,750 square feet (ft^2) per 1,000 gpd of wastewater flow.

Table 4-4 shows the flow rate and approximate drainfield size for each neighborhood based on the above criteria. All drainfields over 3,500 gpd would be regulated by the State. Seashore, if designed as its own system (a single clustered system), would be designed with flow rates of 240 gpd per the WAC regulations (see Section 3.2), and have a total flow less than 3,500 gpd. This would allow it to be regulated through the County instead of the State. The higher flow rates are used here for comparison purposes for the study. Note that the drainfields for Three Crabs, Golden Sands, and Dungeness neighborhoods are over 14,500 gpd and would have additional requirements.

Table 4-4. Drainfield Size Estimates for Clustered LOSS Systems

Neighborhood	Flow Rate (gpd)	Drainfield Size	
Dungeness	26,730	367,538 ft^2	8.4 acres
Three Crabs	32,940	452,925 ft^2	10.4 acres
Golden Sands	15,660	215,325 ft^2	4.9 acres
Seashore	3,780	51,975 ft^2	1.2 acres

LOSS drainfields provide the same level of treatment as conventional individual OSS drainfields do. LOSS drainfields use the soil matrix to filter out pathogens and particles from the effluent; however, the soil matrix does not readily remove nutrients such as nitrogen. Because nutrient loadings from a large, localized drainfield can have a significant impact on the environment, it shall be assumed that each drainfield facility will be equipped with a nutrient reduction system.

Per the County's CARA regulations (see Section 2.7.5), a single LOSS system releasing more than 14,000 gpd of effluent must treat wastewater to reclaimed water Class A requirements. Class A requirements include nitrogen reduction treatment. The design and construction costs for Class A effluent drainfield facilities are significant and can potentially add another 30 percent to the overall costs. To avoid these higher costs, it is proposed that the three larger neighborhoods "split" their systems into smaller collection basins that don't exceed 14,000 gpd. This "flow splitting" technique is allowed by both DOH and the County, and is assumed in the capital cost estimates.

Capital Cost Estimate

The cost estimate for the drainfield includes the pump station located at the end of the collection system, the pressure pipe from the pump station to the LOSS system, and all costs to construct three of the four segments. The fourth reserve segment construction cost is not included and would only be required if one of the segments were to fail.

Table 4-5. Clustered Drainfield System Capital Cost Estimate

Item	Dungeness	Three Crabs	Golden Sands	Seashore	PROJECT TOTAL
Contractor General Costs[a] (10%):	$70,000	$85,000	$43,000	$12,000	
Land Acquisition	$84,000	$104,000	$49,000	$12,000	
Site Grading:	$9,000	$11,000	$5,000	$2,000	
Drainfield Piping System:	$294,000	$364,000	$172,000	$42,000	
Dosing Facility/Emergency Storage:	$75,000	$88,000	$45,000	$10,000	
Nutrient Treatment:	$270,000	$330,000	$160,000	$40,000	
Electrical/I&C:	$50,000	$50,000	$40,000	$20,000	
Subtotal:	**$852,000**	**$1,032,000**	**$514,000**	**$138,000**	**$2,536,000**
Engineering[b] (25%):	$213,000	$258,000	$129,000	$35,000	
Sales Tax (8.4%):	$72,000	$87,000	$44,000	$12,000	
Contingency (35%):	$299,000	$362,000	$180,000	$49,000	
TOTAL:	**$1,436,000**	**$1,739,000**	**$867,000**	**$234,000**	**$4,276,000**

a Includes mobilization, demobilization, and traffic control.

b Includes project design, permits, surveying, and construction management..

4.2.2.1 Drainfield Operation and Maintenance Requirements

Part-time or contracted licensed wastewater professionals would likely be needed to periodically check on the dosing tank and perform drainfield inspections to ensure the system was functioning properly, as well as inspect and maintain the collection system. A monthly fee or yearly fee would need to be established by the user community to pay for these costs associated with the facility, including repairs, replacement, or rental of equipment as needed.

Table 4-6. Clustered Drainfield System Annual O&M Cost Estimate

Item	Dungeness	Three Crabs	Golden Sands	Seashore	PROJECT TOTAL
Pump Out Septic/Dosing Tank	$5,000	$5,000	$3,000	$1,000	
Operation and Maintenance Staff	$7,000	$8,000	$4,000	$1,000	
Billing/Collection Administration	$5,000	$6,000	$2,000	$1,000	
Drainfield Equipment Repair/Replace	$25,000	$29,000	$14,000	$4,000	
Drainfield Electrical Usage	$1,000	$1,000	$1,000	$1,000	
STEP Maintenance	$30,000	$36,000	$17,000	$5,000	
Subtotal:	**$73,000**	**$85,000**	**$42,000**	**$13,000**	**$213,000**
Sales Tax (8.4%):	$7,000	$8,000	$4,000	$2,000	
Contingency (10%):	$8,000	$9,000	$5,000	$2,000	
TOTAL:	**$88,000**	**$102,000**	**$51,000**	**$17,000**	**$258,000**

4.2.3 Clustered/LOSS Permitting Requirements

Permitting requirements are generally the same regardless of the specific type of collection system. For construction of a collection system, local approvals from Clallam County would be required, including preparation of an expanded State Environmental Policy Act (SEPA) environmental checklist and a grading permit application. The project area is in a critical area (critical aquifer recharge area) and as such will be required to go through the critical areas review process. The critical areas review process occurs concurrently with SEPA review. Work occurring in the right-of-way (for example to extend the sewer lines to individual homes along roads) requires a right-of-way permit from the County. A National Pollutant Discharge Elimination System (NPDES) Construction General Stormwater permit from Ecology is required if the project would disturb over 1 acre of land.

If federal funding is used for the project, then other federal laws and statues will apply. This may require an environmental assessment or documented categorical exclusion depending on the potential impacts of project development based on the National Environmental Policy Act (NEPA). While unlikely to impact endangered or threatened species, federal funding would also trigger compliance with the Endangered Species Act (ESA).

Drainfield permitting requirements for the clustered LOSS systems will be under the State DOH jurisdiction because all four neighborhood systems are between 3,500 gpd and 100,000 gpd design flows. The submittals required to obtain a LOSS operating permit include a number of geotechnical and engineering design reports, engineering plans and specifications, and an operation and maintenance manual. A detailed description of the DOH permitting process is described in Section 5.2.2.

Any potential archaeological sites found during construction would require due diligence. The level of effort required for due diligence would depend on whether the project is under federal or state funding. A federally funded project would make it necessary to perform an archaeological survey for most ground-disturbing activities. A state funded project may or may not involve a survey, but would include review of the State Historic Preservation Office files and records, and may include contact with historical societies, archaeological consultants, and tribes.

A more detailed description of the various permits is discussed in Section 5.4.

4.2.4 Recommended Clustered System Alternative

For a clustered wastewater treatment system, the recommended alternative is the STEP system (Section 4.2.1.3) due to the lower cost and lower maintenance of main collection and treatment system components. Grinder pumps are slightly more costly, have a lower possibility of components being flooded by high groundwater, and have more minor lot maintenance. However, they may not protect the main collection and treatment/disposal system from additional maintenance to remove materials such as fats and grease (which can also cause odors).

The total costs for the system, including operation and maintenance, are shown below. The "20 Year Funding Retirement" is the capital cost of the system made over 20 years at an interest rate of 3 percent. The total annual cost would be the amortized capital cost plus the annual operation and maintenance (O&M) cost.

Note that costs are provided per neighborhood, allowing each neighborhood to determine if a clustered system is the right choice. The clustered systems do not need to be built as an "all or none" system (every neighborhood must be on a clustered system or no neighborhood can be on a clustered system), such as a centralized system would require.

Table 4-7. Clustered System Cost Estimate

Item	Dungeness	Three Crabs	Golden Sands	Seashore	PROJECT TOTAL
STEP Pump Collection System	$2,256,000	$2,545,000	$1,247,000	$432,000	$6,480,000
Drainfield	$1,436,000	$1,739,000	$867,000	$234,000	$4,276,000
TOTAL CAPITAL COST:	**$3,692,000**	**$4,284,000**	**$2,114,000**	**$666,000**	**$10,756,000**
TOTAL O&M COST:	**$88,000**	**$102,000**	**$51,000**	**$17,000**	**$258,000**
Number of Lots:	99	122	58	14	293
Total Capital Cost per Lot:	$37,290	$35,120	$36,450	$47,570	$36,710
20 Year Capital Funding Retirement per Lot[a]:	**$1,120**	**$1,060**	**$1,100**	**$1,430**	**$1,100**
Annual O&M Cost per Lot:	**$890**	**$840**	**$880**	**$1,220**	**$880**
TOTAL ANNUAL COST PER LOT:	**$2,010**	**$1,900**	**$1,980**	**$2,650**	**$1,980**

[a] Assumed 3% interest rate.

4.3 CENTRALIZED COLLECTION, TREATMENT, AND DISPOSAL

Most people's idea of a wastewater treatment system is a centralized treatment system, where sewage is collected via a pipe system from each lot and delivered to a wastewater treatment plant for treatment and disposal. Under this alternative, all four neighborhoods would utilize a single wastewater treatment and disposal facility. Capital costs and O&M costs would be applied to the entire service area.

There are several options for collecting, treating, and disposing of wastewater using these larger systems that are not available for smaller systems. Treatment of the collected wastewater can happen via several different methods. For this analysis, membrane bioreactor and sequencing batch reactor treatment technologies were selected, as both of these produce high quality effluent with very low levels of nutrients. High quality effluent would not only reduce pollution concerns within the watershed, but the effluent could also be used for reclaimed water purposes (Class A reclaimed water).

For effluent disposal, three other options are available in addition to a large drainfield system. These options are land application (irrigation), wetland discharge, or stream discharge. Land application would be the least permit burdensome of the three options, with the surface water discharge (wetland or stream discharge) requiring multiple permits.

Wetlands that provide potential human-contact recreational or educational beneficial uses require water quality to be Class A reclaimed water or better. Noncontact recreational or educational beneficial uses or fisheries require Class B reclaimed water. Sewage disposal in critical aquifer recharge areas must meet Class A reclaimed water standards. Constructed wetlands were considered, but water quality concerns within the watershed make this treatment technology less appropriate at this location.

Operational data from other states suggests that wetlands systems, if properly designed, can meet requirements for BOD5 and total suspended solids (TSS) removal. However, there is not sufficient operational evidence available that wetlands systems can consistently achieve nutrient removal, particularly ammonia/nitrogen reduction. Many communities are now being required to achieve ammonia removal for freshwater discharges or overall nitrogen reduction for groundwater discharges. Wetlands systems are not encouraged by the state as a treatment technology option when nitrogen removal is required, unless additional measures, such as additional treatments, are implemented to address this inadequacy (Ecology, 2008).

Due to nitrogen levels above background in local groundwater supplies and ulvoid mat concerns in Dungeness Bay, nitrogen needs to be kept to very low levels for any discharge. Based on this information, the constructed wetlands option was not considered appropriate for this project.

A treatment and/or disposal facility will require licensed wastewater treatment certified operators to oversee operations and ensure proper functioning of the system. Monthly operation and maintenance fees would need to be developed to pay for wastewater operators, repair and replacement of equipment (such as filter cartridges, treatment chemicals, etc.), and water quality reporting and for state agencies.

4.3.1 Collection System

A detailed description of each collection alternative is provided in Section 4.2.1, except for a vacuum system, described here. Note that unlike clustered on-site septic systems, vacuum sewer lines would be more cost effective on a community level where there would be over 200 potential sewer connections.

