PORT OF PORT TOWNSEND

Quilcene Wastewater Feasibility Study

TETRA TECH

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ACRONYMS/ABBREVIATIONS

Acronym or Abbreviation	Definition
ATU	Aerobic treatment units
CDP	Census-designated place
ERU	Equivalent residential units
gpd	Gallons per day
LOSS	Large on-site sewage system
MBR	Membrane bioreactors
MHI	Median household income
O&M	Operations and maintenance
O&M&R	Operations, maintenance and replacement
RVC	Rural Village Center
STEP	Septic tank effluent pump
WSDOH	Washington State Department of Health

EXECUTIVE SUMMARY

The *Quilcene Wastewater Feasibility Study* assesses the feasibility of installing a wastewater collection, treatment, and disposal system to serve the Quilcene Rural Village Center (RVC) in unincorporated Jefferson County. The study assumes that the system would collect wastewater from individual properties in the RVC and convey it to a central site for treatment and disposal using a large on-site sewage system (LOSS). A LOSS treats wastewater and discharges treated effluent into the ground. It typically includes initial treatment of the wastewater to remove solids and some dissolved contaminants, followed by final treatment and disposal by infiltration through the ground. The required level of treatment prior to discharge depends on local soil and groundwater conditions and the proximity of drinking water wells or sensitive water bodies.

The overall feasibility of the project is based on technical feasibility and anticipated cost. The study evaluated the following components of a wastewater system for the community:

- **Service area—**The proposed wastewater system could be built to serve the entire 81-parcel RVC initially, or it could be built to serve only the southern half of the RVC initially (47 parcels), with the rest of the area to be developed in the future to accommodate development. The option of the reduced initial service area would significantly reduce initial cost.
- **Expected wastewater flow**—An analysis based on accepted standards for the amount of wastewater generated by various land uses determined that the system would need to have capacity of 20,900 gallons per day (gpd) to manage wastewater flows from existing development in the entire RVC and a capacity of 12,600 gpd for the reduced initial service area alternative. With future development of any currently vacant lands, the future full-RVC flow would be 26,480 gpd.
- **Availability of a site to install the LOSS**—A site for a LOSS requires suitable soils and adequate space. Ten parcels in and near the RVC were investigated, and four were found to be feasible for siting a LOSS, with current assessed values ranging from $80,000 to $420,000.
- **On-Site Facilities and Collection system**—Wastewater could be conveyed from users' properties to the central treatment site by a gravity sewer system or a pressure system. The gravity system would require a side sewer connection on-site at each property, main sewers installed at slopes and depths to maintain gravity flow, and one or more lift stations where topography would prohibit installation of gravity sewers. The pressure system would require a grinder pump or septic tank effluent pump system on-site at each property.
- **Additional treatment**—Site conditions and regulatory requirements could require additional treatment upstream of the LOSS to remove nitrogen. This study identified three technologies to provide such treatment, all of which were determined to be feasible: a recirculating gravel and wood chip filter; an aerobic treatment unit; or a membrane bioreactor.
- **Effluent discharge**—A LOSS discharges effluent to the ground through a drain field. Three feasible drain field technologies were identified, with the preferred technology to be selected based on conditions at whatever site is chosen for the system: sand beds; trenches; or subsurface irrigation.

Preliminary cost estimates were developed for all identified feasible technologies. A matrix was prepared combining collection, treatment, and discharge alternatives for a system serving the entire RVC or the reduced service area. For all the combinations developed, estimated overall capital costs range from $6.5 million to $20 million.

The choice of collection system accounts for the majority of the variation in the cost. A gravity collection system can cause the overall project cost to be nearly double that of a pressurized collection system. For future analysis, an overall project was identified that includes a pressure collection system with grinder pumps at individual properties, a recirculating gravel and chip filter treatment system for nitrogen removal, and subsurface irrigation for discharge. Table ES-1 summarizes estimated costs for this overall project for the full RVC and for the reduced initial service area.

Table ES-1. Overall Project Capital Cost Summary

	Description	Full RVC	Reduced Initial Service Area
On-Site Systems	On-site grinder pumps at individual properties	$1,520,000	$1,050,000
Collection	Pressure system	$6,630,000	$3,650,000
Treatment	Recirculating gravel and chip filter treatment system	$1,290,000	$1,030,000
Discharge	Subsurface irrigation discharge system	$220,000	$140,000
Planning and Design	Permitting, engineering, administration	$1,100,000	$650,000
Total		**$10,760,000**	**$6,520,000**

A financial analysis estimated the cost to users to pay for installation of the identified overall project and ongoing operations. The analysis considered the cost for two scenarios: one with the entire project paid for by the community, with no outside grants contributing to the capital cost; and one with outside grants being received to cover 100 percent of the capital cost. The analysis determined the monthly user cost per equivalent residential unit (ERU). An ERU represents the average wastewater flow from a typical household of 360 gpd. All residential properties would be charged as one ERU. Other users would be charged as multiple ERUs based on the wastewater flow they generated divided by the residential average of 360 gpd.

Table ES-2. Overall Project Capital Cost Summary

	Number of Parcels	Number of ERUs	Monthly Cost per ERU	
			0% Grants Scenario	100% Grants Scenario
Full RVC	81	72	$907	$67
Reduced Initial Service Area	47	44	$873	$32

Next Steps:

1. Continue community outreach to educate the community on the project and to strategize as a community on specific steps moving forward.
2. Find a project owner to own, administer and operate the facility. The owner should be able to accept and administer grant funding. This agency will need to apply for grants and ultimately set up a system to charge customers. This could be Jefferson County, Jefferson County Public Utility District, or another agency.
3. Identify and work with one or more project champions from the community to advance the project.
4. Secure funding for the project. Funding will come from many different sources. It may be advantageous to secure funding to advance the project to the next step, such as the Predesign Report.
5. Complete the Predesign Report and get Washington State Department of Health Approval.
6. Secure funding for project design and construction.
7. Complete design and construction.
8. Commission and start up the system.

1. INTRODUCTION

Quilcene is an unincorporated Jefferson County community along State Highway 101on the west side of Hood Canal. It is a community of several small businesses, residences, and a public school campus, with a Rural Village Center (RVC) designated by Jefferson County under the Growth Management Act (see Figure 1).

The purpose of the *Quilcene Wastewater Feasibility Study* is to assess the technical and economic feasibility of installing a wastewater collection, treatment, and disposal system to serve the Quilcene RVC and to recommend the most feasible alternatives. The overall feasibility of the project is based on technical feasibility and anticipated cost. Challenges to implementing such a system in Quilcene include small lots, shallow water tables, setback requirements around features such as streams and wells, and aging systems that are reaching the end of their useful life.

This study explores the feasibility of installing a collection system that would discharge to a large on-site sewage system (LOSS), which would treat the wastewater and discharge treated effluent into the ground. A LOSS is an alternative to on-site treatment and discharge at each property (i.e. septic systems) or a wastewater treatment facility. A LOSS typically has two major processes: initial treatment of the wastewater to remove solids and some dissolved contaminants, and final treatment and disposal by infiltration through the ground (see Figure 2). The required level of treatment prior to discharge depends on local soil and groundwater conditions and the proximity of drinking water wells or sensitive water bodies. The Washington State Department of Health (WSDOH) permits wastewater flow rates between 3,500 and 100,000 gallons per day (gpd) for a LOSS.

The feasibility study provides estimates of total wastewater flow, an investigation of potential sites for the treatment and disposal system, preliminary system layouts, and planning level comparative cost estimates of alternatives. In addition to technical analyses, it draws upon 24 individual interviews conducted with Quilcene residents to ask about their preferences for a community septic system and a small-group meeting held to review initial findings with residents.

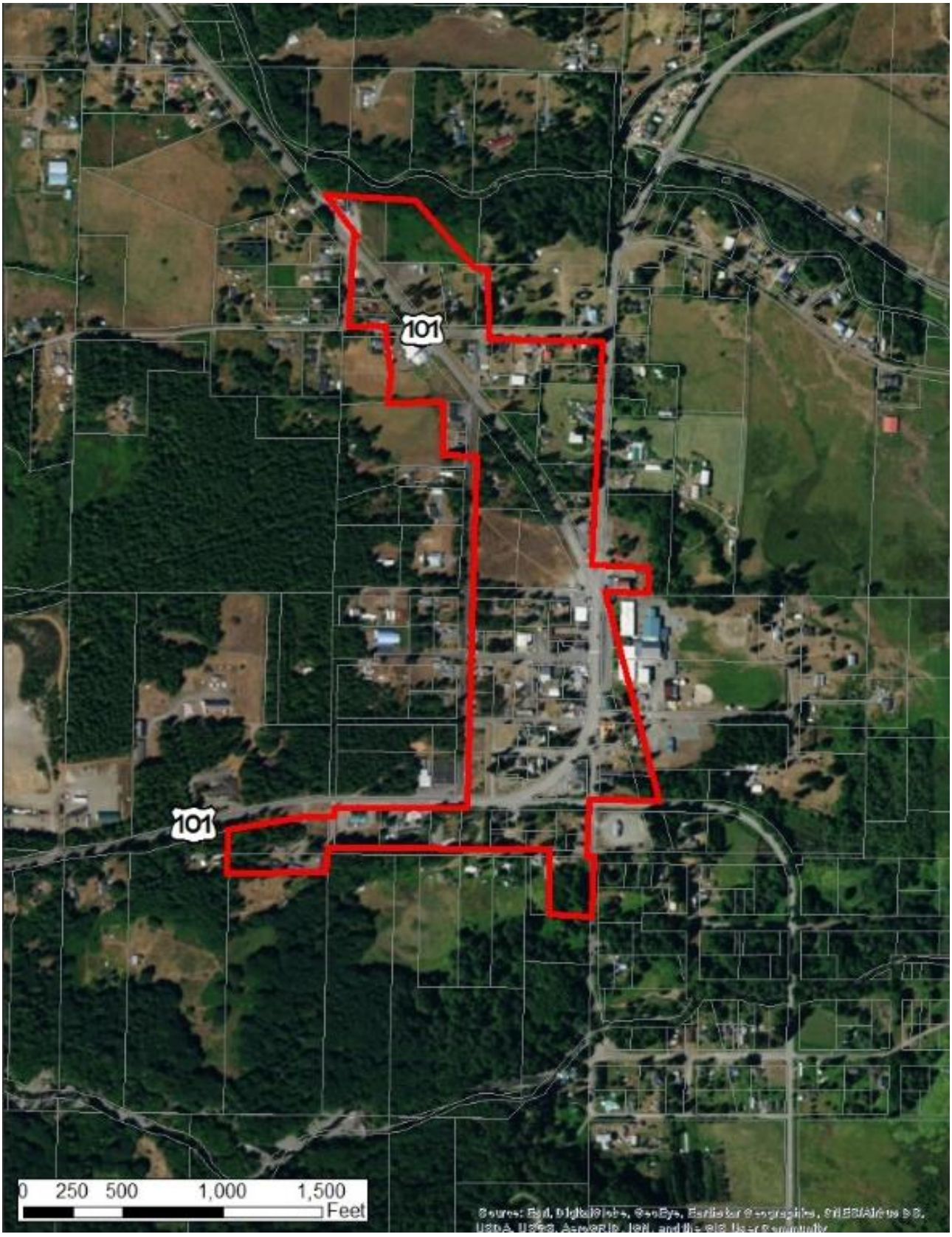


Figure 1. Quilcene Rural Village Center and Vicinity

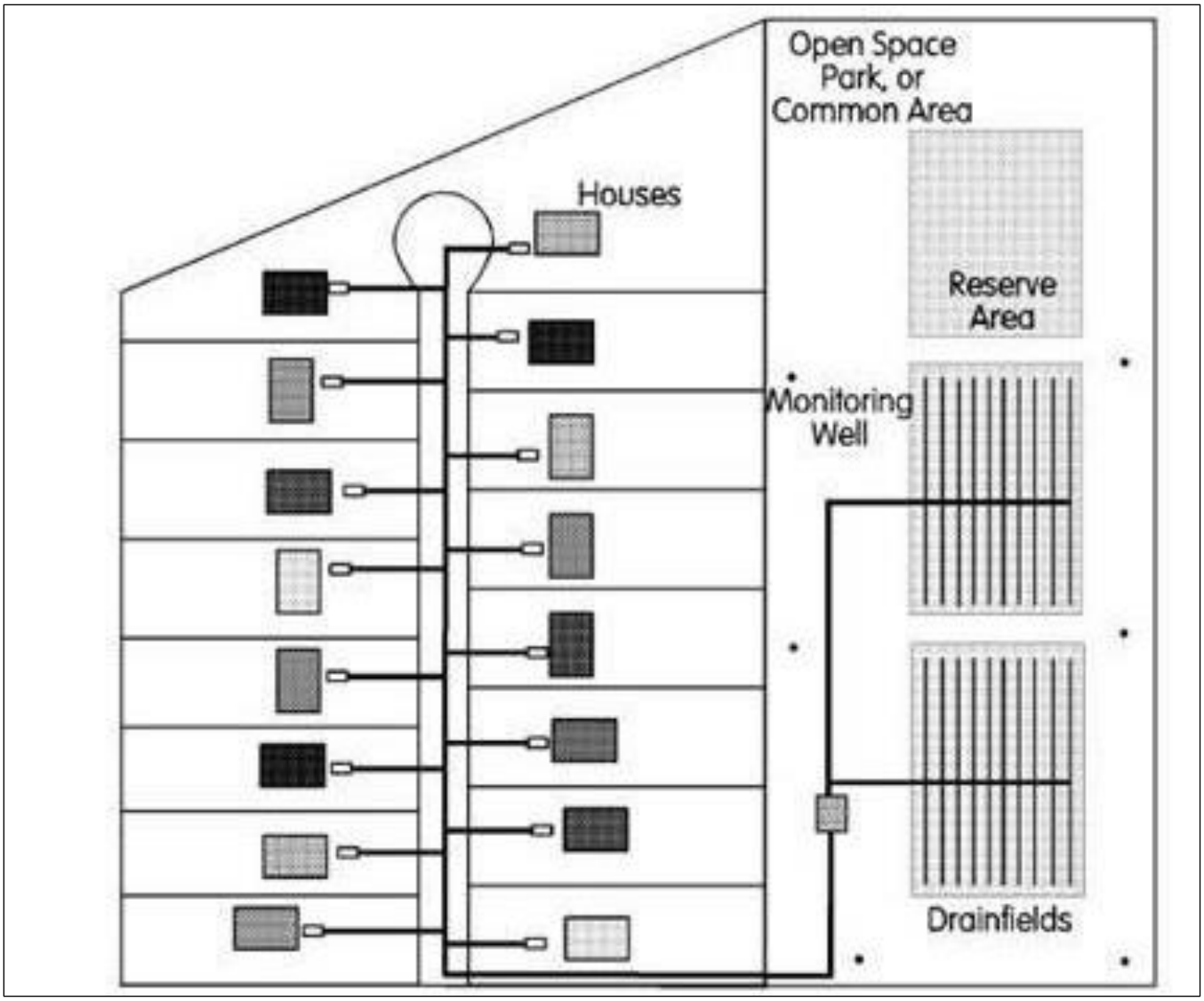


Figure 2. Typical Large On-Site Sewage Disposal System

2. SITE INVESTIGATION

SITE REQUIREMENTS

On-site sewage disposal systems all have some type of subsurface disposal of effluent into the soils on the site. These soils must be original (not fill material), permeable (no water table or impervious layer), and undisturbed (no historical grading or compacting). Different types of systems require different soil depths.

A LOSS is required to have a reserve area available that is able to accommodate 100 percent of the total flow discharged by the system. This area is normally unused but must be available in the event that the primary discharge area becomes unable to accommodate the required discharge rate.

SITE SELECTION AND EVALUATION

Investigations were conducted to identify possible sites for a LOSS in or around the RVC. Owners of properties that appear to have sufficient size and owners who offered sites for investigation were asked for permission to dig test pits to evaluate the soils for suitability for on-site sewage disposal. The following properties were investigated (see Figure 3):

- Parcel 937200702
- Parcel 937200750
- Parcel 956100027
- Parcel 956100031
- Parcel 956100046
- Parcel 702242008
- Parcel 702133009
- Parcel 937500501
- Parcel 956100016
- Parcel 956100017

Soil logs were dug by a backhoe to a depth of 6 feet or until a water table or restrictive layer was encountered. Photos were taken of each soil log. The test pits were filled in immediately after documentation. The sections below describe findings for the selected properties.

Parcels 937200702 and 937200750

These two parcels are adjacent to one another and are bordered on the west by Rodgers Street, on the north by Linger Longer Road, on the east by a residential lot, and on the south by Fremont Avenue. A garage and a shed are currently on the site. The western portion of the property is clear, with gravel base. The eastern parcel has some stockpiled sand and several large trees. The lot is flat, with a gentle slope downward to the east except near the eastern border, where there is a sharp bank down to an abandoned railroad grade.

Buried fuel tanks that were previously on the site have since been removed; that portion of the site is not suitable for treatment, since the soil has been disturbed. There is also an unused well below grade on the property. This well will need to be properly decommissioned to make the site feasible for treatment and discharge.

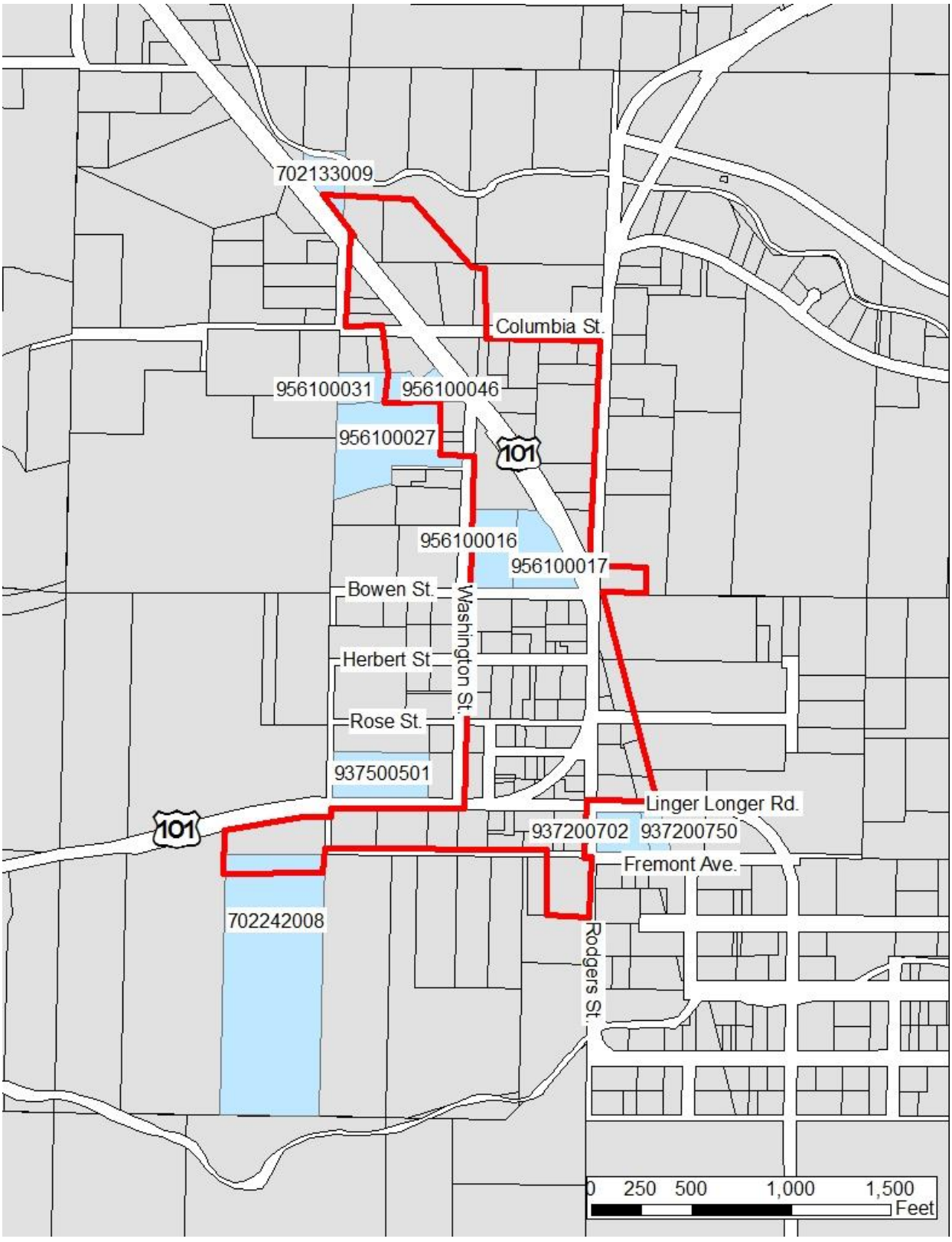


Figure 3. Sites Investigated for LOSS (shaded in blue)

Preliminary observations indicate that the following setbacks from site features would be required:

- Property lines to drain field—5 feet.
- Well to any component of the on-site system—100 feet. This may be reduced to 10 feet if the well is properly decommissioned by a licensed well driller.
- Cut bank to drain field—25 feet.

Three test pits were dug on the property for soil logs. All of the soil logs showed a shallow fill/gravel layer underlain by sandy loam and very coarse sands and gravels to depths of greater than 5 feet. These soils are acceptable for on-site sewage disposal, but added treatment may be necessary due to the lower soil levels being too coarse to slow down the rate of travel of the effluent before it reaches groundwater. Some treatment would occur in the subsurface gravel layer as the water trickles through it. Additional treatment of the effluent before it goes to the drain field would depend on WSDOH reviews of coarse soil type and potential nitrogen treatment requirements for the area. These criteria cannot be set until WSDOH preliminary review has taken place, something that was not part of this initial investigation.

There is approximately 50,000 square feet of usable area on the site after setbacks and disturbed soils are taken into account. This assumes that the well is properly decommissioned in the future, and this may change as future soils studies are conducted to determine disturbed areas.

Based on the soil type and the size of the property, this site is feasible for a LOSS.

Parcels 956100027

This parcel is bounded on all sides by residential lots except for a small portion of the east border, which is along Washington Street. There are no buildings on the site. Wells were observed on adjacent properties. The whole parcel is covered in field grass with trees on the borders. The site gently slopes downhill from south to north. A stream flows along the north border of the property. Much of the northern portion of the parcel was covered with surface water to depths of 1 to 3 inches at the time the site was investigated.

Preliminary observations indicate that the following setbacks from site features would be required:

- Property lines to drain field—5 feet.
- Wells to any component of the on-site system—100 feet.
- Stream to drain field—100 feet minimum. Jefferson County sensitive areas regulations may require greater setbacks.
- Seasonal ponded water to drain field—30 feet.

Two soil logs were dug on the property along the upper northern border. Both of these soil logs showed depths of less than 36 inches to water table, which is unacceptable for a LOSS.

This parcel would not be feasible for a LOSS.

Parcels 956100031 and 956100046

These two parcels are adjacent to each other and are bounded on all sides by residential lots except for the east, which is along Highway 101. There are no buildings on the site. Wells were observed on properties bordering this property. The whole property is covered in field grass with a few trees on the borders. The site gently slopes downhill from north to south. A stream flows along the south border of the property. Much of the southern portion was covered with surface water at depths up to 1 inch at the time the site was investigated.

Preliminary observations indicate that the following setbacks from site features would be required:

- Property lines to drain field—5 feet.
- Wells to any component of the on-site system—100 feet.
- Stream to drain field—100 feet minimum. Jefferson County sensitive areas regulations may require greater setbacks.
- Seasonal ponded water to drain field—30 feet.

One soil log was dug on the property in the northern portion. This soil log showed depths of less than 36 inches to water table, which is unacceptable for a LOSS.

This parcel would not be feasible for a LOSS.

Parcel 702242008

The site is composed of an upper terrace at higher elevation to the north and a lower terrace to the south. The upper terrace contains an existing septic system and drain field that serve the inn on the site. However, there is still area available to build a LOSS to treat and discharge some of the flow for the proposed community sewer system.

The soil log for the upper terrace showed a shallow fill/gravel layer underlain by sandy loam and very coarse sands and gravels to depths of greater than 5 feet. This soil is suitable for a LOSS, but the coarse soils would require a higher level of pretreatment, since the residence time in the soil would be too low to allow adequate treatment before effluent reaches groundwater.

Three soil log pits were dug on the lower terrace. Two of them, at the north end of this terrace, showed over 60 inches of sandy loam material that is finer than that of the upper terrace and is well-suited to a LOSS but would require a lower loading rate. The third hole was dug further to the south and showed a mixture of the dark brown sandy loam and brown gravel to over 5 feet in depth. This soil log also indicated a soil type that is suitable for a LOSS.

Based on the soil type and the size of the property, this site is feasible for a LOSS.

Parcel 702133009

This parcel is at the far north end of the RVC between US 101 and Little Quilcene Creek. A gas station and store are currently on the site.

One hole was dug on the site behind the fuel tanks in what was thought to be an area with no development. The 36-inch deep soil log hole revealed a small power and water line that were unknown prior to digging; the digging did not break or disturb either line. The soils in this hole were brown sandy loam and no water table was encountered. Based on soils, this site would be feasible for an on-site sewage disposal system. However, the site is small, and there is not enough space on the site to accommodate a treatment and disposal system.

This parcel would not be feasible for a LOSS.

Parcel 937500501

This parcel is controlled by two separate entities: a community center and campground. Because this was unknown prior to the site visit, a soil log was dug only on the community center site.

The single soil log showed soils well-suited to a drain field: a shallow fill/gravel layer underlain by sandy loam and very coarse sands and gravels to depths of greater than 5 feet. Some additional treatment would be required to make up for the high permeability of the coarse soils. Based on the soil log, the site topography, the vegetation,

and the soils work done to the west on Parcel 702242008, it is likely that the soils in the campground are the same as those found on the community center site.

This site is feasible for a LOSS, but coordination with both entities controlling the property would be necessary to pursue this site.

Parcels 956100016 and 956100017

These two parcels are adjacent to each other and are centrally located within the RVC. The site is largely undeveloped, although a septic system and drain field had been previously installed. The loading rates on the existing septic system are lower than would be expected for this type of site.

The property owner has decided on a different use for this site, so the site is no longer feasible for a LOSS. No soil logs were taken at the site.

SUMMARY

Ten parcels were investigated at seven sites. Parcels 937200702, 937200750, and 702242008 would be feasible for this application, because the soil characteristics are well-suited to a drain field and the sites are large enough to provide space for treatment and disposal of at least a significant portion of the total wastewater flow. Parcel 937500501 is also feasible for a LOSS based on area and soils, but it would require coordination with two entities that control the property. It is important to note these results indicate feasibility as investigated on these parcels, at the time of testing, for the purposes of this feasibility study. Actual sites would need to be identified, tested, and purchased as the project is developed. It is also important to locate a site in consideration of other long-term project plans in the area such as river management projects that might affect the course of the Quilcene River and may affect local groundwater depths.

3. FLOWS

Potential wastewater flows were estimated for each parcel in the RVC using land use categories determined from parcel-based land use data from the County's geographic information system. Each land use category included one or more County land use designations. The assumed unit wastewater contributions for each land use, based on industry standards and previous projects, are shown in Table 1. Based on the assumed unit flows, the following flow estimates were developed, as summarized in Table 2:

- The assumed unit flows were applied to information on existing development to estimate total current wastewater flows for the entire RVC.
- A second current-flow estimate was developed for a reduced initial service area, covering approximately the southern half of the RVC, south of Herbert Street. This initial service area allows for phased implementation of the wastewater system in order to lower initial capital cost, with future expansion as development increases. Figure 4 shows the service area serving the full RVC, and Figure 5 shows the reduced initial service area. Chapter 4 further describes the two initial service area options.
- For parcels indicated to be vacant, future flow for the full RVC service area was estimated assuming that any currently vacant parcel would be developed according to the underlying zoning.

Table 1. Flow Contribution Assumptions

Land Use Category	Estimated Daily Wastewater Contributions (gpd)
Brewery	1,500 per facility
Church	100 per church
Fire	100 per facility
Light Retail	100 per 5 employees (40 to 700 per business)
Medium Retail	500 per business
Post Office	60 per facility
Residential	360 per residence
Residential and Coffee	500 per business
Residential / Light Retail	360 per residence or business
Restaurant	2,000 per business

Table 2. Flow Contributions Based on Land Use

	Current Daily Flow (gpd)		
Land Use Category	Full RVC	Reduced Service Area	Potential Future Daily Flow (gpd)
Brewery	1,500	1,500	1,500
Church	100	100	100
Fire	100	100	100
Light Retail	2,460	1,500	2,720
Medium Retail	500	0	500
Post Office	60	60	60
Residential	13,680	6,840	14,400
Residential and Coffee	500	500	500
Residential/Light Retail	0	0	4,600
Restaurant	2,000	2,000	2,000
Total	20,900	12,600	26,480

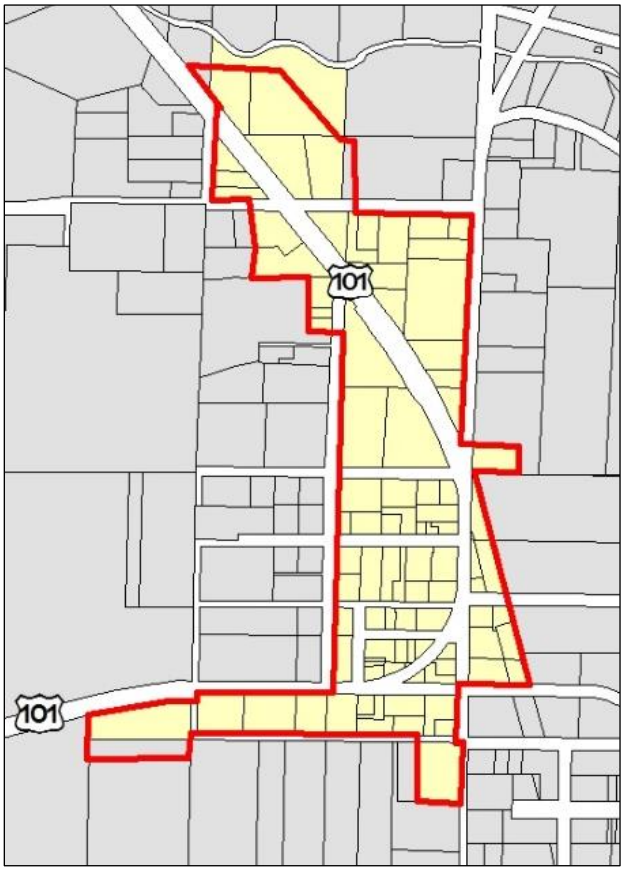


Figure 4. Full RVC Service Area

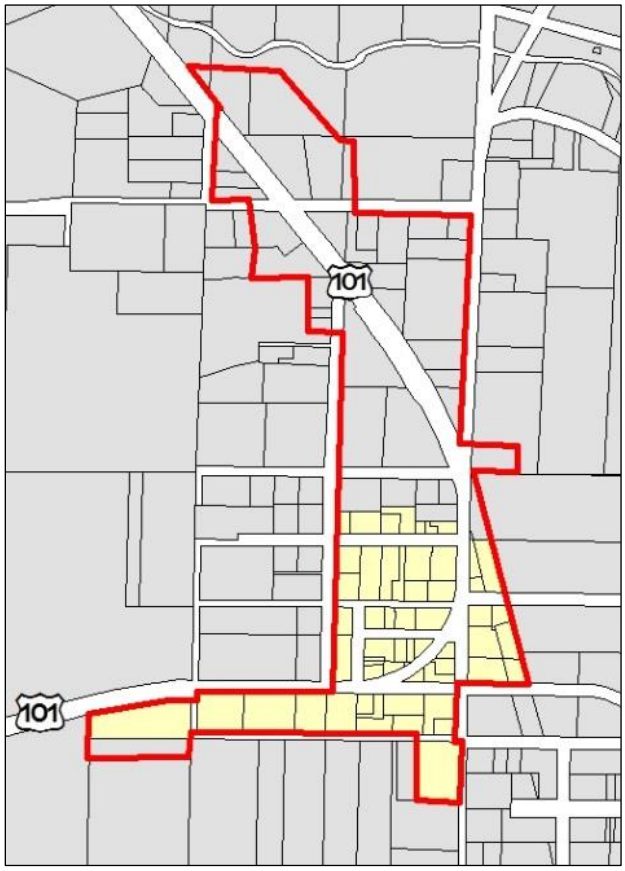


Figure 5. Reduced Initial Service Area

Equivalent residential units (ERUs) have been defined for this study, in order to standardize the flow from all land use categories. An ERU is a standard unit that represents the average amount of flow discharged from a typical single-family home. For on-site septic system planning, the Washington Administrative Code establishes a minimum design flow for a home of 120 gallons per bedroom per day (WAC 246-272A-0230). This study assumed a typical home in Quilcene has three bedrooms, resulting in an ERU 360 gpd (this is the residential unit value used in the flow estimates, as shown in Table 1). Properties with flows equal to or below 360 gpd are considered equal to one ERU. For properties with higher flows (commercial or multi-family residential, for instance), the flow is divided by 360 to determine the number of ERUs.

4. COLLECTION SYSTEM

A sewer collection system consists of a network of pipes to carry wastewater from homes and businesses to a treatment and discharge system. There are two major types of collection systems:

- Pipes in a **gravity system** are sloped continuously downward from the wastewater source to the treatment location so the wastewater can flow by gravity. The advantage of a gravity system is that minimal energy input is required once the system is installed. However, these systems typically require larger pipes placed deeper in the ground than a pressurized collection system, which results in a higher capital cost. Gravity systems are also limited by the topography of the area and may require lift stations to move wastewater from a low point to a higher point within the collection system.
- In **pressure systems**, a mechanical system is used to pressurize the pipe and push the wastewater through the system. This type of system typically includes pumps at each lot discharging to the collection system to create pressure. The advantage of a pressure system is that the pipes can be smaller than those in gravity systems and the average pipe depth is less, since it is not necessary to provide a continuous downward slope. Pressure systems are also less limited by topography, since the pumps are able to move water uphill. However, due to the pumps and wastewater collection tanks in each lot, pressure systems generally cost more to operate and maintain.

Two types of pressure systems were evaluated for this study: grinder systems and septic tank effluent pump (STEP) systems. Both systems include a pressurized pipe network and pumps at each discharge site. A grinder pump system includes a pit or basin containing a pump at each property that collects the sewage from the property and grinds any solids it may contain into a slurry while pumping it into the collection system (see Figure 6). The STEP system collects the waste from the property in a septic tank, which allows the solids to settle out and remain in the tank. Then a pump pulls the clear liquid (or septage) out of the septic tank and pumps it into the collection system. STEP systems require specialized septic tanks; existing septic tanks cannot be used.

Environment One

Figure 6. Grinder Pump

Preliminary layouts were developed for both a gravity system and a pressure system to determine how many feet of collection pipe would be required for each. For each type of collection system, separate layouts were developed for the entire RVC and for the reduced area serving only the southern half of the RVC. The reduced-area system would be installed initially and built upon over time as new development occurs or new properties choose to connect to the sewer system. This would reduce the initial capital cost and improve the likelihood of funding the project.

To serve the entire RVC, a gravity system would require approximately 12,200 feet of 8-inch-diameter sewer main, as shown on Figure 7. Due to the topography, the system also would require two lift stations and approximately 1,220 feet of force main, which is pressurized pipe receiving flow from pumps in the collection system. The system would also require 81 gravity side sewers. Installing a gravity collection system to serve just the southern half of the RVC would require approximately 6,100 feet of gravity pipe and 400 feet of force main, as shown on Figure 8. It also would require 47 side sewers.

The pressurized system would require approximately 12,400 feet of 2-inch-diameter sewer main, as shown on Figure 9. It would require 81 pressure side sewers averaging about 100 feet in length. To serve just the southern half of the RVC, approximately 6,400 feet of pressure main and 47 pressure side sewers, averaging approximately 100 feet, would be required, as shown on Figure 10. The pressurized system also would require a grinder pump or STEP system at each property discharging to the collection system. These collect the wastewater from the property and then pump it out into the collection system, providing the pressure required to move the wastewater downstream.

