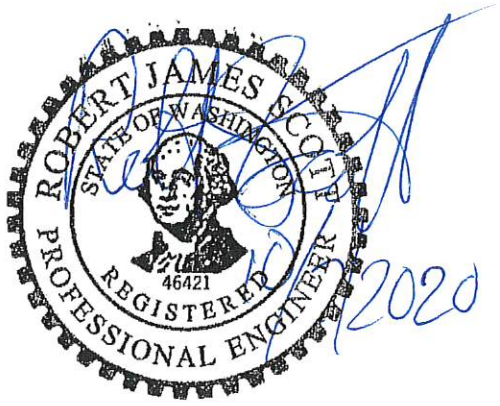
Vantage Bay
Engineering Report
October 2020

PLSA Engineering & Surveying
521 N. 20th Avenue, Suite 3
Yakima, WA 98902

CERTIFICATION

The 2020 Vantage Bay Engineering Report was prepared by PLSA Engineering and Surveying, under the direction of the following Registered Professional Engineer:



Robert J. Scott, PE

PLSA Engineering & Surveying

Abbreviations

AAF ..... Average Annual Flow
ac ..... acre
ACOE ..... Army Corps of Engineers
ADWF ..... Average Dry Weather Flow
AKART ..... All known, available, and reasonable technologies
avg. ..... average
BOD_5 ..... 5-day biochemical oxygen demand
BTU ..... British thermal units
$CaCO_3$ ..... Calcium carbonate
$CBOD_5$ ..... 5-day carbonaceous biochemical oxygen demand
CCWF ..... Centennial Clean Water Fund
CF ..... cubic feet
cfm ..... cubic feet per minute
CFR ..... Code of Federal Regulations
cfs ..... cubic feet per second
cfu ..... colony forming units
CMU ..... concrete masonry units
COD ..... chemical oxygen demand
conc. ..... concentration
constr. ..... construction
CWA ..... Clean Water Act
cy ..... cubic yards
DMR ..... discharge monitoring reports
DNS ..... determination of non-significance
DO ..... dissolved oxygen
DOH ..... Department of Health
DT ..... dry tons
EA ..... each
EIS ..... Environmental Impact Statement
EPA ..... Environmental Protection Agency
ERU ..... equivalent residence unit
ESA ..... Endangered Species Act
FEMA ..... Federal Emergency Management Agency
FIRM ..... Flood Insurance Rate Maps
F/M ..... food to microorganism ratio
ft^2 ..... square feet
ft/s ..... feet per second
FTE ..... full time equivalent
gal ..... gallons
gfd ..... gallons per square foot per day
GMA ..... Growth Management Act
gpad ..... gallons per acre per day
gpcd ..... gallons per capita per day

gpd ..... gallons per day
gpd/ft^2 ..... gallons per square foot
gph ..... gallons per hour
gpm ..... gallons per minute
gpm/ft^2 ..... gallons per minute per square foot
HDPE ..... high density polyethylene
HMI ..... Human-Machine Interface
hp ..... horsepower
HRT ..... hydraulic residence time
HVAC ..... heating, ventilation, and air conditioning
I/I ..... infiltration and inflow
in. ..... inches
kVA ..... kilovolt-amps
kW ..... kilowatt
kWh ..... kilowatt-hour
lb ..... pounds
lb/d ..... pounds per day
$lb/ft^2/day$ ..... pounds per square foot per day
lf ..... lineal feet
LS ..... lump sum
max. ..... maximum
MBR ..... membrane bioreactor
MDF ..... maximum day flow
mg ..... milligrams
mg/L ..... milligrams per liter
misc. ..... miscellaneous
mJ/cm2 ..... millijoules per square centimeter (UV dose measurement)
mL ..... milliliters
MLSS ..... mixed liquor suspended solids
mm ..... millimeter
MM ..... maximum month
MMF ..... maximum month flow
MSL ..... mean sea level
N/A ..... not applicable
NEPA ..... National Environmental Policy Act
NH_3 ..... ammonia nitrogen
NMFS ..... National Marine Fisheries Service
NO_3-N ..... nitrate nitrogen
NPDES ..... National Pollutant Discharge Elimination System
NR ..... not reported
NRCS ..... National Resource Conservation Service
NTU ..... nephelometric turbidity units
NWI ..... National Wetlands Inventory
OD ..... outside diameter
OFM ..... Office of Financial Management
O&M ..... operations and maintenance