4.3.1.1 Vacuum Sewer System

Vacuum systems convey sewage through a vacuum pump/tank system placed on private property. When wastewater reaches a particular level in the tank, a valve opens, creating vacuum suction, and the material is transported to the vacuum sewer main.

The vacuum system consists of three major components described below:

- **Valve Pits**. Wastewater flows via gravity from one or more homes to a 20- to 30-gallon fiberglass holding tank called a valve pit package. As the wastewater level rises in the sump, air is compressed and the sump opens to the vacuum collection line. No electrical power is needed to operate the valve.
- **Collection Piping**. The vacuum piping usually consists of 4-inch to 8-inch mains of Schedule 40 gasketed PVC pipe. The mains are generally laid at the same slope as the ground with a minimum slope of 0.2 percent. Piping is installed in a saw-tooth profile. For uphill transport, lifts are placed to minimize the depth of the piping. There are no manholes in the system; however, access can be gained at each valve pit

or at the end of the line. Division valves are installed on branches and periodically on the mains to allow for isolation when troubleshooting or making repairs or connections. Differential air pressure is the driving force in the system. It provides 7 to 10 pounds per square inch (psi) to transport sewage and to open the transport valves.

- **Vacuum Collection Station**. The vacuum station is typically housed in a building similar to a pump station. The components of the station are a collection tank, a vacuum reservoir tank, vacuum pumps, wastewater pumps, pump controls, and an emergency generator. The vacuum station is similar in function to a lift station in a gravity sewer system. Non-clog sewage pumps transfer sewage from the collection tank through a force main to the treatment plant. The sewage pumps must provide enough net positive suction head to overcome the tank vacuum. Unlike a lift station, the vacuum station has two vacuum pumps that create a vacuum in the sewer lines and the enclosed collection tank. The collection tank capacities typically range from 1,000 to 3,000 gallons. The incoming vacuum lines connect individually to the tank, effectively dividing the system into zones.

Permitting Requirements

The permitting requirements for a vacuum collection system are the same as for other collections systems. See Section 4.2.3 for the description.

Capital Cost Estimate

The cost for a vacuum system serving the community is shown in Table 4-8. Resident pit assemblies are the costs for the basins and piping installed on each property to the force main in the street (vacuum collection piping). One vacuum pump station serves up to 1,200 connections.

Table 4-8. Vacuum Collection System Capital Cost Estimate

Item	Total for Community
General Construction Costs[a] (10%):	$375,000
Resident Pit Assemblies:	$1,617,000
4” to 6” Vacuum Collection Piping:	$701,000
Vacuum Pump Station:	$544,000
Pavement Trenching/Restoration:	$848,000
Piping to Disposal Facility:	$42,000
Subtotal:	**$4,127,000**
Engineering[b] (25%):	$1,032,000
Sales Tax (8.4%):	$347,000
Contingency (35%):	$1,444,000
TOTAL:	**$6,950,000**

[a] Includes mobilization, demobilization, and traffic control.

[b] Includes project design, permits, surveying, and construction management.

4.3.2 Treatment Alternatives

From a cost standpoint, there is little difference between the membrane bioreactor and a sequencing batch reactor treatment system. Operationally, the two are different and are described below. A constructed wetland treatment system was considered a poor option for this project due to its lower ability to treat nitrogen/ammonia nutrients, and no costs were developed for it.

4.3.2.1 Membrane Bioreactor (MBR) System

A Membrane Bioreactor (MBR) is the combination of conventional biological wastewater treatment with membrane filtration. When used with domestic wastewater, MBR processes can produce effluent of high quality sufficient to be discharged to coastal, surface, or brackish waterways or to be reclaimed for urban irrigation. An MBR treatment system includes cassette-type membrane units which are contained within stainless steel tanks. The cassettes serve as a physical barrier to prevent the passage of wastewater contaminants to the discharge water. The micron pore diameter within the membrane cassettes allows the passage of filtered water while preventing the passage of suspended solids and wastewater bacteria. MBR systems can incorporate anoxic and/or anaerobic basins for nutrient removal (nitrogen and phosphorus) into the design.

MBRs require minimal area for advanced treatment of wastewater and produce little odor compared to other systems. Other advantages of MBRs over conventional processes include small footprint and an easy retrofit and upgrade in older wastewater treatment plants. Pharmaceuticals in wastewater are a growing concern as some studies have shown a link between them and abnormalities in aquatic life. Since wastewater treatment effectiveness is based on detention time and sludge age, the MBR process can be designed to have a very long sludge age which increases its treatment efficiency for these pollutants.

The resulting discharge from an MBR can be reused for many reclaimed water uses, including irrigation, which would conserve the existing limited water rights for potable purposes. Excess reclaimed water could be percolated though soil, augmenting flows in an adjacent creek for stream habitat and the local aquifer. Solids produced by the system would be thickened and hauled to another agency for disposal. The MBR process is modular, and the treatment facility can be readily expanded as the neighborhoods grow and the sewer collection system is extended.

To produce Class A reclaimed water, additional treatment is required. After the MBR, the effluent must also be disinfected before discharge. Common disinfection methods include the addition of chlorine or UV light. UV disinfection is often preferred because there are no toxic chemicals to handle, there are no trihalomethane (THM) by-products produced, and some discharge options would require the effluent to be dechlorinated before discharge (such as discharging to a waterbody). However, if the ultimate use of the reclaimed water is typical of potable water, such as irrigation or boiler cooling towers, the reclaimed water will be required to have a small chlorine residual (0.5 mg/L) for disinfection. Disinfection is part of the facility cost.

Table 4-9. MBR Treatment System Capital Cost Estimate

Item	Cost Range	
General Construction Costs[a] (10%):	$275,000	$413,000
MBR Facility[b]:	$2,750,000	$4,125,000
Subtotal:	**$3,025,000**	**$4,538,000**
Engineering[c] (25%):	$757,000	$1,135,000
Sales Tax (8.4%):	$255,000	$328,000
Contingency (35%):	$1,059,000	$1,589,000
TOTAL	**$5,096,000**	**$7,644,000**

[a] Includes mobilization, demobilization, and traffic control.

[b] Includes land acquisition for facility.

[c] Includes project design, permits, surveying, and construction management.

4.3.2.2 Sequencing Batch Reactor (SBR) System

Sequencing or sequential batch reactors (SBR) are industrial processing tanks for the treatment of wastewater. SBRs treat wastewater such as sewage or output from anaerobic digesters or mechanical biological treatment facilities in batches. Oxygen is bubbled through the wastewater to reduce biochemical oxygen demand (BOD) and chemical oxygen demand (COD) to make wastewater suitable for discharge into sewers or for use on land.

While there are several configurations of SBRs, the basic process is similar. The installation consists of at least two identically equipped tanks with a common inlet, so flow can be switched between them. The tanks have a “flow through” system with raw wastewater (influent) coming in at one end and treated water (effluent) flowing out the other. While one tank is in settle/decant mode, the other is aerating and filling. At the inlet there is a section of the tank known as the bio-selector. This consists of a series of walls or baffles which direct the flow either from side to side of the tank or under and over consecutive baffles. This helps to mix the incoming influent and the returned activated sludge, beginning the biological digestion process before the liquor (wastewater and activated sludge mixture) enters the main part of the tank.

If the facility needs to be upgraded to handle more service area flow, one or two additional SBRs and digesters could be added adjacent to the existing SBR. An additional backwash sand filter and UV disinfection channel could also be added if water quality standards required. The headworks and pump stations would be designed and constructed to minimize upgrade modifications.

As discussed in the MBR treatment section, disinfection will be required to produce Class A reclaimed water from an SBR. Disinfection is part of the facility cost.

Table 4-10. SBR Treatment System Capital Cost Estimate

Item	Cost Range	
General Construction Costs[a] (10%):	$248,000	$385,000
SBR Facility[b]:	$2,475,000	$3,850,000
Subtotal:	**$2,723,000**	**$4,235,000**
Engineering[c] (25%):	$681,000	$1,059,000
Sales Tax (8.4%):	$229,000	$356,000
Contingency (35%):	$954,000	$1,483,000
TOTAL:	**$4,587,000**	**$7,133,000**

[a] Includes mobilization, demobilization, and traffic control.
[b] Includes land acquisition for facility.
[c] Includes project design, permits, surveying, and construction management.

4.3.2.3 Permitting Requirements

The centralized facility itself will require the same State DOH permits, including applications and engineering reports, as described in Section 4.2.3 for the Clustered LOSS alternatives. The level of detail of these engineering reports will be significantly greater due to the technical nature of these wastewater treatment facilities. In addition, several County permits/approvals will be required including:

- A commercial building permit.
- Grading permit.
- SEPA review/environmental checklist.
- A critical areas review and report.

If work is required in the right-of-way to extend the discharge outfall, a right-of-way permit will also be necessary from the County. An NPDES Construction General Stormwater permit from Ecology is required if the project would disturb over 1 acre of land.

If federal funding is used for the project, then other federal laws and statues will also apply. Similar to the discussion of the LOSS system, NEPA and ESA documentation would be required (either an environmental assessment or documented categorical exclusion for NEPA).

A more detailed description of the various permits is discussed in Section 5.4.

4.3.3 Disposal Alternatives

Four options were considered based on resources available within or near the project area. These options include a large community drainfield, land application (hay crop irrigation), wetland discharge, and stream discharge. All disposal options will require effluent treated to a high level of quality (Class A reclaimed water), and they will require permits and possibly further studies before they are constructed.

4.3.3.1 Community Drainfield Disposal (LOSS) Option

A single large drainfield could be utilized for disposal. The drainfield would be a LOSS system as described in Section 4.2.2 except sized for the entire project area community flow. Based on sizing criteria, the drainfield would need to be approximately 25 acres to handle a total wastewater flow of 79,110 gpd.

Permitting Requirements

The permits for this option are the same as for a clustered LOSS system and are described in Section 4.2.3.

Note that the availability of suitable land immediately adjacent to the community could make this option difficult to implement. Much of the open space land area is farmland under conservation land easements, is located in the floodplain, or has poor soils.

Capital Cost Estimate

The basis of costs for a community drainfield is the same as described for the clustered drainfield (Section 4.2.2).

Table 4-11. Drainfield Disposal Capital Cost Estimate

Item	Cost
General Construction Costs[a] (10%):	$109,000
Land Acquisition	$250,000
Site Grading:	$25,000
Drainfield Piping:	$875,000
Dosing Facility:	$113,000
Electrical I&C:	$75,000
Subtotal:	**$1,447,000**
Engineering[b] (25%):	$362,000
Sales Tax (8.4%):	$122,000
Contingency (35%):	$507,000
TOTAL:	**$2,438,000**

[a] Includes mobilization, demobilization, and traffic control.

[b] Includes project design, permits, surveying, and construction management.

4.3.3.2 Land Application Spray Disposal Option

Spray irrigation has been conducted in the agriculture industry for some time, but more recently began as a method of disposing and recycling treated wastewater from municipal systems. From a public health and environmental health perspective, spray irrigation is one of the most beneficial ways of dealing with all aspects of wastewater. When properly designed, spray irrigation places effluent where plants can take up nutrients, sunlight can provide some disinfection, soil microbes can consume remaining organic matter, other water supplies are conserved, groundwater is recharged, and point source discharges are avoided.

This method of treated wastewater disposal is used in the nearby SunLand treatment facility. The Class A reclaimed wastewater is applied by spraying to 22 acres of hay land (Mike Langley, District Manager).