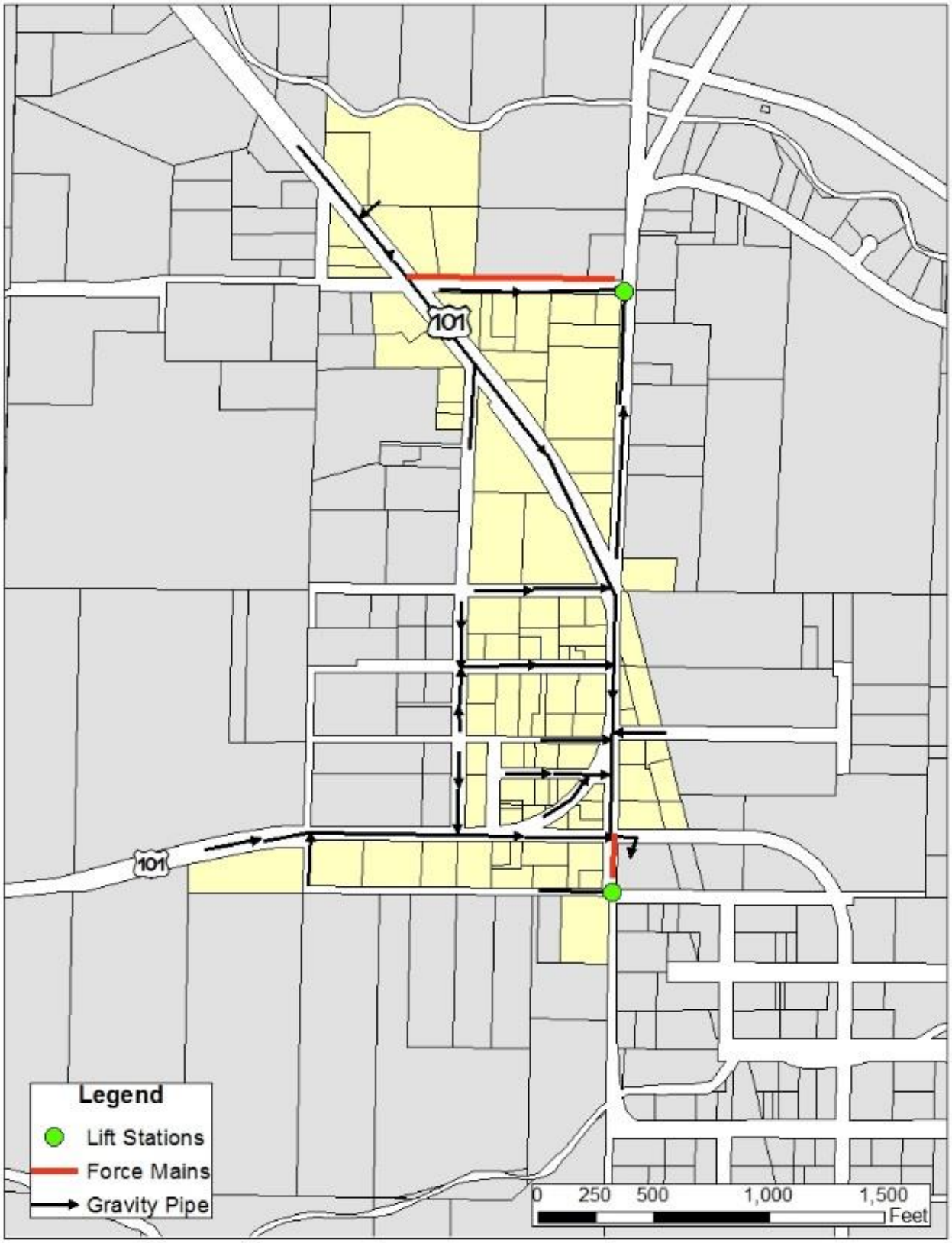


Figure 7. Gravity Collection System Serving Full RVC

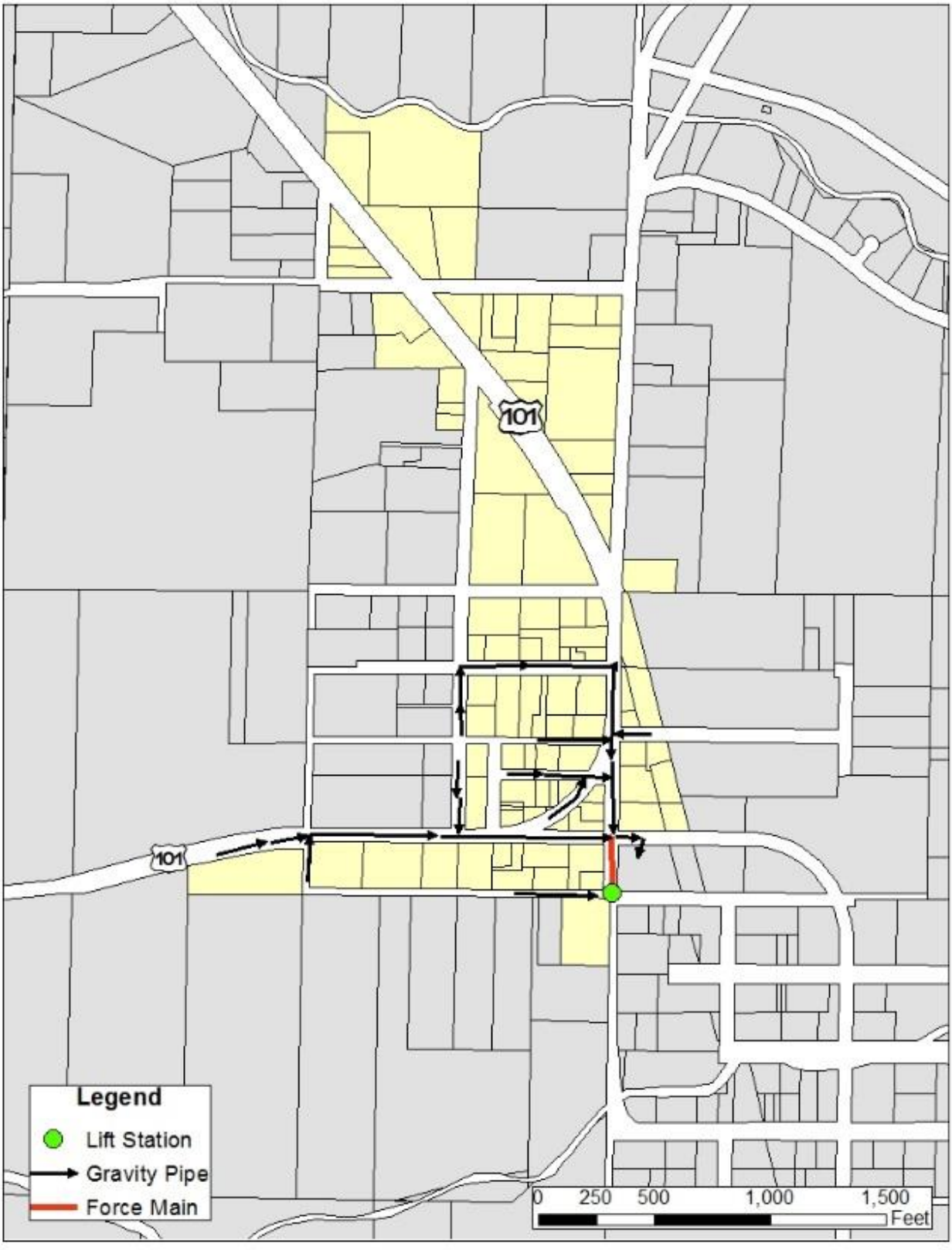


Figure 8. Gravity Collection System Reduced Initial Service Area

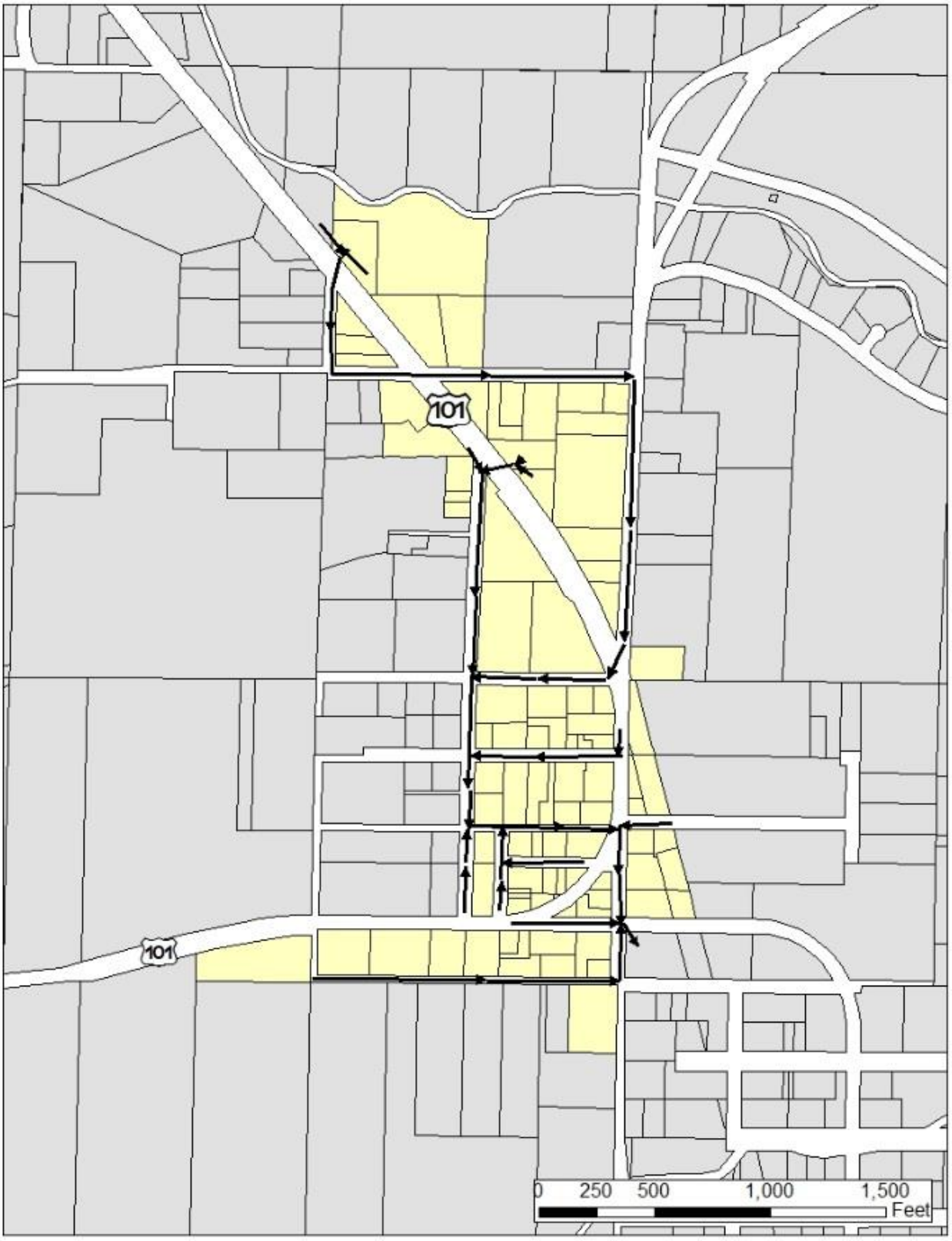


Figure 9. Pressure Collection System Serving the Full RVC

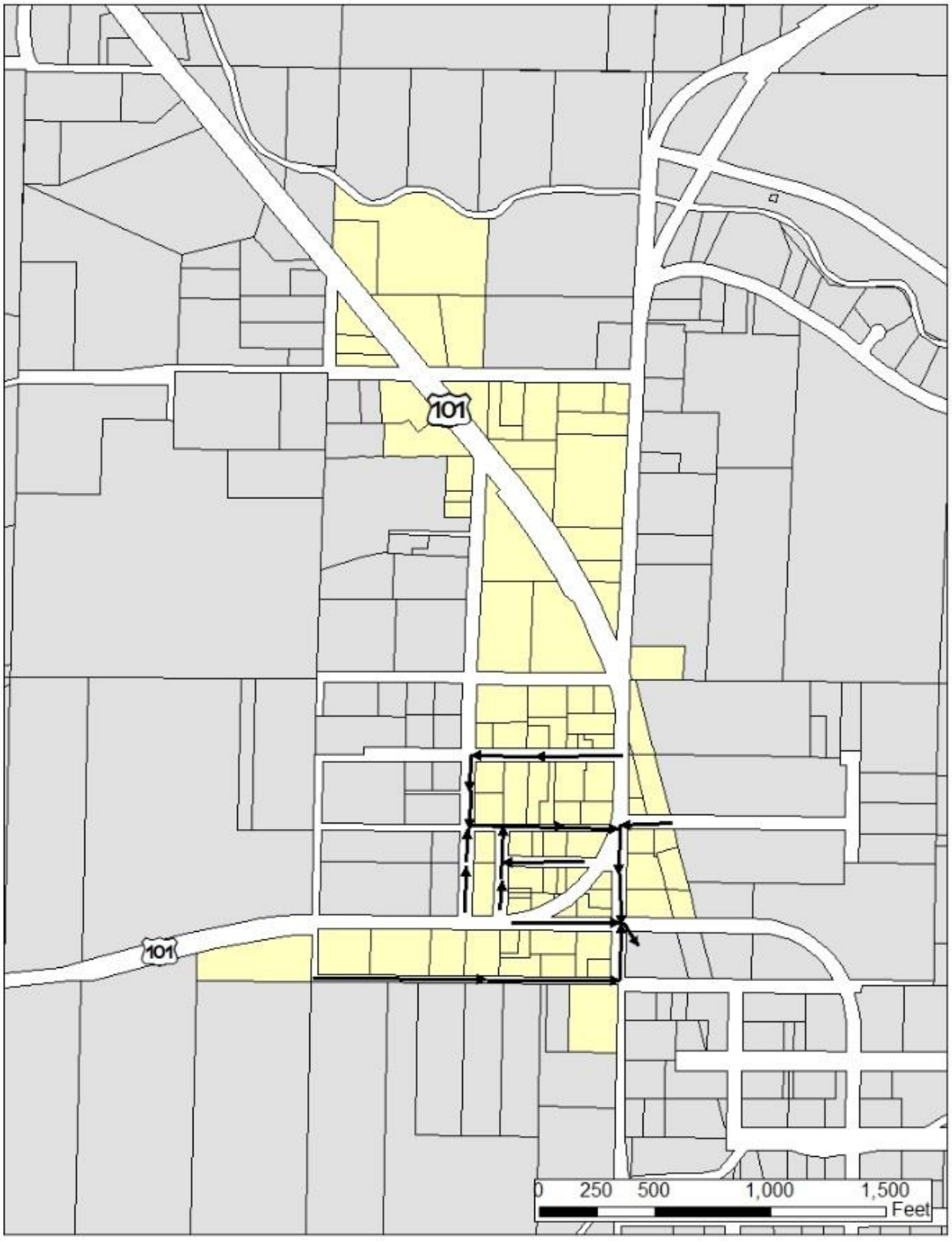


Figure 10. Pressure Collection System Serving the Reduced Initial Service Area

5. TREATMENT OPTIONS

The wastewater collected by the sewer system will need to be treated prior to discharge into groundwater. The treatment system will be required to remove solids, biochemical oxygen demand (BOD), which is a measure of organic matter present in the wastewater, and nitrogen from the wastewater prior to discharge.

NITROGEN REMOVAL

Residential-strength effluent normally does not need additional treatment for nitrogen removal beyond what is provided by a typical residential septic tank. However, WSDOH requires separate treatment for nitrogen removal if there is an aquifer or nearby water body that needs protection. In the Quilcene study area, it is anticipated that some treatment will be required for nitrogen removal because of the proximity of Hood Canal, various streams and a river, and a shallow aquifer with several wells feeding from it. It is not possible at this point to determine the amount of nitrogen removal that will be needed as this is variable and site-specific. A WSDOH hydrogeologist will need to determine this in the preliminary design phases of the project.

While the exact nitrogen removal requirement cannot be determined at this time, this study includes a preliminary analysis of three treatment options, including an estimate of costs for each: recirculating gravel and wood chip filters, aerobic treatment units, and membrane bioreactors. All of these treatment technologies are scalable, and systems can be installed to meet the range of flow expected in the Quilcene system. Smaller systems can be installed initially and expanded as more properties connect to the sewer system.

Recirculating Gravel and Wood Chip Filter

A recirculating gravel and wood chip filter (see Figure 11) is a non-proprietary treatment system that can typically remove 90 to 95 percent of nitrogen from residential-strength waste. Primary treatment for this system is provided in a septic tank, which is a two-compartment tank that provides settling capacity for solids and some anaerobic treatment to reduce BOD. The size of the tank is required to be at least three times the daily flow, providing a minimum of three days retention time. In a system where grinder pumps are used, the septic tank would need to be approximately 33 percent larger to allow for the longer settling times of finer solids. Because this tank would need to serve the entire service area, it would be much larger than septic tanks used on individual properties.

Effluent from the septic tank flows into a mixing tank. Such tanks are generally sized for 150 percent of daily flow from residential contributors and for 100 percent of daily flow for non-residential contributors. For this project, the majority of contributors will likely be residential, so the 150 percent sizing would be used. The mixing tank is a single-compartment tank with valves and pumps inside. It doses the gravel filter with set volumes of effluent on a regular basis. The mixing tank is designed to send effluent to the gravel filter at the same rate regardless of the incoming flows. A mechanical (level) valve sends overflow to a gravity outlet in the upper portion of the tank.

The gravel filter is sized at 1 square foot of surface area per 5 gallons of design flow for residential strength waste, with a lower loading rate for higher-strength wastes. The filter is normally about 5 feet deep and encased in a polyvinyl chloride liner. Effluent is dosed through a series of lateral pipes in the top portion of the filter for even distribution through the filter. It flows by gravity through a pea gravel layer (3 feet deep), being treated biologically as it trickles through the gravel. A coarser gravel layer on the bottom of the filter allows treated effluent to flow through a gravity outlet pipe at the bottom to a recirculation tank. From there, a portion of the effluent is pumped back to the mixing tank for further treatment, and the remainder flows to the chip filter.

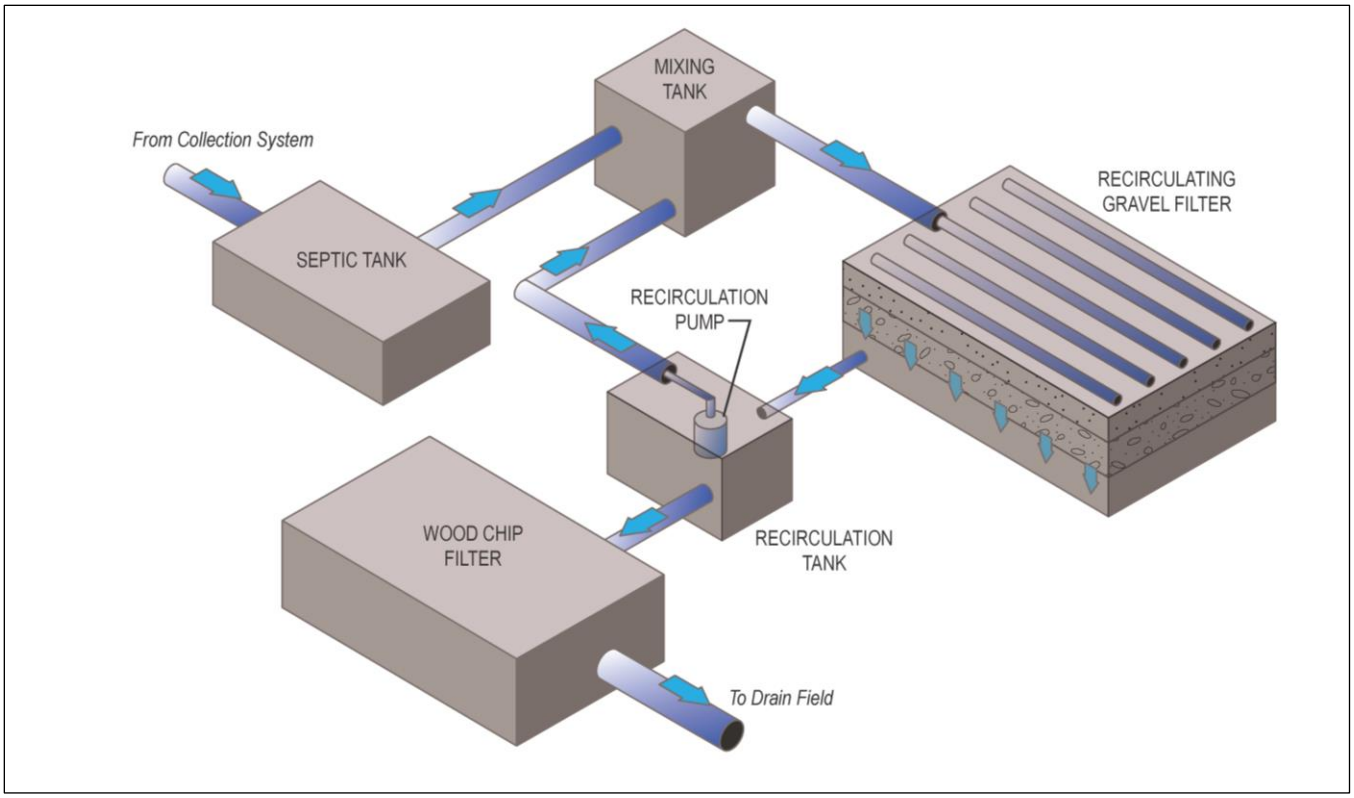


Figure 11. Recirculating Gravel and Wood Chip Filter

The wood chip filter is a rectangular box open to the surface and encased in a polyvinyl chloride liner filled with alder wood chips. The gravel filter effluent enters one end of the filter and flows by gravity to the other end where it discharges to a dosing pump chamber at the drain field downstream. Chemical and biological processes between the effluent and alder chips occur in this filter to further reduce nitrogen levels. The chip filter is sized at 1 square foot of surface area per 7 gallons of design flow.

Aerobic Treatment Units

An aerobic treatment unit (ATU) is a proprietary treatment system that uses a biological process similar to that of the recirculating gravel and chip filter, but with bacteria suspended in a liquid rather than attached to a medium such as gravel or wood chips (see Figure 12). The units typically include a trash tank, an aeration tank, and a settling tank. The trash tank functions similarly to a septic tank, allowing for the settling of large solids such as toilet paper and some removal of dissolved contaminants. The aeration tank contains an aerator that bubbles air into the wastewater to allow bacteria to remove soluble contaminants. This is followed by a settling tank, which settles out the solids and redirects them back into the aeration tank for further treatment.

ATUs are required to be on the WSDOH treatment unit approval list or have individual permission for use from WSDOH, which involves testing and documentation of the system to prove that it will perform as intended. There are several manufacturers of these units; each has different levels of nitrogen removal based on waste strength and flow. These units normally use some method of introducing air bubbling to the effluent to reduce the nitrogen levels, along with some mechanical screening. All of these systems are located in underground tanks.

West Virginia University

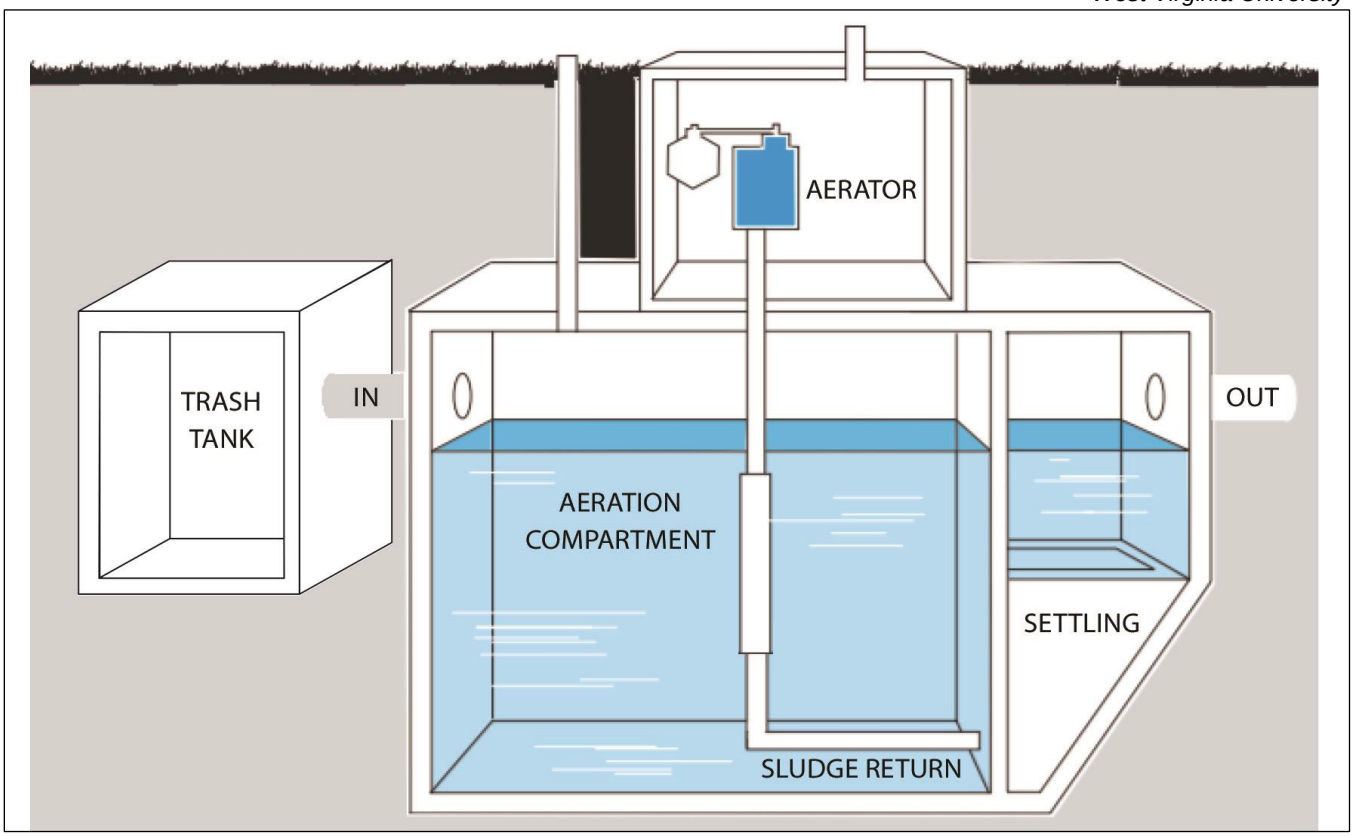


Figure 12. Aerobic Treatment Unit

Membrane Bioreactor

A membrane bioreactor (MBR) plant is similar to an ATU in that it uses a suspended growth biological treatment process. However, instead of settling out the solids, it uses membranes to separate the solids from the effluent. While there is some variability between manufacturers, most MBR units consist of some type of screening upstream of the treatment system to remove solids, one or more treatment tanks, a membrane unit, and one or more pumps (see Figure 13).

The wastewater typically flows through a set of coarse and possibly fine screens at the upstream end of the MBR to remove large solids. Then it flows into a series of treatment tanks, which use bacteria to remove nitrogen. The liquid then flows into the membrane tank, where a pump pulls the liquid through a membrane, which retains solids in the tank, allowing clean water to pass. The clean water then flows to the dosing pump chamber, where it can be pumped to the drain field.

The level of nitrogen removal is dependent on the wastewater characteristics and the layout of the MBR, but most units are able to achieve substantial nitrogen removal. These units are not a part of the WSDOH pre-approved list and must be approved on an individual basis by WSDOH for use as part of on-site sewage systems. Normally these units are above ground and can be ordered on skids. They normally need a building to house all or part of the plant.

Evoqua

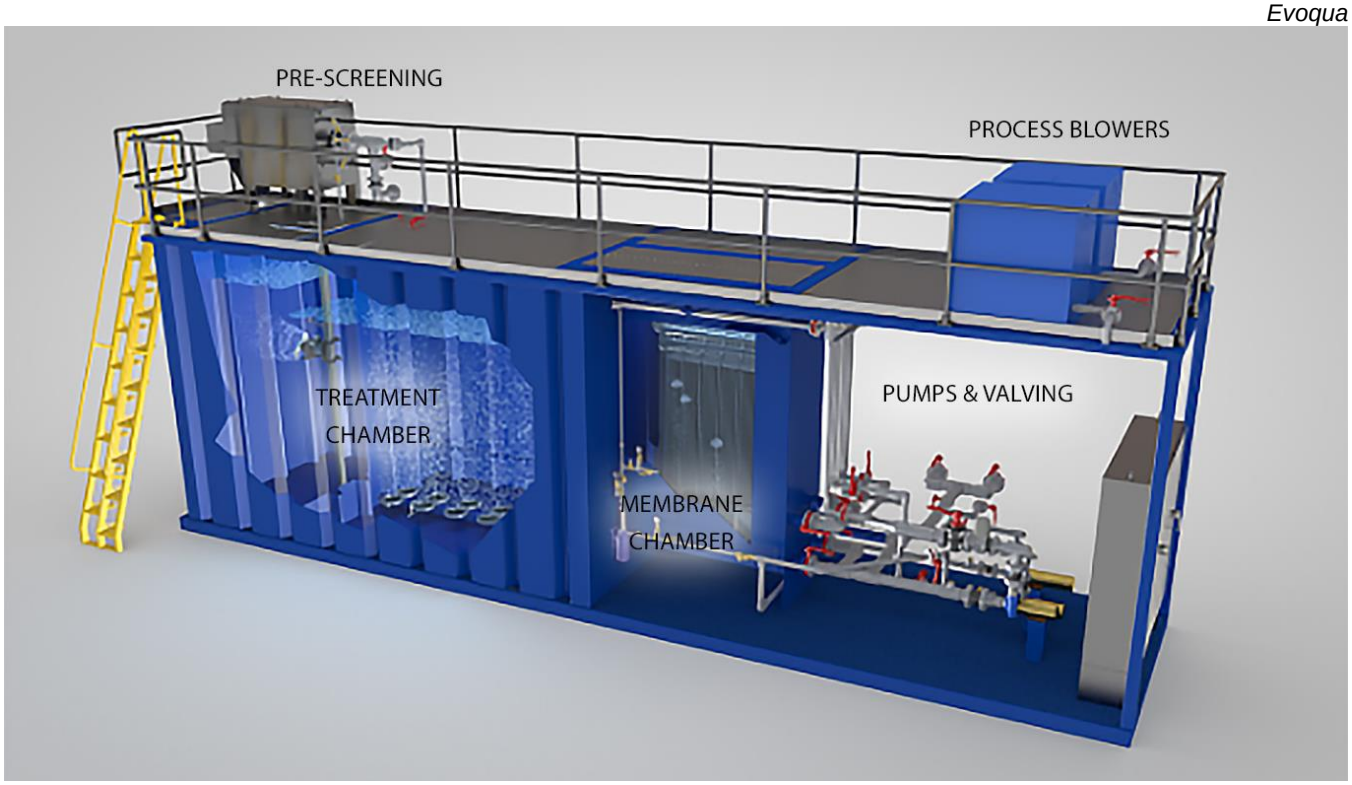


Figure 13. Membrane Bioreactor

ADDITIONAL TREATMENT CONSIDERATIONS

Food production facilities connecting to the community system must provide additional treatment prior to discharge into a sewer system in order to reduce the strength of the discharged waste. This is typically referred to as pre-treatment. A pre-treatment system is usually located at the subject parcel and is sized based on the flows and type and strength of the wastes. Effluent from the pre-treatment system should be of residential strength so it can be introduced into the main collection system. The pre-treatment system is required to be on the WSDOH-approved list of treatment devices in the section for high-strength-to-residential-strength use or be registered with WSDOH prior to being permitted.

If soils in the drain field are shallower than required by WSDOH regulations (normally 4 feet minimum), then additional treatment may be required. All of the acceptable sites investigated as part of this study have more than 4 feet of soil, so this should not be required.

6. DISCHARGE OPTIONS

DESIGN FACTORS

The final component of an on-site sewage disposal system is the drain field, where effluent is discharged to the ground for final treatment and disposal. This component varies in size, type and location based on the following:

- **Flow**—The system is sized on the design flow, which is the maximum flow that is calculated for the system.
- **Soil Type**—Finer soils require a larger surface area for the effluent to be able to pass through the soil structure without saturating it. In Type 1 soils (very coarse sand and gravel), the soil does not provide adequate treatment due to excessive permeability and must be modified using a sand bed or sand-filled trenches to provide additional detention time and treatment.
- **Soil Depth**—WSDOH requires a minimum depth of soil between the discharge elevation of the effluent dispersion system and the groundwater or hardpan elevation. This varies with the treatment levels and types of systems, but is typically 2 to 3 feet.
- **Topography**—Certain systems cannot be installed on steeper slopes. Uneven topography may limit drain field type selection as some discharge systems have to maintain level construction for even and effective dispersion of effluent.
- **Setback Requirements**—System location is dictated by setbacks requirements associated with site features such as sensitive areas, wells, water lines, property lines, trees and other features that require separation from drain field components. These setbacks can be found in the WSDOH LOSS regulations (WAC 246-272B-06050).

DRAIN FIELD TECHNOLOGY OPTIONS

Three types of drain fields were considered for this study: sand beds, trenches, and subsurface irrigation. Preliminary layouts of each type of drain field and reserve area are provided in Appendix B.

Sand Bed

The sand bed system is used only when the soils are coarse sands and gravel (Type 1). This type of system provides effluent treatment in an imported sand layer before the effluent enters the native soils for final infiltration. The sizing for this type of system is 1.0 gallon per day per square foot of infiltrative area. The bed width is limited to 10 feet and the length is normally a maximum of 100 feet.

The effluent is pressure-dosed to a lateral system in a distribution layer composed of gravel or gravel-less trenches, which provides equal distribution to the underlying sand layer. This type of system requires less surface area than trenches but more surface area than subsurface irrigation. This discharge option has a slightly lower capital cost than subsurface irrigation and can be a good option on sites with coarse or gravelly soils and a significant amount of surface area.

Trenches

Pressure distribution trench systems are composed of gravel-filled trenches that are typically 1 foot deep and 3 feet wide. The separation between trenches is 4 feet wall to wall. The loading rate to the drain field trench is

based on the soil type. With a sandy loam soil (Type 4), the loading rate is 0.6 gallons per square foot of trench per day.

Trench systems take up the largest area of any of the discharge systems examined in this study. This system has the lowest capital cost of any of the discharge options and would be a good option for sites with sandy soils and a large amount of surface area.

Subsurface Irrigation

Subsurface irrigation systems consist of a network of small-diameter tubing that is directly buried in the ground 8 inches into the native soils. The lines are spaced at 2 feet on center. The tubing has emitters with pressure-compensating diaphragms spaced at 1 foot intervals. The lines are dosed multiple times per day to keep the surrounding soils damp while not saturating them. There is also a flushing procedure with automatic valves to keep the lines free of solids.

This system is suitable for a variety of soil types, and the loading rate is based on soil type. With a sandy loam soil (Type 4), the loading rate is 0.8 gallons per emitter per day. This type of discharge system takes up the least amount of space but has the highest capital cost. This is a good option for sites with limited space and is cost-competitive when compared to sand beds.

DOSING PUMPS AND PUMP CHAMBER

All the discharge systems considered in this study are required to receive flow through a pressurized piping system fed by dosing pumps. The dosing pumps are housed in a pump chamber that receives flow from the treatment system. The pump chamber pumps, valves and control panels (with timers and flow monitoring gauges) are used to dose the drain field. All types of drain field require a similar type of dosing pump.

RESERVE AREA

All drain fields must have a 100 percent reserve area. In the case of sand bed and trench systems, 50 percent of the reserve area must be incorporated into the regular operation of the system.

7. COST ESTIMATE

Many system options considered in this study are technically feasible, but some are more affordable than others. Planning level cost estimates were developed to compare the feasibility of various alternatives.

ON-SITE AND COLLECTION SYSTEMS

The choice of on-site technology is affected by the choice of collection system, so costs for these two system components are evaluated together, as described below.