PDF ..... peak day flow
PFRP ..... process to further reduce pathogens
pH ..... negative log hydronium ion concentration
PHF ..... peak hour flow
PLC ..... Programmable Logic Controller
PMAC ..... Plan to Maintain Adequate Capacity
P.S. ..... pump station
ppcd ..... pounds per capita per day
psi ..... pounds per square inch
PSRP ..... process to significantly reduce pathogens
PWTF ..... Public Works Trust Fund
Q ..... flow rate
RAS ..... return activated sludge
RCW ..... Revised Code of Washington
ROW ..... right-of-way
rpm ..... revolutions per minute
SBR ..... sequencing batch reactor
scfm ..... standard cubic feet per minute
SEPA ..... State Environmental Policy Act
SERP ..... State Environmental Review Process
sf ..... square feet
S.F. ..... safety factor
SR ..... State Route
SRF ..... State Revolving Fund
SRT ..... solids retention time
SWD ..... side water depth
TBD ..... to be determined
TDH ..... total dynamic head
TKN ..... total Kjeldahl nitrogen
TMDL ..... total maximum daily load
TSS ..... total suspended solids
UGA ..... Urban Growth Area
USGS ..... United States Geologic Survey
UV ..... Ultraviolet Radiation
V ..... volts
VFD ..... variable frequency drive
VOC ..... volatile organic compounds
VS ..... volatile solids
VSS ..... volatile suspended solids
WAC ..... Washington Administrative Code
WAS ..... waste activated sludge
WDFW ..... Washington Department of Fish and Wildlife
WT ..... wet tons
WRF ..... Water Reclamation Facility
WWTF ..... Wastewater Treatment Facility
µm ..... micrometer (micron)

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1 INTRODUCTION

1.01 Purpose

The purpose of this Engineering Report (Report) is to provide a description of the proposed capital project to construct a new water reclamation facility (WRF) serving the Vantage Bay Home Owner's Association (Vantage Bay), a new housing development in Kittitas County. This Report has been prepared in accordance with the provisions of the Revised Code of Washington (RCW), at Section 90.48, *Water Pollution Control*, WAC 173-240-060, *Engineering Report*, and the United States Code of Federal Regulations (CFR) at 40 CFR 35.917, *Facilities Planning*. Development of the Report has been coordinated with Vantage Bay's 2019 *Water System Plan*.

The Report is intended to be feasible in terms of engineering, economic, regulatory, and political frameworks. Included in the Report are conceptual designs and cost estimates for the proposed facilities, and the proposed sewer rates required to finance and operate the facility. The project is consistent with State regulations relating to the prevention and control of pollutants discharged into State waters, anti-degradation of existing and future beneficial uses of ground waters, and anti-degradation of surface waters. The Report will recommend sufficient flexibility to allow for Vantage Bay to grow to its full capacity over time.

1.02 Overview

Vantage Bay is proposing a new planned development located south of the Town of Vantage across I-90, as shown in Figure 1. The development will include 104 individual lots, 40 townhomes, a 40-unit boutique condominium rental property with restaurant, winery, club house with a pool, and a communal garden with a barn. Vantage Bay is also planning to serve a commercial vineyard in the future, although existing water rights do not allow for commercial irrigation. For this reason, Vantage Bay is planning to reuse treated wastewater effluent to offset a portion of the irrigation demands associated with the commercial vineyard. For practical purposes, Vantage Bay is confident that the commercial vineyard will have sufficient irrigation demand to utilize all of the effluent for reuse during irrigation season, and potable water will be used at the vineyard for the remaining makeup water. If reuse water production outpaces commercial irrigation use, the remaining reuse water can be discharged to rapid infiltration basins that will be the primary discharge point for the facility outside of irrigation season.

Preliminary discussions with the Department of Ecology have determined that there are multiple pathways available for reusing treated wastewater for irrigation of crops. Because the irrigation reuse will not be required during initial buildout, Vantage Bay will initially be operated with a State Waste Discharge Permit. In the future, the facility may be transitioned into a Reclaimed Water Permit if the reuse of treated effluent is determined to require permitting of this nature. For planning purposes, the Reclaimed Water requirements will be addressed so as to construct a treatment facility that can meet these requirements, should they

A PORTION OF THE EAST 1/2 OF SECTION 30, TOWNSHIP 17 N., RANGE 26 E., W.M.