There are several large agricultural properties located within or adjacent to the Dungeness area on which Class A or Class D water could be discharged for growing hay or other crops. Land areas would need to be purchased or contracts developed with local property owners. Developing contracts with property owners carries a certain risk in that rights to apply treated wastewater to the land could be revoked. Contracts with local property owners would need to be 5 years or longer, based on typical DOE guidance for land application systems. Cancelled lease/easement agreements would require finding suitable land elsewhere. Because of this uncertainty, the cost estimate for this option assumes the land will be purchased for land application uses to ensure land is always available for treated wastewater disposal.

Land application would likely require 50-foot setbacks from streams or wetlands in the area, an irrigation management plan, a monitoring plan, and a soil survey. Actual application rates would need to be determined during design, and could be higher or lower than the average rate based on crop selection and soils at the site.

Permitting Requirements

Land application requires an additional permit in addition to those listed in Section 4.3.2.3 above – the General Permit for Biosolids Management. This permit is overseen by Ecology in coordination with the Clallam County Department of Health and Human Services.

The facility would also need to be in compliance with ESA requirements, which can range from a Letter of No Effect to a Biological Evaluation opinion study. Final determination for ESA reporting requirements is made by the regulatory agencies based on the project proposal.

Capital Cost Estimate

The cost for land application is based on the application rate, temporary storage facilities, and piping, valves, and fittings. The application rate is assumed to be 5 gpm, as this is an average value used for these systems for hay crops. Approximately 30 days of temporary wastewater storage was assumed for times when the fields could not be irrigated.

Table 4-12. Land Application Disposal Capital Cost Estimate

Item	Cost
General Construction Costs[a] (10%):	$201,000
Sprayer Pump and Controller:	$250,000
Irrigation Piping and Spray Heads:	$700,000
Temporary Storage Lagoon (30 days):	$720,000
Land Acquisition (26 acres):	$260,000
Electric/I&C:	$75,000
Subtotal:	**$2,206,000**
Engineering[b] (25%):	$552,000
Sales Tax (8.4%):	$186,000
Contingency (35%):	$773,000
TOTAL:	**$3,717,000**

a Includes mobilization, demobilization, and traffic control.

b Includes project design, permits, surveying, and construction management.

4.3.3.3 Wetland Discharge Option

Several large wetlands are located within the study area associated with Meadowbrook Creek. Discharge of wastewater to natural wetlands is discouraged by Washington State except in the case of Class A reclaimed wastewater (Ecology, 2008). Wetlands are rated based on their habitat value. It generally is not permitted to discharge reclaimed water into a Category I wetlands or saltwater dominated wetlands unless it can be demonstrated that no existing significant wetland function will be decreased, and discharge will be beneficial to the wetland system (DOH and Ecology, 1997). If this discharge option were selected, a study must be performed to determine if there are any net benefits that reclaimed water would provide to the wetland system. Discharge of treated water, especially Class A treated water, can be beneficial to maintaining wetlands during dry periods. The added advantage of the Meadowbrook Creek wetland location is that it would allow alternative discharge for land application during wetter periods of the year. Combined with limited spray application, the discharge to a wetland can be feasible.

In addition to reclaimed water treatment components, surface water discharge usually requires the addition of a chiller if the effluent temperature is too high and aeration to re-aerate the effluent if the dissolved oxygen content is too low.

An engineered (constructed) wetland could be designed and built for discharge of Class A water only (as opposed to a constructed wetland for treatment). This option is not considered an advantage since it would require (in addition to Class A treatment) the purchase of ample land, capital costs for construction, and would still require its own discharge (and permitting involved) to another water body, such as Meadowbrook Creek or the Dungeness River, or the Meadowbrook wetlands.

Permitting Requirements

A variety of federal, state, and local permits/approvals need to be considered for this type of disposal. These could include:

- Federal Clean Water Act Section 404 and 401 approvals (U.S. Army Corps of Engineers and Ecology, respectively).
- Endangered Species Act compliance (Letter of No Effect, Biological Evaluation (BE), etc., depending on final project construction proposal).

- A State Waste Discharge Permit or an NPDES permit.
- Hydraulic Project Approval (HPA) permit (Washington Department of Fish and Wildlife).
- Shoreline Substantial Development Conditional Use permit (depending on location of discharge).

A more detailed description of the various permits is discussed in Section 5.4.

As part of the County critical areas review, a wetland delineation report would be required which includes a description of the current wetland conditions (hydrology, hydraulics, water quality, and habitat values) and describes how the project impacts the wetlands including the net benefits provided by discharging the reclaimed water into the wetland.

Capital Cost Estimate

Costs include effluent chiller and an effluent re-aeration unit to meet likely surface water discharge requirements for pathogens, temperature, and dissolved oxygen. Due to the numerous permits that will be required for discharge into these more sensitive areas, the engineering, permitting, and construction administration fee was increased, compared to other cost estimates presented in this document, to account for this.

Table 4-13. Wetland Discharge Disposal Capital Cost Estimate

Item	Cost
General Construction Costs[a] (10%):	$49,000
6-Inch Outfall Main:	$259,000
6-Inch Outfall Diffuser:	$74,000
Effluent Chiller Unit:	$67,000
Effluent Re-aeration Unit:	$76,000
Subtotal:	**$530,000**
Engineering[b] (35%):	$186,000
Sales Tax (8.4%):	$45,000
Contingency (35%):	$186,000
TOTAL:	**$947,000**

[a] Includes mobilization, demobilization, and traffic control.

[b] Includes project design, permits, surveying, and construction management.

4.3.3.4 Direct Stream Discharge Option

Several methods allow treated effluent to be discharged to a stream or river, either through subsurface infiltration or direct discharge. Subsurface infiltration requires suitable soils located next to the water body that would allow the discharged water to infiltrate into the stream or river bed. Direct discharge is where treated effluent is discharged into the stream or river via an outfall pipe. The soils within the project area are a silty loam material with poor drainage characteristics, and are not suitable for a subsurface infiltration system. Therefore this option for stream discharge was not considered further in this study.

Meadowbrook Creek is the most likely candidate for stream discharge. Direct discharge to the Dungeness River is also an option; however, the river is located further away from the project area and would likely require more construction (horizontal directional drilling into the river bank) to install the outfall within the river. The river also contains salmonid fish which can impact the permitting process. Direct discharge in general is usually less desirable due to more stringent treatment and permitting requirements.

In addition to reclaimed water treatment components, surface water discharge usually requires the addition of a chiller if the effluent temperature is too high and aeration to re-aerate the effluent if the dissolved oxygen content is too low.

If applicable under the guidelines of the Washington State Water Reclamation and Reuse Standards, the discharge can be categorized as streamflow augmentation. This is beneficial to fish and wildlife habitat. The project must be able to identify beneficial purposes that include in-streamflow enhancement, irrigation supplies, water right replenishment or transfer, and fisheries propagation. However, streamflow augmentation also requires that the entity discharging is committed to releasing a minimum fixed amount of water. In other words, if streamflow augmentation is performed, that flow must be provided to the stream or river consistently. Reclaimed water used for streamflow augmentation cannot be directly discharged into the stream, but must be percolated through the soil. Reclaimed water used for streamflow augmentation must also meet state surface water quality standards and federal requirements for surface water discharge. Additional requirements may be necessary to protect aquatic life under the Endangered Species Act.

Ecology's 2012 water management rule for the Dungeness Watershed (WAC 173-518) requires streamflow impacts from future consumptive water uses to be mitigated. One type of mitigation project recommended by local water management leaders is streamflow augmentation through "shallow aquifer recharge." Based on the location of the project area, the groundwater model indicates that minimal credits would be given to water used for recharge since the most valuable credit areas are further south. The monetary value of Class A water in terms of its potential to generate mitigation credits in this location is roughly estimated at $1,000-$2,000 per acre foot of water (Cronin, 2013). At the maximum design flow, only 0.2 acre feet of water would be produced per day from the entire project area, which is only enough to irrigate a small portion of nearby irrigated lands. Thus, there may or may not be an advantage to having Class A water from this project available for water management scenarios in the lower Dungeness Watershed.

Permitting Requirements

The permits/approvals for the direct stream discharge option are the same as those described above for discharge into wetlands (see Section 4.3.3.3).

Capital Cost Estimate

Stream discharge facility components and permitting costs are similar to the wetland discharge option. The specific site of discharge would be determined during the design process.

Table 4-14. Stream Discharge Disposal Capital Cost Estimate

Item	Cost
General Construction Costs[a] (10%):	$38,000
6-Inch Outfall Main:	$149,000
6-Inch Outfall Diffuser:	$74,000
Effluent Chiller Unit:	$72,000
Effluent Re-Aeration Unit:	$76,000
Subtotal:	**$409,000**
Engineering[b] (35%):	$144,000
Sales Tax (8.4%):	$35,000
Contingency (35%):	$144,000
TOTAL:	**$732,000**

[a] Includes mobilization, demobilization, and traffic control.

[b] Includes project design, permits, surveying, and construction management.

4.3.4 Operation and Maintenance Costs

Operation and maintenance costs for the centralized treatment system include the collection system and the treatment and disposal systems. Typical activities include periodically cleaning the collection pipelines and cleaning and maintaining equipment serving individual lots (i.e. grinder pumps, STEP tanks, etc.) by a part-time maintenance person. The treatment system costs include operation by a certified wastewater operator, sludge disposal from the treatment processes, equipment repair and replacement, and monitoring and reporting water quantity and quality to regulatory agencies. The estimate of these costs on an annual basis is summarized below.

Table 4-15. Centralized Treatment System Operation and Maintenance Cost Estimate

Item	Cost
Operation and Maintenance Staff	$18,000
Wastewater Treatment Plant Operator	$84,000
Billing/Collections Administration	$13,000
Sludge Disposal	$47,000
Equipment Repair/Replacement	$80,000
Electrical Usage	$21,000
Water Quality Testing	$11,000
STEP Maintenance	$87,000
Subtotal:	**$361,000**
Sales Tax (8.4%):	$31,000
Contingency (10%):	$37,000
TOTAL:	**$429,000**

4.3.5 Recommended Centralized System Alternative

For a centralized wastewater treatment system, the recommended alternative is the STEP system (Section 4.2.1.3) due to the lower cost and lower maintenance of main collection and treatment system components. Grinder pumps are slightly more costly, have a lower possibility of components being flooded by high groundwater, and have more minor lot maintenance. However, they may not protect the main collection and treatment/disposal system from additional maintenance to remove materials such as fats and grease (which can also cause odors).

The wetland discharge system is considered equal to the stream discharge system because both will likely require a long permitting process due to baselines studies (for the wetland option) or determining mixing zone requirements (for the direct discharge option). Either Meadowbrook Creek or the Dungeness River outfalls will have to meet certain flow and discharge requirements due to the water quantity and/or quality issues relating to the receiving body of water. The total costs for the system, including operation and maintenance, are shown below. The “20 Year Funding Retirement” is the capital cost of the system made over 20 years at an interest rate of 3 percent. The total annual cost would be the amortized capital cost plus the annual O&M cost.