On-Site Systems

Any type of sewer system will require some type of infrastructure to be built on the properties in order to discharge wastewater to the sewer system. In the case of a gravity system, this would be individual side sewers at each property that would connect the building drain to the service lateral. These would be smaller gravity sewers on private property. They are shallower than gravity sewer mains and do not require the same level of interaction with existing utilities and pavement restoration that the gravity mains require. The estimated cost of installing gravity side sewers is $1 million for the full RVC (81 properties) and $750,000 for the reduced initial service area (47 properties).

The pressure collection system would require more infrastructure at individual properties than the gravity system. Each property would require a pressure lateral and either a grinder pump system or a STEP system. The grinder pump system requires a pump chamber housing a grinder pump, which was assumed to cost $6,500 per property. A STEP system requires a septic tank and a pump chamber with an effluent pump, which was assumed to cost $5,400 per property. The estimated total on-site system cost for a pressure system using grinder pumps is $1.5 million for the entire RVC (81 properties) and $1.1 million for the reduced initial service area.

Collection System

The collection system accounts for the majority of the system cost, and the type of collection system and the service area make the greatest contribution to the economic feasibility of a sewer system. Costs for the collection system were developed per lineal foot of pipe, and the overall cost is more dependent on the number of parcels served than on the expected amount of flow.

Installation of the gravity system would be more expensive, because it would use larger, more expensive pipe, the average pipe depth would be deeper, requiring more excavation, and it would require manholes at pipe junctions. Also, a gravity system in Quilcene would require lift stations to move wastewater from low points in the system—two to serve the full RVC and one for the reduced initial service area; the lift stations would each cost approximately $1 million.

Pressure pipe would be less expensive to install than gravity pipe, because the trench can be much smaller, since the pressure pipe does not need to be sloped and can follow the contours of the ground. This results in less excavation, backfill, and pavement restoration. Also, the pipe would be smaller and manholes would not be required.

To provide service for the entire RVC, the estimated construction cost is $8,300,000 for the gravity system and $3,800,000 for a pressurized system. For the reduced initial service area, the estimated construction cost is

$4,100,000 for the gravity system and $2,100,000 for a pressurized system. Detailed cost estimates for each collection system alternative are included in Appendix C.

Summary

The pressure system would require grinder pumps at each property discharging to the sewer system, but the additional grinder pump cost is not enough to offset the higher cost associated with the greater excavation requirements, manholes, and lift stations for the gravity system. Because the collection system comprises the majority of the sewer system cost and the cost of a gravity collection system is so much higher than that of a pressure system, a pressure sewer collection system is recommended.

TREATMENT

Construction Cost

The cost of the treatment system is dependent on the technology chosen and the quantity of flow. All three of the treatment technologies considered can be installed for a broad range of flows, and the cost of installation generally scales with the amount of flow. Unit capital costs for each treatment alternative were developed for a flow of 5,000 gpd, and that cost was multiplied as needed to represent the flows considered in this analysis:

- Recirculating gravel and chip filters have an estimated unit capital cost of $98,700 per 5,000 gpd. This includes a septic tank, mixing tank, recirculation pumps, gravel filter, wood chip filter, recirculation tank, controls, and the pump chamber and dosing pumps that discharge to the drain field.
- Aerobic treatment units have an estimated unit capital cost of $114,000 per 5,000 gpd. This includes a trash tank, aeration tank, controls, and the pump chamber and dosing pumps that discharge to the drain field.
- Membrane bioreactors have an estimated unit capital cost of $230,000 per 5,000 gpd. This includes the package MBR system, controls, and the pump chamber and dosing pumps that discharge to the drain field. These systems can have significant variability in cost based on the manufacturer and the wastewater characteristics.

Table 3 summarizes the construction costs for the treatment options for the full RVC and the reduced initial service area. These costs do not include costs for the drain field or land.

Table 3. Construction Cost Summary for Treatment Systems

Treatment Option	Cost for Full RVC (20,900 gpd)	Cost for Reduced Area (12,600 gpd)
Recirculating Gravel/Chip Filters	$400,000	$250,000
Aerobic Treatment Units	$460,000	$290,000
Membrane Bioreactors	$910,000	$570,000

Operation and Maintenance Costs

The operating requirements for the recirculating gravel and chip filter are relatively minimal, requiring operators to read the pump runtime meters every month and perform inspections on the system every six months. Annual operating costs are estimated to be $3,000 to $4,000.

There is some variability in the operations requirements of ATUs, based on the manufacturer. Typically ATUs require a greater level of monitoring and inspection than recirculating gravel filters, requiring quarterly inspections for the first year and inspections every six months following that. Operators also require a certification

provided by the County to operate ATUs. The anticipated annual operating cost is estimated to be $4,000 to $5,000.

MBR systems have higher operating costs and require more operator involvement than either recirculating filters or ATUs. This includes aeration, pumping to draw liquid through the membranes, and trained operators to monitor the system and respond to alarms. The estimated operations and maintenance cost for MBRs is $10 to $20 per 1,000 gallons treated. This totals $75,000 to $150,000 annually for a system serving the full RVC and $45,000 to $90,000 annually for the reduced initial service area.

Summary

The cost of the treatment system accounts for a relatively small percentage of the overall cost. All three of the alternatives discussed above are likely viable for this system from a capital cost perspective. However, the operation and maintenance costs of the MBR are so much higher than those of the other two alternatives that the MBR is likely not a feasible treatment option.

DISCHARGE

Like the treatment systems, the disposal methods are easily scalable to meet various levels of flow. The amount of discharge area just needs to increase along with the flow. A unit cost to accommodate a flow of 5,000 gpd was developed for each disposal method and was multiplied to meet the expected wastewater flow. The costs include any required piping, excavation, aggregate, and backfill. Costs do not include the cost of land purchase. All three methods of disposal require a pump chamber and dosing pump, which were included in the cost of the treatment systems.

Discharge trenches are the least expensive method of disposal, with an estimated unit cost of $25,000 per 5,000 gpd. Sand beds have an estimated unit cost of $30,000 per 5,000 gpd. A choice between these two methods would be based on soil type, because they are suitable for different types of soil and are not interchangeable on the same site. Trenches occupy approximately 30 percent more land area than sand beds. Subsurface irrigation is the most expensive disposal method, with an estimated unit cost of $31,500 per 5,000 gpd. This is only slightly more than the sand beds, and approximately 25 percent more than trenches. Table 4 presents the total estimates.

Table 4. Construction Cost Summary for Discharge Systems

Item	Cost for Full RVC (20,900 gpd)	Cost for Reduced Area (12,600 gpd)
Sand Beds	$120,000	$75,000
Trenches	$100,000	$63,000
Subsurface Irrigation	$125,000	$80,000

The disposal system is the least costly element of the wastewater system, and there is not much variability in cost between the three types of systems considered. Therefore, the type of disposal method chosen for this application should be based on factors other than cost.

LAND ACQUISITION

Land acquisition is a potentially significant component of the cost of the sewer system. The amount of land required for treatment and disposal will depend on the total wastewater flow and the selected treatment or disposal method. Discharge trenches occupy significantly more land for a given flow than either sand beds or subsurface irrigation. Which parcel or parcels are selected for treatment and discharge also has the potential to significantly affect the cost of the project. According to the Jefferson County Assessor, the feasible parcels range in value from

$80,000 to $420,000. The cost estimate includes an allotment of $600,000 for total land acquisition, which allows for the acquisition of multiple parcels if needed to accommodate treatment and discharge.

ADDITIONAL COSTS

The overall construction cost includes the collection system, treatment, and discharge, with an additional 30 percent project contingency and a 9 percent sales tax. Additional soft costs account for permitting, planning and design, and project and construction management. Each of these costs was assumed to be a percentage of the construction cost, as listed in Table 5.These are commonly used estimates for planning-level efforts.

Table 5. Additional Costs

Soft Cost	Percentage of Construction Cost
Permitting	5%
Planning and Design	15%
Project Management/Administration	3%
Construction Management	15%

OVERALL COSTS

A matrix was prepared combining various collection, treatment, and discharge alternatives. The matrix was prepared for a system serving the entire RVC and a system serving only the southern portion of the RVC. The overall capital costs of the project range from $6.5 million to $20 million. The choice of collection system accounts for the majority of the variation in the cost. A gravity collection system can cause the overall project cost to be nearly double that of a pressurized collection system. In contrast, the most expensive treatment and discharge options lead to a project cost only 10 percent higher than an alternative with the least expensive treatment and discharge system.

Table 6 summarizes overall project costs for select alternatives, which include a recirculating gravel and chip filter for treatment and a subsurface irrigation system for discharge. The reduced initial service area is a cost-effective option, because it is able to receive approximately 60 percent of the flow with approximately 50 percent of the pipe length for the collection system. As a result, the pressure system for a reduced initial service area also has the lowest cost per ERU. Table 7 shows the approximate cost per ERU for the four alternatives.

Table 6. Overall Project Capital Cost Summary

	Full RVC w/ Gravity System	Full RVC w/ Pressure System	Reduced Area w/ Gravity System	Reduced Area w/ Pressure System
On-Site Systems[a]	$1,060,000	$1,520,000	$730,000	$1,050,000
Collection	$14,480,000	$6,630,000	$7,080,000	$3,650,000
Treatment[b]	$1,290,000	$1,290,000	$1,030,000	$1,030,000
Discharge[d]	$220,000	$220,000	$140,000	$140,000
Planning and Design	$2,000,000	$1,100,000	$1,020,000	$650,000
Total	**$19,050,000**	**$10,760,000**	**$10,000,000**	**$6,520,000**

a. Assumes on-site grinder pumps at individual properties for pressure systems and side sewers for gravity systems.
b. Assumes a recirculating gravel and chip filter treatment system
c. Assumes subsurface irrigation discharge system

Table 7. Capital Cost per Equivalent Residential Unit (ERU)

Alternative	Cost per ERU
Full RVC w/ Gravity System	$209,000
Full RVC w/ Pressure System	$119,000
Reduced Area w/ Gravity System	$154,000
Reduced Area w/ Pressure System	$100,000

8. FUNDING AND FINANCIAL IMPACTS

This section identifies potential funding sources for implementing a wastewater collection and treatment system in the Quilcene RVC and estimates cost impacts on customers. It also identifies steps that the community can take in the direction of securing funding for the project. For the funding and finance discussion, costs fall into one of two categories:

- Capital Costs—Includes design, construction and other non-construction costs necessary to build, install and get the new wastewater system operational
- Ongoing Costs—Includes costs to keep the wastewater system running on an ongoing basis, such as operations and maintenance, billing, administration, state utility taxes and system renewal and reinvestment.

PROJECT OWNERSHIP

To seek funding for design and construction, a project owner will need to be identified. This would be the owner of the facility, as approved by WSDOH. The owner will secure funding, including grants, loans or bonds. The rules and eligibility will depend on the type of organization identified as the owner (e.g., county, public utility district, water/sewer district, etc.). The owner will be responsible for debt repayment and must own the facility for as long as the debt is outstanding. The owner may choose to operate the facility or contract for operations.

Potential owners include Jefferson County, the Port of Jefferson County, Jefferson County Public Utility District #1 (PUD), a new special district under Jefferson County, or a new sewer district. The PUD currently operates other large on-site sewage systems in the area. There are other public and private contract operators in the area.

ESTIMATED RATEPAYER ERUS

A conservative estimate of the potential ratepayers for a new wastewater system is based on the current uses for the parcels in the service area. The ratepayer estimate shown in Table 8 assumes that each residential dwelling unit is counted as 1 ERU, and each commercial property is a minimum of 1 ERU, with higher-use commercial customers converted to ERUs at 360 gpd = 1 ERU, as described in Chapter 3. Based on current use, there are an estimated 72 ERUs in the full RVC and 44 ERUs in the reduced initial service area. All commercial properties are below the Washington Department of Ecology's threshold of 3,500 gpd for small commercial. Vacant parcels are not included as initial customers but are included in future flows.

AFFORDABILITY

The most common measure of affordability for a wastewater system is the median household income (MHI) of the community, which is summarized in Table 9. Ecology defines affordability for wastewater systems as sewer costs up to 2 percent of the MHI each month. For the Quilcene CDP, sewer would be considered affordable at 2 percent of $50,486 MHI, or $84.14 per month for a single-family residence. As the cost of sewer exceeds 2 percent of MHI, the cost is defined as a hardship. Ecology and other programs design their financial assistance programs to reduce the cost of sewer by lowering the interest rate or providing a grant. Financial assistance available in each program cycle is limited, and the amount and form of assistance can only be estimated before completing the application process.

Table 8. Estimated Ratepayer ERUs

Estimated Ratepayer ERUs (based on current use)	Full RVC		Reduced Initial Service Area	
	Parcels	ERUs[a]	Parcels	ERUs[a]
Residential Properties	38	38	19	19
Small Commercial Properties[b]	30	34	16	25
Vacant Parcels[c]	13	0	12	0
Total	**81**	**72**	**47**	**44**

a. A residential ERU is 1 dwelling unit, a commercial ERU is the equivalent of a 3 bedroom home, or 360 gpd.
b. All commercial appear to meet Ecology's definition of small commercial < 3,500 gpd
c. Vacant parcels are considered in future flow estimates.

Table 9. Annual Median Household Income

Community	MHI
Quilcene CDP (census-designated place)	$50,486
Jefferson County	$49,279
Washington State	$61,062

Source: *Ecology Water Quality Financial Assistance Funding Guidelines for State Fiscal Year 2019*, Appendix L

CAPITAL FUNDING SOURCES

Capital funds to construct a new wastewater system can come from a variety of sources. Often, this involves some level of borrowing from one or more sources. The funder will require assurance that repayment will be made as scheduled, and that the system will be maintained properly to outlast any debt. With new systems that lack current customers, the borrower's financial strength is key.

Typical Types of Capital Funding

The following are typical categories of funding sources for constructing a new wastewater system:

- **Grants and Appropriations**—These sources are beneficial because they do not need to be repaid. However, the availability of funds is limited and unpredictable. Grant programs are often combined with low-interest loan programs or are available in smaller amounts. Legislative appropriations can be from any level of government and would be requested and approved for a specific project.
- **Low-Interest Loan Programs**—Several state and federal low-interest loan programs have been designed to provide financial assistance to make a new wastewater system more affordable for existing residences and small businesses. Each program has its own rules and application process. The loans may be paired with a grant, subsidy, lower interest rate, longer period of repayment, etc. A successful project must be scheduled to fit into the funding process. Water/sewer districts, public utility districts, cities, and counties are typically eligible applicants.
- **Bond Sales**—This category is a common source of capital funding for large projects to be repaid over a number of years. It helps the utility lock in current interest rates, construct the project, and spread the repayment over many years to make it more affordable. Several types of bonds are available: general obligation, revenue, and local improvement district. These bonds are matched to the type of borrower agency and project, and the owner/borrower can control the funding process to match the project schedule.

- **Utility Local Improvement District (ULID)—**This is a method of funding capital improvements that benefit specific properties. The properties that are eligible to connect to the new wastewater system would be included in the boundaries of the ULID. Each property would pay a special assessment, which cannot exceed the benefit and must be proportional among properties. The assessment can be paid off over 15 to 20 years. Construction funding would come from a low-interest loan program or a bond sale. Washington law specifies a detailed process for establishing a ULID depending on the sponsoring agency (Water/Sewer Districts RCW 57.16, Counties RCW 36.94.220, Public utility districts RCW 54.16)
- **Developer Extension**—With this type of funding, a private individual or developer extends the sewer line in order to connect to it. This would not work for a new wastewater system.
- **Sewer Users**—This includes system development fees paid by new connections, monthly sewer rates to pay for projects or repay debt, and sewer reserves for future capital improvements. While this category of funding is essential for ongoing costs and repaying debt, it is not a source for constructing a new system.

Key Funding Programs

The main sources of capital funding for developing a LOSS wastewater system are reviewed below. For all of these funding programs, the entity borrowing funds (system owner) is responsible for repayment. A financial plan or rate study is necessary to show how the owner plans to repay the loans, such as through monthly sewer rates, system development charges, or ULID assessments.

Department of Ecology Integrated Water Quality Funding Program

This is an annual low-interest loan program with applications typically due in October each year. Eligible projects include planning, design and construction of a community LOSS. To be eligible, the Department of Ecology must approve a sewer comprehensive plan and an engineering report/facility plan for the system element prior to application. In the case of a LOSS for Quilcene, the WSDOH is expected to be the approval agency for planning and design documents that make the project eligible to apply for Ecology funding. Competitive scoring is based on the water quality problem and solution. Loan repayment begins one year after substantial completion. This allows time for construction and for customers to connect before repayment.

For projects in excess of $5 million, design must be completed and WSDOH must approve it before applying for construction funds. For projects less than $5 million, a Step 4 application can be made for design and construction funds together.

The interest rate offered for the current Ecology program (applications due October 2017) was 2.0 percent for a standard 20-year loan (60 percent of the bond market rate). The interest rate can be reduced for hardship when the cost of sewer is greater than 2 percent of MHI ($84.14 per month for Quilcene) or for repayment of five years or less. Ecology now offers a 30-year loan term with a standard interest rate of 2.6 percent. The loan term cannot exceed the useful life of the project.

A partial grant for a percentage of the project, up to a maximum of $5 million, may be available for hardship. A partial grant (forgivable principal) may also be available for certain Green Project Reserve elements:

- **Preconstruction Projects—**Quilcene is eligible to apply for preconstruction activities but is currently ineligible for hardship funding for preconstruction (up to 50-percent grant), as shown in Appendix L of the *Ecology Water Quality Financial Assistance Funding Guidelines for State Fiscal Year 2019*.
- **Construction Projects—**Ecology would consider the Quilcene LOSS project eligible for hardship consideration if the cost of sewer is greater than $84.14 per month. As the level of hardship increases, Ecology provides a portion of grants not to exceed $5 million and lower interest rates (2.0 percent standard down to 0 percent for severe hardship for a 20-year loan). The interest rates and potential grant eligibility are reviewed for each funding cycle.

Public Works Trust Fund Program, Department of Commerce

This is a low-interest loan program currently in transition in legislative budget talks. As a result, it is not reliable right now. Nonetheless, it should remain on the list of funding sources to review when seeking pre-construction or construction funding. The program is shifting away from an annual cycle to allow project applications to come in at several times during the year.

U.S. Department of Agriculture Rural Development, Water and Waste Disposal

This is a federal loan program with partial grants in some hardship cases. The interest rates vary (recently 2.0 to 3.375 percent), and loans are up to 40 years. Applications are open year-round. This program is designed for smaller project applicants that cannot borrow with reasonable terms.

Grant Programs

Each grant program has a focus for prioritizing its investments. The Quilcene LOSS could be considered under water quality, community projects/facilities, or economic development.

- **Legislative Appropriation, Washington State Legislature**—Quilcene would submit a community project request form to the local state legislator typically at the beginning of a legislative session. The form would need to be sponsored by a legislator in order to be considered.
- **Jefferson County Public Infrastructure Fund**—This fund provided funding for this feasibility study.
- **Community Economic Revitalization Board, Washington Department of Commerce Construction Program**—Public facilities projects designed to attract and retain private business, create permanent jobs, and promote economic development. The maximum loan is $2 million per project up to 20 years, and the maximum grant is $300,000.
- **Community Development Block Grant, Washington Department of Commerce**—Construction of public infrastructure and community facilities, based on low- to moderate-income households in the project area. Grants up to $750,000.
- **U.S. Department of Agriculture Rural Development, Community**—System development charges or special assessment grants to individual income-qualified property owners. The grant is up to $25,000.
- **U.S. Economic Development Administration, U.S. Department of Commerce, Public Works, and Economic Development Program**—This supports public infrastructure necessary to generate or retain private sector jobs and investments, attract private sector capital, and promote regional competitiveness. The typical maximum grant is $1 million to $3 million, often in connection with a required loan.
- **Washington State Pilot or Ongoing Local Infrastructure Financing Programs**—The successful applicant is approved to retain a portion of the increased taxes from an area resulting from the targeted investment in infrastructure. Given the state's budget issues, these programs may or may not be available and are typically subject to legislative approval.
- **Infrastructure Assistance Coordinating Council**—This organization maintains an updated infrastructure funding database on its website, www.infrafunding.wa.gov.

CAPITAL FUNDING STRATEGY

The capital funding strategy aims to maximize the grants and appropriations to reduce the capital cost to ratepayers. This may steer the project to a financial assistance program, such as Ecology, to tap into additional grant or subsidy, or to receive a lower interest rate.

A contribution from the state in the form of a legislative appropriation should also be sought to help make the project more affordable to existing homes and businesses. A request would be submitted at the beginning of a legislative session for a budget appropriation specific to this project.

The potential gain from a financial assistance program should be weighed against the associated costs, such as a potential delay in the schedule and resulting cost increase, additional audit, bookkeeping, administrative and design requirements.

TOTAL COST FOR SYSTEM ALTERNATIVES

A financial analysis was performed for the two overall pressure system alternatives presented in Chapter 6: Full RVC and Reduced Initial Service Area. The gravity sewer alternatives were not analyzed because of their significantly higher estimated costs. The pressurized collection system with grinder pumps, recirculating filter and subsurface irrigation is the system reviewed. Funding scenarios are presented to assess the potential financial impact on customers.

One-Time Capital Costs

Project capital costs are one-time costs that will need to be funded with a combination of grants, contributions, appropriations or borrowing. The amount borrowed will need to be repaid by sewer customers over time. This feasibility analysis assumes that the funds are financed over 20 years at 3.0 percent interest. The actual amount borrowed, number of years for repayment and interest rate will all affect the actual impact on customers and will need to be reviewed as the project continues. The estimated capital costs, as presented in Chapter 7, are $10,800,000 for the Full RVC alternative and $6,600,000 for the Reduced Initial Area alternative.

Ongoing Annual Costs

Annual operation, maintenance and replacement (O&M&R) costs are costs that will need to be funded each year by ratepayers. Collection system operation and maintenance (O&M) costs include grinder pump electricity and maintenance and pressure sewer maintenance. The grinder pumps are assumed to be replaced every 15 years. The LOSS O&M includes maintenance for the recirculating filter, and the system is assumed to be replaced every 20 years. The estimated annual O&M&R cost is $57,765 for the Full RVC alternative and $16,840 for the Reduced Initial Area alternative.

Monthly Cost per ERU

Capital and ongoing costs were converted to a monthly cost per ERU, based on the estimated 72 initial ERUs in the Full RVC and 44 ERUs in the reduced initial area. Two funding scenarios were used to represent a range of potential impacts—no capital grants and 100-percent capital grants. Summaries of estimated monthly costs for both alternatives and scenarios are presented in Table 10.

Table 10. Funding Scenario—

	Full RVC		Reduced Initial Area	
	0% Grant	100% Grant	0% Grant	100% Grant
Project Capital Cost	$10,800,000	$10,800,000	$6,600,000	$6,600,000
Initial ERUs	72	72	44	44
Estimated Annual Debt	$726,000	$0	$444,000	$0
Monthly Debt per ERU	$840	$0	$841	$0
Ongoing O&M&R	$57,765	$57,765	$16,840	$16,840
Monthly O&M&R per ERU	$67	$67	$32	$32
Monthly Cost Range per ERU	**$907**	**$67**	**$873**	**$32**

The estimated monthly cost per ERU for the Full RVC alternative ranges from $67 to $907 depending on the amount of grants and contributions, with 100-percent grants resulting in the lowest cost. The estimated monthly cost per ERU for the Reduced Initial Area alternative ranges from $32 to $873.For both alternatives, the varying grant scenarios represent monthly costs ranging from less than 2 percent of the MHI to greater than 20 percent.

In addition to the estimated costs above, the management of the system will need to be considered. This will include administration, billing and state utility tax. Depending on the service provider, this could range from 20 to 40 percent of the O&M costs.

FINANCIAL CONCLUSION

At this early feasibility stage of analysis, it is clear that significant grants, contributions and appropriations can greatly influence the affordability of the project. The remainder of the capital project costs will need to be borrowed. In order to borrow this level of funds, the Quilcene community will need to identify a system owner that will be capable of borrowing and either providing maintenance or contracting for maintenance services.

The most common financial assistance programs for wastewater systems (Ecology and USDA-RD) require a governmental or quasi-governmental agency (county, city, PUD, water/sewer district) as an eligible applicant and system owner. USDA-RD allows community projects in some instances, but would need an acceptable organization to borrow the substantial funding. This system would be a new system without current ratepayers. Lenders will look to the credit of the system owner to ensure that the loans will be repaid on time.

Ecology considers sewer service to be affordable at 2 percent of median household income. If costs are higher, then typical funding programs provide financial assistance in the form of grants, longer loan repayment or lower interest rates. This analysis demonstrates the clear need for financial assistance in the form of grants and appropriations to bring the cost into the “affordable” range.

The Reduced Initial Service Area is an option worth consideration, with a lower amount of capital funding required. It is common for wastewater systems to start in a core area and then grow by phases in the future. This will help to focus the request for grants, contributions and appropriations to make it more obtainable.

The annual cost to ratepayers will depend on the actual financing package with the amount borrowed, years of repayment, interest rate, financing and reserve cost requirements. Ecology’s Integrated Water Quality Financial Assistance program and USDA Rural Development are programs that would likely offer a combined grant/loan package. In addition, a request for an appropriation from the state legislature and U.S. Congress could help bring costs within an affordable range.

There are planning and design requirements that must be met in order to borrow the necessary funds. The financing plan will need to be refined along with required planning reports and design documents. The annual O&M costs must be added, along with a placeholder for administration/billing/state taxes.

9. CONCLUSION

A sewer system in Quilcene is technically feasible, with topographic, soil, and groundwater characteristics allowing for the installation of collection, treatment, and discharge systems. However, financial considerations limit the options available, and careful planning and analysis will be important to ensure that any sewer system installed in Quilcene is appropriate and affordable.

While the capital costs of any sewer system are significant, a pressure system initially installed in just the southern half of the RVC is an option that may be attainable. This could be gradually expanded upon until it serves the entirety of the RVC. The initial capital investment can be reduced through funding from several state and federal government programs or through a legislative appropriation.

Quilcene Wastewater Feasibility Study

Appendix A. Site Review Predesign Report

QUILCENE
LARGE ON-SITE SEWAGE DISPOSAL SYSTEM
PREDESIGN REPORT

Prepared for

Eric Toews
Port of Port Townsend
PO Box 1180
Port Townsend, WA 98368

Prepared by

Tetra Tech
1420 Fifth Avenue, Suite 600
Seattle, WA 98101

October 2017

QUILCENE
LARGE ON-SITE SEWAGE DISPOSAL SYSTEM
PREDESIGN REPORT

Contact Information:

Owner:

[Insert owner contact information]

Design Engineer:

[Insert design engineer contact information]

Site Civil Engineer:

[Insert site civil engineer contact information]

Site Information:

[Insert parcel number, address, legal description, and county for location of large on-site sewage disposal system]

Vicinity Map:

[Provide vicinity map showing LOSS project site, including project property boundaries, parcels surrounding and adjoining the project property, and zoning and current land use of all identified properties]

Site Map:

The site map is attached as Appendix 2 of this report. The site map shows the following features:

Project Boundaries:

[Include figure showing the project boundaries]

Topographic Contours:

[Include figure showing topographic contours]

Cuts, Banks, Fill:

[Indicate the location of any cuts, banks, or fill]

Slopes Greater Than 30%:

[Indicate if there are any slopes of greater than 30% on the project site]

Areas of Soil or Slope Instability:

[Identify any areas of soil or slope instability on the project site]

Bedrock Outcrops:

[Indicate if there are any bedrock outcrops on the project site]

Setbacks to WAC 246-272B-06050 Items:

[Indicate required setbacks per WAC 246-272B-06050]

Wells within 1,000 Feet of Project Property Boundaries:

[Provide a figure showing nearby wells and identify any wells within 100 feet of the project property boundaries]

100 Year Flood Boundaries:

[Provide figure showing 100-year flood boundaries]

Primary and Reserve Drain Field Boundaries:

[Provide a figure showing primary and reserve drain field boundaries]

Test Pits:

[Provide a figure showing the location of soil log test pits]

Tribal Lands and Archaeological Resources:

[Identify tribal land or archaeological resources within 1000 feet of the project property boundaries]

Existing Underground Utilities:

[Identify and describe any existing underground facilities on the project site]

USDA NRCS Soil Map and Unit Mapping Description:

[Provide a USDA NRCS soil map of the site]

Narrative of Proposed LOSS Project:

Proposed Development:

[Provide description of proposed LOSS]

Drinking Water:

[Describe the drinking water source serving the project site]

Total Land Area Available:

[Indicate the total land area available at the project site for the LOSS]

Development Regulations (City and County):

[Description of relevant development regulations]

Compatibility with Comprehensive and County Development Plans:

[Description of compatibility with County development plans]

Public Sewer Requirements:

[Indicate whether there is a public sewer at the site and whether there are any requirements that the property be connected to a public sewer]

Design Flow and Waste Strength:

[Indicate the design flow and the anticipated strength of wastewater flowing into the LOSS]

Proposed Treatment and Disposal Method:

[Provide a description of the treatment and disposal method being used for the LOSS]

Ownership and Management Requirements:

[Provide a description of how the owner proposes to meet the ownership and management requirements in WAC 246-272B-04100]

Soil Logs:

[Provide soil logs meeting the requirements of WAC 246-272B-03400 for the primary and reserve drain field areas]

Soil Type and Hydraulic Loading Rate:

[Indicate the soil type and the appropriate hydraulic loading rate based on Table 1 in WAC 246-272B-03400]

Drain Field Narrative:

[Provide narrative describing drain field location, including topography and slope, vegetation, predominant soil type, vertical separation, site drainage patterns, and water table or any restrictive soil layers]

Minimum Land Area Requirements:

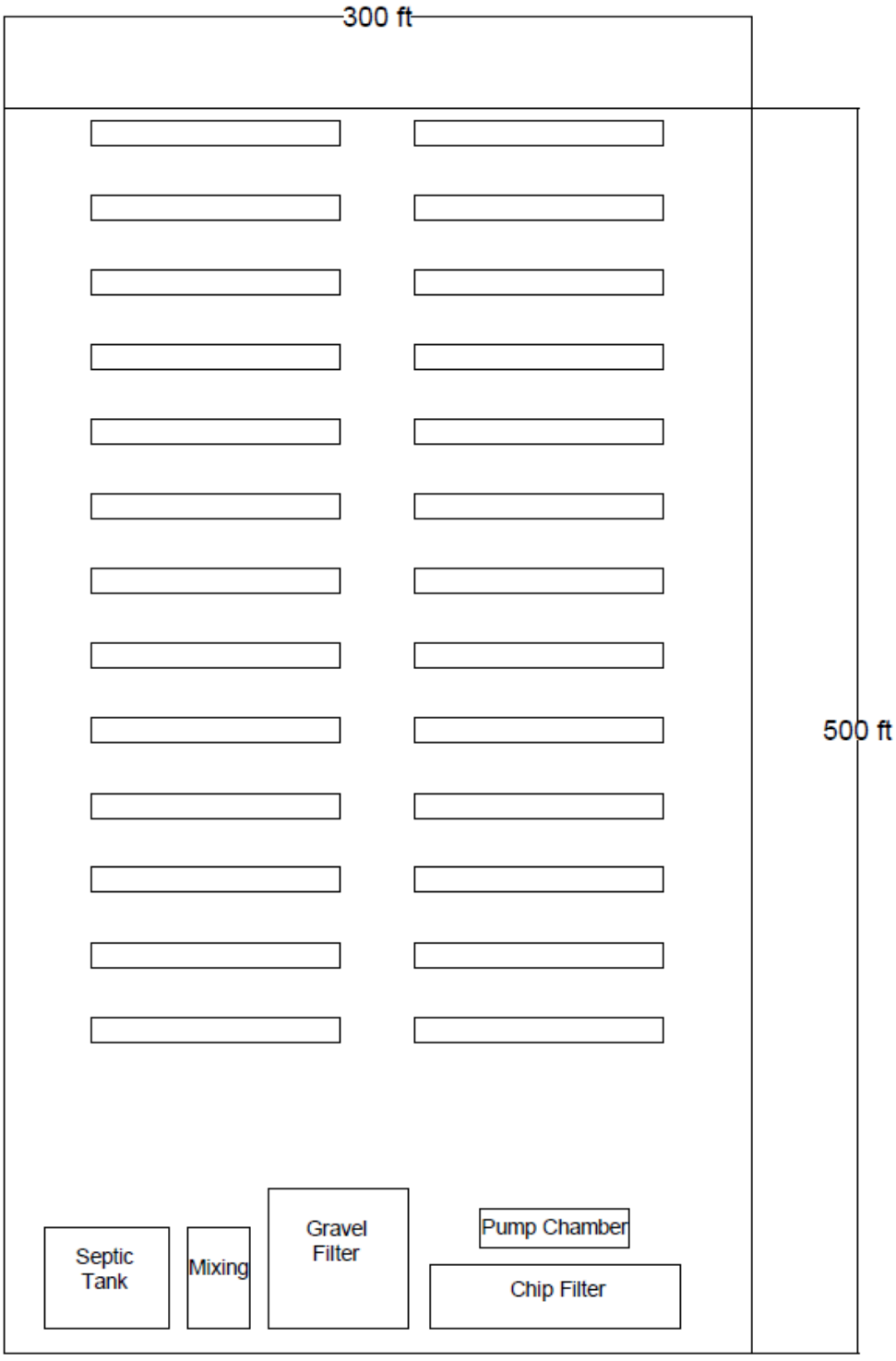
[Provide calculations showing that the proposed site meets the minimum land area requirements of WAC 246-272B-03500 based on the soil type and design flow rate]

SEPA or Environmental Review:

[Provide a copy of the SEPA checklist and determination or other environmental review and determination for the proposed LOSS]