SCALE: 1" = 250'

0 125' 250'

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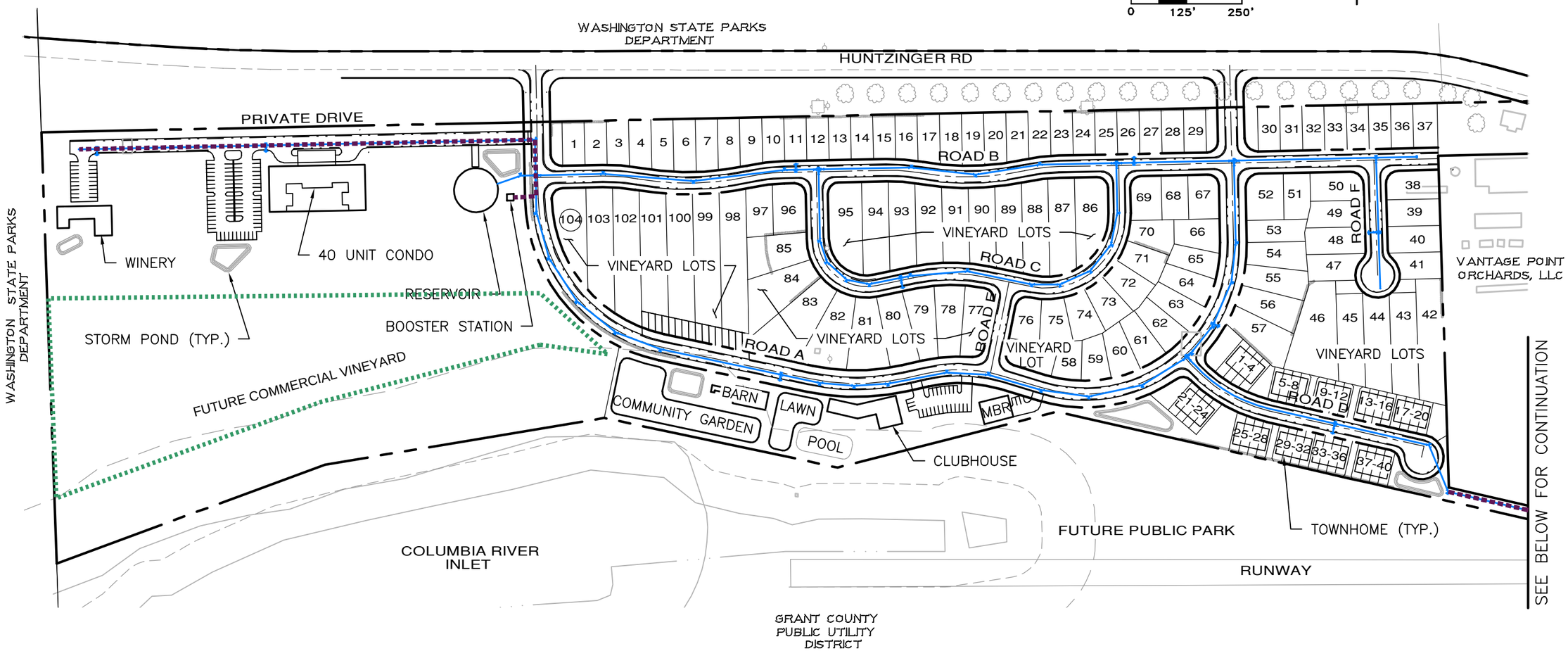
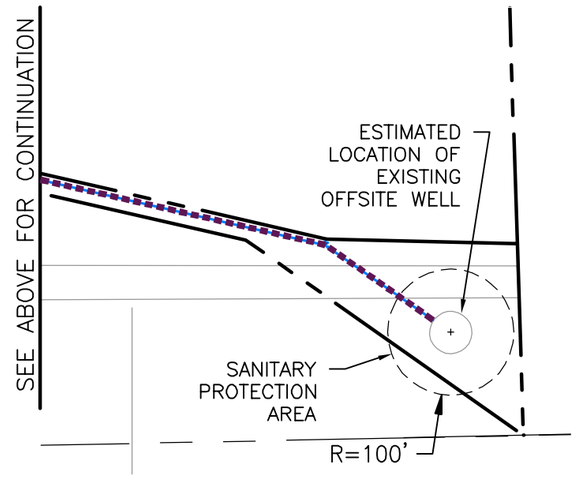


LEGEND

- 8" WATER MAIN
- 10" WATER MAIN
- LAND AVAILABLE FOR VINEYARD DEVELOPMENT



DRAWING: EN-06

BCSCBN, INC.