Table 4-16. Centralized System Cost Estimate

Item	Cost Range	
STEP Pump Collection System:	$6,480,000	$6,480,000
SBR Treatment System:	$4,587,000	$7,133,000
Stream/Wetlands Disposal System:	$732,000	$947,000
TOTAL:	**$11,799,000**	**$14,560,000**
TOTAL O&M COST:	**$429,000**	**$429,000**
Number of Lots:	293	293
Capital Cost per Lot	$40,270	$49,700
20 Year Funding Retirement per Lot	**$1,210**	**$1,500**
Annual O&M Cost per Lot	**$1,470**	**$1,470**
TOTAL ANNUAL COST PER LOT:	**$2,680**	**$2,970**

4.4 CENTRALIZED COLLECTION AND CONVEYANCE TO EXISTING WWTP

The fourth option for consideration is collecting wastewater from all four neighborhoods and conveying it to an established wastewater treatment plant (WWTP) in the region, either SunLand or the City of Sequim. Costs would be for building the collection and conveyance system, with established monthly sewer charges by the utility once the collection system was connected. In the case of SunLand, facility upgrades would be required before wastewater could be accepted from the project area.

4.4.1 Collection System

Any of the collection systems described in Section 4.3.1 would work with this treatment alternative. The collection system would serve the entire community (all four neighborhoods) and convey all of the sewage to a pump station. The pump station would then pump the sewage through a 6-inch-diameter force main to the treatment facility.

4.4.2 Pump Station

A pump station would be required to pump the sewage from the community to an existing treatment plant. Pump stations need access to electricity, a standby generator for power outages, and must be located out of the 100-year floodplain. The pump station would be designed to meet the County's construction criteria. At a minimum, the pump station would have a pump rate capacity of 250 gpm (to accommodate peaks flows), a redundant pump in case of mechanical failure, instrumentation and controls to enable remote monitoring of the facility, and a building to house the electrical and mechanical equipment.

The force main (pressurized main trunk of the conveyance pipeline) between the pump station and the point of discharge to the receiving wastewater system would be a 6-inch-diameter high-density polyethylene (HDPE) pipe. The force main would be located within the City and/or County right-of-way and outside of the paved roadways where possible.

4.4.3 Existing Treatment Plants

There are two regional wastewater treatment facilities near the project area, SunLand WWTP and the City of Sequim Water Reclamation Facility (WRF). Wastewater would be collected from each neighborhood, combined, and then pumped to one of these facilities for treatment and disposal. Design, permitting, and construction costs with this option would be for the collection and conveyance system only, since the treatment and disposal system are already established. However, in the case of SunLand, they would require some facility upgrades before receiving additional wastewater. This would generate additional capital costs for the connecting community for design, permitting, and construction.

The main issue with this option is restrictions imposed by the Growth Management Act, and as specifically addressed in case law established through the Court of Appeals, Division 2 in *The Cooper Point Association vs. Thurston County No. 26425-1-II of September 14, 2001*. This judgment makes it illegal to connect an outlying, noncontiguous development to a City Wastewater Treatment Facility unless it can be shown that the sewer connection was "necessary to protect basic health and safety and the environment." The local public health officer would have to make this determination. Two Urban Growth Areas can be connected with a utility service, but connections cannot be added from outside the Urban Growth Area boundaries.

For the Dungeness Area to be served by either the SunLand Water District or the City of Sequim, it would require Dungeness Village to modify its respective LAMIRD/UGA (Urban Growth Area) limits to incorporate the full project area. This would require the County to modify their Comprehensive Plan and obtain approval from the State Growth Management Hearings Board. Because the main purpose of the GMA is to encourage urban growth and protect rural areas, the success of this option is unlikely. A more detailed description of UGA boundaries is presented further in Section 5.1.

4.4.3.1 SunLand Water District

The SunLand WWTP serves about 950 residential lots surrounding an 18-hole golf course. The sewer system originated during the 1970s with a sewage lagoon. The District currently operates an SBR facility producing Class A reclaimed water for summer flows averaging 90,000 gpd and winter flows averaging 120,000 gpd. The effluent is applied through spray irrigation to about 22 acres of adjacent pasture used to produce hay. The District intends to make significant upgrades to their system within the next 10 years. Current sewer rates are $59 monthly for the SunLand residents. For this study, it is assumed that the monthly costs for service to the Dungeness area would be at least 25 percent greater to account for reserve capacity impacts to the District's facilities and associated administrative and maintenance costs.

Any required system upgrades or expansion to the SunLand WWTP would need to be completed before additional wastewater was sent to them. They would require the project to fund these treatment system upgrades and changes to their discharge permits. No preliminary design work has been performed to determine the cost of these upgrades, though rough estimates are shown below. It also has not been determined how these facility upgrade capital costs would be funded and how operation and maintenance costs of the upgrades would be distributed between the service areas. It is assumed these added costs would render the option of conveying to SunLand WWTP infeasible.

Permitting Requirements

Under this option, permits would mostly be triggered by the connections between residences/ businesses and the treatment plant, including the pump station. Likely permits include:

- SEPA and critical areas review.
- A right-of-way permit.
- Approval (and contract) from the City or water district involved to approve the new connections.

Similar to other options, an NPDES General Construction Stormwater permit would be required if soil disturbance during construction will exceed 1 acre. Federal funds would trigger the need to comply with NEPA and ESA similar to what is described for a LOSS system. A more detailed description of the various permits is discussed in Section 5.4.

Note that extension of the SunLand sewer line into the rural area would require either declaration of a public health threat, or the Dungeness LAMIRD limits to be modified to incorporate the entire project area. The County would need to modify their Comprehensive Plan and obtain approval from the State Growth Management Hearings Board for this to be approved.

Capital Cost Estimate

The cost estimate assumes a pump station and a pressure main between the last Dungeness collection point and SunLand Wastewater Treatment facility. The cost for the community collection system before the pump station (STEP, grinder, or vacuum) is presented elsewhere. Cost estimates of WWTP upgrades that are required for accepting the additional wastewater from Dungeness have been included.

Table 4-17. Conveyance to SunLand Wastewater Treatment Plant Capital Cost Estimate

Item	Cost
General Construction Costs[a] (10%):	$110,000
Traffic Control:	$60,000
250 gpm Pump Station:	$500,000
6-Inch Force Main Piping:	$492,000
Gravel Shoulder Restoration:	$47,000
Upgrade SunLand Wastewater Treatment Facility[b]:	$2,500,000
Subtotal:	**$3,709,000**
Engineering[c] (25%):	$928,000
Sales Tax (8.4%):	$312,000
Contingency (35%):	$1,299,000
TOTAL:	**$6,248,000**

a Includes mobilization, demobilization, and traffic control.

b Rough estimate based on cost for new SBR presented earlier. A more detailed study would be required to analyze the existing facility and quantify the necessary upgrades.

c Includes project design, permits, surveying, and construction management.

4.4.3.2 City of Sequim

The City of Sequim WRF produces Class A reclaimed water with an annual average flow of about 500,000 gpd. The City's 2010 census population is 6,600. The reclaimed water is currently used for recreational purposes in Carrie Blake Park and some landscape irrigation. The WRF has capacity available for additional wastewater; therefore, no facility upgrades or expansions would be required. There is a connection fee for the force main from the Dungeness community called the "reserve capacity" cost. This is a one-time fee the community would pay to offset costs to the City of Sequim for using a portion of their sewer lines and treatment system (to reserve the right to the capacity those systems have for wastewater conveyance and treatment).

The current monthly sewer rate for single family residences outside city limits is two times base residential (in-city) rate. The City of Sequim would likely bill the wastewater wholesale, at 1.25 times the standard sewer rate, which would be approximately $70 per month as of January 1, 2013.

The wastewater from the project area would have to be pumped only as far as the nearest City's collection main. From there it would flow through the existing City system. No preliminary design work has been performed to determine the best location for this connection, or if any collection system improvements would be required to handle the increased flow. The City has identified a preference that the Dungeness wastewater be discharged to the City's existing pump station on Medsker Road. Upgrades to this pump station may be required, such as upsizing the pumps and improving the odor control system.

Permitting Requirements

Permitting requirements for conveying wastewater to the City of Sequim treatment facility would be the same as for SunLand.

Note that extension of the City's sewer services into the rural area would require either declaration of a public health threat, or the County and/or City UGA limits to be modified to incorporate the project area into the Dungeness LAMRID. The County would need to modify their Comprehensive Plan and obtain approval from the State Growth Management Hearings Board for this to be approved. As mentioned above, this approval is unlikely.

Capital Cost Estimate

The cost estimate assumes a pump station and a pressure main between the last Dungeness collection point and the first available manhole structure that has the capacity to accept this additional flow. The costs of community collection system options before the pump station (STEP, grinder, or vacuum) are presented elsewhere.

Table 4-18. Conveyance to Sequim WRF Capital Cost Estimate

Item	Cost
General Construction Costs[a] (10%):	$236,000
Traffic Control:	$100,000
250 gpm Pump Station:	$500,000
6-Inch Force Main Piping:	$798,000
Gravel Shoulder Restoration:	$76,000
Upgrade Sequim Pump Station	$50,00
Cost of Capacity:	$997,000
Subtotal:	**$2,774,000**
Engineering[b] (25%):	$694,000
Sales Tax (8.4%):	$234,000
Contingency (35%):	$971,000
TOTAL:	**$4,673,000**

[a] Includes mobilization, demobilization, and traffic control.

[b] Includes project design, permits, surveying, and construction management.

4.4.4 Operation and Maintenance Costs

Under either option (to SunLand or to Sequim), the collection system, pump station, and main pipeline (force main) would be operated and maintained by the County or some other public utility provider. It would not be part of the SunLand or City of Sequim's system. Billing for any maintenance activities from these components would be in addition to the service billing from SunLand or City of Sequim. The costs for maintaining the portions of the system not under control of SunLand or City of Sequim are summarized below.

Table 4-19. Centralized Conveyance System to WWTP Operation and Maintenance Cost Estimate

Item	Cost
Operation and Maintenance Staff	$19,000
Billing/Collections Administration	$13,000
Pump Station Equipment Repair/Replacement	$19,000
Electrical Usage	$6,000
Individual STEP Maintenance	$87,000
Subtotal:	**$144,000**
Sales Tax (8.4%):	$13,000
Contingency (10%):	$15,000
TOTAL DUNGENESS COLLECTION SYSTEM:	**$172,000**

4.4.5 Recommended Centralized Conveyance System to WWTP Alternative

For a centralized collection and conveyance system to an existing wastewater treatment plant, the recommended alternative is the STEP system (Section 4.2.1.3) due to the lower cost and lower maintenance of main collection and treatment system components. Grinder pumps are slightly more costly, have a lower possibility of components being flooded by high groundwater, and have more minor lot maintenance. However, they may not protect the main collection and treatment/disposal system from additional maintenance to remove materials such as fats and grease (which can also cause odors).

The total costs for the system, including operation and maintenance, are shown in Table 4-20. The "20 Year Funding Retirement" is the capital cost of the system made over 20 years at an interest rate of 3 percent. The total annual cost would be the amortized capital cost plus the annual O&M cost.

Table 4-20. Centralized Conveyance to Existing WWTP System Cost Estimate

Item	Cost
STEP Pump Collection System:	$6,480,000
Pump Station and Force Main System:	$2,733,000
Sequim WRF Reserve Capacity Purchase:	$1,940,000
Total Capital Cost:	**$11,153,000**
Dungeness Conveyance System O&M:	$190,000
Sequim Sewer Fee:	$293,000
Total O&M Cost:	**$465,000**
Number of Lots:	293
Capital Cost per Lot	$38,070
20 Year Funding Retirement per Lot	**$1,150**
Annual O&M Cost per Lot	**$1,600**
TOTAL ANNUAL COST:	**$2,750**

5. REGULATORY COMPLIANCE

The project will be affected either directly or indirectly by local, state, and federal regulations. Local and state land use regulations and urban area definitions will heavily influence where treatment system components can be located and connected. As mentioned with each collection, treatment, or disposal option, permits from local, state, and federal agencies will be required based on the proposed project. These include permits for operating an OSS; building permits; grading and right-of-way permits; critical areas permits (such as shorelands); water quality and NPDES permits; and compliance with SEPA, NEPA, and the Endangered Species Act (ESA).