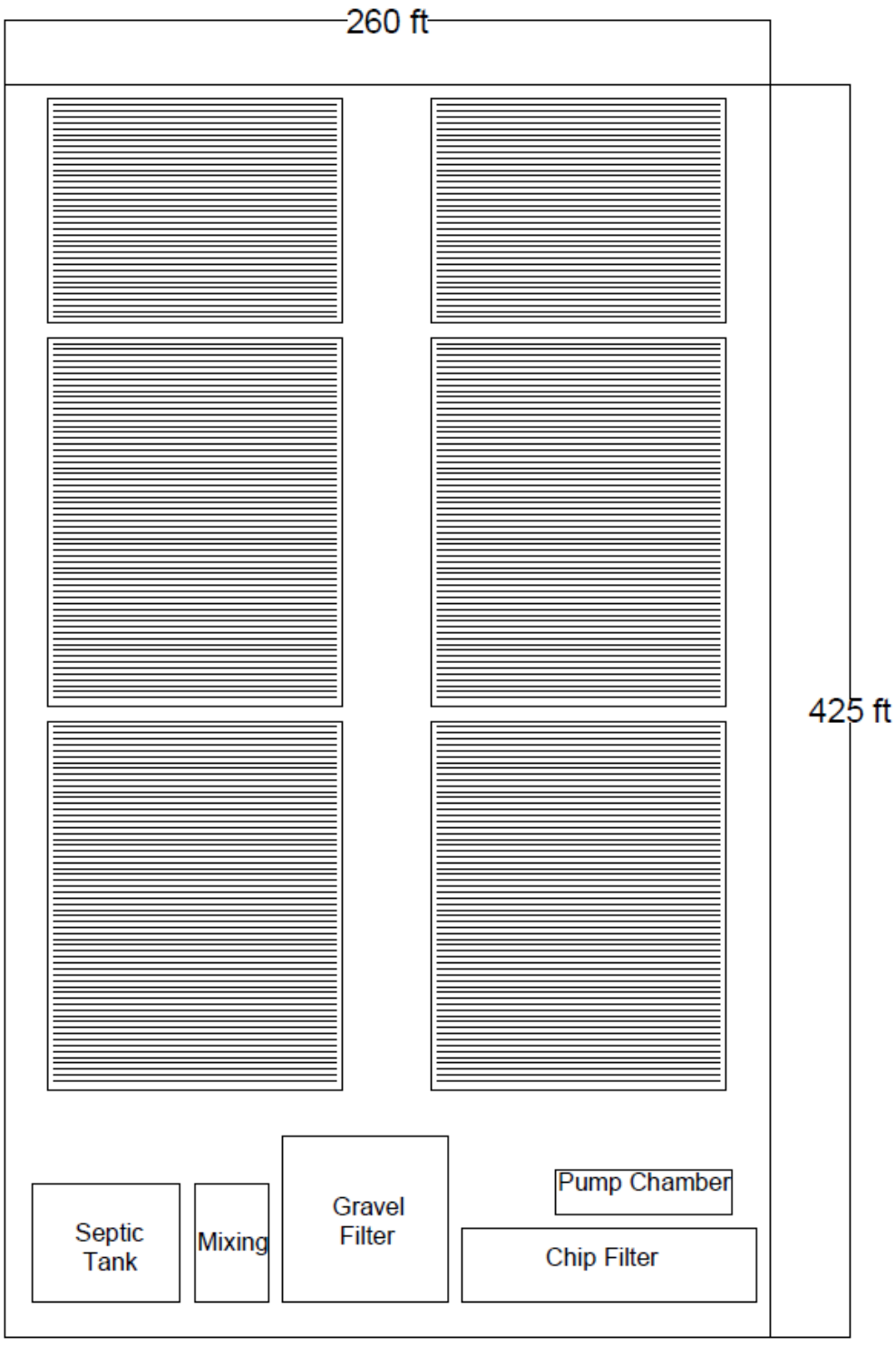
Quilcene Wastewater Feasibility Study

Appendix B. Treatment and Discharge Layouts



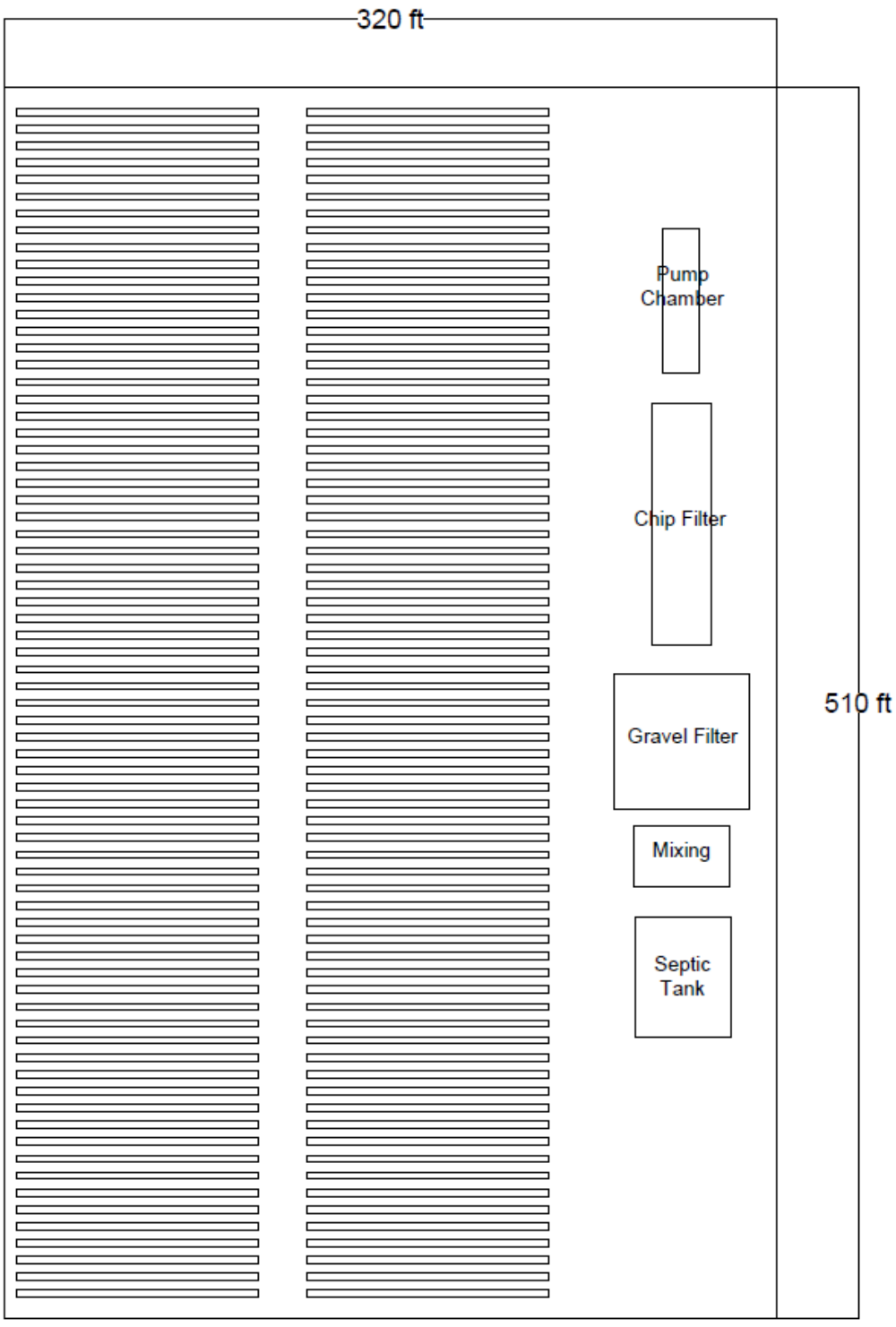
Treatment and Discharge –

Recirculating Filter and Sand Beds



Treatment and Discharge –

Recirculating Filter and Subsurface Irrigation



Treatment and Discharge –

Recirculating Filter and Trenches

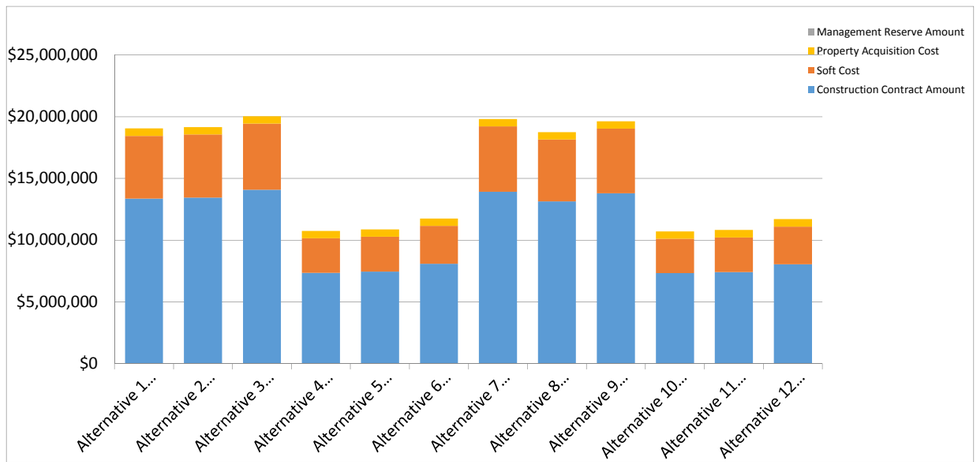
Quilcene Wastewater Feasibility Study

Appendix C. Detailed Cost Estimate

Project: Quilcene Sanitary Sewer

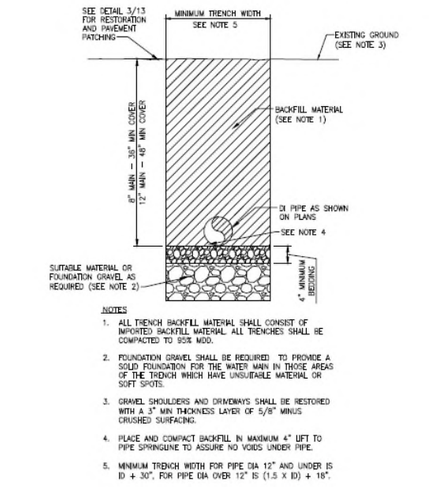
Title Summary of Project Costs for Sewer Alternatives (Full RVC)

		Alternative 1 (Gravity+Filter+Irrigation)	Alternative 2 (Gravity+ATU+Irrigation)	Alternative 3 (Gravity+MBR+Irrigation)	Alternative 4 (Grinder+Filter+Irrigation)	Alternative 5 (Grinder+ATU+Irrigation)	Alternative 6 (Grinder+MBR+Irrigation)	Alternative 7 (Gravity+Filter+Trenches)	Alternative 8 (Gravity+ATU+Trenches)	Alternative 9 (Gravity+MBR+Trenches)	Alternative 10 (Grinder+Filter+Trenches)	Alternative 11 (Grinder+ATU+Trenches)	Alternative 12 (Grinder+MBR+Trenches)
Hard Cost	**Construction Cost**	**$9,434,595**	**$9,495,795**	**$9,945,795**	**$5,194,421**	**$5,255,621**	**$5,705,621**	**$9,828,595**	**$9,282,295**	**$9,732,295**	**$5,168,421**	**$5,229,621**	**$5,679,621**
	On-Site System	**$607,500**	**$607,500**	**$607,500**	**$870,401**	**$870,401**	**$870,401**	**$420,000**	**$420,000**	**$420,000**	**$870,401**	**$870,401**	**$870,401**
	Collection	**$8,306,295**	**$8,306,295**	**$8,306,295**	**$3,803,219**	**$3,803,219**	**$3,803,219**	**$8,913,795**	**$8,306,295**	**$8,306,295**	**$3,803,219**	**$3,803,219**	**$3,803,219**
	Treatment	**$394,800**	**$456,000**	**$906,000**	**$394,800**	**$456,000**	**$906,000**	**$394,800**	**$456,000**	**$906,000**	**$394,800**	**$456,000**	**$906,000**
	Discharge	**$126,000**	**$126,000**	**$126,000**	**$126,000**	**$126,000**	**$126,000**	**$100,000**	**$100,000**	**$100,000**	**$100,000**	**$100,000**	**$100,000**
	Design Contingency	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
	Construction Bid Amount	**$12,264,973**	**$12,344,533**	**$12,929,533**	**$6,752,747**	**$6,832,307**	**$7,417,307**	**$12,777,173**	**$12,066,983**	**$12,651,983**	**$6,718,947**	**$6,798,507**	**$7,383,507**
	Sales Tax Percentage	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
	Sales Tax Amount	$1,103,848	**$1,111,008**	**$1,163,658**	**$607,747**	**$614,908**	**$667,558**	**$1,149,946**	**$1,086,028**	**$1,138,678**	**$604,705**	**$611,866**	**$664,516**
	Construction Contract Amount	**$13,368,821**	**$13,455,541**	**$14,093,191**	**$7,360,494**	**$7,447,215**	**$8,084,865**	**$13,927,119**	**$13,153,012**	**$13,790,662**	**$7,323,652**	**$7,410,373**	**$8,048,023**
Soft Cost	Permitting	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
	Planning and Design	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
	PM/Admin	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Construction Management	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
	Soft Cost	**$5,080,152**	**$5,113,106**	**$5,355,413**	**$2,796,988**	**$2,829,942**	**$3,072,249**	**$5,292,305**	**$4,998,144**	**$5,240,451**	**$2,782,988**	**$2,815,942**	**$3,058,249**
Property Cost	Property Acquisition Cost	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000
Base Cost		**$19,048,972**	**$19,168,647**	**$20,048,604**	**$10,757,482**	**$10,877,156**	**$11,757,113**	**$19,819,424**	**$18,751,156**	**$19,631,113**	**$10,706,640**	**$10,826,314**	**$11,706,271**
Management Reserve	Management Reserve Percentage	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Management Reserve Amount	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Cost		**$19,048,972**	**$19,168,647**	**$20,048,604**	**$10,757,482**	**$10,877,156**	**$11,757,113**	**$19,819,424**	**$18,751,156**	**$19,631,113**	**$10,706,640**	**$10,826,314**	**$11,706,271**
Total Cost (Rounded)		**$19,000,000**	**$19,200,000**	**$20,000,000**	**$10,800,000**	**$10,900,000**	**$11,800,000**	**$19,800,000**	**$18,800,000**	**$19,600,000**	**$10,700,000**	**$10,800,000**	**$11,700,000**

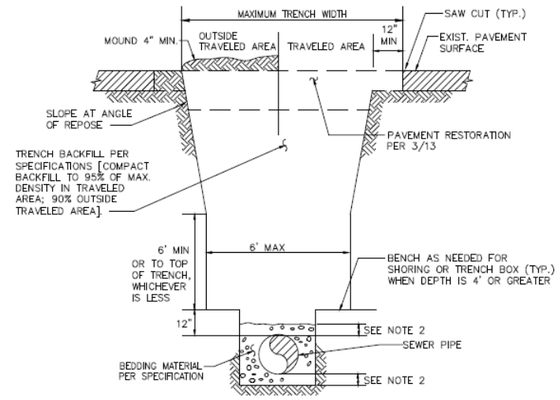


Unit Costs

Gravity System					Comment
Gravity Main					
Dimensions of Excavation					
Cover Depth	10 ft				
Trench Width	4.34 ft				
Item	**Quantity per LF**	**Unit**	**Unit Cost**	**Cost per LF**	
Excavation	1.99	CY	$15.16	$30.21	King County Tabula
Backfill	1.45	CY	$39.64	$57.34	King County Tabula
Complete Pavement Restoration	0.70	SY	$100.26	$70.63	King County Tabula
Overlay Pavement Restoration	3.3	SY	$32.64	$107.72	King County Tabula
Trench Safety	24.8	SF	$0.62	$15.32	King County Tabula
Spoil Load and Haul	1.99	CY	$18.65	$37.18	King County Tabula
Pipe Material	1	lf	$19.82	$19.82	King County Tabula
Pipe Installation	1	lf	$29.15	$29.15	King County Tabula
Place Pipe Zone Fill	0.48	CY	$39.64	$19.11	King County Tabula
Existing Utilities	1	lf	$3.00	$3.00	King County Tabula
Dewatering	1	lf	$24.00	$24.00	King County Tabula
Traffic Control	1	lf	$8.00	$8.00	King County Tabula
Manholes	0.002	EA	$9,712.00	$19.42	King County Tabula
Cost Per Linear Foot	$440.92				
Force Main					
Dimensions					
Cover Depth	5 ft				
Trench Width	3.5 ft				
Item	**Quantity per LF**	**Unit**	**Unit Cost**	**Cost per LF**	
Excavation	0.88	CY	$15.16	$13.26	King County Tabula
Backfill	0.52	CY	$39.64	$20.55	King County Tabula
Complete Pavement Restoration	0.61	SY	$100.26	$61.27	King County Tabula
Overlay Pavement Restoration	1.39	SY	$32.64	$45.49	King County Tabula
Trench Safety	13.52	SF	$0.62	$8.36	King County Tabula
Spoil Load and Haul	0.88	CY	$18.65	$16.32	King County Tabula
Pipe Material	1.00	lf	$34.98	$34.98	King County Tabula
Pipe Installation	1.00	lf	$25.65	$25.65	King County Tabula
Place Pipe Zone Fill	0.34	CY	$39.64	$13.36	King County Tabula
Existing Utilities	1.00	lf	$3.50	$3.50	King County Tabula
Dewatering	1.00	lf	$27.98	$27.98	King County Tabula
Traffic Control	1.00	lf	$9.33	$9.33	King County Tabula
Cost Per Linear Foot	$280.04				
Side Sewers (in ROW)					
Item	**Quantity**	**Unit**	**Unit Cost**	**Cost per LF**	
Side Sewer Connections	-	EA	$7,500.00	-	
Cost Per Connection	$7,500.00				
Side Sewers (Private)					
Item	**Quantity**	**Unit**	**Unit Cost**	**Cost per LF**	
Side Sewer Connections	-	EA	$7,500.00	-	



4 WATER MAIN TRENCH
SCALE: NTS



1 TYP SANITARY SEWER AND STORM DRAIN TRENCH DETAIL
SCALE: NONE

Cost Per Connection	$7,500.00				
Lift Stations					
Item	**Quantity**	**Unit**	**Unit Cost**	**Cost per LF**	
Lift Station	-	EA	$1,000,000	-	
Cost per Lift Station	$1,000,000				

Grinder System					Comment
Pressure Main					
Dimensions					
Cover Depth	5 ft				
Trench Width	3.5 ft				
Item	**Quantity per LF**	**Unit**	**Unit Cost**	**Cost per LF**	
Excavation	0.88	CY	$15.16	$13.26	King County Tabula
Backfill	0.52	CY	$39.64	$20.55	King County Tabula
Complete Pavement Restoration	0.61	SY	$100.26	$61.27	King County Tabula
Overlay Pavement Restoration	1.39	SY	$32.64	$45.49	King County Tabula
Trench Safety	13.52	SF	$0.62	$8.36	King County Tabula
Spoil Load and Haul	0.88	CY	$18.65	$16.32	King County Tabula
Pipe Material	1.00	lf	$14.25	$14.25	RS Means
Pipe Installation	1.00	lf	$15.10	$15.10	RS Means
Place Pipe Zone Fill	0.34	CY	$39.64	$13.36	King County Tabula
Existing Utilities	1.00	lf	$3.50	$3.50	King County Tabula
Dewatering	1.00	lf	$27.98	$27.98	King County Tabula
Traffic Control	1.00	lf	$9.33	$9.33	King County Tabula
Cost per Linear Foot	$248.77				
Pressure Laterals					
Dimensions					
Cover Depth	3 ft				
Trench Width	2.5 ft				
Item	**Quantity per LF**	**Unit**	**Unit Cost**	**Cost per LF**	
Excavation	0.37	CY	$15.16	$5.61	
Backfill	0.21	CY	$39.64	$8.26	
Complete Pavement Restoration	0.5	SY	$100.26	$50.13	
Overlay Pavement Restoration	1.39	SY	$32.64	$45.37	
Trench Safety	0	SF	$0.62	$0.00	
Spoil Load and Haul	0.37	CY	$18.65	$6.91	
Pipe Material	1	lf	$14.25	$14.25	RS Means
Pipe Installation	1	lf	$15.10	$15.10	RS Means
Place Pipe Zone Fill	0.07	CY	$39.64	$2.75	
Existing Utilities	1	lf	$3.50	$3.50	
Dewatering	1	lf	$27.98	$27.98	
Traffic Control	0	lf	$9.33	$0.00	
Cost per Linear Foot	$179.86				

On-Site Infrastructure		Comment
Pressure Laterals		
Dimensions		
Cover Depth	3 ft	

Trench Width 2.5 ft

Item	Quantity per LF	Unit	Unit Cost	Cost per LF
Excavation	0.37	CY	$15.16	$5.61
Backfill	0.22	CY	$39.64	$8.81
Complete Pavement Restoration	0.00	SY	$100.26	$0.00
Overlay Pavement Restoration	0.00	SY	$32.64	$0.00
Trench Safety	0.00	SF	$0.62	$0.00
Spoil Load and Haul	0.37	CY	$18.65	$6.91
Pipe Material	1.00	lf	$14.25	$14.25
Pipe Installation	1.00	lf	$15.10	$15.10
Place Pipe Zone Fill	0.07	CY	$39.64	$2.75
Existing Utilities	1.00	lf	$3.50	$3.50
Dewatering	1.00	lf	$27.98	$27.98
Traffic Control	0.00	lf	$9.33	$0.00
Total Cost per Linear Foot	**$84.91**			

Individual STEP System

Component	Unit Cost	
Septic Tank (1000 gal)	$1,200	Dave Jensen
Pump Chamber (1000 gal)	$1,200	Dave Jensen
Effluent Pump	$1,500	Dave Jensen
Control Panel/Alarm	$1,500	Dave Jensen
Total Cost	**$5,400**	

Individual Grinder Pump Station

Component	Unit Cost	
Poly Vault with Grinder Pum	$5,000	Dave Jensen
Control Panel/Alarm	$1,500	Dave Jensen
Total Cost	**$6,500**	

Community Treatment Comment

Recirculating Gravel/Chip Filter

Component	Unit Cost	
Septic Tank (15,000 gal)	$22,500	Dave Jensen
Mixing Tank (7,500 gal)	$12,000	Dave Jensen
Recirc Pumps	$4,000	Dave Jensen
Control Panel / Alarm	$3,000	Dave Jensen
Recirc Filter (1,000 sf)	$20,000	Dave Jensen
Chip Filter (714 sf)	$10,700	Dave Jensen
Pump Chamber (10,000 gal)	$17,500	Dave Jensen
Dose Pumps	$6,000	Dave Jensen
Control Panel / Alarm	$3,000	Dave Jensen
Total Cost	**$98,700**	

Aerobic Treatment Unit

Component	Unit Cost	
Trash Tank (5,000 gal)	$7,500	Dave Jensen
ATU	$80,000	Dave Jensen
Pump Chamber (10,000 gal)	$17,500	Dave Jensen
Dose Pumps	$6,000	Dave Jensen
Control Panel / Alarm	$3,000	Dave Jensen
Total Cost	**$114,000**	

MBR Plant		
Component	**Unit Cost**	
MBR	$200,000	Dave Jensen
Pump Chamber	$17,500	Dave Jensen
Dose Pumps	$6,000	Dave Jensen
Control Panel Alarm	$3,000	Dave Jensen
Total Cost	**$226,500**	

Discharge		
Sand Beds		
Component	**Unit Cost**	
Beds	$30,000	Dave Jensen
Total Cost	**$30,000**	
Trenches		
Component	**Unit Cost**	
Trenches	$25,000	Dave Jensen
Total Cost	**$25,000**	
Subsurface Irrigation		
Component	**Unit Cost**	
Subsurface Irrigation	$31,500	Dave Jensen
Total Cost	**$31,500**	

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.17**
Alternative:	**Gravity + Recirc Filters +Subsurface Irrigation**	**By:**	**AWC**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	*Gravity Main*	12,150	LF	$441	$5,357,143
2	Force Main	1,220	LF	$280	$341,652
3	Lift Station	2	EA	$1,000,000	$2,000,000
4	Side Sewer	81	EA	$7,500	$607,500
Private					
5	Side Sewer	81	LF	$7,500	$607,500
Treatment					
5	Septic Tank	4	EA	$22,500	$90,000
6	Mixing Tank	4	EA	$12,000	$48,000
7	Recirc Pumps	4	EA	$4,000	$16,000
8	Control Panel/Alarm	4	EA	$3,000	$12,000
9	Recirc Filter	4	EA	$20,000.00	$80,000
10	Chip Filter	4	EA	$10,700.00	$42,800
11	Pump Chamber	4	EA	$17,500.00	$70,000
12	Dose Pumps	4	EA	$6,000.00	$24,000
13	Control Panel/Alarm	4	EA	$3,000.00	$12,000
Disposal					
9	Subsurface Irrigation	4	EA	$31,500	$126,000
	Subtotal				**$9,434,595**
	30% Contingency				**$2,830,378**
	Subtotal				**$12,264,973**
	Sales Tax				**$1,103,848**
	Total construction Cost				**$13,368,821**

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Gravity + ATU +Subsurface Irrigation**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	*Gravity Main*	12,150	LF	$441	$5,357,143
2	Force Main	1,220	LF	$280	$341,652
3	Lift Station	2	EA	$1,000,000	$2,000,000
4	Side Sewer	81	EA	$7,500	$607,500
Private					
5	Side Sewer	81	LF	$7,500	$607,500
Treatment					
5	Trash Tank	4	EA	$7,500	$30,000
6	ATU	4	EA	$80,000	$320,000
7	Pump Chamber	4	EA	$17,500	$70,000
8	Dose Pumps	4	EA	$6,000	$24,000
9	Control Panel/Alarm	4	EA	$3,000.00	$12,000
Disposal					
9	Subsurface Irrigation	4	EA	$31,500	$126,000
	Subtotal				**$9,495,795**
	30% Contingency				**$2,848,738**
	Subtotal				**$12,344,533**
	Sales Tax				**$1,111,008**
	Total construction Cost				**$13,455,541**

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking pits
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Gravity + MBR +Subsurface Irrigation**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	*Gravity Main*	12,150	LF	$441	$5,357,143
2	Force Main	1,220	LF	$280	$341,652
3	Lift Station	2	EA	$1,000,000	$2,000,000
4	Side Sewer	81	EA	$7,500	$607,500
Private					
5	Side Sewer	81	LF	$7,500	$607,500
Treatment					
5	MBR	4	EA	$200,000	$800,000
6	Pump Chamber	4	EA	$17,500	$70,000
7	Dose Pumps	4	EA	$6,000	$24,000
8	Control Panel/Alarm	4	EA	$3,000	$12,000
Disposal					
9	Subsurface Irrigation	4	EA	$31,500	$126,000
	Subtotal				**$9,945,795**
	30% Contingency				**$2,983,738**
	Subtotal				**$12,929,533**
	Sales Tax				**$1,163,658**
	Total construction Cost				**$14,093,191**

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Grinder + Recirc Filters +Subsurface Irrigation**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	Service Pipe	4,050	LF	$180	$728,445
2	Small Diameter Pipe	12,360	LF	$249	$3,074,775
Private					
3	Service Pipe (Private Property)	4,050	LF	$85	$343,901
4	Grinder	81	EA	$6,500	$526,500
Treatment					
5	Septic Tank	4	EA	$22,500	$90,000
6	Mixing Tank	4	EA	$12,000	$48,000
7	Recirc Pumps	4	EA	$4,000	$16,000
8	Control Panel/Alarm	4	EA	$3,000	$12,000
9	Recirc Filter	4	EA	$20,000.00	$80,000
10	Chip Filter	4	EA	$10,700.00	$42,800
11	Pump Chamber	4	EA	$17,500.00	$70,000
12	Dose Pumps	4	EA	$6,000.00	$24,000
13	Control Panel/Alarm	4	EA	$3,000.00	$12,000
Disposal					
9	Subsurface Irrigation	4	EA	$31,500	$126,000
	Subtotal				**$5,194,421**
	30% Contingency				**$1,558,326** 0.3
	Subtotal				**$6,752,747**
	Sales Tax				**$607,747** 0.09
	Total construction Cost				**$7,360,494**

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Grinder + ATU +Subsurface Irrigation**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	Service Pipe	4,050	LF	$180	$728,445
2	Small Diamerter Pipe	12,360	LF	$249	$3,074,775
Private					
3	Service Pipe (Private Property)	4,050	LF	$85	$343,901
4	Grinder	81	EA	$6,500	$526,500
Treatment					
5	Trash Tank	4	EA	$7,500	$30,000
6	ATU	4	EA	$80,000	$320,000
7	Pump Chamber	4	EA	$17,500	$70,000
8	Dose Pumps	4	EA	$6,000	$24,000
9	Control Panel/Alarm	4	EA	$3,000.00	$12,000
Disposal					
9	Subsurface Irrigation	4	EA	$31,500	$126,000
	Subtotal				**$5,255,621**
	30% Contingency				**$1,576,686**
	Subtotal				**$6,832,307**
	Sales Tax				**$614,908**
	Total construction Cost				**$7,447,215**

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Grinder + MBR +Subsurface Irrigation**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	Service Pipe	4,050	LF	$180	$728,445
2	Small Diameter Pipe	12,360	LF	$249	$3,074,775
Private					
3	Service Pipe (Private Property)	4,050	LF	$85	$343,901
4	Grinder	81	EA	$6,500	$526,500
Treatment					
5	MBR	4	EA	$200,000	$800,000
6	Pump Chamber	4	EA	$17,500	$70,000
7	Dose Pumps	4	EA	$6,000	$24,000
8	Control Panel/Alarm	4	EA	$3,000	$12,000
Disposal					
9	Subsurface Irrigation	4	EA	$31,500	$126,000
	Subtotal				**$5,705,621**
	30% Contingency				**$1,711,686**
	Subtotal				**$7,417,307**
	Sales Tax				**$667,558**
	Total construction Cost				**$8,084,865**

General Notes:

1 Assume 10% for mob./demob.
2 Open cut includes import bedding and backfill.
3 Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4 Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5 Assume some support for traffic control. Assume trenches are plated at night.
6 Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7 A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8 Dewatering assumes sump in trench and no formal dewatering well system is required.
9 Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10 Includes no permit fees.
11 Assumes 6" CSTC.
12 Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13 Replace curb and gutter includes removal of existing gutter. Length assumed.
14 Assumes 12 foot average manhole depth.
15 Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1 Construct new wet well along east side of existing drywell as shown on sketch.
2 Relocate utility conflicts at new wet well.
3 Provide temporary sewage pumping as needed during construction
4 Remove existing LS#1 pumps, piping and controls
5 Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6 Install associated piping as shown on sketch.
7 Provide new grating mezzanine above new 14" discharge pipe.
8 Provide all new controls including on site data logger and telemetry to remote City PW facility.
9 Mount new controls at mezzanine level, similar to existing controls.
10 Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11 Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12 Modify HVAC to eliminate conflicts with new piping
13 Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14 Provide new electrical service large enough to run all three 50 hp pumps
15 Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16 Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Gravity + Recirc Filters +Trenches**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	*Gravity Main*	12,150	LF	$441	$5,357,143
2	Force Main	1,220	LF	$280	$341,652
3	Lift Station	2	EA	$1,000,000	$2,000,000
4	Side Sewer	81	EA	$15,000	$1,215,000
Private					
5	Side Sewer	56	LF	$7,500	$420,000
Treatment					
5	Septic Tank	4	EA	$22,500	$90,000
6	Mixing Tank	4	EA	$12,000	$48,000
7	Recirc Pumps	4	EA	$4,000	$16,000
8	Control Panel/Alarm	4	EA	$3,000	$12,000
9	Recirc Filter	4	EA	$20,000.00	$80,000
10	Chip Filter	4	EA	$10,700.00	$42,800
11	Pump Chamber	4	EA	$17,500.00	$70,000
12	Dose Pumps	4	EA	$6,000.00	$24,000
13	Control Panel/Alarm	4	EA	$3,000.00	$12,000
Disposal					
9	Trenches	4	EA	$25,000	$100,000
	Subtotal				**$9,828,595**
	30% Contingency				**$2,948,578**
	Subtotal				**$12,777,173**
	Sales Tax				**$1,149,946**
	Total construction Cost				**$13,927,119**

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Gravity + ATU +Trenches**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	*Gravity Main*	12,150	LF	$441	$5,357,143
2	Force Main	1,220	LF	$280	$341,652
3	Lift Station	2	EA	$1,000,000	$2,000,000
4	Side Sewer	81	EA	$7,500	$607,500
Private					
5	Side Sewer	56	LF	$7,500	$420,000
Treatment					
5	Trash Tank	4	EA	$7,500	$30,000
6	ATU	4	EA	$80,000	$320,000
7	Pump Chamber	4	EA	$17,500	$70,000
8	Dose Pumps	4	EA	$6,000	$24,000
9	Control Panel/Alarm	4	EA	$3,000.00	$12,000
Disposal					
9	Trenches	4	EA	$25,000	$100,000
	Subtotal				**$9,282,295**
	30% Contingency				**$2,784,688**
	Subtotal				**$12,066,983**
	Sales Tax				**$1,086,028**
	Total construction Cost				**$13,153,012**

General Notes:

1 Assume 10% for mob./demob.
2 Open cut includes import bedding and backfill.
3 Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4 Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5 Assume some support for traffic control. Assume trenches are plated at night.
6 Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7 A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking pits
8 Dewatering assumes sump in trench and no formal dewatering well system is required.
9 Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10 Includes no permit fees.
11 Assumes 6" CSTC.
12 Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13 Replace curb and gutter includes removal of existing gutter. Length assumed.
14 Assumes 12 foot average manhole depth.
15 Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1 Construct new wet well along east side of existing drywell as shown on sketch.
2 Relocate utility conflicts at new wet well.
3 Provide temporary sewage pumping as needed during construction
4 Remove existing LS#1 pumps, piping and controls
5 Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6 Install associated piping as shown on sketch.
7 Provide new grating mezzanine above new 14" discharge pipe.
8 Provide all new controls including on site data logger and telemetry to remote City PW facility.
9 Mount new controls at mezzanine level, similar to existing controls.
10 Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11 Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12 Modify HVAC to eliminate conflicts with new piping
13 Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14 Provide new electrical service large enough to run all three 50 hp pumps
15 Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16 Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Gravity + Recirc Filters +Trenches**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	*Gravity Main*	12,150	LF	$441	$5,357,143
2	Force Main	1,220	LF	$280	$341,652
3	Lift Station	2	EA	$1,000,000	$2,000,000
4	Side Sewer	81	EA	$7,500	$607,500
Private					
5	Side Sewer	56	LF	$7,500	$420,000
Treatment					
5	MBR	4	EA	$200,000	$800,000
6	Pump Chamber	4	EA	$17,500	$70,000
7	Dose Pumps	4	EA	$6,000	$24,000
8	Control Panel/Alarm	4	EA	$3,000	$12,000
Disposal					
9	Trenches	4	EA	$25,000	$100,000
	Subtotal				**$9,732,295**
	30% Contingency				**$2,919,688**
	Subtotal				**$12,651,983**
	Sales Tax				**$1,138,678**
	Total construction Cost				**$13,790,662**

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Grinder + Recirc Filters +Trenches**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	Service Pipe	4,050	LF	$180	$728,445
2	Small Diameter Pipe	12,360	LF	$249	$3,074,775
Private					
3	Service Pipe (Private Property)	4,050	LF	$85	$343,901
4	Grinder	81	EA	$6,500	$526,500
Treatment					
5	Septic Tank	4	EA	$22,500	$90,000
6	Mixing Tank	4	EA	$12,000	$48,000
7	Recirc Pumps	4	EA	$4,000	$16,000
8	Control Panel/Alarm	4	EA	$3,000	$12,000
9	Recirc Filter	4	EA	$20,000.00	$80,000
10	Chip Filter	4	EA	$10,700.00	$42,800
11	Pump Chamber	4	EA	$17,500.00	$70,000
12	Dose Pumps	4	EA	$6,000.00	$24,000
13	Control Panel/Alarm	4	EA	$3,000.00	$12,000
Disposal					
9	Trenches	4	EA	$25,000	$100,000
	Subtotal				**$5,168,421**
	30% Contingency				**$1,550,526**
	Subtotal				**$6,718,947**
	Sales Tax				**$604,705**
	Total construction Cost				**$7,323,652**

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Grinder + ATU +Trenches**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	Service Pipe	4,050	LF	$180	$728,445
2	Small Diamerter Pipe	12,360	LF	$249	$3,074,775
Private					
3	Service Pipe (Private Property)	4,050	LF	$85	$343,901
4	Grinder	81	EA	$6,500	$526,500
Treatment					
5	Trash Tank	4	EA	$7,500	$30,000
6	ATU	4	EA	$80,000	$320,000
7	Pump Chamber	4	EA	$17,500	$70,000
8	Dose Pumps	4	EA	$6,000	$24,000
9	Control Panel/Alarm	4	EA	$3,000.00	$12,000
Disposal					
9	Trenches	4	EA	$25,000	$100,000
	Subtotal				**$5,229,621**
	30% Contingency				**$1,568,886**
	Subtotal				**$6,798,507**
	Sales Tax				**$611,866**
	Total construction Cost				**$7,410,373**

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Grinder + MBR +Trenches**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	Service Pipe	4,050	LF	$180	$728,445
2	Small Diameter Pipe	12,360	LF	$249	$3,074,775
Private					
3	Service Pipe (Private Property)	4,050	LF	$85	$343,901
4	Grinder	81	EA	$6,500	$526,500
Treatment					
5	MBR	4	EA	$200,000	$800,000
6	Pump Chamber	4	EA	$17,500	$70,000
7	Dose Pumps	4	EA	$6,000	$24,000
8	Control Panel/Alarm	4	EA	$3,000	$12,000
Disposal					
9	Trenches	4	EA	$25,000	$100,000
	Subtotal				**$5,679,621**
	30% Contingency				**$1,703,886**
	Subtotal				**$7,383,507**
	Sales Tax				**$664,516**
	Total construction Cost				**$8,048,023**

General Notes:

1 Assume 10% for mob./demob.
2 Open cut includes import bedding and backfill.
3 Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4 Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5 Assume some support for traffic control. Assume trenches are plated at night.
6 Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7 A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8 Dewatering assumes sump in trench and no formal dewatering well system is required.
9 Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10 Includes no permit fees.
11 Assumes 6" CSTC.
12 Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13 Replace curb and gutter includes removal of existing gutter. Length assumed.
14 Assumes 12 foot average manhole depth.
15 Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1 Construct new wet well along east side of existing drywell as shown on sketch.
2 Relocate utility conflicts at new wet well.
3 Provide temporary sewage pumping as needed during construction
4 Remove existing LS#1 pumps, piping and controls
5 Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6 Install associated piping as shown on sketch.
7 Provide new grating mezzanine above new 14" discharge pipe.
8 Provide all new controls including on site data logger and telemetry to remote City PW facility.
9 Mount new controls at mezzanine level, similar to existing controls.
10 Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
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12 Modify HVAC to eliminate conflicts with new piping
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14 Provide new electrical service large enough to run all three 50 hp pumps
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16 Remove connection to emergency outfall from existing wet well.