VANTAGE BAY PUD

FIGURE 1

ESM CONSULTING ENGINEERS LLC
33400 8th Ave S. Suite 205
Federal Way, WA 98003
FEDERAL WAY (253) 838-6113
EVERETT (425) 297-9900
www.esmcivil.com
Civil Engineering | Land Surveying | Land Planning
Public Works | Project Management | Landscape Architecture

JOB NO. 1396/001/014 DATE: 03/07/2019

DRAWN: CJR SHEET 1 OF 1

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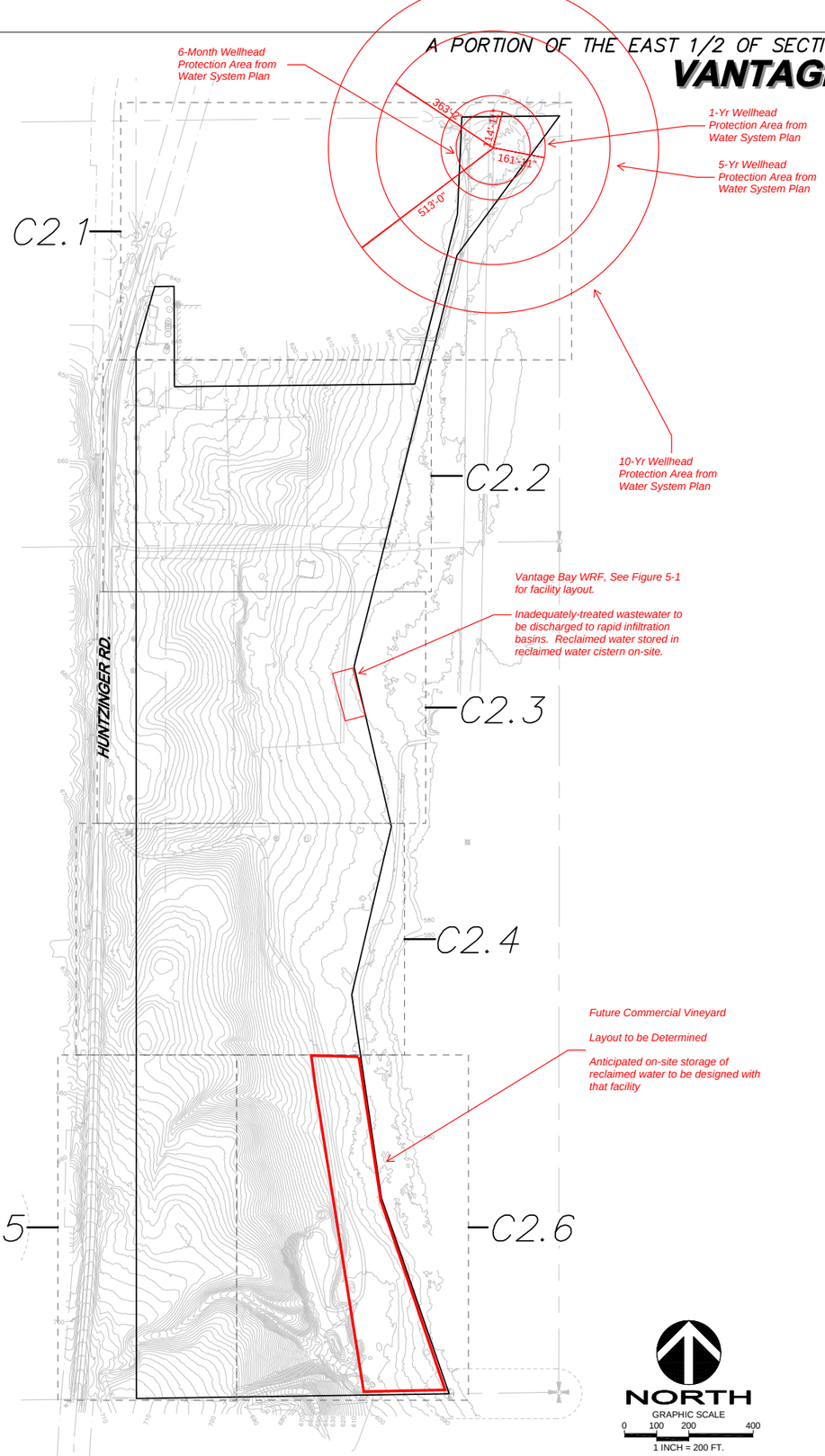
A PORTION OF THE EAST 1/2 OF SECTION 30, TOWNSHIP 17 N., RANGE 26 E.,W.M.