5.1 LAND USE REGULATIONS (COUNTY AND STATE PLANNING DEPARTMENTS)

The Growth Management Act (GMA) is a state regulation used to control urban sprawl by limiting where higher density housing and its infrastructure can occur. In general, it is prohibited to expand urban infrastructure (such as wastewater sewer lines) into rural areas unless it is required to protect public health and safety.

5.1.1 Urban Growth Area (UGA) Boundaries

Clallam County adopted a new Comprehensive Plan in 1995 in response to the state GMA, Revised Code of Washington (RCW) 36.70A. The GMA enacted a new framework for land use planning and regulation. A goal of the GMA is to encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner (RCW 36.70A.020 [1]). These “Urban Growth Areas” (UGAs) are designated by a county pursuant to RCW 36.70A.110. The County adopted an interim UGA around the City of Sequim in 1993 and designated a final UGA boundary in 1995. Since that time, two changes have been made to the UGA boundary. These include the removal of a portion of the Palo Verde Loop neighborhood (off of Priest Road) and expanding the UGA to include Battelle lands.

Extending Public Sewers Outside a UGA

The *Cooper Point Association v. Thurston County* – Court of Appeals decision found that the County failed to show that the proposed sewer extension, outside of UGA boundaries, was “necessary to protect basic health and safety and the environment.” The County was proposing to extend a 4-inch sewer line from the urban LOTT (Lacey, Olympia, Tumwater, and Thurston County Alliance, now known as the LOTT Clean Water Alliance) plant through the rural area of Cooper Point to two more densely developed, unincorporated communities. Because of the ruling, the County was ordered to abandon its planned extension of sewer service from the treatment plant to Cooper Point.

The Court found RCW 36.70A110(4) provides that it is not appropriate that urban governmental services be extended to or expanded in rural areas except in those limited circumstances shown to be necessary to protect basic public health and safety and the environment, and when such services are financially supportable at rural densities and do not permit urban development.

Two Urban Growth Areas can be connected, such as the Dungeness LAMRID to the City of Sequim, but connections outside of these UGA areas (such as for Three Crabs) would not be allowed.

5.1.2 Dungeness LAMIRD

LAMIRD is an acronym for Limited Areas of More Intense Rural Development and is a subset under the State's "rural" land use designation (RCW 36.70A.070). This is a designation allowed under the GMA for lands that historically (pre-1990) were developed as small towns or crossroads activity centers, but not appropriate for urban growth.

Dungeness Village LAMIRD is located within the project area. Sixty-seven acres are designated as rural village (RV) and rural village low zoning (RV2). LAMIRD is surrounded primarily by lower density zoned (R5) rural lands and some agricultural retention lands. The rural village zoning that applies to this LAMIRD does not extend beyond the boundaries of this LAMIRD.

Extending the LAMIRD boundaries would involve an amendment to the Zoning Code, pursuant to Chapter 33.35 CCC and would require the applicant to demonstrate "consistency with all goals, policies, and mapping criteria of the comprehensive plan."

The Sequim Dungeness Planning Region (SDPR) Regional Plan (Clallam County Planning Commission CCC 31.03.290) recognizes this LAMIRD as an area that "may permit components of urban type growth but not be allowed to spread over wide areas requiring urban governmental services."

Any development and redevelopment that may occur near streams, wetlands, landslide areas, and critical aquifer recharge areas is subject to buffers and other protective development permit conditions according to Chapter 35.01 CCC, Shoreline Management Act (SMA) and the Clallam County Shoreline Master Program (SMP), as well as Chapter 27.12 CCC, Critical Areas Code (CAC). The Dungeness LAMIRD's critical areas are primarily associated with the defined boundaries, and the relevant development restrictions augment both the logical outer boundaries as well as the existing rural character.

5.2 HEALTH REGULATIONS (COUNTY AND STATE HEALTH DEPARTMENTS)

Clallam County Health and Human Services Environmental Health Section oversees the on-site septic systems program and is responsible for enforcing local and state regulations. The Washington State DOH, in cooperation with Ecology, oversees state regulations for OSS and LOSS systems, as well as public water quality concerns such as shellfish harvesting.

5.2.1 Clallam County

The following are required for OSS permitting through Clallam County Environmental Health Services (EHS) for OSS generating less flow than 3,500 gpd (see Clallam County Code 41.20 for On-Site Sewage Systems):

1. Septic Permits are required when new septic systems are installed, or when systems are repaired or expanded.
2. A Site Registration is filed when the soils on a site are evaluated and the type of septic system that would work best on the site is determined.
3. System Status Reports are evaluations of existing septic systems to see if they are working properly or are in need of any maintenance or repairs.
4. Operation and Maintenance (O&M) Agreements are required as part of the permit process for certain on-site system designs and in some locations (Clallam County, 2008-2012b).

Clallam County Shoreline Master Program (SMP) (November 2012 Final Draft) includes the following regulation for sewage systems:

Regulations – Sewage Systems 3.12.10

1. On-site sewage disposal systems may be permitted in shoreline and critical area buffers when accessory to an approved residential structure, for which it is not feasible to connect to a public sanitary sewer system.
2. Outfall pipelines and diffusers are water-dependent but shall be located to minimize adverse effects on shoreline ecological functions and processes or adverse impacts upon shoreline resources and values.
3. New outfalls and modifications to existing outfalls shall be designed and constructed by the project proponent to avoid impacts to existing native aquatic vegetation attached to or rooted in substrate. Diffusers or discharge points must be located offshore at a distance beyond the nearshore area to avoid impacts to those habitats.
4. Septic tanks and drainfields are prohibited where public sewer lines are readily available.
5. Sewage and sludge disposal, except on-site sewage disposal systems releasing less than fourteen thousand (14,000) gallons per day and approved consistent with Chapter 246-272 Washington Administrative Code (WAC) and local health codes, shall be prohibited in critical aquifer recharge areas on lands designated as high or moderate susceptibility.

Clallam County Code (CCC) on-site sewage code also includes the following:

41.20.060 Connection to Public Sewer System

(2) When adequate public sewer services are available within 200 feet of the residence or facility, the Health Officer, upon the failure of an existing on-site sewage system, shall require hook-up to the public sewer system. The distance shall be measured along the usual or most feasible route of access.

(3) The owner of a residence or other facility served by a Table IX repair, as described in WAC 246-272A-0280, shall abandon the OSS according to the requirements specified in this chapter and connect the residence or other facility to a public sewer system when:

- (a) Connection is deemed necessary to protect public health by the Health Officer;
- (b) An adequate public sewer becomes available within 200 feet of the residence or other facility as measured along the usual or most economically feasible route of access; and
- (c) The sewer utility allows the sewer connection.

(4) The Health Officer may require a new development to connect to a public sewer system to protect public health.

(5) The Health Officer shall require new development or a development with a failing system to connect to a public sewer system if it is required by the Comprehensive Land Use Plan or development regulations.

Local Health Officer

The local health officer has powers and duties described in RCW 70.05.070. These are to:

(1) Enforce the public health statutes of the state, rules of the state board of health and the secretary of health, and all local health rules, regulations and ordinances within his or her jurisdiction including imposition of penalties authorized under RCW 70.119A.030 and 70.118.130, the confidentiality provisions in RCW 70.24.105 and rules adopted to implement those provisions, and filing of actions authorized by RCW 43.70.190;

(2) Take such action as is necessary to maintain health and sanitation supervision over the territory within his or her jurisdiction;

(3) Control and prevent the spread of any dangerous, contagious or infectious diseases that may occur within his or her jurisdiction;

(4) Inform the public as to the causes, nature, and prevention of disease and disability and the preservation, promotion and improvement of health within his or her jurisdiction;

(5) Prevent, control, or abate nuisances which are detrimental to the public health;

(6) Attend all conferences called by the secretary of health or his or her authorized representative;

(7) Collect such fees as are established by the state board of health or the local board of health for the issuance or renewal of licenses or permits or such other fees as may be authorized by law or by the rules of the state board of health;

(8) Inspect, as necessary, expansion or modification of existing public water systems, and the construction of new public water systems, to assure that the expansion, modification, or construction conforms to system design and plans;

(9) Take such measures as he or she deems necessary in order to promote the public health, to participate in the establishment of health educational or training activities, and to authorize the attendance of employees of the local health department or individuals engaged in community health programs related to or part of the programs of the local health department.

5.2.2 State LOSS (Large On-Site Sewage Disposal Systems) Requirements

LOSS means a large on-site sewage system with design flows of between 3,500 gpd and 100,000 gpd. Washington Administrative Code (WAC) Chapter 246-272B, establishes the regulations for constructing a LOSS.

State Department of Health LOSS Program staff review and approve LOSS project applications state-wide. The LOSS rule is Chapter 246-272B WAC, developed under authority of Chapter 70.118B RCW. The revised rule became effective July 1, 2011:

1. Persons may not install or operate a LOSS without an operating permit.
2. Owners shall obtain an operating permit from the department and shall renew it annually.
3. LOSS permitted prior to the effective date of this chapter, that do not fully comply with the design, construction, and operating requirements in this chapter may continue in service without upgrade until modified, expanded, or repaired. The department shall require upgrades if it determines there is a threat to public health or the environment.

4. The LOSS owner shall operate and maintain the LOSS to consistently and reliably treat sewage.
5. The department may impose more stringent requirements than those described in this chapter when necessary to protect public health or the environment.

5.2.2.1 LOSS Management Requirements (WAC 246-272-04100)

Regulations for LOSS systems require a management plan to be submitted as part of the engineering design report (WAC 246-272-04000). A management plan is used to describe who operates the system, how it is funded for maintenance and operation, and how access to system components occurs. If a development being served by a LOSS has individually owned lots or units, the system must be managed by:

- A public entity or a wastewater company regulated by the Washington Utilities and Transportation Commission; or
- A private management entity with a public entity or a wastewater company regulated by the Washington Utilities and Transportation Commission contracted as a third-party guarantor.

An agreement, ordinance, covenant, or other legal document must be given to all customers, which explains the rights and responsibilities of individual users of the LOSS and of the owner, management entity, or other responsible person. This document must include, but is not limited to, the following:

- The fees and rates to be charged.
- How charges may be amended.
- A list of substances that are prohibited from entering the LOSS in WAC 246-272B-06000.

Easements must be recorded for LOSS and LOSS components that allow access to perform O&M, repair, modification, and replacement, if located on private property or in the public right-of-way. This includes easements for sewage tanks on individual lots.

A signed and notarized management agreement between the LOSS owner and the management entity must be made in which the management entity agrees to:

- Operate and maintain the LOSS consistent with LOSS regulations and any other applicable rules or statutes and with the requirements in the owner's operating permit.
- Provide adequate management, staff, and facilities to properly manage the LOSS.
- Provide the owner and the department updated contact information when changes occur.
- Contract with licensed, certified, or local health jurisdiction-approved professionals for maintenance service, pumping, electrical, and mechanical repair and modifications, as needed.
- When a proprietary treatment component is used, employ the proprietary treatment component manufacturer to monitor and maintain the proprietary system, or employ a LOSS operator who meets the requirements of WAC 246-272B-07200(3).

Records must be maintained of performance and all inspections, repairs, sampling, pumping, and improvements.