NPV Summary

Life Cycle Year (after Year 0)	59	99
Alternative 4	$11,960,000	$12,115,000
Alternative 5	$12,304,000	$12,491,000
Alternative 6	$15,408,000	$15,910,000

60 Year Life Cycle Cost		
Alt4	$11,960,410	$1,202,928
Alt5	$12,304,171	$1,427,014
Alt6	$15,408,175	$3,651,061

NPV Calculation

Discount Rate (i)	3.0%

Alternative 4

Element	Type	Description	Frequency (Years)	First Instance (Year)		PV Rate (related to 2017)	1	1	1	1	1	1	1	1	1	1	1	1
						Year relative to Construction Year (Year 0)	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
							2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Design & Permitting		Half Soft Cost	-	-2	$1,398,494			$720,224	$741,831										
Construction		With 1/2 Soft Cost, Construction & Property Acquisition	-	0	$9,358,988					$10,226,819									
Sewer	O&M	Grinder Pump Electricity	1	1	$1,215						$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
	O&M	Grinder Pump Maintenance and Repair	1	1	$4,050						$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
	O&M	Pressure Sewer Maintenance	1	1	$800						$800	$800	$800	$800	$800	$800	$800	$800	$800
	Replacement	Grinder Pumps Replacement	15	15	$526,500														
LOSS	O&M	Recirculating Filter O&M	1	1	$ 3,000						$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
	Replacement	Recirculating Filter Equipment	20	20	$ 272,000														
						Annual Total		$720,224	$741,831	$10,226,819	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065
						Present Worth		$699,247	$699,247	$9,358,988	$8,054	$7,820	$7,592	$7,371	$7,156	$6,948	$6,745	$6,549	$6,358
						Cumulative Present Worth		$699,247	$1,398,494	$10,757,482	$10,765,536	$10,773,356	$10,780,947	$10,788,318	$10,795,474	$10,802,422	$10,809,167	$10,815,716	$10,822,074

Alternative 5

Element	Type	Description	Frequency (Years)	First Instance (Year)			2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Design & Permitting		Half Soft Cost	-	-2	$1,414,971			$728,710	$750,571										
Construction		With 1/2 Soft Cost, Construction & Property Acquisition	-	0	$9,462,185					$10,339,585									
Sewer	O&M	Grinder Pump Electricity	1	1	$1,215						$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
	O&M	Grinder Pump Maintenance and Repair	1	1	$4,050						$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
	O&M	Pressure Sewer Maintenance	-	1	$800						$800	$800	$800	$800	$800	$800	$800	$800	$800
	Replacement	Grinder Pumps Replacement	15	15	$526,500														
LOSS	O&M	Aerobic Treatment Unit O&M	1	1	$ 5,000						$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
	Replacement	Aerobic Treatment Unit	20	20	$ 456,000														
						Annual Total		$728,710	$750,571	$10,339,585	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065
						Present Worth		$707,485	$707,485	$9,462,185	$9,831	$9,545	$9,267	$8,997	$8,735	$8,480	$8,233	$7,994	$7,761
						Cumulative Present Worth		$707,485	$1,414,971	$10,877,156	$10,886,987	$10,896,532	$10,905,799	$10,914,796	$10,923,530	$10,932,011	$10,940,244	$10,948,238	$10,955,999

Alternative 6

Element	Type	Description	Frequency (Years)	First Instance (Year)			2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Design & Permitting		Half Soft Cost	-	-2	$1,536,124			$791,104	$814,837										
Construction		With 1/2 Soft Cost, Construction & Property Acquisition	-	0	$10,220,989					$11,168,750									
Wastewater Sewers	O&M	Grinder Pump Electricity	1	1	$ 1,215						$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
	O&M	Grinder Pump Maintenance and Repair	1	1	$ 4,050						$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
	O&M	Pressure Sewer Maintenance	1	1	$ 800						$800	$800	$800	$800	$800	$800	$800	$800	$800
	Replacement	Grinder Pumps Replacement	15	15	$ 526,500														
LOSS	O&M	Membrane Bioreactor O&M	1	1	$ 76,066						$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066
	Replacement	Membrane Bioreactor Replacement	20	20	$ 906,000														
						Annual Total		$791,104	$814,837	$11,168,750	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131
						Present Worth		$768,062	$768,062	$10,220,989	$72,972	$70,847	$68,783	$66,780	$64,835	$62,947	$61,113	$59,333	$57,605
						Cumulative Present Worth		$768,062	$1,536,124	$11,757,113	$11,830,085	$11,900,932	$11,969,716	$12,036,496	$12,101,331	$12,164,277	$12,225,391	$12,284,724	$12,342,329

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0.6810	0.6611	0.6419	0.6232	0.6050	0.5874	0.5703	0.5537	0.5375	0.5219	0.5067	0.4919	0.4776	0.4637	0.4502	0.4371	0.4243	0.4120	0.4000	0.3883	0.3770	0.3660	0.3554	0.3450	0.3350	0.3252	0.3158	0.3066
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057
$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800
					$526,500															$526,500							
$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
										$272,000																	
$9,065	$9,065	$9,065	$9,065	$9,065	$535,565	$9,065	$9,065	$9,065	$9,065	$281,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$535,565	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065
$6,173	$5,993	$5,818	$5,649	$5,484	$314,588	$5,170	$5,019	$4,873	$4,731	$142,413	$4,459	$4,329	$4,203	$4,081	$3,962	$3,847	$3,735	$3,626	$3,520	$201,922	$3,318	$3,222	$3,128	$3,037	$2,948	$2,862	$2,779
$10,828,246	$10,834,239	$10,840,058	$10,845,707	$10,851,191	$11,165,779	$11,170,949	$11,175,968	$11,180,841	$11,185,572	$11,327,985	$11,332,445	$11,336,774	$11,340,978	$11,345,059	$11,349,021	$11,352,867	$11,356,602	$11,360,228	$11,363,748	$11,565,670	$11,568,988	$11,572,210	$11,575,338	$11,578,374	$11,581,322	$11,584,185	$11,586,964

2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057
$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800
					$526,500															$526,500							
$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
										$456,000																	
$11,065	$11,065	$11,065	$11,065	$11,065	$537,565	$11,065	$11,065	$11,065	$11,065	$467,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$537,565	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065
$7,535	$7,315	$7,102	$6,895	$6,695	$315,763	$6,310	$6,126	$5,948	$5,775	$236,658	$5,443	$5,285	$5,131	$4,981	$4,836	$4,695	$4,559	$4,426	$4,297	$202,676	$4,050	$3,932	$3,818	$3,707	$3,599	$3,494	$3,392
$10,963,533	$10,970,849	$10,977,951	$10,984,846	$10,991,541	$11,307,303	$11,313,614	$11,319,740	$11,325,688	$11,331,463	$11,568,121	$11,573,564	$11,578,849	$11,583,979	$11,588,961	$11,593,797	$11,598,492	$11,603,051	$11,607,477	$11,611,774	$11,814,450	$11,818,500	$11,822,433	$11,826,250	$11,829,957	$11,833,556	$11,837,049	$11,840,441

2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057
$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800
					$526,500															$526,500							
$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066
										$906,000																	
$82,131	$82,131	$82,131	$82,131	$82,131	$608,631	$82,131	$82,131	$82,131	$82,131	$988,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$608,631	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131
$55,927	$54,298	$52,717	$51,181	$49,691	$357,507	$46,838	$45,474	$44,149	$42,864	$500,678	$40,403	$39,226	$38,084	$36,974	$35,898	$34,852	$33,837	$32,851	$31,895	$229,470	$30,064	$29,188	$28,338	$27,512	$26,711	$25,933	$25,178
$12,398,256	$12,452,554	$12,505,271	$12,556,452	$12,606,143	$12,963,649	$13,010,488	$13,055,962	$13,100,111	$13,142,975	$13,643,652	$13,684,055	$13,723,282	$13,761,365	$13,798,340	$13,834,237	$13,869,089	$13,902,926	$13,935,778	$13,967,672	$14,197,142	$14,227,206	$14,256,394	$14,284,731	$14,312,244	$14,338,955	$14,364,888	$14,390,066

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0.2976	0.2890	0.2805	0.2724	0.2644	0.2567	0.2493	0.2420	0.2350	0.2281	0.2215	0.2150	0.2088	0.2027	0.1968	0.1910	0.1855	0.1801	0.1748	0.1697	0.1648	0.1600	0.1553	0.1508	0.1464	0.1421	0.1380	0.1340
38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085
$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800
							$526,500															$526,500					
$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
		$272,000																				$272,000					
$9,065	$9,065	$281,065	$9,065	$9,065	$9,065	$9,065	$535,565	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$807,565	$9,065	$9,065	$9,065	$9,065	$9,065
$2,698	$2,619	$78,851	$2,469	$2,397	$2,327	$2,260	$129,606	$2,130	$2,068	$2,008	$1,949	$1,892	$1,837	$1,784	$1,732	$1,681	$1,632	$1,585	$1,539	$1,494	$1,450	$125,439	$1,367	$1,327	$1,289	$1,251	$1,215
$11,589,662	$11,592,281	$11,671,132	$11,673,601	$11,675,998	$11,678,325	$11,680,585	$11,810,191	$11,812,321	$11,814,389	$11,816,396	$11,818,345	$11,820,238	$11,822,075	$11,823,859	$11,825,590	$11,827,272	$11,828,904	$11,830,489	$11,832,027	$11,833,521	$11,834,971	$11,960,410	$11,961,777	$11,963,105	$11,964,393	$11,965,644	$11,966,859

2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085
$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800
							$526,500															$526,500					
$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
		$456,000																				$456,000					
$11,065	$11,065	$467,065	$11,065	$11,065	$11,065	$11,065	$537,565	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$993,565	$11,065	$11,065	$11,065	$11,065	$11,065
$3,293	$3,197	$131,032	$3,014	$2,926	$2,841	$2,758	$130,090	$2,600	$2,524	$2,450	$2,379	$2,310	$2,243	$2,177	$2,114	$2,052	$1,992	$1,934	$1,878	$1,823	$1,770	$154,330	$1,669	$1,620	$1,573	$1,527	$1,483
$11,843,735	$11,846,932	$11,977,964	$11,980,978	$11,983,904	$11,986,744	$11,989,503	$12,119,593	$12,122,192	$12,124,716	$12,127,167	$12,129,546	$12,131,856	$12,134,098	$12,136,276	$12,138,389	$12,140,442	$12,142,434	$12,144,368	$12,146,247	$12,148,070	$12,149,840	$12,304,171	$12,305,839	$12,307,459	$12,309,032	$12,310,559	$12,312,042

2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085
$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800
							$526,500															$526,500					
$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066
		$906,000																				$906,000					
$82,131	$82,131	$988,131	$82,131	$82,131	$82,131	$82,131	$608,631	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$1,514,631	$82,131	$82,131	$82,131	$82,131	$82,131
$24,444	$23,733	$277,213	$22,370	$21,719	$21,086	$20,472	$147,288	$19,297	$18,735	$18,189	$17,659	$17,145	$16,646	$16,161	$15,690	$15,233	$14,789	$14,359	$13,940	$13,534	$13,140	$235,267	$12,386	$12,025	$11,675	$11,335	$11,005
$14,414,511	$14,438,243	$14,715,456	$14,737,826	$14,759,545	$14,780,631	$14,801,103	$14,948,391	$14,967,688	$14,986,422	$15,004,611	$15,022,270	$15,039,415	$15,056,061	$15,072,222	$15,087,911	$15,103,144	$15,117,934	$15,132,292	$15,146,233	$15,159,767	$15,172,907	$15,408,175	$15,420,560	$15,432,585	$15,444,260	$15,455,595	$15,466,600

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0.1301	0.1263	0.1226	0.1190	0.1156	0.1122	0.1089	0.1058	0.1027	0.0997	0.0968	0.0940	0.0912	0.0886	0.0860	0.0835	0.0811	0.0787	0.0764	0.0742	0.0720	0.0699	0.0679	0.0659	0.0640	0.0621	0.0603	0.0586
66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113
$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800
									$526,500															$526,500			
$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
														$272,000													
$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$535,565	$9,065	$9,065	$9,065	$9,065	$281,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$535,565	$9,065	$9,065	$9,065
$1,179	$1,145	$1,112	$1,079	$1,048	$1,017	$988	$959	$931	$53,396	$877	$852	$827	$803	$24,172	$757	$735	$713	$693	$672	$653	$634	$615	$598	$34,273	$563	$547	$531
$11,968,038	$11,969,183	$11,970,295	$11,971,374	$11,972,421	$11,973,439	$11,974,426	$11,975,385	$11,976,316	$12,029,712	$12,030,589	$12,031,441	$12,032,268	$12,033,071	$12,057,244	$12,058,001	$12,058,735	$12,059,449	$12,060,142	$12,060,814	$12,061,467	$12,062,101	$12,062,716	$12,063,314	$12,097,587	$12,098,150	$12,098,697	$12,099,228

2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113
$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800
									$526,500															$526,500			
$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
														$456,000													
$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$537,565	$11,065	$11,065	$11,065	$11,065	$467,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$537,565	$11,065	$11,065	$11,065
$1,439	$1,397	$1,357	$1,317	$1,279	$1,242	$1,205	$1,170	$1,136	$53,595	$1,071	$1,040	$1,010	$980	$40,169	$924	$897	$871	$845	$821	$797	$774	$751	$729	$34,401	$687	$667	$648
$12,313,481	$12,314,879	$12,316,235	$12,317,553	$12,318,832	$12,320,073	$12,321,279	$12,322,449	$12,323,585	$12,377,181	$12,378,252	$12,379,292	$12,380,301	$12,381,281	$12,421,450	$12,422,374	$12,423,271	$12,424,142	$12,424,987	$12,425,808	$12,426,605	$12,427,379	$12,428,130	$12,428,860	$12,463,260	$12,463,948	$12,464,615	$12,465,263

2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113
$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800
									$526,500															$526,500			
$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066
														$906,000													
$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$608,631	$82,131	$82,131	$82,131	$82,131	$988,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$608,631	$82,131	$82,131	$82,131
$10,684	$10,373	$10,071	$9,777	$9,493	$9,216	$8,948	$8,687	$8,434	$60,681	$7,950	$7,718	$7,494	$7,275	$84,982	$6,858	$6,658	$6,464	$6,276	$6,093	$5,916	$5,743	$5,576	$5,414	$38,949	$5,103	$4,954	$4,810
$15,477,284	$15,487,657	$15,497,727	$15,507,505	$15,516,998	$15,526,214	$15,535,162	$15,543,849	$15,552,283	$15,612,964	$15,620,914	$15,628,632	$15,636,126	$15,643,401	$15,728,383	$15,735,240	$15,741,898	$15,748,362	$15,754,638	$15,760,731	$15,766,647	$15,772,390	$15,777,966	$15,783,380	$15,822,328	$15,827,431	$15,832,385	$15,837,195

1	1	1	1	1	1	1
0.0569	0.0552	0.0536	0.0520	0.0505	0.0490	0.0476
94	95	96	97	98	99	100
2114	2115	2116	2117	2118	2119	2120
$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
$800	$800	$800	$800	$800	$800	$800
$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
						$272,000
$9,065	$9,065	$9,065	$9,065	$9,065	$9,065	$281,065
$515	$500	$486	$472	$458	$445	$13,384
$12,099,743	$12,100,243	$12,100,729	$12,101,201	$12,101,659	$12,102,103	$12,115,487

2114	2115	2116	2117	2118	2119	2120
$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
$800	$800	$800	$800	$800	$800	$800
$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
						$456,000
$11,065	$11,065	$11,065	$11,065	$11,065	$11,065	$467,065
$629	$611	$593	$576	$559	$543	$22,240
$12,465,892	$12,466,503	$12,467,096	$12,467,672	$12,468,231	$12,468,774	$12,491,014

2114	2115	2116	2117	2118	2119	2120
$1,215	$1,215	$1,215	$1,215	$1,215	$1,215	$1,215
$4,050	$4,050	$4,050	$4,050	$4,050	$4,050	$4,050
$800	$800	$800	$800	$800	$800	$800
$76,066	$76,066	$76,066	$76,066	$76,066	$76,066	$76,066
						$906,000
$82,131	$82,131	$82,131	$82,131	$82,131	$82,131	$988,131
$4,670	$4,534	$4,402	$4,274	$4,149	$4,028	$47,052
$15,841,865	$15,846,399	$15,850,800	$15,855,074	$15,859,223	$15,863,251	$15,910,303

Project Quilcene Sewer Evaluation

O&M Costs for Top 3 Alternatives

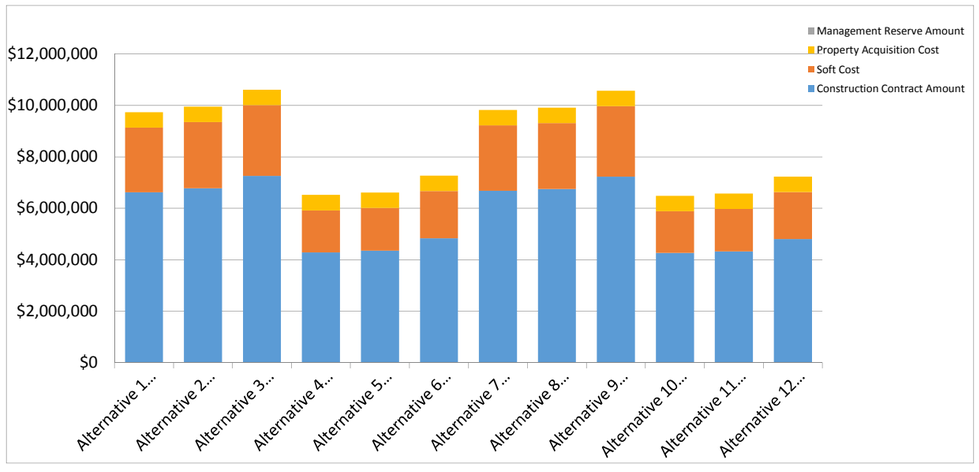
Unit Cost Estimates assume burdened labor, soft cost and admin.

	Full RVC	
On Site Systems		
Grinder Pumps		Based on E/One estimate
Electricity Consumption	$ 1,215	$15/pump/year
Maintenance/Repair	$ 4,050	60 hrs x 2 crew for more significant fix
	$ 5,265	
Collection System		Based on E/One Discussion
Pressure System Maintenance	$ 800	8 hours per year x 2 person crew x $50/person/hr (valve maintenance)
Treatment and Disposal		
Recirculating Filter and Discharge	$ 3,000	Dave Jensen estimate (pumping + periodic inspection and maintenance)
ATU and Discharge	$ 5,000	Dave Jensen estimate (pumping + aeration + periodic inspection and maintenance)
MBR and Discharge	$ 76,066	Bioprocess H2O Estimate - $10-20 per 1000 gallons treated (aeration + pumping + operations staffing + periodic maintenance)

Project: Quilcene Sanitary Sewer

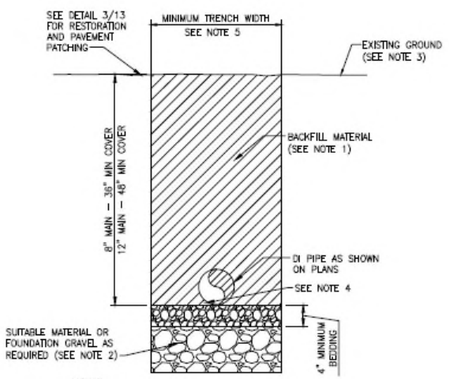
Title Summary of Project Costs for Sewer Alternatives (Reduced Initial Service Area)

		Alternative 1 (Gravity+Filter+Irrigation)	Alternative 2 (Gravity+ATU+Irrigation)	Alternative 3 (Gravity+MBR+Irrigation)	Alternative 4 (Grinder+Filter+Irrigation)	Alternative 5 (Grinder+ATU+Irrigation)	Alternative 6 (Grinder+MBR+Irrigation)	Alternative 7 (Gravity+Filter+Trenches)	Alternative 8 (Gravity+ATU+Trenches)	Alternative 9 (Gravity+MBR+Trenches)	Alternative 10 (Grinder+Filter+Trenches)	Alternative 11 (Grinder+ATU+Trenches)	Alternative 12 (Grinder+MBR+Trenches)
Hard Cost	**Construction Cost**	**$4,672,993**	**$4,783,993**	**$5,121,493**	**$3,027,953**	**$3,073,853**	**$3,411,353**	**$4,718,593**	**$4,764,493**	**$5,101,993**	**$3,008,453**	**$3,054,353**	**$3,391,853**
	On-Site System	**$352,500**	**$352,500**	**$352,500**	**$541,717**	**$541,717**	**$541,717**	**$352,500**	**$352,500**	**$352,500**	**$541,717**	**$541,717**	**$541,717**
	Collection	**$3,994,993**	**$3,994,993**	**$3,994,993**	**$2,095,635**	**$2,095,635**	**$2,095,635**	**$3,994,993**	**$3,994,993**	**$3,994,993**	**$2,095,635**	**$2,095,635**	**$2,095,635**
	Treatment	**$246,750**	**$342,000**	**$679,500**	**$296,100**	**$342,000**	**$679,500**	**$296,100**	**$342,000**	**$679,500**	**$296,100**	**$342,000**	**$679,500**
	Discharge	**$78,750**	**$94,500**	**$94,500**	**$94,500**	**$94,500**	**$94,500**	**$75,000**	**$75,000**	**$75,000**	**$75,000**	**$75,000**	**$75,000**
	Design Contingency	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
	Construction Bid Amount	**$6,074,890**	**$6,219,190**	**$6,657,940**	**$3,936,338**	**$3,996,008**	**$4,434,758**	**$6,134,170**	**$6,193,840**	**$6,632,590**	**$3,910,988**	**$3,970,658**	**$4,409,408**
	Sales Tax Percentage	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
	Sales Tax Amount	$546,740	**$559,727**	**$599,215**	**$354,270**	**$359,641**	**$399,128**	**$552,075**	**$557,446**	**$596,933**	**$351,989**	**$357,359**	**$396,847**
	Construction Contract Amount	**$6,621,631**	**$6,778,918**	**$7,257,155**	**$4,290,609**	**$4,355,649**	**$4,833,887**	**$6,686,246**	**$6,751,286**	**$7,229,524**	**$4,262,977**	**$4,328,018**	**$4,806,255**
Soft Cost	Permitting	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
	Planning and Design	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
	PM/Admin	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Construction Management	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
	Soft Cost	**$2,516,220**	**$2,575,989**	**$2,757,719**	**$1,630,431**	**$1,655,147**	**$1,836,877**	**$2,540,773**	**$2,565,489**	**$2,747,219**	**$1,619,931**	**$1,644,647**	**$1,826,377**
Property Cost	Property Acquisition Cost	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000
Base Cost		**$9,737,850**	**$9,954,906**	**$10,614,874**	**$6,521,040**	**$6,610,796**	**$7,270,764**	**$9,827,019**	**$9,916,775**	**$10,576,743**	**$6,482,909**	**$6,572,664**	**$7,232,632**
Management Reserve	Management Reserve Percentage	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Management Reserve Amount	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Cost		**$9,737,850**	**$9,954,906**	**$10,614,874**	**$6,521,040**	**$6,610,796**	**$7,270,764**	**$9,827,019**	**$9,916,775**	**$10,576,743**	**$6,482,909**	**$6,572,664**	**$7,232,632**
Total Cost (Rounded)		**$9,800,000**	**$10,000,000**	**$10,700,000**	**$6,600,000**	**$6,700,000**	**$7,300,000**	**$9,900,000**	**$10,000,000**	**$10,600,000**	**$6,500,000**	**$6,600,000**	**$7,300,000**



Unit Costs

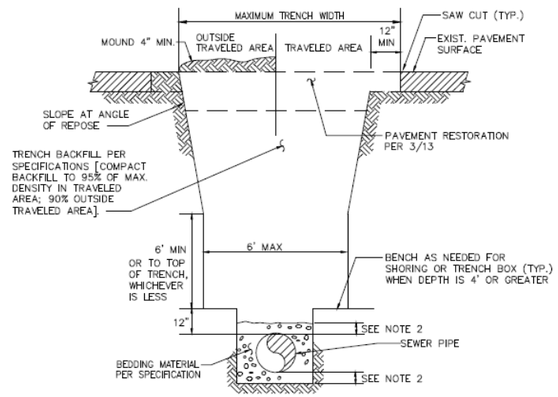
Gravity System					Comment
Gravity Main					
Dimensions					
Cover Depth	8 ft				
Trench Width	4.34 ft				
Item	**Quantity per LF**	**Unit**	**Unit Cost**	**Cost per LF**	
Excavation	1.67	CY	$15.16	$25.34	King County Tabula
Backfill	1.13	CY	$39.64	$44.60	King County Tabula
Complete Pavement Restoration	0.70	SY	$100.26	$70.63	King County Tabula
Overlay Pavement Restoration	3.3	SY	$32.64	$107.72	King County Tabula
Trench Safety	20.8	SF	$0.62	$12.85	King County Tabula
Spoil Load and Haul	1.67	CY	$18.65	$31.18	King County Tabula
Pipe Material	1	lf	$19.82	$19.82	King County Tabula
Pipe Installation	1	lf	$29.15	$29.15	King County Tabula
Place Pipe Zone Fill	0.48	CY	$39.64	$19.11	King County Tabula
Existing Utilities	1	lf	$3.00	$3.00	King County Tabula
Dewatering	1	lf	$24.00	$24.00	King County Tabula
Traffic Control	1	lf	$8.00	$8.00	King County Tabula
Manholes	0.002	EA	$9,712.00	$19.42	King County Tabula
Cost Per Linear Foot	$414.83				
Force Main					
Dimensions					
Cover Depth	5 ft				
Trench Width	3.5 ft				
Item	**Quantity per LF**	**Unit**	**Unit Cost**	**Cost per LF**	
Excavation	0.88	CY	$15.16	$13.26	King County Tabula
Backfill	0.52	CY	$39.64	$20.55	King County Tabula
Complete Pavement Restoration	0.61	SY	$100.26	$61.27	King County Tabula
Overlay Pavement Restoration	1.39	SY	$32.64	$45.49	King County Tabula
Trench Safety	13.50	SF	$0.62	$8.34	King County Tabula
Spoil Load and Haul	0.88	CY	$18.65	$16.32	King County Tabula
Pipe Material	1.00	lf	$34.98	$34.98	King County Tabula
Pipe Installation	1.00	lf	$25.65	$25.65	King County Tabula
Place Pipe Zone Fill	0.34	CY	$39.64	$13.36	King County Tabula
Existing Utilities	1.00	lf	$3.50	$3.50	King County Tabula
Dewatering	1.00	lf	$27.98	$27.98	King County Tabula
Traffic Control	1.00	lf	$9.33	$9.33	King County Tabula
Cost Per Linear Foot	$280.03				
Side Sewers (In ROW)					
Item	**Quantity**	**Unit**	**Unit Cost**	**Cost per LF**	
Side Sewer Connections	-	EA	$7,500.00	-	
Cost Per Connection	$7,500.00				
Side Sewers (Private)					
Item	**Quantity**	**Unit**	**Unit Cost**	**Cost per LF**	
Side Sewer Connections	-	EA	$7,500.00	-	
Cost Per Connection	$7,500.00				
Lift Stations					



NOTES

1. ALL TRENCH BACKFILL MATERIAL SHALL CONSIST OF IMPORTED BACKFILL MATERIAL. ALL TRENCHES SHALL BE COMPACTED TO 95% MDD.
2. FOUNDATION GRAVEL SHALL BE REQUIRED TO PROVIDE A SOLID FOUNDATION FOR THE WATER MAIN IN THOSE AREAS OF THE TRENCH WHICH HAVE UNSUITABLE MATERIAL OR SOFT SPOTS.
3. GRAVEL SHOULDERS AND DRIVEWAYS SHALL BE RESTORED WITH A 3" MIN THICKNESS LAYER OF 5/8" MINUS CRUSHED SURFACING.
4. PLACE AND COMPACT BACKFILL IN MAXIMUM 4" LIFT TO PIPE SPRINGLINE TO ASSURE NO VOIDS UNDER PIPE.
5. MINIMUM TRENCH WIDTH FOR PIPE DIA 12" AND UNDER IS ID + 30", FOR PIPE DIA OVER 12" IS (1.5 X ID) + 18".

4 – WATER MAIN TRENCH
SCALE: NTS



NOTES

1. MINIMUM TRENCH WIDTH FOR PIPE DIAMETER 12" AND UNDER IS ID + 30", FOR PIPE DIAMETER OVER 12" IS (1.5 x ID) + 18".
2. BEDDING SEE PIPE BEDDING COK PLAN CK–S.03.

1 TYP – SANITARY SEWER AND STORM DRAIN TRENCH DETAIL
SCALE: NONE

Item	Quantity	Unit	Unit Cost	Cost per LF
Lift Station	-	EA	$1,000,000	-
Cost per Lift Station	$1,000,000			

Grinder System					Comment
Pressure Main					
Dimensions					
Cover Depth	5 ft				
Trench Width	3.5 ft				
Item	**Quantity per LF**	**Unit**	**Unit Cost**	**Cost per LF**	
Excavation	0.88	CY	$15.16	$13.26	King County Tabula
Backfill	0.52	CY	$39.64	$20.55	King County Tabula
Complete Pavement Restoration	0.61	SY	$100.26	$61.27	King County Tabula
Overlay Pavement Restoration	1.39	SY	$32.64	$45.49	King County Tabula
Trench Safety	13.50	SF	$0.62	$8.34	King County Tabula
Spoil Load and Haul	0.88	CY	$18.65	$16.32	King County Tabula
Pipe Material	1.00	lf	$14.25	$14.25	RS Means
Pipe Installation	1.00	lf	$15.10	$15.10	RS Means
Place Pipe Zone Fill	0.34	CY	$39.64	$13.36	King County Tabula
Existing Utilities	1.00	lf	$3.50	$3.50	King County Tabula
Dewatering	1.00	lf	$27.98	$27.98	King County Tabula
Traffic Control	1.00	lf	$9.33	$9.33	King County Tabula
Cost per Linear Foot	$248.75				
Pressure Laterals					
Dimensions					
Cover Depth	3 ft				
Trench Width	2.5 ft				
Item	**Quantity per LF**	**Unit**	**Unit Cost**	**Cost per LF**	
Excavation	0.37	CY	$15.16	$5.61	
Backfill	0.21	CY	$39.64	$8.26	
Complete Pavement Restoration	0.50	SY	$100.26	$50.13	
Overlay Pavement Restoration	1.39	SY	$32.64	$45.37	
Trench Safety	0.00	SF	$0.62	$0.00	
Spoil Load and Haul	0.37	CY	$18.65	$6.91	
Pipe Material	1.00	lf	$14.25	$14.25	RS Means
Pipe Installation	1.00	lf	$15.10	$15.10	RS Means
Place Pipe Zone Fill	0.07	CY	$39.64	$2.75	
Existing Utilities	1.00	lf	$3.50	$3.50	
Dewatering	1.00	lf	$27.98	$27.98	
Traffic Control	0.00	lf	$9.33	$0.00	
Cost per Linear Foot	$179.86				

On-Site Infrastructure					Comment
Pressure Laterals					
Dimensions					
Cover Depth	3 ft				
Trench Width	2.5 ft				
Item	**Quantity per LF**	**Unit**	**Unit Cost**	**Cost per LF**	
Excavation	0.37	CY	$15.16	$5.61	
Backfill	0.21	CY	$39.64	$8.26	

Complete Pavement Restoration	0.00	SY	$100.26	$0.00
Overlay Pavement Restoration	0.00	SY	$32.64	$0.00
Trench Safety	0.00	SF	$0.62	$0.00
Spoil Load and Haul	0.37	CY	$18.65	$6.91
Pipe Material	1.00	lf	$14.25	$14.25
Pipe Installation	1.00	lf	$15.10	$15.10
Place Pipe Zone Fill	0.07	CY	$39.64	$2.75
Existing Utilities	1.00	lf	$3.50	$3.50
Dewatering	1.00	lf	$27.98	$27.98
Traffic Control	0.00	lf	$9.33	$0.00
Total Cost per Linear Foot	$84.36			

Individual STEP System

Component	Unit Cost	
Septic Tank (1000 gal)	$1,200	Dave Jensen
Pump Chamber (1000 gal)	$1,200	Dave Jensen
Effluent Pump	$1,500	Dave Jensen
Control Panel/Alarm	$1,500	Dave Jensen
Total Cost	**$5,400**	

Individual Grinder Pump Station

Component	Unit Cost	
Poly Vault with Grinder Pump	$5,000	Dave Jensen
Control Panel/Alarm	$1,500	Dave Jensen
Total Cost	**$6,500**	

Community Treatment

Comment

Recirculating Gravel/Chip Filter

Component	Unit Cost	
Septic Tank (15,000 gal)	$22,500	Dave Jensen
Mixing Tank (7,500 gal)	$12,000	Dave Jensen
Recirc Pumps	$4,000	Dave Jensen
Control Panel / Alarm	$3,000	Dave Jensen
Recirc Filter (1,000 sf)	$20,000	Dave Jensen
Chip Filter (714 sf)	$10,700	Dave Jensen
Pump Chamber (10,000 gal)	$17,500	Dave Jensen
Dose Pumps	$6,000	Dave Jensen
Control Panel / Alarm	$3,000	Dave Jensen
Total Cost	**$98,700**	

Aerobic Treatment Unit

Component	Unit Cost	
Trash Tank (5,000 gal)	$7,500	Dave Jensen
ATU	$80,000	Dave Jensen
Pump Chamber (10,000 gal)	$17,500	Dave Jensen
Dose Pumps	$6,000	Dave Jensen
Control Panel / Alarm	$3,000	Dave Jensen
Total Cost	**$114,000**	

MBR Plant

Component	Unit Cost	
MBR	$200,000	Dave Jensen
Pump Chamber	$17,500	Dave Jensen
Dose Pumps	$6,000	Dave Jensen

Control Panel Alarm	$3,000	Dave Jensen
Total Cost	**$226,500**	

Discharge		
Sand Beds		
Component	**Unit Cost**	
Beds	$30,000	Dave Jensen
Total Cost	**$30,000**	
Trenches		
Component	**Unit Cost**	
Trenches	$25,000	Dave Jensen
Total Cost	**$25,000**	
Subsurface Irrigation		
Component	**Unit Cost**	
Subsurface Irrigation	$31,500	Dave Jensen
Total Cost	**$31,500**	

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.17**
Alternative:	**Gravity + Recirc Filters +Subsurface Irrigation**	**By:**	**AWC**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	*Gravity Main*	6,100	LF	$415	$2,530,482
2	Force Main	400	LF	$280	$112,011
3	Lift Station	1	EA	$1,000,000	$1,000,000
4	Side Sewer	47	EA	$7,500	$352,500
Private					
5	Side Sewer	47	LF	$7,500	$352,500
Treatment					
5	Septic Tank	2.5	EA	$22,500	$56,250
6	Mixing Tank	2.5	EA	$12,000	$30,000
7	Recirc Pumps	2.5	EA	$4,000	$10,000
8	Control Panel/Alarm	2.5	EA	$3,000	$7,500
9	Recirc Filter	2.5	EA	$20,000.00	$50,000
10	Chip Filter	2.5	EA	$10,700.00	$26,750
11	Pump Chamber	2.5	EA	$17,500.00	$43,750
12	Dose Pumps	2.5	EA	$6,000.00	$15,000
13	Control Panel/Alarm	2.5	EA	$3,000.00	$7,500
Disposal					
9	Subsurface Irrigation	2.5	EA	$31,500	$78,750
	Subtotal				**$4,672,993**
	30% Contingency				**$1,401,898**
	Subtotal				**$6,074,890**
	Sales Tax				**$546,740**
	Total construction Cost				**$6,621,631**