VANTAGE BAY PUD



NORTH

GRAPHIC SCALE

0 100 200 400

1 INCH = 200 FT.

BCSCBN, INC.

VANTAGE BAY PUD

FIGURE 2

CONSULTING ENGINEERS LLC

33400 8th Ave S, Suite 205
Federal Way, WA 98003

FEDERAL WAY (253) 838-6113
EVERETT (425) 297-9600

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JOB NO. 136/060.01a | DATE: 03/07/2019

DRAWN: CJR | SHEET 1 OF 1

be applicable in the future.

The proposed water system includes looped 8- and 10-inch water mains, a 150 gpm groundwater well, a 705,000 gallon welded steel reservoir, and a 73 gpm booster station with fire pump to serve a pressure zone in the southwest portion of the water system.

The owner of the system is BCSCBN, Inc., a Washington For Profit Corporation. The Owner's contact is:

Bill Cowin, President
BCSCBN, Inc.
21828 87th Avenue SE, Suite 200
Woodinville, WA 98072
(425) 488-7625

The water system and water reclamation facility will be operated on a contractual basis. The water system operator will be Valley Water Services, and the water reclamation facility (WRF) operator will be Ron Roduner. The ongoing operation of the water, wastewater, and reclaimed water utilities will be administered by the Vantage Bay Homeowner's Association that will be formed by BCSCBN, Inc. Due to the measured, consistent growth within the development that is assumed at this time, BCSCBN will undertake this administrative role until such a time as there has been sufficient private ownership within the development to establish the Homeowner's Association. It has been BCSCBN's experience that every development is different, and the transition period where the Homeowner's Association will receive operating authority will be determined as it makes the most sense for this community. BCSCBN is a developer with extensive experience transitioning its communities into self-reliance in this manner.

1.03 Review of Existing Reports

Existing documents and reports that were reviewed in preparing this Report include:

- *Vantage Bay Water System Plan*, PLSA Engineering & Surveying, 2019
- *MBR System Budget Proposal*, Enereau Systems Group, Inc., 2020
- *Infiltration Evaluation,* Earth Solutions NW LLC, 2020
- *Technical Memorandum*, RH2 Engineering, 2020

In addition to the above documents, BCSCBN, Inc. staff members were consulted to help develop the planning numbers and assumptions used in this Report.

1.04 Scope

This document is organized into the following chapters:

Chapter 1 – Introduction. This chapter contains a background of the project, purpose, and scope of the report.

Chapter 2 – Planning Data. This chapter includes a discussion of general planning data required to complete later chapters of the report.

Chapter 3 – Regulatory Requirements. This chapter includes a discussion of the anticipated Reclaimed Water Permit requirements, Biosolids Management (WAC 173-308), and its effect on the WRF.

Chapter 4 – Wastewater Flows and Loadings. This chapter develops flows and loadings that will be used in subsequent chapters to develop the capacity of the WRF.

Chapter 5 – Water Reclamation Facility Design. This chapter describes and provides detailed capacity analysis of the proposed WRF.

Chapter 6 – Financing. This chapter presents a plan for Vantage Bay to finance the project and operation and maintenance costs associated with the proposed WRF.

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2 PLANNING DATA

2.01 Introduction

The configuration of a wastewater collection and treatment system is influenced by community development trends and timing, regulatory requirements, growth considerations, and topography. This chapter addresses growth considerations by providing a projection of the population growth within the sewer service area for the 20-year planning period.

2.02 Planning Period

The developer is currently in the process of constructing the transportation and utility infrastructure for Vantage Bay and has been approached by potential buyers for approximately half of the residential lots. Once this infrastructure has been constructed, lots will be sold and homes will begin construction in the following years. It is anticipated that the WRF will be in construction concurrently with the initial buildout of lots, and these homes will be ready for occupation when the WRF is commissioned. For planning purposes, the initial commissioning of the WRF is assumed to occur with 14 individual homes constructed.