The management entity must provide proof of an accounting and audit system set up and maintained using standard accounting practices, and a description of how the owner or management entity will obtain and maintain adequate current and future funding for LOSS operations and capital improvement expenses including:

- Long-term maintenance and operation of the LOSS and operator costs;
- Inspection, repair, and replacement of components; and
- Compliance with any conditions of construction approval or conditions that may be included in the operating permit.

If the LOSS serves individually owned units or lots, the management plan must also include the following:

- Articles of incorporation and bylaws, including procedures to amend existing agreements for homeowner associations, corporations, or other associations of owners.
- Name of the association's or corporation's registered agent; and
- Copies of recorded easements to the LOSS and all components, including sewage tanks on individual lots, regarding access to perform O&M, repair, modification, and replacement. Easements for sewage tanks on individual lots must be obtained and recorded as the lots are built upon, if not before.

5.3 MARINE RECOVERY AREA

In 2006, the Washington state legislature established Marine Recovery Areas (MRAs) to address degradation of marine water quality in part due to improperly functioning on-site sewage disposal systems (RCW 70.118A). The purpose of establishing an MRA is to "authorize enhanced local programs in marine recovery areas to inventory existing on-site sewage disposal systems, to identify the location of all on-site sewage disposal systems in marine recovery areas, to require inspection of on-site sewage disposal systems and repairs to failing systems, to develop electronic data systems capable of sharing information regarding on-site sewage disposal systems, and to monitor these programs to ensure that they are working to protect public health and Puget Sound water quality."

Local health officers are required to develop a written on-site program management plan and propose a "Marine Recovery Area" for land areas where existing on-site septic systems are affecting shellfish growing areas, 303(d) listed marine waters, or marine waters with elevated nitrogen levels.

The Sequim-Dungeness Clean Water District was created by Clallam County in 2001 as required by 90.27 RCW due to commercial and recreational shellfish bed closures in Dungeness Bay, as well as bacterial pollution in streams that empty into the Bay and the Strait of Juan de Fuca. Human waste, most likely from improperly functioning septic systems, is contributing to these pollution problems based on recent research identifying bacterial sources.

The shellfish bed downgrade was partly the result of these pollution issues and was the basis for determining MRA boundaries in 2007. The MRA regulation is the main driver for OSS inspection and enforcement actions being pursued by the County.

5.4 PERMITTING REGULATIONS

Construction and operation of the project will likely require permits from multiple agencies, ranging from county level to possibly federal level. While the required permits were discussed for each option, this section explains the various permits in more detail.

5.4.1 County Level

Permits at this level are administered by Clallam County, often based on or driven by state regulations.

5.4.1.1 Shoreline Substantial Development, Conditional Use, Variance Permit, or Exemption

This permit is from the County under the Shoreline Management Act, 90.58 RCW and is required for work or activity in the 100-year floodplain, or within 200 feet of the ordinary high water mark of shorelines of the state (10 cubic feet per second average flow), and that includes any one of the following:

- Dumping.
- Drilling.
- Dredging.
- Filling.
- Placement or alteration of structures (whether temporary or permanent).
- Any activity that substantially interferes with normal public use of the waters regardless of cost.

5.4.1.2 Critical Areas Ordinances

This permit is reviewed by the County for work in frequently flooded areas, geologically unstable areas, wildlife habitats, aquifer recharge areas, and wetlands. Projects located in these areas must meet certain conditions, such as having drainage and erosion control plans, clearing and grading plans, buffers, geotechnical reports, and habitat management plans. Requirements are based on the type and classification of the critical area. Compliance with this chapter is demonstrated through the issuance of a certificate of compliance. Issuance of a certificate of compliance by Clallam County certifies that a proposed development activity meets the requirements of this chapter, as conditioned (if applicable). Before a certificate of compliance is granted, it shall be shown that the proposed development is consistent with the Critical Area Chapter and all other applicable provisions of the Clallam County Code.

If the project requires a variance, or exception from the performance standards prescribed by the Critical Areas Code, it may be authorized by the Hearing Examiner as specified in CCC 27.12.720. A variance application will be heard only if it meets certain criteria regarding the nature of the request.

Since the project is located within an aquifer recharge area (see Section 2.7.5), County code requires any on-site sewage disposal systems larger than 14,000 gallons per day (gpd) to treat the effluent to state Class A reclaimed water standards prior to discharge.

5.4.1.3 Other County Permits

Standard permits issued by the County that may be required for portions of the project include:

- Grading Permits – required for land disturbing activity (such as earthwork) to address drainage and erosion concerns.
- Right-of-Way Permits – required to perform work within a public right-of-way, such as along roads and streets.
- Building Permits – required for any building to ensure it is designed and built safely and to code.
- Septic Permits – an On-Site Sewage Construction Permit is required when new septic systems are installed, or when systems are repaired or expanded.

5.4.2 State Level

Permits at this level are administered by a state agency due to either state legislation or federal legislation giving the state regulatory authority.

5.4.2.1 LOSS Operating Permit

A Large On-Site Sewage System (LOSS) is required to obtain and annually renew an operating permit from the Department of Health (Chapter 246-272B WAC).

5.4.2.2 General Permit for Biosolids Management

Publicly or privately owned wastewater treatment facilities (among others) must apply for a biosolids management permit if the facility generates biosolids and must dispose of them. Biosolids are municipal sewage sludge that is a primarily organic, semisolid product resulting from the wastewater treatment process. Ecology has the regulatory authority over the permit, per Chapter 173-308 WAC.

5.4.2.3 Hydraulic Project Approval (HPA)

The HPA for the Department of Fish and Wildlife, under 75.20 RCW, is required for projects including construction or other work that will use, divert, obstruct, or change the natural flow or bed of any fresh or saltwater of the state. This includes all construction or other work waterward and over the ordinary high water line, including dry channels, and may include project landward of the ordinary high water line (e.g., activities outside the ordinary high water line that will directly impact fish life and habitat, falling trees into streams or lakes, etc.).

5.4.2.4 Section 401 Water Quality Certification

This permit is from Ecology’s regional office under 33 USC §1341 and is needed when a federal approval is required for a project. Issuance of a certification means that Ecology anticipates that the applicant’s project will comply with state water quality standards and other requirements of state law. The 401 Certification can cover the construction, operation, and maintenance of the proposed project. Conditions of the 401 Certification become conditions of the Federal permit or license.

This certification is usually part of the Section 404 permit (see Section 5.4.3.1).

5.4.2.5 NPDES Permit

A National Pollutant Discharge Elimination System (NPDES) permit is a legal document that allows an entity to discharge wastewater, but limits the concentration and/or loading of particular pollutants that can be discharged. All outfall to surface waters requires NPDES permits. These permits are authorized by Section 402 of the Clean Water Act and administered by the states.

NPDES permits are required municipal wastewater discharge (treated wastewater) or for stormwater discharges from a construction site over 1 acre in size.

5.4.2.6 SEPA Compliance

The State Environmental Policy Act (SEPA) identifies the possible environmental impacts (immediate or cumulative) that may result from a project. Information provided during the SEPA review process helps agency decision-makers, applicants, and the public understand how a proposal will affect the environment. This information can be used to change a proposal to reduce likely impacts, or to condition or deny a proposal when adverse environmental impacts are identified.

Some minor projects do not require environmental review, so the lead agency (local or state agency that will be regulating the project) will first decide if environmental review is needed. If the proposed project is the type of project that has been "categorically exempt" from SEPA review, no further environmental review is needed.

If the proposed project is not exempt, the applicant will usually be asked to fill out an "environmental checklist." This checklist asks questions about the proposal and its potential impacts on the environment. The elements of the environment that will be evaluated include earth, air, water, plants, animals, energy, environmental health, land use, transportation, public services, and utilities.

After the checklist has been completed, the lead agency will review the checklist and other information about the proposal. If the lead agency needs additional information to evaluate the proposal, they may ask the applicant to conduct studies, such as a traffic study, or a study to determine if there are wetlands on the project site, etc. The lead agency and applicant may also work together to change the proposal to reduce likely impacts.

If the lead agency has enough information to determine that the proposal is unlikely to have a significant adverse environmental impact, the agency will issue a determination of non-significance (DNS). If the information indicates the proposal is likely to have a significant adverse environmental impact, the lead agency will require the preparation of an environmental impact statement (EIS). The EIS will include an evaluation of alternatives to the proposal and measures that would eliminate or reduce the likely environmental impacts of the proposal.

5.4.3 Federal Level

These permits are regulated by a federal agency.

5.4.3.1 Section 404 Permit

This permit is from the Army Corps of Engineers under 33 USC §1344 required for projects that include:

- Placement of dredged or fill material waterward of the ordinary high water mark, or the mean higher high tide line in tidal areas in waters of the United States, including wetlands.
- Mechanized land clearing and side casting in waters of the United States, including wetlands.
- Endangered Species Act (ESA) consultation.

5.4.3.2 NEPA Compliance

The National Environmental Policy Act (NEPA) is the federal version of SEPA. While the two share a similar process, there are differences between them. For NEPA, the lead agency is a federal agency, as opposed to a state or local agency. Instead of a checklist, NEPA requires a written environmental assessment (EA) to determine whether or not a federal undertaking would significantly affect the environment. If the answer is no, the agency issues a finding of no significant impact (FONSI). The FONSI may address measures which an agency will take to mitigate potentially significant impacts.

If the EA determines that the environmental consequences of a proposed federal undertaking may be significant, an EIS is prepared. If a federal agency anticipates that an undertaking may significantly impact the environment, or if a project is environmentally controversial, a federal agency may choose to prepare an EIS without having to first prepare an EA. After a final EIS is prepared and at the time of its decision, a federal agency will prepare a public record of its decision addressing how the findings of the EIS, including consideration of alternatives, were incorporated into the agency's decision-making process.

6. PROJECT FUNDING OPTIONS

Funding options vary widely from state and federal grants and loans to community local improvement district tax assessments. This section reviews typical funding sources that the project could use for financing capital improvements.

6.1 STATE AND FEDERAL GRANT AND LOAN FUNDING SOURCES

State and federal funding will be the two main sources of grants and loans for planning, design, and construction of the project. This section summarizes some potential sources of these funds.

6.1.1 State Funding

Ecology manages three sources of water quality funding with an annual funding cycle. These are the Revolving Fund, the Centennial Fund, and the Section 319 Fund. Applicants use one integrated financial assistance application to apply for funds from all three funding sources. It distributes funds to the highest priority projects in a combination of grants and loans depending on the project type and funding source. These three funds are available to counties for wastewater facility planning, plans, design, and construction (including reclaimed water facilities), as well as OSS community systems (planning, design and construction), survey, repair, and replacement.

Additional state level funding is available through the Public Works Board through the Washington State Department of Commerce. Funded activities include planning, preconstruction, construction, and infrastructure emergencies.

6.1.1.1 Washington State Water Pollution Control Revolving Fund Program

The United States Congress passed legislation allowing for the establishment of the Washington State Water Pollution Control Revolving Fund Program (Revolving Fund) as part of the Clean Water Act (CWA) Amendments of 1987. The Environmental Protection Agency (EPA) offers states capitalization grants each year according to a formula established in the CWA. The capitalization grants are required to be matched with 20 percent state funds and are added to payments of principal and interest from previous loans. Ecology loans out the combined funds to eligible public bodies, and loan recipients make payments to the Revolving Fund with interest.