General Notes:

1 Assume 10% for mob./demob.
2 Open cut includes import bedding and backfill.
3 Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4 Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5 Assume some support for traffic control. Assume trenches are plated at night.
6 Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7 A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8 Dewatering assumes sump in trench and no formal dewatering well system is required.
9 Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10 Includes no permit fees.
11 Assumes 6" CSTC.
12 Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13 Replace curb and gutter includes removal of existing gutter. Length assumed.
14 Assumes 12 foot average manhole depth.
15 Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1 Construct new wet well along east side of existing drywell as shown on sketch.
2 Relocate utility conflicts at new wet well.
3 Provide temporary sewage pumping as needed during construction
4 Remove existing LS#1 pumps, piping and controls
5 Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6 Install associated piping as shown on sketch.
7 Provide new grating mezzanine above new 14" discharge pipe.
8 Provide all new controls including on site data logger and telemetry to remote City PW facility.
9 Mount new controls at mezzanine level, similar to existing controls.
10 Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11 Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12 Modify HVAC to eliminate conflicts with new piping
13 Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14 Provide new electrical service large enough to run all three 50 hp pumps
15 Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16 Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Gravity + ATU +Subsurface Irrigation**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	*Gravity Main*	6,100	LF	$415	$2,530,482
2	Force Main	400	LF	$280	$112,011
3	Lift Station	1	EA	$1,000,000	$1,000,000
4	Side Sewer	47	EA	$7,500	$352,500
Private					
5	Side Sewer	47	LF	$7,500	$352,500
Treatment					
5	Trash Tank	3	EA	$7,500	$22,500
6	ATU	3	EA	$80,000	$240,000
7	Pump Chamber	3	EA	$17,500	$52,500
8	Dose Pumps	3	EA	$6,000	$18,000
9	Control Panel/Alarm	3	EA	$3,000.00	$9,000
Disposal					
9	Subsurface Irrigation	3	EA	$31,500	$94,500
	Subtotal				**$4,783,993**
	30% Contingency				**$1,435,198**
	Subtotal				**$6,219,190**
	Sales Tax				**$559,727**
	Total construction Cost				**$6,778,918**

General Notes:

1 Assume 10% for mob./demob.
2 Open cut includes import bedding and backfill.
3 Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4 Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5 Assume some support for traffic control. Assume trenches are plated at night.
6 Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7 A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking pits
8 Dewatering assumes sump in trench and no formal dewatering well system is required.
9 Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10 Includes no permit fees.
11 Assumes 6" CSTC.
12 Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13 Replace curb and gutter includes removal of existing gutter. Length assumed.
14 Assumes 12 foot average manhole depth.
15 Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1 Construct new wet well along east side of existing drywell as shown on sketch.
2 Relocate utility conflicts at new wet well.
3 Provide temporary sewage pumping as needed during construction
4 Remove existing LS#1 pumps, piping and controls
5 Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6 Install associated piping as shown on sketch.
7 Provide new grating mezzanine above new 14" discharge pipe.
8 Provide all new controls including on site data logger and telemetry to remote City PW facility.
9 Mount new controls at mezzanine level, similar to existing controls.
10 Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11 Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12 Modify HVAC to eliminate conflicts with new piping
13 Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14 Provide new electrical service large enough to run all three 50 hp pumps
15 Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16 Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Gravity + MBR +Subsurface Irrigation**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	*Gravity Main*	6,100	LF	$415	$2,530,482
2	Force Main	400	LF	$280	$112,011
3	Lift Station	1	EA	$1,000,000	$1,000,000
4	Side Sewer	47	EA	$7,500	$352,500
Private					
5	Side Sewer	47	LF	$7,500	$352,500
Treatment					
5	MBR	3	EA	$200,000	$600,000
6	Pump Chamber	3	EA	$17,500	$52,500
7	Dose Pumps	3	EA	$6,000	$18,000
8	Control Panel/Alarm	3	EA	$3,000	$9,000
Disposal					
9	Subsurface Irrigation	3	EA	$31,500	$94,500
	Subtotal				**$5,121,493**
	30% Contingency				**$1,536,448**
	Subtotal				**$6,657,940**
	Sales Tax				**$599,215**
	Total construction Cost				**$7,257,155**

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Grinder + Recirc Filters +Subsurface Irrigation**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL	
Collection						
1	Service Pipe	2,800	LF	$180	$503,616	
2	Small Diameter Pipe	6,400	LF	$249	$1,592,019	
Private						
3	Service Pipe (Private Property)	2,800	LF	$84	$236,217	
4	Grinder	47	EA	$6,500	$305,500	
Treatment						
5	Septic Tank	3	EA	$22,500	$67,500	
6	Mixing Tank	3	EA	$12,000	$36,000	
7	Recirc Pumps	3	EA	$4,000	$12,000	
8	Control Panel/Alarm	3	EA	$3,000	$9,000	
9	Recirc Filter	3	EA	$20,000.00	$60,000	
10	Chip Filter	3	EA	$10,700.00	$32,100	
11	Pump Chamber	3	EA	$17,500.00	$52,500	
12	Dose Pumps	3	EA	$6,000.00	$18,000	
13	Control Panel/Alarm	3	EA	$3,000.00	$9,000	
Disposal						
9	Subsurface Irrigation	3	EA	$31,500	$94,500	
	Subtotal				**$3,027,953**	
	30% Contingency				**$908,386**	0.3
	Subtotal				**$3,936,338**	
	Sales Tax				**$354,270**	0.09
	Total construction Cost				**$4,290,609**	

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Grinder + ATU +Subsurface Irrigation**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	Service Pipe	2,800	LF	$180	$503,616
2	Small Diamerter Pipe	6,400	LF	$249	$1,592,019
Private					
3	Service Pipe (Private Property)	2,800	LF	$84	$236,217
4	Grinder	47	EA	$6,500	$305,500
Treatment					
5	Trash Tank	3	EA	$7,500	$22,500
6	ATU	3	EA	$80,000	$240,000
7	Pump Chamber	3	EA	$17,500	$52,500
8	Dose Pumps	3	EA	$6,000	$18,000
9	Control Panel/Alarm	3	EA	$3,000.00	$9,000
Disposal					
9	Subsurface Irrigation	3	EA	$31,500	$94,500
	Subtotal				**$3,073,853**
	30% Contingency				**$922,156**
	Subtotal				**$3,996,008**
	Sales Tax				**$359,641**
	Total construction Cost				**$4,355,649**

General Notes:

1 Assume 10% for mob./demob.
2 Open cut includes import bedding and backfill.
3 Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4 Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5 Assume some support for traffic control. Assume trenches are plated at night.
6 Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7 A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8 Dewatering assumes sump in trench and no formal dewatering well system is required.
9 Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10 Includes no permit fees.
11 Assumes 6" CSTC.
12 Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13 Replace curb and gutter includes removal of existing gutter. Length assumed.
14 Assumes 12 foot average manhole depth.
15 Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1 Construct new wet well along east side of existing drywell as shown on sketch.
2 Relocate utility conflicts at new wet well.
3 Provide temporary sewage pumping as needed during construction
4 Remove existing LS#1 pumps, piping and controls
5 Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6 Install associated piping as shown on sketch.
7 Provide new grating mezzanine above new 14" discharge pipe.
8 Provide all new controls including on site data logger and telemetry to remote City PW facility.
9 Mount new controls at mezzanine level, similar to existing controls.
10 Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11 Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12 Modify HVAC to eliminate conflicts with new piping
13 Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14 Provide new electrical service large enough to run all three 50 hp pumps
15 Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16 Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Grinder + MBR +Subsurface Irrigation**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	Service Pipe	2,800	LF	$180	$503,616
2	Small Diameter Pipe	6,400	LF	$249	$1,592,019
Private					
3	Service Pipe (Private Property)	2,800	LF	$84	$236,217
4	Grinder	47	EA	$6,500	$305,500
Treatment					
5	MBR	3	EA	$200,000	$600,000
6	Pump Chamber	3	EA	$17,500	$52,500
7	Dose Pumps	3	EA	$6,000	$18,000
8	Control Panel/Alarm	3	EA	$3,000	$9,000
Disposal					
9	Subsurface Irrigation	3	EA	$31,500	$94,500
	Subtotal				**$3,411,353**
	30% Contingency				**$1,023,406**
	Subtotal				**$4,434,758**
	Sales Tax				**$399,128**
	Total construction Cost				**$4,833,887**

General Notes:

1 Assume 10% for mob./demob.
2 Open cut includes import bedding and backfill.
3 Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4 Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5 Assume some support for traffic control. Assume trenches are plated at night.
6 Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7 A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8 Dewatering assumes sump in trench and no formal dewatering well system is required.
9 Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10 Includes no permit fees.
11 Assumes 6" CSTC.
12 Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13 Replace curb and gutter includes removal of existing gutter. Length assumed.
14 Assumes 12 foot average manhole depth.
15 Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1 Construct new wet well along east side of existing drywell as shown on sketch.
2 Relocate utility conflicts at new wet well.
3 Provide temporary sewage pumping as needed during construction
4 Remove existing LS#1 pumps, piping and controls
5 Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6 Install associated piping as shown on sketch.
7 Provide new grating mezzanine above new 14" discharge pipe.
8 Provide all new controls including on site data logger and telemetry to remote City PW facility.
9 Mount new controls at mezzanine level, similar to existing controls.
10 Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11 Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12 Modify HVAC to eliminate conflicts with new piping
13 Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14 Provide new electrical service large enough to run all three 50 hp pumps
15 Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16 Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Gravity + Recirc Filters +Trenches**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	*Gravity Main*	6,100	LF	$415	$2,530,482
2	Force Main	400	LF	$280	$112,011
3	Lift Station	1	EA	$1,000,000	$1,000,000
4	Side Sewer	47	EA	$7,500	$352,500
Private					
5	Side Sewer	47	LF	$7,500	$352,500
Treatment					
5	Septic Tank	3	EA	$22,500	$67,500
6	Mixing Tank	3	EA	$12,000	$36,000
7	Recirc Pumps	3	EA	$4,000	$12,000
8	Control Panel/Alarm	3	EA	$3,000	$9,000
9	Recirc Filter	3	EA	$20,000.00	$60,000
10	Chip Filter	3	EA	$10,700.00	$32,100
11	Pump Chamber	3	EA	$17,500.00	$52,500
12	Dose Pumps	3	EA	$6,000.00	$18,000
13	Control Panel/Alarm	3	EA	$3,000.00	$9,000
Disposal					
9	Trenches	3	EA	$25,000	$75,000
	Subtotal				**$4,718,593**
	30% Contingency				**$1,415,578**
	Subtotal				**$6,134,170**
	Sales Tax				**$552,075**
	Total construction Cost				**$6,686,246**

General Notes:

1 Assume 10% for mob./demob.
2 Open cut includes import bedding and backfill.
3 Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4 Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5 Assume some support for traffic control. Assume trenches are plated at night.
6 Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7 A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8 Dewatering assumes sump in trench and no formal dewatering well system is required.
9 Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10 Includes no permit fees.
11 Assumes 6" CSTC.
12 Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13 Replace curb and gutter includes removal of existing gutter. Length assumed.
14 Assumes 12 foot average manhole depth.
15 Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1 Construct new wet well along east side of existing drywell as shown on sketch.
2 Relocate utility conflicts at new wet well.
3 Provide temporary sewage pumping as needed during construction
4 Remove existing LS#1 pumps, piping and controls
5 Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6 Install associated piping as shown on sketch.
7 Provide new grating mezzanine above new 14" discharge pipe.
8 Provide all new controls including on site data logger and telemetry to remote City PW facility.
9 Mount new controls at mezzanine level, similar to existing controls.
10 Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11 Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12 Modify HVAC to eliminate conflicts with new piping
13 Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14 Provide new electrical service large enough to run all three 50 hp pumps
15 Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16 Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Gravity + ATU +Trenches**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	*Gravity Main*	6,100	LF	$415	$2,530,482
2	Force Main	400	LF	$280	$112,011
3	Lift Station	1	EA	$1,000,000	$1,000,000
4	Side Sewer	47	EA	$7,500	$352,500
Private					
5	Side Sewer	47	LF	$7,500	$352,500
Treatment					
5	Trash Tank	3	EA	$7,500	$22,500
6	ATU	3	EA	$80,000	$240,000
7	Pump Chamber	3	EA	$17,500	$52,500
8	Dose Pumps	3	EA	$6,000	$18,000
9	Control Panel/Alarm	3	EA	$3,000.00	$9,000
Disposal					
9	Trenches	3	EA	$25,000	$75,000
	Subtotal				**$4,764,493**
	30% Contingency				**$1,429,348**
	Subtotal				**$6,193,840**
	Sales Tax				**$557,446**
	Total construction Cost				**$6,751,286**

General Notes:

1 Assume 10% for mob./demob.
2 Open cut includes import bedding and backfill.
3 Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4 Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5 Assume some support for traffic control. Assume trenches are plated at night.
6 Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7 A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking pits
8 Dewatering assumes sump in trench and no formal dewatering well system is required.
9 Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10 Includes no permit fees.
11 Assumes 6" CSTC.
12 Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13 Replace curb and gutter includes removal of existing gutter. Length assumed.
14 Assumes 12 foot average manhole depth.
15 Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1 Construct new wet well along east side of existing drywell as shown on sketch.
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12 Modify HVAC to eliminate conflicts with new piping
13 Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14 Provide new electrical service large enough to run all three 50 hp pumps
15 Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16 Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Gravity + Recirc Filters +Trenches**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	*Gravity Main*	6,100	LF	$415	$2,530,482
2	Force Main	400	LF	$280	$112,011
3	Lift Station	1	EA	$1,000,000	$1,000,000
4	Side Sewer	47	EA	$7,500	$352,500
Private					
5	Side Sewer	47	LF	$7,500	$352,500
Treatment					
5	MBR	3	EA	$200,000	$600,000
6	Pump Chamber	3	EA	$17,500	$52,500
7	Dose Pumps	3	EA	$6,000	$18,000
8	Control Panel/Alarm	3	EA	$3,000	$9,000
Disposal					
9	Trenches	3	EA	$25,000	$75,000
	Subtotal				**$5,101,993**
	30% Contingency				**$1,530,598**
	Subtotal				**$6,632,590**
	Sales Tax				**$596,933**
	Total construction Cost				**$7,229,524**

General Notes:

1 Assume 10% for mob./demob.
2 Open cut includes import bedding and backfill.
3 Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4 Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5 Assume some support for traffic control. Assume trenches are plated at night.
6 Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7 A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8 Dewatering assumes sump in trench and no formal dewatering well system is required.
9 Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10 Includes no permit fees.
11 Assumes 6" CSTC.
12 Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13 Replace curb and gutter includes removal of existing gutter. Length assumed.
14 Assumes 12 foot average manhole depth.
15 Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1 Construct new wet well along east side of existing drywell as shown on sketch.
2 Relocate utility conflicts at new wet well.
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4 Remove existing LS#1 pumps, piping and controls
5 Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6 Install associated piping as shown on sketch.
7 Provide new grating mezzanine above new 14" discharge pipe.
8 Provide all new controls including on site data logger and telemetry to remote City PW facility.
9 Mount new controls at mezzanine level, similar to existing controls.
10 Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11 Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12 Modify HVAC to eliminate conflicts with new piping
13 Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14 Provide new electrical service large enough to run all three 50 hp pumps
15 Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16 Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Grinder + Recirc Filters +Trenches**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	Service Pipe	2,800	LF	$180	$503,616
2	Small Diameter Pipe	6,400	LF	$249	$1,592,019
Private					
3	Service Pipe (Private Property)	2,800	LF	$84	$236,217
4	Grinder	47	EA	$6,500	$305,500
Treatment					
5	Septic Tank	3	EA	$22,500	$67,500
6	Mixing Tank	3	EA	$12,000	$36,000
7	Recirc Pumps	3	EA	$4,000	$12,000
8	Control Panel/Alarm	3	EA	$3,000	$9,000
9	Recirc Filter	3	EA	$20,000.00	$60,000
10	Chip Filter	3	EA	$10,700.00	$32,100
11	Pump Chamber	3	EA	$17,500.00	$52,500
12	Dose Pumps	3	EA	$6,000.00	$18,000
13	Control Panel/Alarm	3	EA	$3,000.00	$9,000
Disposal					
9	Trenches	3	EA	$25,000	$75,000
	Subtotal				**$3,008,453**
	30% Contingency				**$902,536**
	Subtotal				**$3,910,988**
	Sales Tax				**$351,989**
	Total construction Cost				**$4,262,977**

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Grinder + ATU +Trenches**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	Service Pipe	2,800	LF	$180	$503,616
2	Small Diamerter Pipe	6,400	LF	$249	$1,592,019
Private					
3	Service Pipe (Private Property)	2,800	LF	$84	$236,217
4	Grinder	47	EA	$6,500	$305,500
Treatment					
5	Trash Tank	3	EA	$7,500	$22,500
6	ATU	3	EA	$80,000	$240,000
7	Pump Chamber	3	EA	$17,500	$52,500
8	Dose Pumps	3	EA	$6,000	$18,000
9	Control Panel/Alarm	3	EA	$3,000.00	$9,000
Disposal					
9	Trenches	3	EA	$25,000	$75,000
	Subtotal				**$3,054,353**
	30% Contingency				**$916,306**
	Subtotal				**$3,970,658**
	Sales Tax				**$357,359**
	Total construction Cost				**$4,328,018**

General Notes:

1. Assume 10% for mob./demob.
2. Open cut includes import bedding and backfill.
3. Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4. Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5. Assume some support for traffic control. Assume trenches are plated at night.
6. Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7. A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8. Dewatering assumes sump in trench and no formal dewatering well system is required.
9. Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10. Includes no permit fees.
11. Assumes 6" CSTC.
12. Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13. Replace curb and gutter includes removal of existing gutter. Length assumed.
14. Assumes 12 foot average manhole depth.
15. Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

1. Construct new wet well along east side of existing drywell as shown on sketch.
2. Relocate utility conflicts at new wet well.
3. Provide temporary sewage pumping as needed during construction
4. Remove existing LS#1 pumps, piping and controls
5. Install three new 2000 gpm pumps (2 duty and one standby) Assume Cornell 8"NHTA with 50 hp motors per Mar 11, 2016 email (attached). I suggest assume a delivered cost of $40,000 for each pump to allow for 50 hp motors instead of 30HP as mentioned in Mar 14, 2016 email (attached)
6. Install associated piping as shown on sketch.
7. Provide new grating mezzanine above new 14" discharge pipe.
8. Provide all new controls including on site data logger and telemetry to remote City PW facility.
9. Mount new controls at mezzanine level, similar to existing controls.
10. Provide new overhead rail crane so City maintenance crews can move new pumps to existing NW access hatch as needed for pump removal and offsite repairs
11. Modify existing access manway hatches and ladders for access from ground surface to mezzanine and dry well floor levels.
12. Modify HVAC to eliminate conflicts with new piping
13. Provide two new mag flow meters, one on each 12" discharge forcemain. Locate flow meters in new underground vault near south side of existing dry well. Provide isolation plug valves downstream of each flow meter.
14. Provide new electrical service large enough to run all three 50 hp pumps
15. Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16. Remove connection to emergency outfall from existing wet well.

PROJECT SUMMARY

Client	**Port of Port Townsend**	**Estimate Class:**	**Planning Level**
Project:	**Quilcene Sanitary Sewer Evaluation**	**Date:**	**6.28.16**
Alternative:	**Grinder + MBR +Trenches**	**By:**	**DT**
		Reviewed:	

No.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Collection					
1	Service Pipe	2,800	LF	$180	$503,616
2	Small Diameter Pipe	6,400	LF	$249	$1,592,019
Private					
3	Service Pipe (Private Property)	2,800	LF	$84	$236,217
4	Grinder	47	EA	$6,500	$305,500
Treatment					
5	MBR	3	EA	$200,000	$600,000
6	Pump Chamber	3	EA	$17,500	$52,500
7	Dose Pumps	3	EA	$6,000	$18,000
8	Control Panel/Alarm	3	EA	$3,000	$9,000
Disposal					
9	Trenches	3	EA	$25,000	$75,000
	Subtotal				**$3,391,853**
	30% Contingency				**$1,017,556**
	Subtotal				**$4,409,408**
	Sales Tax				**$396,847**
	Total construction Cost				**$4,806,255**

General Notes:

1 Assume 10% for mob./demob.
2 Open cut includes import bedding and backfill.
3 Piping shallower than 20 foot deep can be open cut except where auger is required to get under Shell Creek culvert.
4 Assume 60" microtunnel steel casing with 30" PVC pipe grouted in place.
5 Assume some support for traffic control. Assume trenches are plated at night.
6 Assume 24" pipe installed upstream of LS #1 to work in parallel with existing undersized pipe. Assume 24" pipe follows Sunset Ave. and Caspers and goes under Shell Cr. Culvert to connect to existing sewer on Brookmere.
7 A big assumption is made as to the number and type of utilities that may have to be relocated. The allowance factors in whether jacking
8 Dewatering assumes sump in trench and no formal dewatering well system is required.
9 Assumes no property acquisition is required as microtunnel launch shaft is in public R/W.
10 Includes no permit fees.
11 Assumes 6" CSTC.
12 Assumes 4" asphalt pavement patch, 15 feet wide for 15'-20' deep trench, 12 foot wide for 10'-15' deep trench, and 8 feet wide for 5'-10'
13 Replace curb and gutter includes removal of existing gutter. Length assumed.
14 Assumes 12 foot average manhole depth.
15 Assumes 12 dia. forcemain replaces 10-AC forcemain from LS #1 to Edmonds St. where it then goes by gravity to the WWTP.

Lift Station Notes

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14 Provide new electrical service large enough to run all three 50 hp pumps
15 Provide new standby generator and ATS to run all three 50 hp pumps. Standby generator will have 70 dB enclosure.
16 Remove connection to emergency outfall from existing wet well.

NPV Summary

Life Cycle Year (after Year 0)	59	99
Alternative 4	$7,397,000	$7,511,000
Alternative 5	$7,668,000	$7,807,000
Alternative 6	$9,581,000	$9,912,000

60 Year Life Cycle Cost		
Alt4	$7,397,433	$876,393
Alt5	$7,667,917	$1,057,121
Alt6	$9,580,934	$2,310,170

NPV Calculation

Discount Rate (i)	3.0%

Alternative 4

Element	Type	Description	Frequency (Years)	First Instance (Year)		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
						1	1	1	1	1	1	1	1	1	1	1	1	1
					PV Rate (related to 2017)		0.9709	0.9426	0.9151	0.8885	0.8626	0.8375	0.8131	0.7894	0.7664	0.7441	0.7224	0.7014
					Year relative to Construction Year (Year 0)	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
Design & Permitting		Half Soft Cost	-	-2	$815,216		$419,836	$432,431										
Construction		With 1/2 Soft Cost, Construction & Property Acquisitio	-	0	$5,705,825				$6,234,908									
Sewer	O&M	Grinder Pump Electricity	1	1	$840					$840	$840	$840	$840	$840	$840	$840	$840	$840
	O&M	Grinder Pump Maintenance and Repair	1	1	$2,800					$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800
	O&M	Pressure Sewer Maintenance	1	1	$800					$800	$800	$800	$800	$800	$800	$800	$800	$800
	Replacement	Grinder Pumps	15	15	$364,000													
LOSS	O&M	Recirculating Filter O&M	1	1	$ 3,000					$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
	Replacement	Recirculating Filter Equipment	20	20	$ 204,000													
					Annual Total		$419,836	$432,431	$6,234,908	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440
					Present Worth		$407,608	$407,608	$5,705,825	$6,610	$6,418	$6,231	$6,049	$5,873	$5,702	$5,536	$5,375	$5,218
					Cumulative Present Worth		$407,608	$815,216	$6,521,040	$6,527,651	$6,534,068	$6,540,299	$6,546,349	$6,552,222	$6,557,924	$6,563,460	$6,568,835	$6,574,053

Alternative 5

Element	Type	Description	Frequency (Years)	First Instance (Year)		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Design & Permitting		Half Soft Cost	-	-2	$827,573		$426,200	$438,986										
Construction		With 1/2 Soft Cost, Construction & Property Acquisitio	-	0	$5,783,222				$6,319,483									
Sewer	O&M	Grinder Pump Electricity	1	1	$840					$840	$840	$840	$840	$840	$840	$840	$840	$840
	O&M	Grinder Pump Maintenance and Repair	1	1	$2,800					$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800
	O&M	Pressure Sewer Maintenance	1	1	$800					$800	$800	$800	$800	$800	$800	$800	$800	$800
	Replacement	Grinder Pumps	15	15	$364,000													
LOSS	O&M	Aerobic Treatment Unit O&M	1	1	$ 5,000					$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
	Replacement	Aerobic Treatment Unit	20	20	$ 342,000													
					Annual Total		$426,200	$438,986	$6,319,483	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440
					Present Worth		$413,787	$413,787	$5,783,222	$8,387	$8,143	$7,906	$7,676	$7,452	$7,235	$7,024	$6,820	$6,621
					Cumulative Present Worth		$413,787	$827,573	$6,610,796	$6,619,183	$6,627,326	$6,635,232	$6,642,908	$6,650,360	$6,657,595	$6,664,619	$6,671,438	$6,678,060

Alternative 6

Element	Type	Description	Frequency (Years)	First Instance (Year)		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Design & Permitting		Half Soft Cost	-	-2	$1,258,110		$419,836	$432,431										
Construction		With 1/2 Soft Cost, Construction & Property Acquisitio	-	0	$6,352,325				$6,941,357									
Sewer	O&M	Grinder Pump Electricity	1	1	$840					$840	$840	$840	$840	$840	$840	$840	$840	$840
	O&M	Grinder Pump Maintenance and Repair	1	1	$2,800					$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800
	O&M	Pressure Sewer Maintenance	-	1	$800					$800	$800	$800	$800	$800	$800	$800	$800	$800
	Replacement	Grinder Pumps	15	15	$364,000													
LOSS	O&M	Membrane Bioreactor O&M	1	50	$ 45,990					$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990
	Replacement	Membrane Bioreactor Replacement	20	20	$ 679,500													
					Annual Total		$419,836	$432,431	$6,941,357	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430
					Present Worth		$407,608	$407,608	$6,352,325	$44,806	$43,501	$42,234	$41,004	$39,810	$38,650	$37,525	$36,432	$35,371
					Cumulative Present Worth		$407,608	$815,216	$7,167,541	$7,212,347	$7,255,849	$7,298,083	$7,339,087	$7,378,897	$7,417,547	$7,455,072	$7,491,504	$7,526,874

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0.6810	0.6611	0.6419	0.6232	0.6050	0.5874	0.5703	0.5537	0.5375	0.5219	0.5067	0.4919	0.4776	0.4637	0.4502	0.4371	0.4243	0.4120	0.4000	0.3883	0.3770	0.3660	0.3554	0.3450	0.3350	0.3252	0.3158	0.3066	0.2976	
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	
2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	
$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	
$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	
					$364,000															$364,000									
$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	
										$204,000																			
$7,440	$7,440	$7,440	$7,440	$7,440	$371,440	$7,440	$7,440	$7,440	$7,440	$211,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$371,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	
$5,066	$4,919	$4,775	$4,636	$4,501	$218,182	$4,243	$4,119	$3,999	$3,883	$107,135	$3,660	$3,553	$3,450	$3,349	$3,252	$3,157	$3,065	$2,976	$2,889	$140,043	$2,723	$2,644	$2,567	$2,492	$2,420	$2,349	$2,281	$2,214	
$6,579,119	$6,584,038	$6,588,814	$6,593,450	$6,597,951	$6,816,133	$6,820,376	$6,824,495	$6,828,495	$6,832,378	$6,939,513	$6,943,173	$6,946,726	$6,950,176	$6,953,525	$6,956,777	$6,959,934	$6,962,999	$6,965,975	$6,968,864	$7,108,907	$7,111,630	$7,114,275	$7,116,842	$7,119,334	$7,121,754	$7,124,103	$7,126,384	$7,128,598	

2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	
$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	
$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	
					$364,000															$364,000									
$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	
										$342,000																			
$9,440	$9,440	$9,440	$9,440	$9,440	$373,440	$9,440	$9,440	$9,440	$9,440	$351,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$373,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	
$6,428	$6,241	$6,059	$5,883	$5,711	$219,357	$5,384	$5,227	$5,074	$4,927	$178,072	$4,644	$4,509	$4,377	$4,250	$4,126	$4,006	$3,889	$3,776	$3,666	$140,797	$3,455	$3,355	$3,257	$3,162	$3,070	$2,981	$2,894	$2,810	
$6,684,488	$6,690,729	$6,696,788	$6,702,671	$6,708,382	$6,927,739	$6,933,122	$6,938,349	$6,943,423	$6,948,350	$7,126,422	$7,131,065	$7,135,574	$7,139,951	$7,144,201	$7,148,327	$7,152,333	$7,156,222	$7,159,998	$7,163,664	$7,304,461	$7,307,916	$7,311,271	$7,314,528	$7,317,690	$7,320,760	$7,323,741	$7,326,635	$7,329,445	

2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	
$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	
$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	
					$364,000															$364,000									
$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	
										$679,500																			
$50,430	$50,430	$50,430	$50,430	$50,430	$414,430	$50,430	$50,430	$50,430	$50,430	$729,930	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$414,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	
$34,340	$33,340	$32,369	$31,426	$30,511	$243,434	$28,760	$27,922	$27,109	$26,319	$369,850	$24,808	$24,086	$23,384	$22,703	$22,042	$21,400	$20,776	$20,171	$19,584	$156,251	$18,460	$17,922	$17,400	$16,893	$16,401	$15,923	$15,460	$15,009	
$7,561,215	$7,594,555	$7,626,924	$7,658,350	$7,688,861	$7,932,295	$7,961,055	$7,988,977	$8,016,085	$8,042,404	$8,412,254	$8,437,062	$8,461,148	$8,484,532	$8,507,235	$8,529,277	$8,550,676	$8,571,453	$8,591,624	$8,611,208	$8,767,459	$8,785,919	$8,803,841	$8,821,241	$8,838,134	$8,854,535	$8,870,458	$8,885,918	$8,900,927	

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0.2890	0.2805	0.2724	0.2644	0.2567	0.2493	0.2420	0.2350	0.2281	0.2215	0.2150	0.2088	0.2027	0.1968	0.1910	0.1855	0.1801	0.1748	0.1697	0.1648	0.1600	0.1553	0.1508	0.1464	0.1421	0.1380	0.1340	0.1301	0.1263	
39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	
2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	
$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	
$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	
						$364,000															$364,000								
$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	
	$204,000																				$204,000								
$7,440	$211,440	$7,440	$7,440	$7,440	$7,440	$371,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$575,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	
$2,150	$59,318	$2,026	$1,967	$1,910	$1,854	$89,888	$1,748	$1,697	$1,648	$1,600	$1,553	$1,508	$1,464	$1,421	$1,380	$1,340	$1,301	$1,263	$1,226	$1,190	$89,383	$1,122	$1,089	$1,058	$1,027	$997	$968	$940	
$7,130,748	$7,190,066	$7,192,092	$7,194,060	$7,195,970	$7,197,824	$7,287,712	$7,289,460	$7,291,157	$7,292,805	$7,294,405	$7,295,958	$7,297,466	$7,298,930	$7,300,351	$7,301,731	$7,303,071	$7,304,371	$7,305,634	$7,306,860	$7,308,051	$7,397,433	$7,398,555	$7,399,645	$7,400,702	$7,401,729	$7,402,726	$7,403,694	$7,404,634	

2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	
$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	
$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	
						$364,000															$364,000								
$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	
	$342,000																				$342,000								
$9,440	$351,440	$9,440	$9,440	$9,440	$9,440	$373,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$715,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	
$2,728	$98,594	$2,571	$2,496	$2,424	$2,353	$90,372	$2,218	$2,153	$2,091	$2,030	$1,971	$1,913	$1,857	$1,803	$1,751	$1,700	$1,650	$1,602	$1,556	$1,510	$111,129	$1,424	$1,382	$1,342	$1,303	$1,265	$1,228	$1,192	
$7,332,172	$7,430,766	$7,433,338	$7,435,834	$7,438,257	$7,440,610	$7,530,982	$7,533,200	$7,535,354	$7,537,444	$7,539,474	$7,541,445	$7,543,358	$7,545,215	$7,547,019	$7,548,770	$7,550,469	$7,552,120	$7,553,722	$7,555,278	$7,556,788	$7,667,917	$7,669,341	$7,670,723	$7,672,065	$7,673,368	$7,674,632	$7,675,860	$7,677,053	

2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	
$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	
$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	
						$364,000															$364,000								
$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	
	$679,500																				$679,500								
$50,430	$729,930	$50,430	$50,430	$50,430	$50,430	$414,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$1,093,930	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	
$14,572	$204,777	$13,736	$13,336	$12,947	$12,570	$100,292	$11,849	$11,503	$11,168	$10,843	$10,527	$10,221	$9,923	$9,634	$9,353	$9,081	$8,816	$8,560	$8,310	$8,068	$169,920	$7,605	$7,384	$7,169	$6,960	$6,757	$6,560	$6,369	
$8,915,500	$9,120,276	$9,134,012	$9,147,348	$9,160,295	$9,172,865	$9,273,157	$9,285,005	$9,296,509	$9,307,677	$9,318,520	$9,329,047	$9,339,268	$9,349,191	$9,358,825	$9,368,178	$9,377,259	$9,386,076	$9,394,635	$9,402,946	$9,411,014	$9,580,934	$9,588,539	$9,595,923	$9,603,091	$9,610,051	$9,616,808	$9,623,368	$9,629,737	

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0.1226	0.1190	0.1156	0.1122	0.1089	0.1058	0.1027	0.0997	0.0968	0.0940	0.0912	0.0886	0.0860	0.0835	0.0811	0.0787	0.0764	0.0742	0.0720	0.0699	0.0679	0.0659	0.0640	0.0621	0.0603	0.0586	0.0569	0.0552	0.0536	
68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	
2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	
$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	
$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	
							$364,000															$364,000							
$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	
												$204,000																	
$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$371,440	$7,440	$7,440	$7,440	$7,440	$211,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	$371,440	$7,440	$7,440	$7,440	$7,440	$7,440	$7,440	
$912	$886	$860	$835	$811	$787	$764	$37,033	$720	$699	$679	$659	$18,184	$621	$603	$586	$569	$552	$536	$520	$505	$490	$23,770	$462	$449	$436	$423	$411	$399	
$7,405,546	$7,406,432	$7,407,291	$7,408,126	$7,408,937	$7,409,724	$7,410,488	$7,447,521	$7,448,241	$7,448,940	$7,449,619	$7,450,278	$7,468,462	$7,469,083	$7,469,686	$7,470,272	$7,470,841	$7,471,392	$7,471,928	$7,472,449	$7,472,954	$7,473,444	$7,497,214	$7,497,676	$7,498,125	$7,498,561	$7,498,984	$7,499,394	$7,499,793	

2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	
$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	
$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	
							$364,000															$364,000							
$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	
												$342,000																	
$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$373,440	$9,440	$9,440	$9,440	$9,440	$351,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	$373,440	$9,440	$9,440	$9,440	$9,440	$9,440	$9,440	
$1,158	$1,124	$1,091	$1,059	$1,028	$998	$969	$37,232	$914	$887	$861	$836	$30,225	$788	$765	$743	$721	$700	$680	$660	$641	$622	$23,898	$587	$569	$553	$537	$521	$506	
$7,678,210	$7,679,334	$7,680,425	$7,681,484	$7,682,513	$7,683,511	$7,684,481	$7,721,713	$7,722,627	$7,723,514	$7,724,375	$7,725,211	$7,755,436	$7,756,224	$7,756,989	$7,757,732	$7,758,454	$7,759,154	$7,759,834	$7,760,494	$7,761,135	$7,761,757	$7,785,655	$7,786,241	$7,786,811	$7,787,364	$7,787,900	$7,788,422	$7,788,928	

2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	
$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	$840	
$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	$2,800	
$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	$800	
							$364,000															$364,000							
$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	$45,990	
												$679,500																	
$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$414,430	$50,430	$50,430	$50,430	$50,430	$729,930	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	$414,430	$50,430	$50,430	$50,430	$50,430	$50,430	$50,430	
$6,184	$6,004	$5,829	$5,659	$5,494	$5,334	$5,179	$41,319	$4,881	$4,739	$4,601	$4,467	$62,776	$4,211	$4,088	$3,969	$3,853	$3,741	$3,632	$3,526	$3,424	$3,324	$26,521	$3,133	$3,042	$2,953	$2,867	$2,784	$2,703	
$9,635,921	$9,641,925	$9,647,753	$9,653,412	$9,658,906	$9,664,240	$9,669,419	$9,710,738	$9,715,619	$9,720,359	$9,724,960	$9,729,427	$9,792,203	$9,796,414	$9,800,502	$9,804,471	$9,808,324	$9,812,065	$9,815,698	$9,819,224	$9,822,648	$9,825,972	$9,852,493	$9,855,626	$9,858,668	$9,861,621	$9,864,489	$9,867,273	$9,869,975	

1	1	1	1
0.0520	0.0505	0.0490	0.0476
97	98	99	100
2117	2118	2119	2120
$840	$840	$840	$840
$2,800	$2,800	$2,800	$2,800
$800	$800	$800	$800
$3,000	$3,000	$3,000	$3,000
			$204,000
$7,440	$7,440	$7,440	$211,440
$387	$376	$365	$10,068
$7,500,180	$7,500,556	$7,500,921	$7,510,989

2117	2118	2119	2120
$840	$840	$840	$840
$2,800	$2,800	$2,800	$2,800
$800	$800	$800	$800
$5,000	$5,000	$5,000	$5,000
			$342,000
$9,440	$9,440	$9,440	$351,440
$491	$477	$463	$16,735
$7,789,419	$7,789,896	$7,790,359	$7,807,093

2117	2118	2119	2120
$840	$840	$840	$840
$2,800	$2,800	$2,800	$2,800
$800	$800	$800	$800
$45,990	$45,990	$45,990	$45,990
			$679,500
$50,430	$50,430	$50,430	$729,930
$2,624	$2,548	$2,473	$34,757
$9,872,599	$9,875,147	$9,877,620	$9,912,378

Project **Quilcene Sewer Evaluation**

O&M Costs for Top 3 Alternatives

Unit Cost Estimates assume burdened labor, soft cost and admin.