6.1.1.2 Centennial Clean Water Program

The Centennial Program (Centennial) is state-funded through the Washington State General Fund, primarily through the State Building Construction Account. Ecology administers the Centennial Program by providing grants to local governments and tribes. The grant funds are available to improve water quality, such as on-site septic repair and replacement and other nonpoint activities. Ecology also uses Centennial grants for facilities-type projects, including wastewater treatment construction projects for financially distressed communities.

6.1.1.3 Clean Water Act Section 319 Nonpoint Source Grant Program

The United States Congress established the Section 319 program (Section 319) as part of the CWA amendments of 1987. The EPA provides Section 319 grant funds to the State and the State is required to provide a 40 percent match. While Ecology has no specific state rule to guide the management of Section 319, much of the program is steered by federal regulations and guidelines, as well as Centennial rule. Ecology places a high priority on the collection of data in order to estimate load reductions of nitrogen, phosphorus, and sediments.

Ecology may offer a combination of hardship grants, forgivable principal loans, or subsidized loans for wastewater treatment facility construction, on-site septic repair and replacement local loan fund, and stormwater projects. The hardship criteria and funding subsidies vary depending on the type of project and level of hardship.

6.1.1.4 Public Works Trust Fund Loan Programs

This program funds comprehensive plans, design and engineering, environmental reviews, construction bid, and construction. Loan programs include construction, preconstruction, planning, and emergency. Currently, non-construction loan programs are suspended until the economy improves. Eligible systems include drinking water, wastewater, stormwater, and solid waste recycling. No match is required. The funds are financed by local taxes and loan repayments.

6.1.2 Federal Funding

The main sources of federal funding are the U.S. Department of Agriculture (USDA) and the U.S. Department of Housing and Urban Development (HUD). These funds are usually competitive and based on need. Note that if federal funding is used for the final project, it could trigger a NEPA (federal level) environmental assessment requirement.

6.1.2.1 USDA Rural Development, Water and Waste Disposal Programs

The USDA provides loans and grants in several programs (technical assistance and training, solid waste management, water and waste grants, guaranteed loans, and set-asides). Rural areas, cities, and towns with populations of 10,000 or less are eligible. Grants are accepted on a continual basis; the process starts with determining eligibility with a Rural Development Specialist.

Water and Waste Disposal Loans and Grants can be used to construct, enlarge, extend or otherwise improve water or waste disposal facilities; pay reasonable fees necessary for the project development, such as legal and engineering; cost of acquiring land, rights-of-way, permits, etc.; and the purchase or lease of necessary equipment to install, operate, maintain, extend or protect facilities.

Funds are not to be used for facilities which are not modest in size, design, and cost; loan or grant finder’s fees; new combined sanitary and stormwater sewer facilities; that portion of a water and/or waste disposal facility normally provided by a business or industrial user; or any portion of the cost of the facility which does not serve a rural area.

Water and Waste Guaranteed Loans may be used to construct, enlarge, relocate, or extend water or waste disposal facilities; purchase major equipment; and purchase existing facilities when necessary to improve or prevent the loss of a service. Expenses related to acquisition and construction may also be financed with loan funds, including: loan fees, engineering, rights-of-way acquisition, water rights, permits and other development costs, and equipment necessary to operate and maintain the facility.

The funds may not be used for facilities used primarily for recreation purposes; facilities which are not modest in size, design, and cost; finders and packager’s fees; new combined sanitary and stormwater sewer facilities; on-site utility systems or business and industrial buildings in connection with industrial parks. Guarantees may not be issued on tax-exempt obligations or loans made by Federal and State agencies.

6.1.2.2 Department of Commerce, Community Development Block Grants (CDBG)

This grant is a program of Washington State Department of Commerce, funded by HUD. It provides funding for public facilities (i.e., water, wastewater, storm sewer, and streets), community facilities, economic development, and barrier removal projects. Activities **must** benefit low- and moderate-income persons. Grants are available annually through a competitive process. There was $11,000,000 available in 2012. The annual application due date is March 1. Cities and towns with populations less than 50,000 and counties with less than 200,000 are not entitled to receive CDBG funds directly from HUD are eligible. Clallam County is on the list of local governments served by the State CDBG program.

There are five grant sub-programs, which are general purpose grants, planning only grants, public service grants, housing enhancement grants, and imminent threat grants. For this project, general grants or planning-only grants would meet eligibility requirements. Imminent threat grants would be appropriate if a water quality emergency developed.

6.2 COUNTY-ADMINISTERED FUNDING

The County has limited options available outside of grants or low-interest loans for developing wastewater infrastructure. There are two options that would be feasible for this project. These are general obligation bonds and a utility local improvement district.

6.2.1 General Obligation Bonds

The County can sell general obligation bonds that are based on the County's ability to tax properties. Bond repayment does not require a tax to be levied, but instead can be paid off by revenues from the utility rates. This approach is used by Cowlitz County to finance the regional wastewater treatment plant serving Kelso, Longview, and the Beacon Hill Sewer District, among others.

6.2.2 ULID Assessment Method

A Utility Local Improvement District (ULID) is a geographical district formed by a group of property owners to fund improvements for water or sewer utilities authorized by RCW 36.94. A local government such as the County oversees the design, financing, and construction of the improvements and sells bonds to provide money for the project, in essence acting as the ULID's agent. The property owners that stand to benefit from these improvements repay the money through special assessments on their property over a period of 15 to 20 years.

6.2.3 Shellfish Protection District Assessment Method

Chapter 90.72.070 RCW states that a shellfish protection district, such as the Sequim-Dungeness, may finance a water quality protection program through county tax revenues, reasonable inspection fees and similar fees for services provided, and reasonable charges or rates specified in its protection program. It cannot impose fees, rates, or charges for those properties that are paying fees already for similar sewer or stormwater service (NPDES discharges) fees, such as those connected to a city sewer system.

7. SELECTED OPTION

The process for selecting a wastewater management option for further development and implementation involved several steps. First, Clallam County and Parametrix held two public workshops in Dungeness presenting the draft Feasibility Study in February and March, 2013, to review the four proposed alternatives and their associated costs. "Benefits Scoring" charts were included in the presentation which objectively compared decision-making criteria from three categories: Environmental, Financial, and Regulatory (see Appendix D). This scoring provided one way of comparing differences between the alternatives, and served as a starting point for discussing which values were subjectively most important to the public. Approximately 40 people attended at least one of the workshops, including Commissioners Jim McEntire and Mike Doherty.

In addition to the input received at the workshops, a survey taken after the workshops showed that the majority of those who responded (18 out of 26 respondents, or 69 percent) preferred the alternative of operating and maintaining individual on-site septic systems. On the other hand, 15 percent of respondents preferred the alternative of collecting wastewater and conveying it to the City of Sequim. Complete results from the surveys appear in Appendix E.

Common comments received at that time include:

- Current data fails to prove that individual OSS in the study area are primarily responsible for fecal coliform pollution.
- More emphasis should be on enforcement of current OSS regulations.
- Failing systems should be made to meet current standards.
- More sophisticated wastewater management options shouldn't be chosen unless testing could verify direct water quality benefits and guarantee an upgrade in shellfish growing classification for Dungeness Bay.
- The County should track baseline data on existing systems in the study area (such as failure and repair rates, the typical type of repair, the cost of repairs, how many are not repairable, etc.)
- Reminding owners when an OSS inspection is due.
- Conduct more outreach.
- Determine whether or not nitrogen presents a specific water quality problem, and whether ulvoid (algae) is caused by excess nitrogen.
- Address the potential for problems associated with sea level rise and other climate change impacts.
- Make project information available online and at the library.

The public comment period ended March 22, 2013. A meeting was then held between Commissioner McEntire, various County staff, and Parametrix on April 10, 2013, to review the comments received and establish the County's selected alternative so that specific implementation strategies could be developed. Consideration was given to comments and preferences from the public and other stakeholders, as well as costs, regulations, and implementation of each alternative (Appendix F contains the draft general implementation plan for each). It was recognized that:

- To varying degrees, the majority of residents do not believe there are problems directly tied to individual OSS in their neighborhoods and are thus reluctant to support investing in infrastructure.
- The choice of operating and maintaining individual OSS places the property investment risk and responsibility of maintenance on the landowner, with the burden of compliance and enforcement on the County—whether or not funding is made available.
- Eventual regionalization of wastewater collection and treatment is probable.

While none of the alternatives are ruled out, at this point in time, the individual OSS systems alternative was chosen to be the selected alternative—with the understanding that there is a range of management actions the County has the authority to take that would improve compliance, monitoring, and water quality. Specifically, the state health code update in 2005 prioritizes MRAs for management actions, and within an MRA, those areas where there is a direct human exposure pathway to pathogens (through shellfish and, to a lesser degree, water recreation).

Under the selected option, the project area would continue to utilize individual OSS systems for sewage treatment and disposal—and the County would establish stable funding for efforts to increase OSS inspection, compliance, and water quality monitoring as recommended in the County's 2007 OSS Management Plan (EHS, 2007). The current O&M program activities have only recently started, and its influence has yet to be fully realized. The O&M program can evolve and adapt as it attempts the implementation strategies featured in this report.

While the individual OSS alternative has been selected for further action at this time, the other alternatives (clustered or centralized systems) are still viable options if conditions or other determining factors change in the future. Potential changing conditions include:

- An increase in the rate of failing OSS,
- An increase in evidence of pollution from existing systems,
- An increase in demand from the community,
- An increase in value or decrease in cost of a centralized system,
- A public health declaration or other provision that allows extension of sewer to serve the project area,
- Tighter state regulations regarding OSS in sensitive environmental areas, or
- An increase in study area population requiring the development of lots not suited to OSS.

This study provides the information, and implementation recommendations in Section 8, necessary to determine if these changed conditions warrant a change in approach to wastewater management within the project area.

8. IMPLEMENTATION STRATEGIES

Implementation strategies for wastewater management in general consist of four main focus areas, as outlined in the Draft General Implementation Plans found in Appendix F. For the selected alternative, individual OSS, implementation possibilities range broadly. Management models (EPA 2003, Appendix G) range from offering minimal technical support and outreach to enlisting an O&M provider to own and maintain the individual OSS for an entire community. Elements of the five models listed by EPA are incorporated into the four main focus areas detailed in the next sections. These areas are:

- **Public Awareness:** "Public awareness" is increasing the knowledge of water quality conditions in the lower Dungeness watershed, with an emphasis on educating OSS owners about their OSS, such as how they function and how to maintain them, as well as general outreach to the community regarding improving water quality through good stewardship and regulatory compliance.
- **Studies, Engineering, and Design:** "Studies, engineering, and design" consist of water quality studies and monitoring that would provide data to determine how well OSS are working as a wastewater management model for the community as indicated by water pollution levels and other measures. It also includes what is required from the professional community to obtain an OSS permit.
- **Regulatory and Permitting:** "Regulatory and permitting" include County OSS codes and enforcement, including permits required for OSS and other permit activities (e.g. building permits) that would trigger OSS compliance checks.
- **Funding:** "Funding" (last but most critical) evaluates options for funding all recommended activities listed above. Funding sources may include grants, loans, and fees.

Several strategies for increasing the compliance of OSS with regulatory requirements were provided in the *Clallam County On-Site Septic System Management Plan* (EHS, 2007). This plan used a "stakeholder" work group of people who live and work in Clallam County, as well as ex-officio members from outside the County, to assist with the Washington State Board of Health code requirement (Chapter 246-272A WAC) which requires local health departments to create plans for the management of on-site septic systems in their jurisdictions.