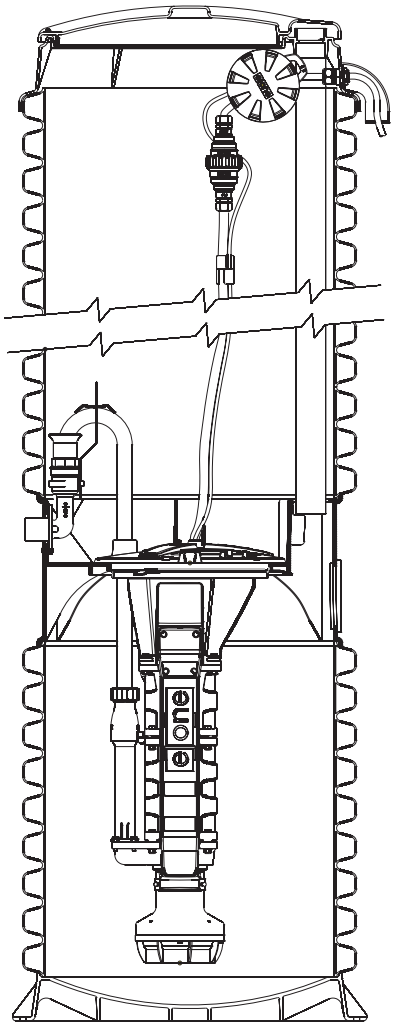
On Site Systems			
Grinder Pumps			Based on E/One estimate
Electricity Consumption	$	840	$15/pump/year
Maintenance/Repair	$	2,800	60 hrs x 2 crew for more significant fix
	$	**3,640**	
Collection System			Based on E/One Discussion
Pressure System Maintenance	$	800	8 hours per year x 2 person crew x $50/person/hr (valve maintenance)
Treatment and Disposal			
Recirculating Filter and Discharge	$	3,000	Dave Jensen estimate (pumping + periodic inspection and maintenance)
ATU and Discharge	$	5,000	Dave Jensen estimate (pumping + aeration + periodic inspection and maintenance)
MBR and Discharge	$	45,990	Bioprocess H2O Estimate - $10-20 per 1000 gallons treated (aeration + pumping + operations staffing + periodic maintenance)

Quilcene Wastewater Feasibility Study

Appendix D. Equipment

E/ONE EXTREME SERIES

DH071/DR071



General Features

The model DH071 or DR071 grinder pump station is a complete unit that includes: the grinder pump, check valve, HDPE (high density polyethylene) tank, controls, and alarm panel. A single DH071 or DR071 is a popular choice for one, average single-family home and can also be used for up to two average single-family homes where codes allow and with consent of the factory.

- Rated for flows of 700 gpd (2650 lpd)
- 70 gallons (265 liters) of capacity
- Indoor or outdoor installation
- Standard outdoor heights range from 61 inches to 160 inches

The DH071 is the “hardwired,” or “wired,” model where a cable connects the motor controls to the level controls through watertight penetrations.

The DR071 is the “radio frequency identification” (RFID), or “wireless,” model that uses wireless technology to communicate between the level controls and the motor controls.

Operational Information

Motor
1 hp, 1,725 rpm, high torque, capacitor start, thermally protected, 120/240V, 60 Hz, 1 phase

Inlet Connections
4-inch inlet grommet standard for DWV pipe. Other inlet configurations available from the factory.

Discharge Connections
Pump discharge terminates in 1.25-inch NPT female thread. Can easily be adapted to 1.25-inch PVC pipe or any other material required by local codes.

Discharge
15 gpm at 0 psig (0.95 lps at 0 m)
11 gpm at 40 psig (0.69 lps at 28 m)
7.8 gpm at 80 psig (0.49 lps at 56 m)

Accessories

E/One requires that the Uni-Lateral, E/One’s own stainless steel check valve, be installed between the grinder pump station and the street main for added protection against backflow.

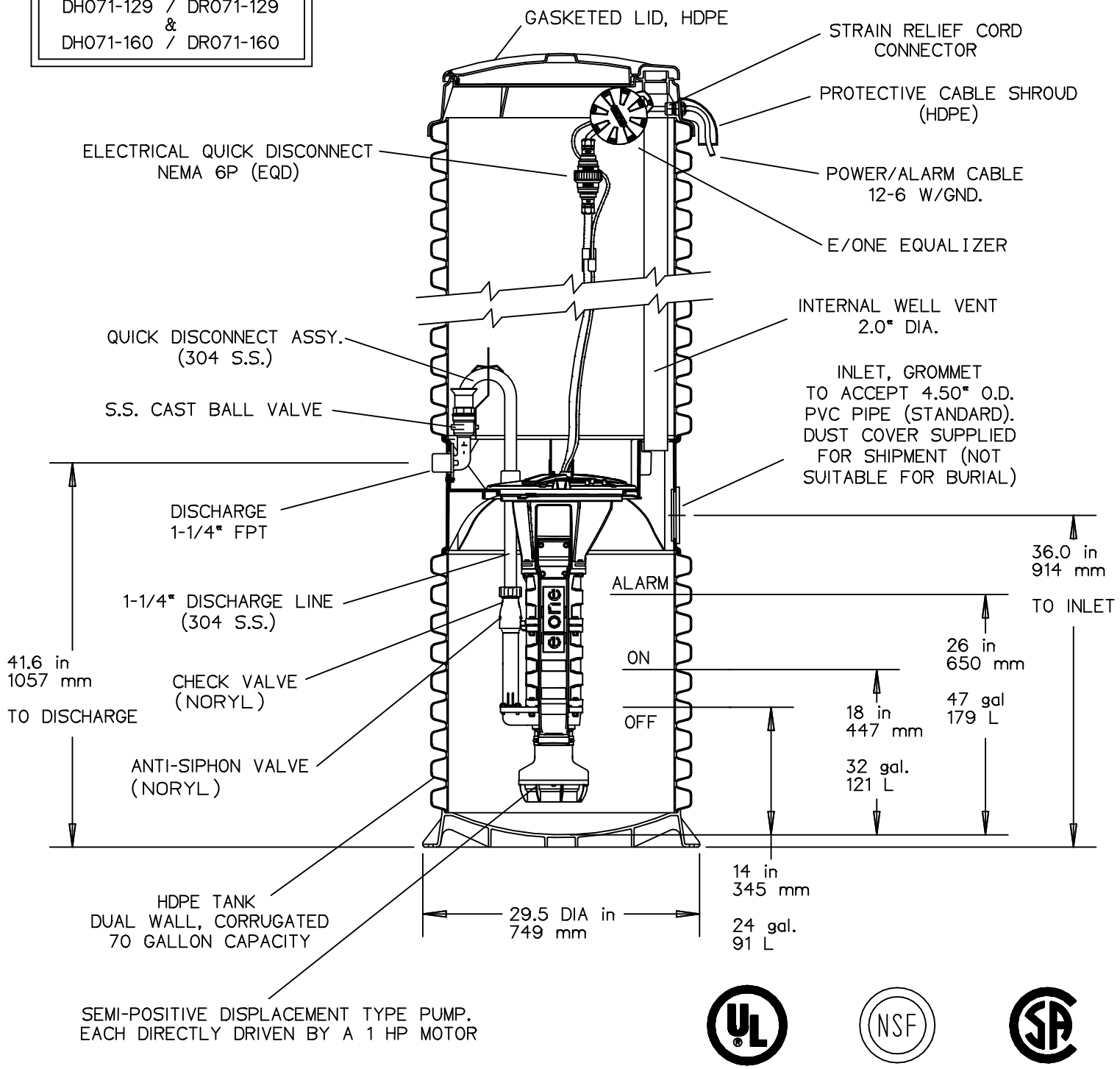
Alarm panels are available with a variety of options, from basic monitoring to advanced notice of service requirements.

The Remote Sentry is ideal for installations where the alarm panel may be hidden from view.

Patent Numbers: 5,752,315
5,562,254 5,439,180

OPTIONS : ☐ DH071 (HARD WIRED LEVEL CONTROLS)
☐ DR071 (WIRELESS LEVEL CONTROLS)

FIELD JOINT REQUIRED
FOR MODELS
DH071-129 / DR071-129
&
DH071-160 / DR071-160



CONCRETE BALLAST MAY BE REQUIRED
SEE INSTALLATION INSTRUCTION
FOR DETAILS

NOTE: DIMENSIONS ARE FOR REF ONLY

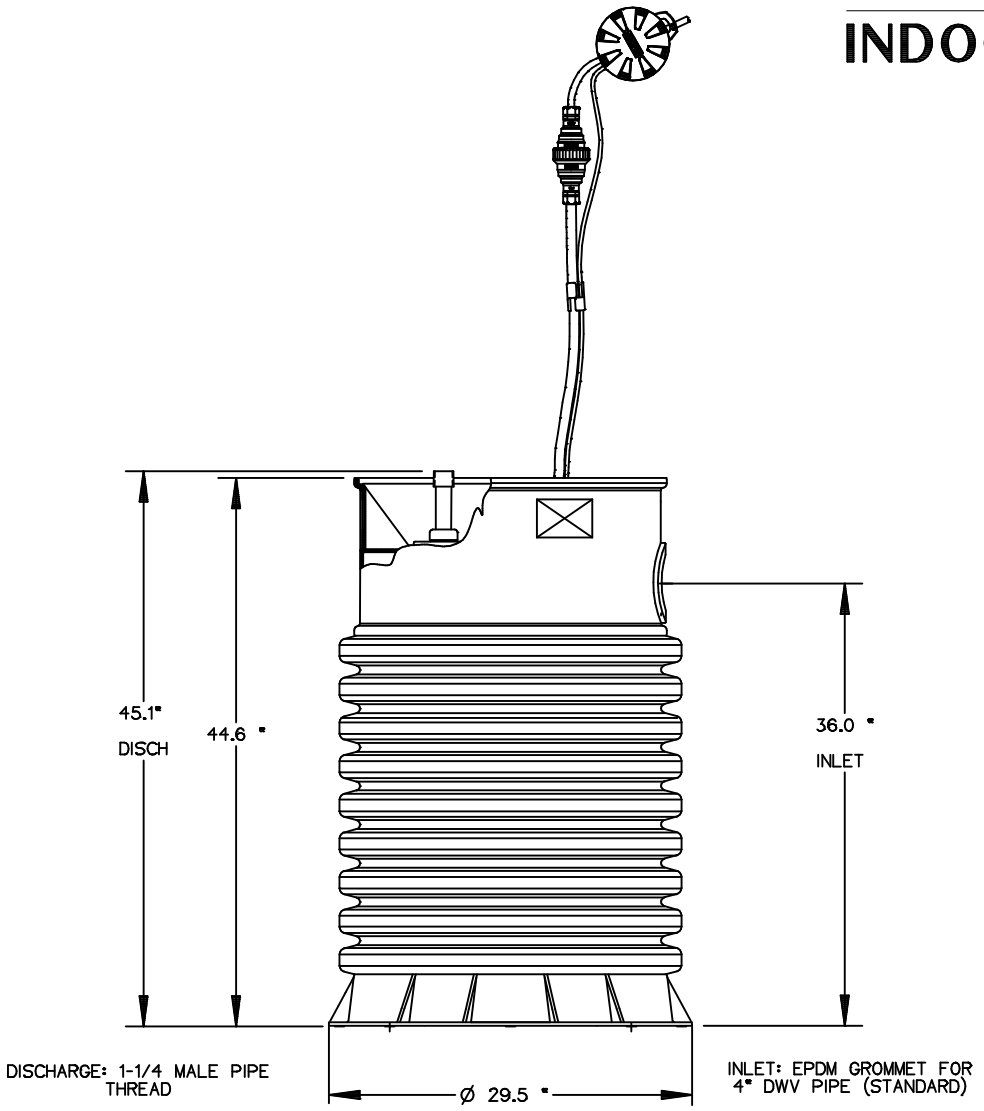
AD	CH	10/20/10	D	
DR BY	CHK'D	DATE	ISSUE	SCALE

SEWER SYSTEMS

MODEL DH071 / DR071
DETAIL SHEET

NA0050P02

DH071-44
INDOOR UNIT



NOTE: DIMENSIONS ARE FOR REF ONLY

LNT	GAE	04/24/07	A	
DR BY	CHK'D	DATE	ISSUE	SCALE

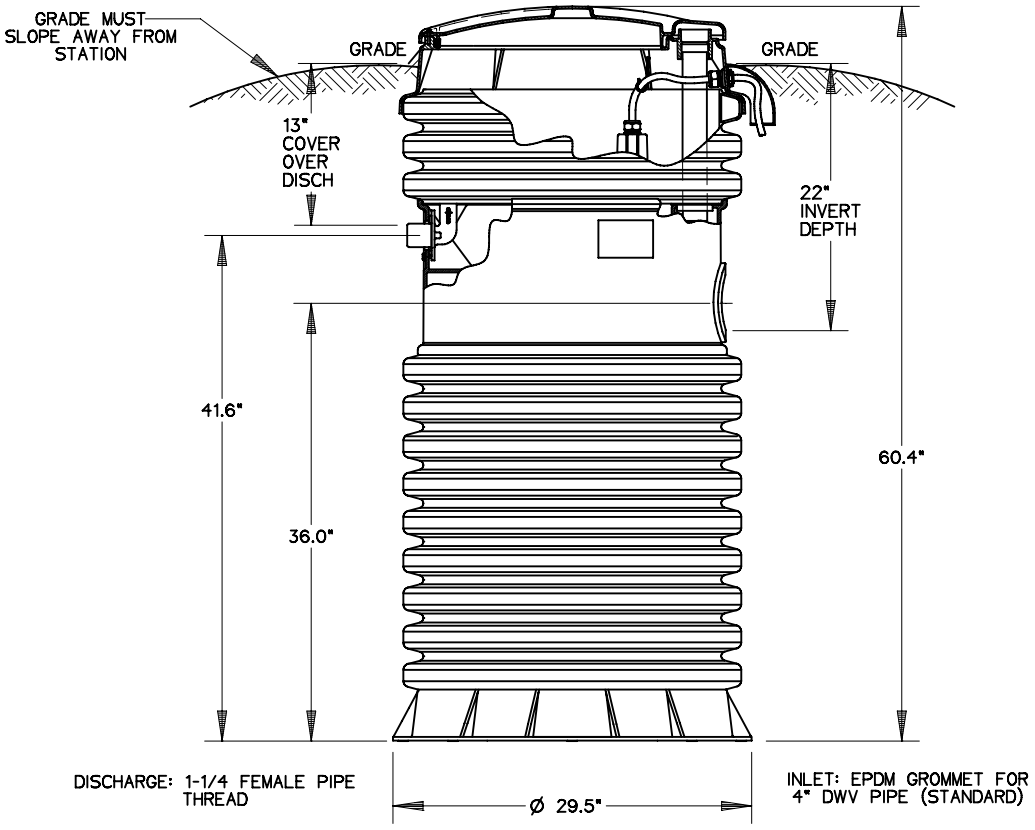
SEWER SYSTEMS

MODEL DH071-44

NA0050P03

OPTIONS : ☐ DH071-61 (HARD WIRED LEVEL CONTROLS)

☐ DR071-61 (WIRELESS LEVEL CONTROLS)



CONCRETE BALLAST MAY BE REQUIRED
SEE INSTALLATION INSTRUCTIONS
FOR DETAILS

NOTE: DIMENSIONS ARE FOR REF ONLY

AD	CAH	07/12/07	B	1/16
DR BY	CHK'D	DATE	ISSUE	SCALE

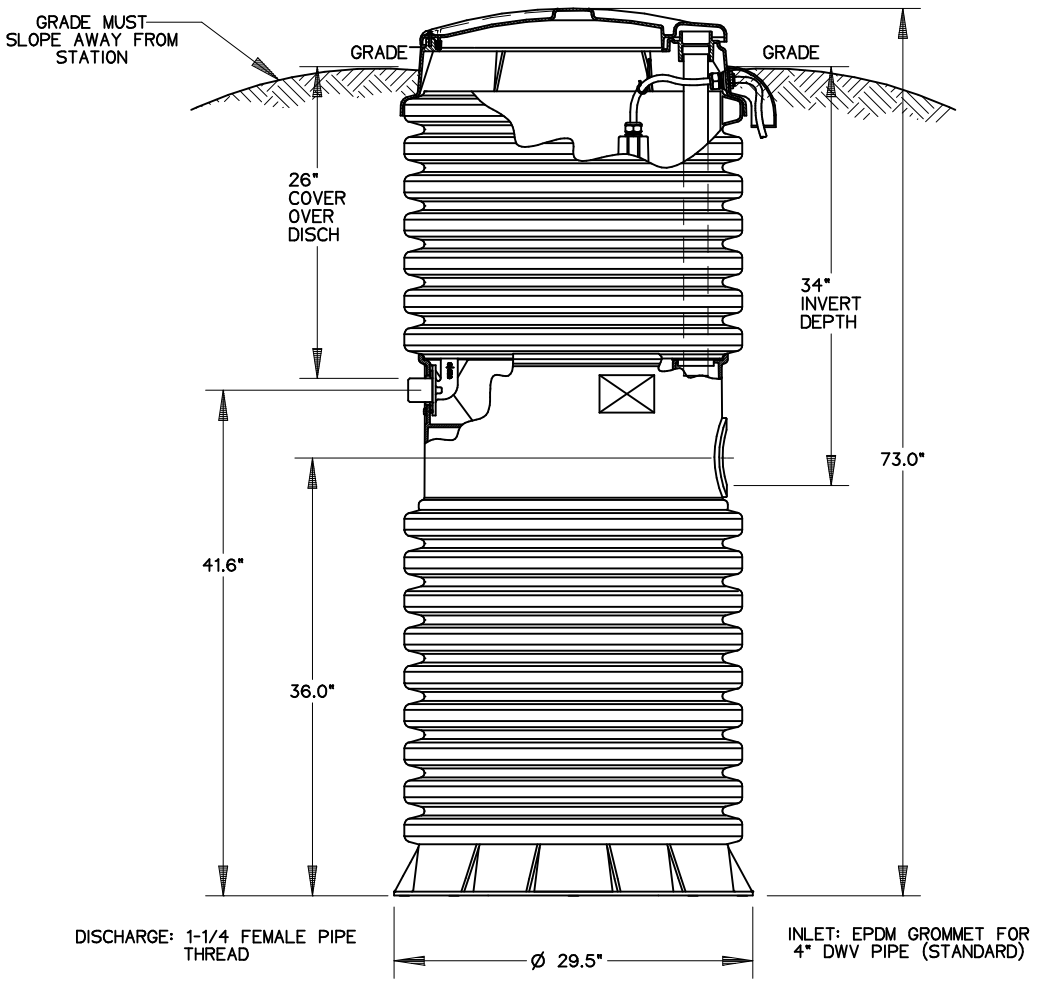
SEWER SYSTEMS

MODEL DH071-61 / DR071-61

NA0050P04

OPTIONS : ☐ DH071-74 (HARD WIRED LEVEL CONTROLS)

☐ DR071-74 (WIRELESS LEVEL CONTROLS)



CONCRETE BALLAST MAY BE REQUIRED
SEE INSTALLATION INSTRUCTIONS
FOR DETAILS

NOTE: DIMENSIONS ARE FOR REF ONLY

AD	CAH	07/12/07	B	1/16
DR BY	CHK'D	DATE	ISSUE	SCALE

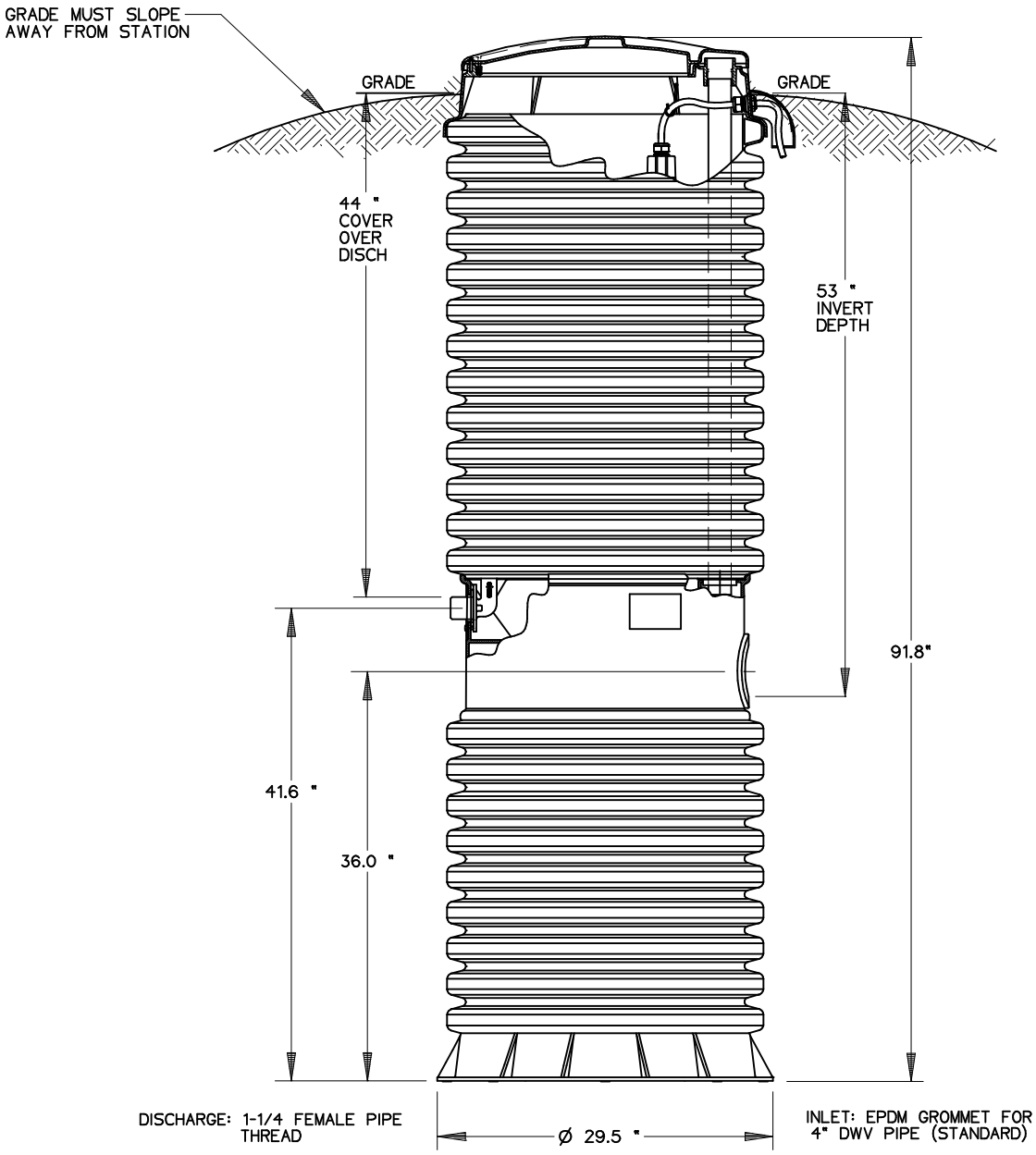
SEWER SYSTEMS

MODEL DH071-74 / DR071-74

NA0050P05

OPTIONS : ☐ DH071-93 (HARD WIRED LEVEL CONTROLS)

☐ DR071-93 (WIRELESS LEVEL CONTROLS)



CONCRETE BALLAST MAY BE REQUIRED
SEE INSTALLATION INSTRUCTIONS
FOR DETAILS

NOTE: DIMENSIONS ARE FOR REF ONLY

AD	CAH	07/12/07	B	1/16
DR BY	CHK'D	DATE	ISSUE	SCALE

SEWER SYSTEMS

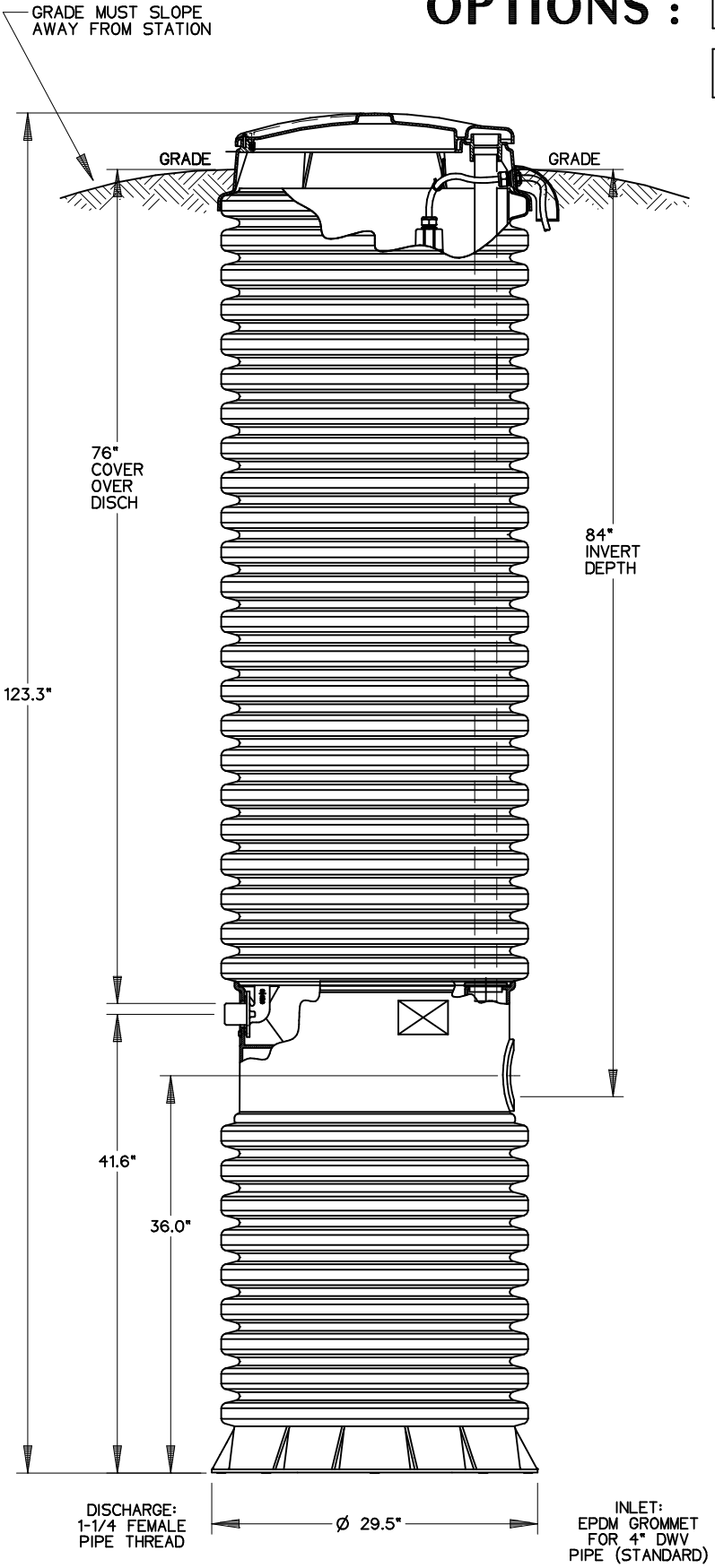
MODEL DH071-93 / DR071-93

NA0050P06

OPTIONS :

☐ DH071-124 (HARD WIRED LEVEL CONTROLS)

☐ DR071-124 (WIRELESS LEVEL CONTROLS)



CONCRETE BALLAST MAY BE REQUIRED
SEE INSTALLATION INSTRUCTIONS
FOR DETAILS

NOTE: DIMENSIONS ARE FOR REF ONLY

AD	CAH	07/13/07	B	1/16
DR BY	CHK'D	DATE	ISSUE	SCALE

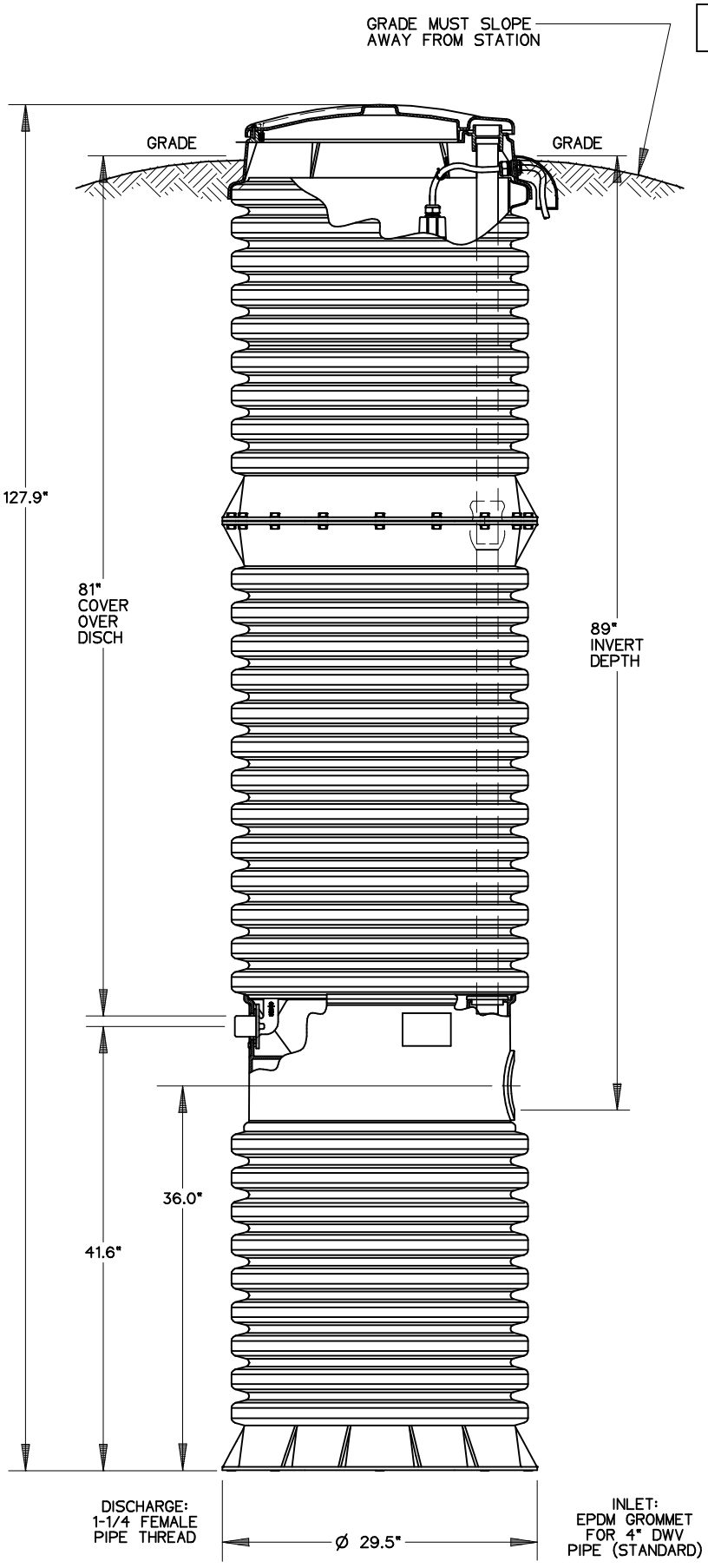
SEWER SYSTEMS

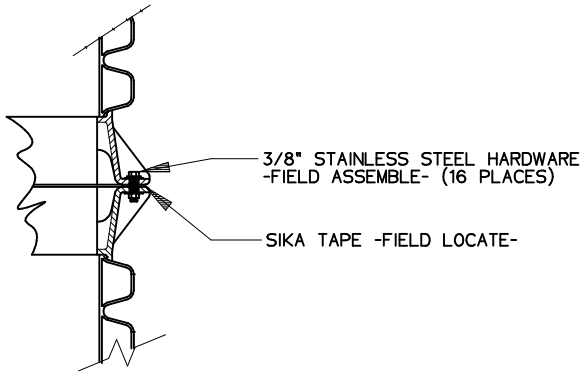
MODEL DH071-124 / DR071-124

NA0050P07

OPTIONS : ☐ DH071-129 (HARD WIRED LEVEL CONTROLS)

☐ DR071-129 (WIRELESS LEVEL CONTROLS)





DETAIL, FIELD JOINT

SEE INSTALLATION INSTRUCTIONS FOR FURTHER DETAILS

CONCRETE BALLAST MAY BE REQUIRED SEE INSTALLATION INSTRUCTIONS FOR DETAILS

NOTE: DIMENSIONS ARE FOR REF ONLY

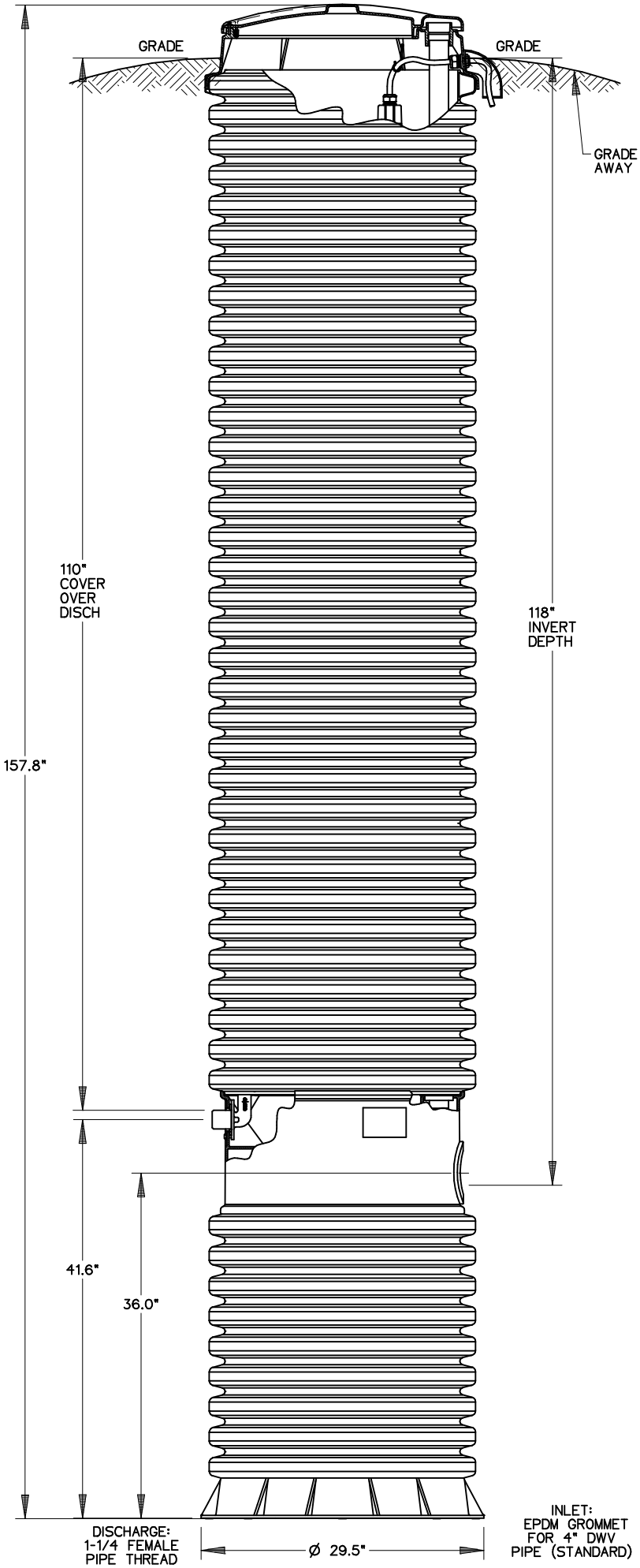
AD	CAH	07/13/07	B	1/16
DR BY	CHK'D	DATE	ISSUE	SCALE