Many of the recommendations in the plan have been implemented by the County, such as inspection schedules, requirements for owner inspections, designation of the MRA, and proof of OSS compliance when permits are issued. However, all recommendations to date have been achieved with the aid of temporary grant funding, and need stable funding in order to continue or be developed further.

Since OSS issues and concerns are not limited to the Dungeness area, the County could benefit from separating out those actions which are needed County-wide, such as maintenance of an electronic database for tracking OSS permits and inspection status, from those actions specific to the project area, such as water quality monitoring for potentially failing OSS.

8.1 PUBLIC AWARENESS

On-site septic system owner awareness is an important component for ensuring OSS are in compliance with county and state codes and regulations. Owners should be informed of the purpose, use, and care of the septic system and be informed of current and any proposed new rules. They need to know what to look for after storms or floods, too. After all, owning a septic system is like having your own personal sewage treatment plant with almost as many responsibilities.

OSS users should also be informed of the potential impact on the environment and public health from OSS effluent without adequate treatment. For example, the health risk of fecal coliform originating from human waste is greater than that from other animals, and people are more vulnerable to that risk when the pathway is direct, such as it is when eating raw or undercooked shellfish. This information should be disseminated to recreational shellfish collectors as well.

Public education can be in the form of classes (in-person and online), flyers, and public meetings, to name a few options. The OSS Management Plan recommended that the County develop a training program for OSS owners to inspect their own septic systems, currently known as Septics 201. The program, developed in 2012, includes hands-on training and a certification process to verify their training. The County determined those trained in a community may perform the inspections for their neighbor's system. Professional inspections would be required initially to develop as-built drawings of the system and to evaluate the system's current condition before owner inspections could start. DOH has the information, including online videos, for these owner self-inspections—however, the County needs stable funding in order to offer the program publicly. Information on the County's program can be found at http://www.clallam.net/HHS/EnvironmentalHealth/Septics201DIY.html.

The DOH and other sources provide OSS educational and social marketing material online. Information includes septic system care and inspection videos and forms, and mailers and flyers for OSS owner education. The "Septics Edition" quarterly newsletter mailings can continue to be made to OSS owners to inform and remind them of O&M requirements, updates on water quality monitoring results, and any upcoming changes to OSS regulations that could affect them. Additional public outreach could be made by the County by attending and presenting information at homeowner's association or other community meetings. All these educational efforts require stable funding to continue.

The Clean Water District work group and Dungeness River Management Team will hopefully continue to collaborate with the County to exchange information, public outreach efforts, and water quality information.

Public comment received from this project requested that more information and assistance be provided—as directly as possible. The top priorities for this implementation strategy are:

- Increase public understanding of sewage impacts to the environment and on public health.
- Educate OSS owners of how and where OSS work— and don't work.
- Increase OSS owner awareness of O&M requirements.
- Develop a public outreach program for coordinating communications with the public and OSS owners.

8.2 STUDIES, ENGINEERING, AND DESIGN

To verify local OSS are not failing and to document the positive impacts of enhancing the County's O&M program, water quality monitoring is recommended for local water bodies (Meadowbrook Creek, Cassalery Creek, Cooper Creek, Golden Sands Slough, the Dungeness River and its tributary Matriotti Creek, Dungeness Bay nearshore, and irrigation ditch outfalls and tail waters, if any). As recommended in the OSS Management Plan, using Streamkeepers or Surfriders (or volunteers sampling marine water under the Beach Environmental Assessment, Communication & Health [BEACH] program) could be a way to obtain additional data. This will require funding for water sampling and testing.

A sampling plan should be developed (in coordination with the Clean Water District work group) that would also address public questions and concerns regarding fecal coliform and nitrogen – their water quality standards in fresh and marine water, and their relationship to the OSS systems. The relationship between nitrogen and algae (ulvoid macroalgae) blooms along the shoreline should be studied as well.

An electronic database should be used to tabulate and determine trends from the collected data as well as data from prior years (Streamkeepers of Clallam County maintains a database which could be utilized). This would require staff time for data entry and monthly, quarterly, or yearly data tabulation and interpretation (or funding directed to Streamkeepers). This also requires funding to be maintained.

The risk posed by sea level rise is currently unknown for the project area; most studies present a range of possibilities and very little area-specific information. Information on impacts from increased storm surge erosion is more consistent but specific amounts of flooding and rates of erosion are not available. Such assessments should be undertaken.

Individual OSS owners are currently required to use a licensed OSS designer or professional engineer for OSS design. This ensures the system has been evaluated for compliance with local code and regulations. The County should continue to develop engineering and design guidelines for OSS systems in environmentally sensitive areas, such as maintenance requirements for aerobic treatment units (ATUs) and performance standards for nitrogen-reduction technology.

The top priorities for this implementation strategy are:

- Develop a sampling plan and perform ongoing water quality monitoring (streams, marine water, and groundwater).
- Determine nutrient characteristics for streams and nearshore marine water.
- Assess the risk posed by sea-level rise and increased flooding and/or storm erosion on area landowners.
- Determine technical guidelines for use of advanced OSS technology.

8.3 REGULATORY AND PERMITTING

Currently, individual OSS owners obtain permits from the County. Septic system inspections are triggered by a change in permit status, such as building permits, plats, variances to critical areas, shoreline permits, certificate of occupancy, property sale, etc. In addition, OSS inspections are required once every 3 years for conventional gravity systems, and once a year for all others.

Enforcement of existing regulations is essential to comply with the law and protect public health and the environment. It is assumed that compliance with inspection requirements would result in the protections the law affords. The Red-to-Green program should be continued with stable funding so that the County has a well-maintained database of OSS inspection status within the project area. Red-to-Green maps should be updated every 4 to 6 months and posted online. The “Yellow” category should be more closely defined, such as to distinguish whether compliance has lapsed over the long- or short-term. An optional program for an OSS owner to receive a reminder when their inspection is due should be started (by mail or email).

All systems within the project area should be evaluated to ensure they are not failing. Due to the sensitive environment, County codes could be strengthened for the project area (or a portion of it). Special programs could be started—some examples include: required upgrade for any system built before current standards were effective (over time, with funding assistance); performance standards must be met; dye testing must be allowed; a maintenance contract is required; etc. It is often difficult to gain access to all properties for inspection, but an "administrative" search warrant is a tool that would allow inspection of each property in a defined area without discrimination.

In addition to funding, political will is needed in order to effectively enforce or amend existing codes. Benchmarks that would trigger next steps in enforcement or regulatory oversight should be set to provide an objective decision point. Next steps could include revisiting this Feasibility Study and consideration of facility planning.

Finally, the County should consider at least one additional non-grant-specific employee to support the process of bringing systems into compliance. (At the time of this report, there is only one permanent staff person for all OSS permitting activities for the entire County; there is one other grant-dependent staff person with time only for grant-funded OSS activities.)

Public comment received from this project was clear: the County should achieve 100 percent compliance within the project area before it imposes a new wastewater management program. The top priorities for achieving this are:

- Fund and maintain Red-to-Green program.
- Improve enforcement.
- Increase permanent-status staffing to support OSS compliance.
- Consider special programs to improve overall treatment of wastewater.

8.4 FUNDING

There are a few funding opportunities for OSS owners and the County described here. For OSS owners in Clallam County with septic repair/upgrade needs, Craft3 Clean Water Loans are available, which cover 100 percent of the costs of designing, permitting, installing, and maintaining a septic system. To qualify, the septic system needs to be at least 25 years old, failing, or otherwise under orders to be fixed by the County. There also must be a permanent structure that connects to the OSS (it cannot be a trailer, RV, etc.). Other banks may also offer specific loans for OSS repair and upgrades.

Sources of permanent funding are necessary for the County to implement the programs described above: Public Awareness; Studies, Engineering, and Design; and Regulatory and Permitting. The OSS Management Plan recommended a fee collected via property tax billing and a collection process for implementing and maintaining the OSS program. The Plan recommends that the fee be assessed to all properties in the County using OSS, but not those on sewer systems. The fee range would be $10 to $20 a year (or $1 to $1.50 a month). This could help fund County-wide OSS program components that would be a benefit to the Dungeness area or other watersheds, such as electronic database management, homeowner educational services and training, and ensuring compliance with state inspection and repair requirements through additional staff.

Another option is for the County to assess a fee just within the MRA, as described in Section 6.2.3. Shellfish protection districts, such as the Sequim-Dungeness, may finance a water quality protection program through county tax revenues. With approximately 10,000 OSS owners in the MRA (outside of the City and Sunland), a fee of $10 per year would fund at least one full-time employee.

Periodic funding for specific, temporary activities is sometimes available through competitive grants from the state or federal government. An example of this is contract funding from DOH to implement the OSS Management Plan, since it is one of the twelve Puget Sound counties that can receive funding from DOH for this purpose. The County is required to regularly report to DOH its progress in meeting the Puget Sound Action Agenda benchmarks for OSS management.

In May, 2013, the DOH is expected to begin developing an on-site sewage funding program for the twelve Puget Sound counties to use for OSS O&M programs and a low interest loan program to repair and replace on-site sewage systems in the Puget Sound region. The program may start within the next 1 to 2 years (DOH, 2013).

The top priorities for this implementation strategy are:

- Determine County financial needs to support inspections, regulatory compliance, and public outreach.
- Consider MRA/Shellfish District or County-wide fee assessment.
- Track DOH progress in making funds available for the County OSS program.
- Determine need for code changes and funding for special programs.

9. CONCLUSIONS

This study has looked at four different wastewater management alternatives to address the current concerns in the Dungeness/Three Crabs area regarding water quality, sea level changes, and system compliance: individual OSS, a clustered (neighborhood) system, a centralized (community-wide) system, and a centralized collection system that conveys wastewater to Sequim’s treatment facility. These options differed in their costs, ease of implementation, and ability to treat wastewater over 20 years.

Utilizing individual OSS is the selected alternative based on public input and County staff and management evaluation. In general, it was felt the current O&M program had not been given sufficient time to progress and be evaluated for its effectiveness. The Dungeness area would continue to use individual OSS for sewage treatment and disposal—and the County would establish stable funding for efforts to increase OSS inspection, compliance, and water quality monitoring as recommended in the implementation plan.

The selected option should be implemented by continuing many current efforts including increasing public education and awareness, conducting studies and assessments, strengthening enforcement and regulatory compliance within the study area and MRA, and providing stable funding to continue these activities. Some of these activities are within the scope of the Board of Commissioners, but compliance with state health regulations, such as for on-site sewage systems, is the authority and responsibility of the Board of Health.

On July 16, 2013, the Clallam County Board of Health adopted five key conclusions regarding this study and the selected alternative (Appendix H) as a way of fulfilling its “statutory duty to prevent communicable disease outbreaks in the Dungeness/Three Crabs area.”

As the County develops more specific actions to implement this alternative, these activities should be continuously reviewed by both the public and county staff to verify they are effective and to improve performance of individual OSS where possible. If at any time it is determined that the individual OSS program cannot provide adequate treatment to meet water quality standards for shellfish growing, or other measures, the other alternatives reviewed in this Feasibility Study should be revisited.

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Appendix A

Environmental Reference Information

Appendix B

Public Comments from May and June 2012 Meetings

Appendix C

Vendor Cut Sheets of Wastewater Collection Systems

Appendix D

Benefit Scoring Matrix from March 2013 Workshop

Appendix E

Public Comments from March 2013 Workshop

Appendix F

Draft General Implementation Plans

Appendix G

EPA's Summary of Wastewater Management Models

Appendix H

Clallam County Board of Health – Final Action

Appendix I

Public Comment Responsiveness Summary