SEWER SYSTEMS

MODEL DH071-129 / DR071-129

NA0050P08

OPTIONS : ☐ DH071-158 (HARD WIRED LEVEL CONTROLS)
☐ DR071-158 (WIRELESS LEVEL CONTROLS)



CONCRETE BALLAST MAY BE REQUIRED
SEE INSTALLATION INSTRUCTIONS
FOR DETAILS

NOTE: DIMENSIONS ARE FOR REF ONLY

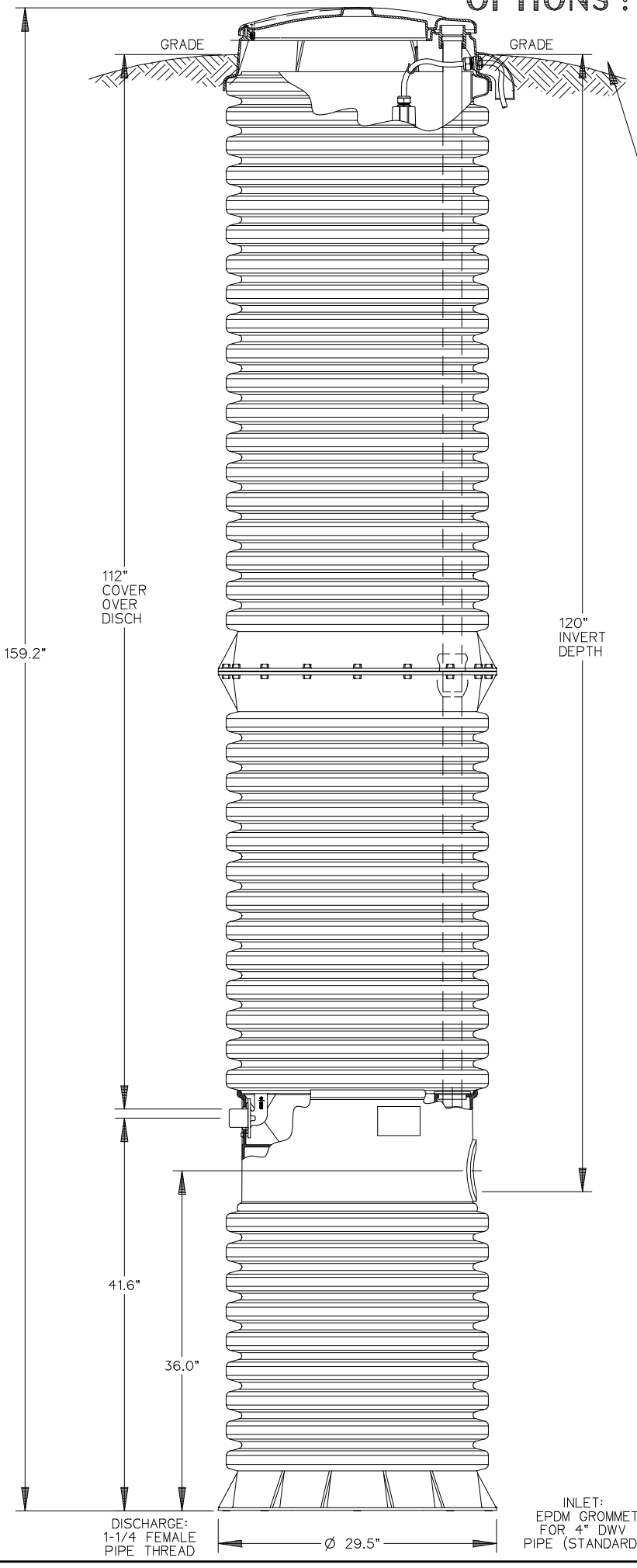
AD	CAH	07/13/07	B	1/16
DR BY	CHK'D	DATE	ISSUE	SCALE

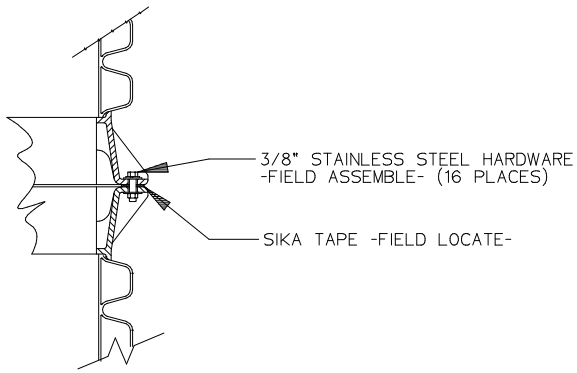
SEWER SYSTEMS

MODEL DH071-158 / DR071-158

NA0050P09

OPTIONS : ☐ DH071-160 (HARD WIRED LEVEL CONTROLS)
☐ DR071-160 (WIRELESS LEVEL CONTROLS)





DETAIL, FIELD JOINT

SEE INSTALLATION INSTRUCTIONS FOR FURTHER DETAILS

CONCRETE BALLAST MAY BE REQUIRED SEE INSTALLATION INSTRUCTIONS FOR DETAILS

NOTE: DIMENSIONS ARE FOR REF ONLY

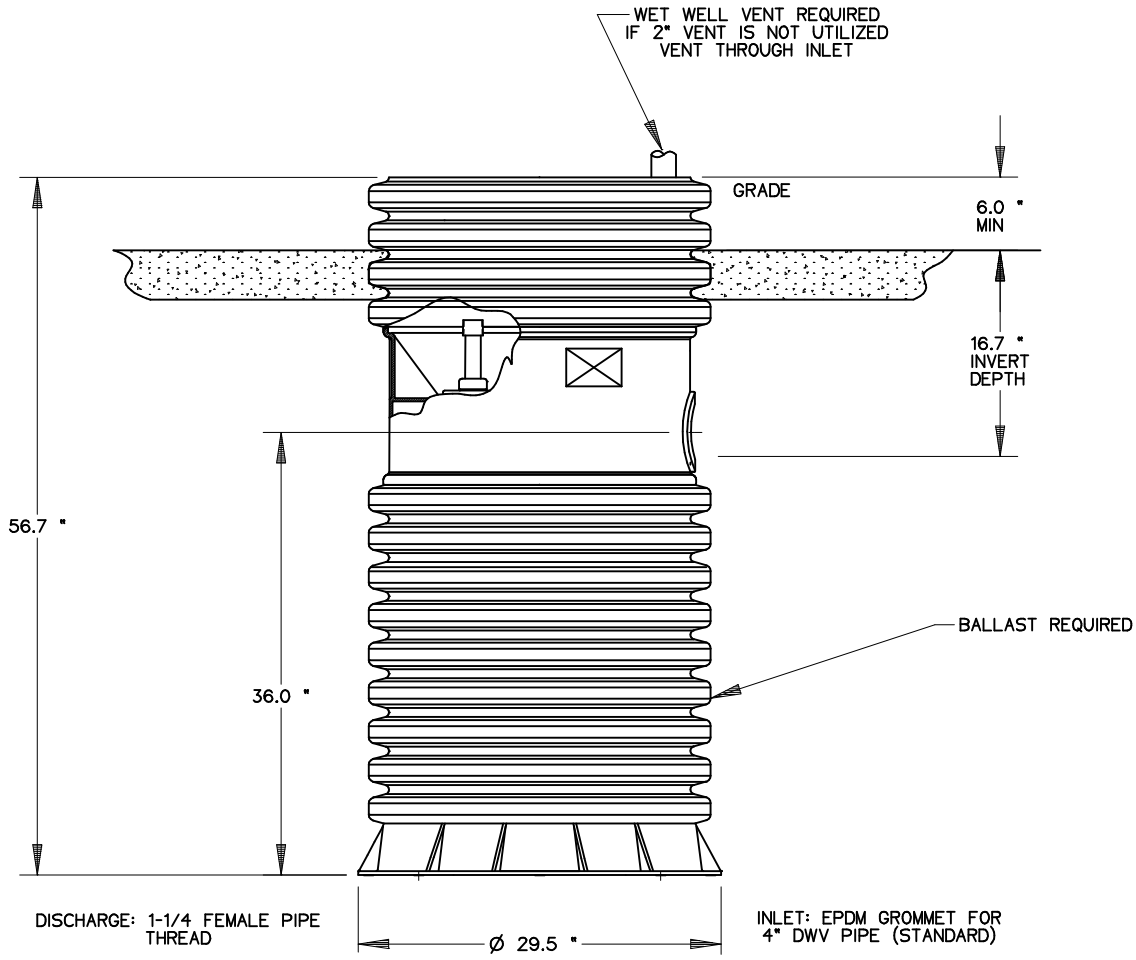
AD	CAH	07/13/07	B	1/16
DR BY	CHK'D	DATE	ISSUE	SCALE

SEWER SYSTEMS

MODEL DH071-160 / DR071-160

NA0050P10

DH071-57
BUILDERS MODEL
STRAIGHT DISCHARGE



NOTE: DIMENSIONS ARE FOR REF ONLY

AD	CAH	04/26/07	A	1/16
DR BY	CHK'D	DATE	ISSUE	SCALE

SEWER SYSTEMS

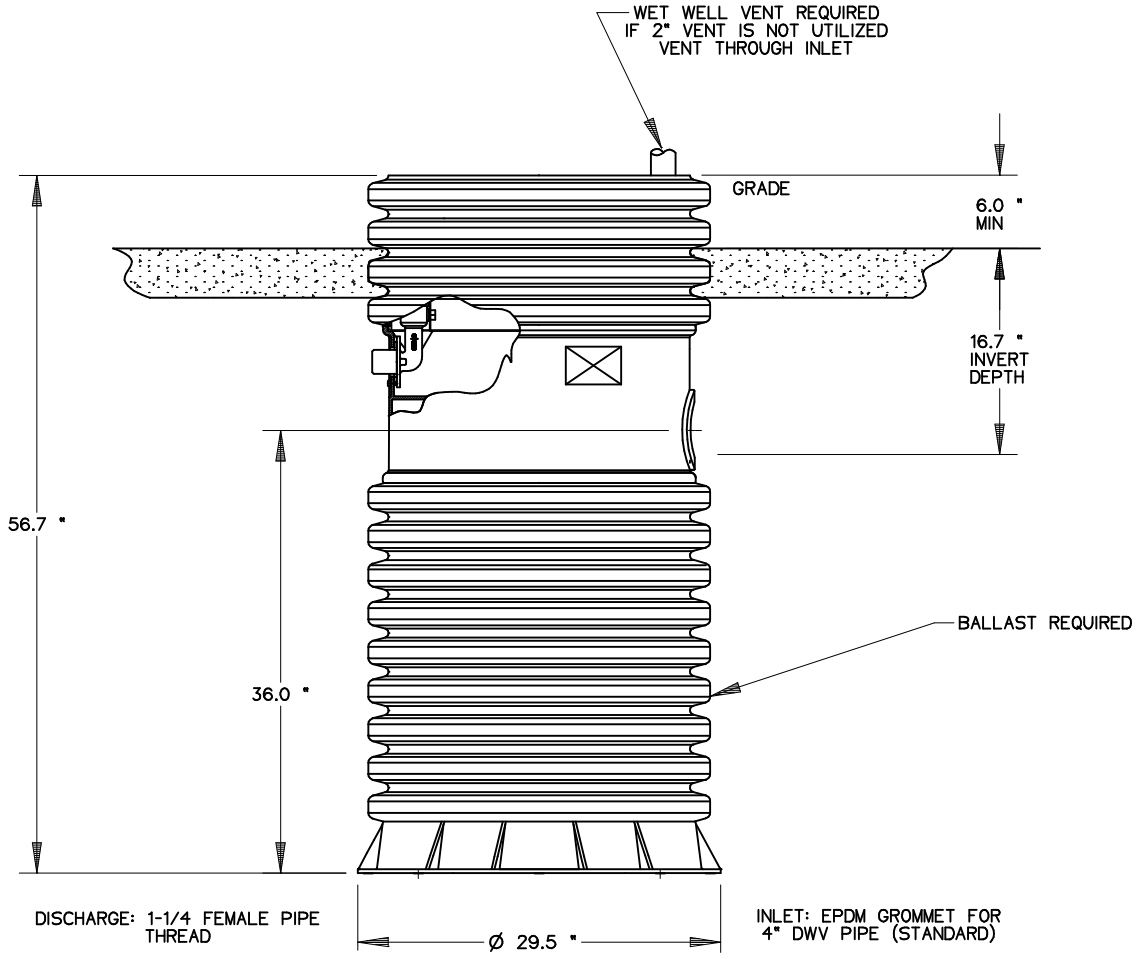
MODEL DH071-57
BUILDERS

NA0050P11

DH071-57

BUILDERS MODEL

DISCHARGE VALVE



NOTE: DIMENSIONS ARE FOR REF ONLY

AD	CAH	04/26/07	A	1/16
DR BY	CHK'D	DATE	ISSUE	SCALE

SEWER SYSTEMS

MODEL DH071-57
BUILDERS

NA0050P12

Quilcene Wastewater Feasibility Study

Appendix E. Public Engagement

Quilcene Community Septic Feasibility Study
Interview Summary

Prepared by Triangle Associates, Inc.
v. August 24, 2016

Bob Wheeler and Rachel Aronson from Triangle Associates (Triangle, facilitation team) interviewed residents of Quilcene in-person and by phone in June, July, and August 2016. Triangle was able to interview 24 people. Attachment 1 includes the people interviewed.

Interview Summary

The following is a summary of themes and comments heard in the live and phone interviews Triangle conducted with residents, property owners, and business owners of the unincorporated Quilcene area regarding their thoughts and opinions about the development of a community septic system for the management of wastewater within the Quilcene Rural Village Center (RVC). The summary is arranged by topic area and does not attribute comments to individual people. A few individual comments that represent the wide range of ideas expressed during the interviews are also included.

It is important to recognize that for these interviews Triangle attempted to interview enough individuals with a variety of interests to capture the different perspectives that exist in Quilcene. With that said, perspectives captured represent only the interviewed sample of Quilcene residents and does not represent a community-wide complete survey. It is important to recognize that this interview process is only a preliminary indication of the perspectives on this topic.

Overview

Almost all the interviewees mentioned that Quilcene is a divided community, and that broad community consensus is very difficult to achieve because of this. A common theme mentioned in this respect relates to those who are long-term Quilcene residents (even multi-generational) and those who are more recent arrivals. This does not indicate who does or does not support the potential new community septic system, but it is an important community characteristic to be aware of.

The opinions of interviewees regarding a potential community septic system for Quilcene were generally in three categories:

1) Very much in favor.
2) In favor, as long as they personally do not have to pay for or use such a system.
3) Very much against.

The major interview themes reflect this diversity in opinion.

Major Interview Themes:

The following major themes came through clearly in most of the Quilcene interviews:

- **Economic development:** Some people would like to see new businesses in Quilcene, such as a bakery or retirement home, and would like to expand current businesses and create new jobs.

  Some businesses could not meet new standards for septic systems and had to close.
  "There is no use doing anything with vacant buildings until you can flush a toilet."

  People expressed a desire to capture more economic benefits from the Highway 101 traffic that already comes through Quilcene (1.6 million trips/year), and to draw in new visitors. The gas station is unable to advertise their existence on DOT signs because they do not have a public restroom.

Habitat for Humanity would like to build low-income housing in Quilcene but will not work in places that do not have some sort of public wastewater system.

However, a number of people feel that Quilcene does not need more businesses, and expressed skepticism over the number and type of jobs that would result, and whether these jobs would be significant in terms of living wage positions. People also would like Quilcene to retain its affordability.

It was pointed out that the food bank on Wednesdays draws 250 to 300 people, and the Quilcene schools are 44% assisted lunch program. Anything that can help economically is important to the health of the community.

- **Costs of an individual septic system vs. a community septic system**: Among interviewees who do live, work or own property in the RVC, we heard that the cost of a new individual septic system that would meet their needs on their own property ranges from $15,000-$50,000 including design. We heard that people would tie their properties into a community system if their personal costs were below the cost of their own installation. We also heard that the county is quite strict in the approval process of new personal septic systems and some people had had their individual plans/permit applications rejected multiple times.

- **Affordability of a system**: We heard that many residents/businesses of the RVC would likely need grants or low-income support for the installation of a new system, decommissioning of their old system and ongoing costs of a new system.

- **Water quality is important**: Coast Seafoods is the only large employer in Quilcene, and they have a strong interest in clean water for aquaculture. Many people also fish in the river and want to see the fish population stay healthy. All of these require good water quality. Some wells supplying structures with potable water are within 30 feet of a leach field system, whereas the requirement for separation is approximately 100 feet. One interviewee stated that, "*the public health benefit is common ground."*

Information Desired from Project Team:

Quilcene residents would like to have the feasibility study answer such questions as:

- How will local expertise and opinion factor into any decisions that are made?
- Who will make the decision and what will they use to make the decision?
- What might a community septic system cost to install? Will users be able to pay those costs over time?
- What might the ongoing costs for a property be? What would future fee increases look like, if there were any?
- Could the system be a nonprofit? If not, who would be profiting?
- Who would run the system? Could it be run locally? Will it be maintained professionally?
- Would people who do not connect to the system have to pay?
- What is a potential schedule for next steps and construction?
- Will it smell?
- Will it be resilient to sea level rise and flooding?
- How big does a system need to be?
- Would it be expandable later on?
- Could several drainfield sites be used instead of one large drainfield?

Thoughts on Potential Community Septic System

Potential locations

- Interviewees suggested many parcels within the RVC to the project team for further investigation.
- Several of the suggested parcels are adjacent to but outside the RVC. The suggested parcels are owned by Jefferson County, the Forest Service, or individuals.

Two or more systems

- A suggestion was made by multiple people to consider two or more smaller septic systems instead of one large system. Benefits of multiple systems could include:
    - Ability to put systems on opposite sides of the highway so no highway digging/boring is needed to cross the highway.
    - Starting with a smaller system would allow people to see if it works and bring in more support for the next system.
    - Backup in case one fails.

Communications

Below are some of the initial ideas Quilcene residents had for communications going forward:

- Recognize that Quilcene is a special and highly-loved place.
  "Quilcene is paradise."
- Emphasize how this project will be unique to Quilcene, and is not trying to make Quilcene like any other place.
- Use volunteers to get the word out, write grants, and help with labor.
- Make a simple video about the project.
- Get word to people that there may be benefits to the community that they will not have to pay for.
- Remind people that the project team will not be assessing their current septic systems.
- Get information out early, not just at decision times.
- Anyone who wants to hold a public meeting can do so at the community center.
- Post information at community congregation sites, such as the Post Office, Community Center, US Bank, Logger's Rest, Peninsula Foods, etc.
- The Facebook group "I've Heard of Quilcene" is a good place to post information, as well as "Quilcene Conversations" email listserv.

Miscellaneous Comments

- A few comments were heard about the water system and that completion of that system was supposed to reduce the need for a community drainfield system.
- Opinions of the Highway 101 improvement project are also sharply divided.
- Quilcene has the only warm salt water beach in Puget Sound area; that could be a draw for visitors.
- Public restrooms are needed in Quilcene.
- Some people are concerned about what can keep Quilcene from becoming a ghost town.
- Quilcene has a strong community of volunteers who do help on other community projects and may be able to help on a construction project.

Attachment 1: Interview Participants

Name
Alvin Ackerman
Anne Ricker
Bob Rosen
Charles Thrasher
Charlie Brown
Chris Jones
Cindy Kay
Clayton White
Jim Munn
Kathleen Wright
Keith Meyer
Kit Kittredge
Linda Herzog
Linda Oen
Lorna Ward
Lyle Courtsal
Mary Schmidt
Paul Schmidt
Robert Alexander
Sally Brown
Sharon McClain
Stan Nealey
Tom Brotherton
Wally Peterson

Quilcene Community Septic Feasibility Study
Small Group Meeting Summary

Friday, November 17th, 2017
10:30-12:00 PM
Quilcene Masonic Lodge
170 Herbert St, Quilcene, WA 98376

Welcome and Introductions:

Bob Wheeler, meeting facilitator, welcomed attendees to the meeting. He noted that the Quilcene Community Septic Feasibility Study report was nearly finalized and that Katy Isaksen, a utility financial planning expert, was present to discuss financial possibilities and answer questions.

Attendees noted that septic capacity limits Quilcene's vitality. Kathleen Kler, Jefferson County Commissioner and Quilcene resident, thanked the Port of Port Townsend for managing the project. Eric Toews, Port of Port Townsend, noted that the Port was very happy to help the County and community by taking on the project management of the feasibility study. The Port looks to continue to play a supportive role but will likely not have the future capacity to manage further stages. Kathleen Kler let attendees know that the County now has more staff capacity than previously and may be able to play a more active role in developing Quilcene's septic capacity in the future.

Presentation on Final Report:

Kevin Dour, Tetra Tech, reviewed how the technical team conducted the feasibility study. Tetra Tech was asked to look at the Rural Village Center (RVC) and estimate and evaluate potential wastewater flows from a more developed RVC. The team then evaluated management of those wastewater flows through a potential large onsite septic system. The team analyzed how such a system could be implemented, how it could be expanded over time, and what it would cost. The team looked at possible candidate locations and tested the soil in ten parcels. Two locations were most promising: the County parcel in the southeast corner of the RVC and part of the Mt. Walker Inn site in the southwest corner of town. The team also analyzed pressurized systems vs. gravity systems for conveying wastewater flows from properties to the treatment site and determined that a pressurized system would be more cost effective. The team developed initial cost estimates for a partial service area and a full-service area.

The final report will be put online. Next steps for the Quilcene community were discussed and would likely be to:

- Conduct community outreach.
- Find a sponsoring agency/owner, such as the County or Public Utility District. This entity will need to apply for grants, and ultimately set up a system to charge customers. The owner could contract for management or billing. The sponsoring agency/owner needs to be able to own the facility, borrow money and/or accept grants and assure repayment, and operate and maintain the system long enough to pay off the debt incurred in building it. Based on their experience,

the project team does not believe that a community-based organization would be able to borrow enough funding to build the system, because they would not have any history of a revenue stream.

- Identify and work with a project champion/s
- Secure financial support.
- Buy or obtain right of entry to the land for the treatment system.
- Prepare a Site Review Predesign Report in accordance with Department of Health (DOH) Requirements
- Obtain preliminary approval from the Washington Department of Health (DOH).
- Develop a collection and treatment design.
- Obtain approval from DOH.
- Build the system.
- Operate and maintain the system.

The project team noted that the feasibility study was tasked with only considering sewer service to those properties within the RVC, though the wastewater treatment and disposal systems could be outside the RVC. In responding to a question from attendees, it was noted that changing the RVC limits is possible but challenging.

Kathleen Kler noted that Jefferson County is conducting a Comprehensive Plan update. This is a once in 20 years opportunity to shape how land is used in the County. If Quilcene community septic was a goal in the Comprehensive Plan, this would support future grant applications. On November 30th, 2017, at 6 PM, the County is having a meet and greet with the Quilcene community. This would be an opportunity to talk with County government about the septic system.

Presentation on Financial Possibilities:

Katy Isaksen, Katy Isaksen & Associates, reviewed her financial analysis, which is included in the final report. Katy has worked on a number of similar projects throughout the state. A new sewer system is very expensive. Expenses include capital costs, the one-time costs to get the system constructed, and ongoing costs/operating costs. Capital costs are included in Table 1 [see attachment]. These numbers are intended to be conservative (e.g. higher than expected in the costs, lower than expected in revenue).

Katy noted that she took information on Quilcene's feasibility study to the Infrastructure Assistance Coordinating Council (IACC) in October 2017. The IACC brings funders and recipients together every year in Wenatchee. Katy reviewed the feasibility study summary (see attachment) with the agencies who may be potential future funders. The kinds of comments that Katy heard included that the costs per parcel were quite high, and that Quilcene was a typical community in terms of desire to have a system without being too impacted by costs. The presence of only one large employer was troubling to funders, but Coast Seafood could be brought on as a supporter of the project to ameliorate those concerns.

Katy reviewed three categories of funds, other than direct customer payments to fund the system: appropriations, grants and loans. Grants and appropriations are money that does not have to be repaid, and that is coming from outside the community. An appropriation is a line item in a state or federal budget. Grants would come from many types of agencies, both state and federal. Katy said that strategically, it works best to seek appropriations, then fill in with grants, then borrow the remainder of the funds. Citizens could lobby their elected officials for appropriations but would need the sponsoring agency/owner to accept them.

Grants could come from economic development or water quality sectors. The Washington Department of Ecology (DOE) manages the water quality funding. A loan or partial grant could come from DOE. Ecology funds pre-construction (planning and design) money and construction money up to $5 million. Ecology's program is designed to address documented water quality problems. If no one in Quilcene has a failing septic and the water isn't impacted, this isn't the most likely source of funding. However, in general, Ecology likes the removal of individual systems in favor of managed systems. The project team reminded attendees that the feasibility study did not look for or encounter failing systems.

Ecology's grants are based on the median household income of the community. For Quilcene, the cost for sewer is "affordable" at 2% of the median household income. For residents, this would be about $84 per month. Businesses are usually converted to a number of households depending on water usage. The range of sewer costs estimated from this Feasibility Study range from $907 (0% grant) -$67 (100% grant) for the full RVC [see attachment]. This cost figure does not include an estimated 20% for administrative costs. It does, however, include 30% for contingencies. Ecology can provide grant funding for design and construction for residential and small commercial businesses. Most Quilcene businesses would fit into the small commercial category. An independent third party could conduct a survey for income if people think the outcome would be more beneficial than the census for determining median household income.

Several federal and state programs are targeted to economic development. These programs are looking for businesses to certify that they will add a certain number of living wage jobs. The US Economic Development Administration will give up to $3 million for infrastructure to support these jobs. Additionally, the US Department of Agriculture has rural development grants and loans. The Washington Community Economic Revitalization Board has planning grants, construction grants, and loans. Community development block grants are targeted toward low to moderate income people, residences in the community.

Katy noted that building these kinds of systems take years. Project champions are essential to keep it going, both within and without the sponsoring agency.

Katy recommended finding the owner, working with the legislature, specifically the community's state representatives, and working on land purchase and engineering design through appropriations. She also recommended demonstrating community involvement and engagement with the County, Port, and elected officials.

Comments and questions:

- Will this large septic system meet water quality standards?
    - Yes. High strength users or industrial users would need a pre-treatment system (which might include a grease trap or a separation system).
- The hospital could be a source of funds if there was a health benefit to the community.
- What is the likelihood that if an initial, smaller service area system is constructed that the entire RVC would eventually be served?
    - If Quilcene gets the sewer system up and running, developers and businesses can come in and connect organically, parcel by parcel. This is more likely than a formal Phase II where the rest of the RVC is connected all at once.
- Is there a cost savings in building the whole system rather than the initial service area and a second service area later?
    - There might be a cost savings, but it also might never get started. You may have willing developers who would pay for the second part. It depends on economics.
- What is the chance of finding money to build a system that they could afford?
    - In response to this question, the team stated that, from their experience, the best chance of securing funding would be to work as a community with legislators to obtain an appropriation for planning, design, and development of an Engineering Report in the near-term. After completion of that work effort, and with an ability to show progress, work with potential grant agencies to obtain grants.
- What happens when Ecology detects a problem with water quality and moves in?
    - This could result in a consent decree, but it is unclear at this point who Ecology would develop such a decree with for implementation.
- What do you need in order to reach out to a legislator?
    - Legislators have a community projects form. You need to involve the system owner, and make the project seem appealing and successful. Collect stories like the Whistling Oyster to show how businesses need such a septic system in order to thrive in Quilcene.

Next steps:

Bob summarized next steps. The Tetra Tech Team will finalize the report and make some number of hard copies, especially the core of the report without some of the detailed appendices, for those who desire a hard copy. Importantly, the report will be available electronically and will be posted, on the Port's website as a PDF of the total report and as a PDF of the core report without detailed appendices.

The consultants thanked the community for the opportunity to conduct the feasibility study.

Attendees

Kathleen Kler, Commissioner, Jefferson County

Cathy Barsukoff

Elizabeth Bindschadler

Cass Brotherton

Tom Brotherton

Jim Dziuba

Chuck Gibilisco

Linda Herzog

Diane Johnson

Stan Nealey

Wayne Siscoe

Clayton White

Project Team

Eric Toews, Port of Port Townsend

Kevin Dour, Tetra Tech

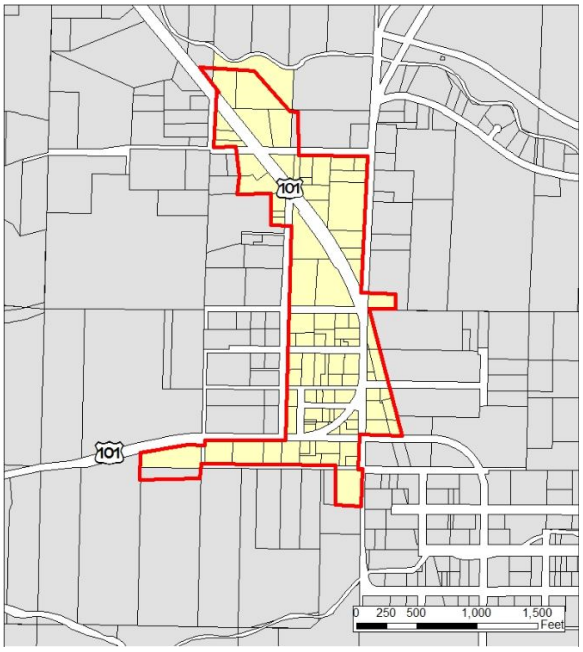
Katy Isaksen, Katy Isaksen & Associates

Bob Wheeler, Triangle Associates

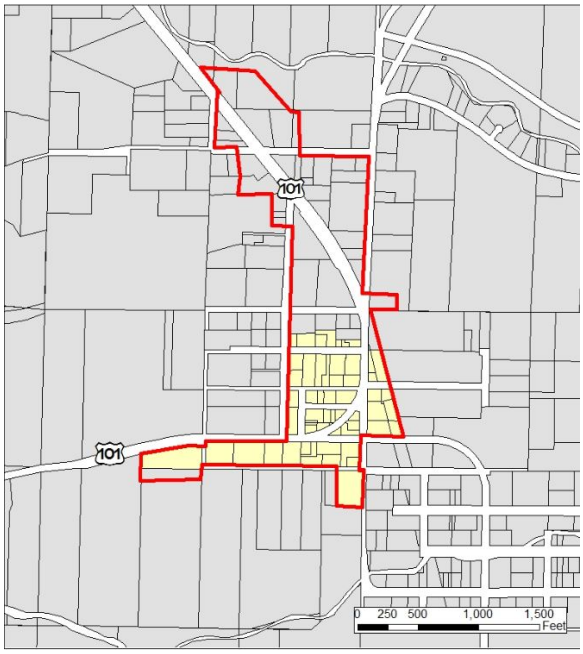
Rachel Aronson, Triangle Associates

Quilcene Wastewater Feasibility Study, Draft October 2017

Purpose of Project: *Determine the feasibility of a wastewater management system by assessing the current wastewater infrastructure, developing and evaluating alternatives, and recommending next steps to implement a wastewater system*



Alternative 1: Entire RVC Service Area
Flow: 20,900 gal/day from 81 parcels



Alternative 2: Reduced Initial Service Area
Flow: 12,600 gal/day from 47 parcels

Recommended Alternative

- Pressurized Collection System
  - Each property requires on-site grinder pump ($6,500-10,000 each)
  - Lower capital cost than gravity system
- Recirculating gravel and wood chip filter has lower capital and O&M cost than other treatment alternatives
- Subsurface irrigation has smaller footprint than other discharge options

Table 1 – Capital Cost Breakdown for Recommended System

	Full RVC	Reduced Initial Area
On-Site Systems	$1.5-2 Million	$1-1.5 Million
Collection	$6.5-7.5 Million	$3.5-4 Million
Treatment[b]	$1-1.4 Million	$0.6-1.2 Million
Discharge	$150,000-250,000	$100,000-200,000
Planning and Design	$1-1.5 Million	$0.7-1 Million
Total Project Cost[c]	$10-12.5 Million	$6-8 Million

a. System includes grinder pump collection system, recirculating gravel filter, and subsurface irrigation.
b. Includes cost of land acquisition of $600,000.
c. Total project costs include construction (bid) cost, permitting, land acquisition, planning and design, project administration, construction administration, sales tax, and contingency.

Financial Impacts

- Need to define owner of sewer system, who will be responsible for debt repayment. Some funding agencies require a government or quasi-government agency.
- Affordable system would have monthly cost of 2% of median household income ($50,486) or $84.14/month.
- Full construction cost of sewer system would be defined as a hardship (monthly cost exceeds 2% of median household income) and makes project eligible for hardship funding with grants, longer repayment period and/or lower interest rate.
- Funding assistance is required to make this system affordable.

Table 2 – Estimated Ratepayer ERUs

Estimated Ratepayer ERUs (based on current use)	Full RVC		Reduced Initial Service Area	
	Parcels	ERUs[a]	Parcels	ERUs[a]
Residential Properties	38	38	19	19
Small Commercial Properties[b]	30	34	16	25
Vacant Parcels[c]	13	0	12	0
Total	81	72	47	44

a. A residential ERU is 1 dwelling unit, a commercial ERU is the equivalent of a 3 bedroom home, or 360 gpd.
b. All commercial properties appear to meet Ecology's definition of small commercial <3,500 gpd.
c. Vacant parcels are considered in future flow estimates.

Table 3 – Funding Scenario

	Full RVC		Reduced Initial Area	
	0% Grant	100% Grant	0% Grant	100% Grant
Project Capital Cost	$10,800,000	$10,800,000	$6,600,000	$6,600,000
Initial ERUs	72	72	44	44
Estimated Annual Debt	$726,000	$0	$444,000	$0
Ongoing O&M&R	$57,765	$57,765	$16,840	$16,840
Monthly Cost Range per ERU	$907	$67	$873	$32

Debt assumes 20 years at 3% interest. System management costs will need to be added (admin, billing and state taxes).

Potential Funding Sources

- Legislative appropriation (state and/or federal)
- WA State Dept. of Ecology Integrated Water Quality grant/loan
- US Dept. of Agriculture, Rural Development, Water & Wastewater Disposal grant/loan
- WA State Dept. of Commerce, Public Works Trust Fund (PWTF) loan
- Jefferson County Public Infrastructure Fund grant/loan
- WA State Dept. of Commerce, Community Economic Revitalization Board (CERB) grant/loan
- WA State Dept. of Commerce, Community Development Block Grant (CDBG)
- US Dept. of Commerce, Economic Development Administration grant

Possible Next Steps

1. Identify system owner/operator as funding recipient
2. Identify project champion or champions
3. Secure funding for engineering report
4. Complete engineering report
5. Secure funding for design and construction
6. Complete design and construction
7. Connect to system