Per Page 24 of the *Vantage Bay Water System Plan* (PLSA, August 2019) (Water System Plan), it is assumed that the water system will reach complete buildout within a 10-year planning period. It is further assumed that the WRF will be constructed and commissioned in the spring of 2021. This would correlate to a 10-year buildout by the end of 2031. To remain consistent with Department of Ecology planning requirements, a 20-year planning period will also be identified herein.

2.03 Service Area

The service area for Vantage Bay is shown in Figure 1. The projected service area is defined as the residential, business, commercial, and public areas served within Kittitas County parcels 272933 and 622933. Growth within the service area is expected to occur through infill within the service area. It is not anticipated that there will be new connections outside of this system in the future. A commercial vineyard will be developed in the future east and south of the currently planned development.

2.04 Service Area Population

As described in the *Water System Plan*, the planned housing density for Vantage Bay is 2.57 people per household, and there are 184 housing units (104 individual, 40 townhome, 40 condo units) planned for the development. Three nonresidential connections will also be established for community use. This results in a buildout population of 473 people (184 housing units * 2.57 people/household). The planned population growth, assuming 14 individual units constructed and steady growth for the following 10 years, is summarized in Table 2-1.

Table 2-1
Vantage Bay Projected Population

Year	Individual Households (1)	Additional Housing Units (2)	Service Area Population (3)
2021	14	0	36
2022	23	8	80
2023	32	16	124
2024	41	24	168
2025	50	32	211
2026	59	40	255
2027	68	48	299
2028	77	56	342
2029	86	64	386
2030	95	72	430
2031	104	80	473
2041	104	80	473

(1) 14 Individual Households in 2021 and construction of 9 units each year thereafter.
(2) Assumed construction/occupancy of an additional 8 housing units within townhome and condo facilities each year
(3) Service Area Population = (Individual Households + Additional Housing Units) * 2.57.

2.05 Environmental Factors

Various natural features of the service area are discussed below, such as climate and precipitation, geography, topography, soils, surface and ground water resources, and flood hazard areas.

2.05.1 Climate and Precipitation

The climate in the Vantage area is influenced to a great extent by the Cascade Range and the Rocky Mountains. The Rocky Mountains shield the County from the more severe winter storms moving southward across Canada, while the Cascade Range forms a barrier to the early movement of moist air from over the ocean; however, some of the air from each of these sources reaches Vantage.

In the Vantage area, summers are warm or hot. Precipitation in summer falls mainly as showers, frequently as thunderstorms. In winter the ground is frequently covered with snow. Chinook winds, which blow downslope and are warm and dry, often melt and evaporate the snow.

Table 2-2 presents the temperature and precipitation data for the City of Quincy, which is near the project area.

TABLE 2-2
Climate Data – City of Quincy [1]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	40	48	59	67	76	83	92	91	81	66	50	38	66
Average Min. Temperature (F)	26	27	32	38	46	53	58	56	47	37	30	23	39
Average Temperature (F)	33	38	46	53	61	68	75	74	64	52	40	31	53
Average Total Precipitation (in)	0.9	0.7	0.7	0.6	0.5	0.6	0.3	0.2	0.3	0.6	1.1	1.2	7.6
Average Pan Evaporation (in)	0.0	0.0	0.0	5.8	8.1	9.0	10.2	8.5	5.5	2.6	0.0	0.0	49.7

(1) Data from Weather Atlas, weather-us.com and Western Regional Climate Center, wrcc.dri.edu

2.05.2 Geography

Vantage Bay is located south of the Town of Vantage in Kittitas County, along Interstate 90. The development is approximately 29 miles east of Ellensburg, 43 miles southwest of Moses Lake, and 69 miles northwest of Richland.

2.05.3 Topography

Vantage Bay is located along the west face of the Columbia River. The topography of the site rises somewhat evenly from east to west, parallel to the river. The southwest portion of the development is at a higher elevation and will be served with potable water through a booster station. The service elevations throughout Vantage Bay are expected to range between approximately 590 ft above mean sea level (amsl) and 720 ft. asml.

2.05.4 Soils

Soils in the vicinity of Vantage Bay are primarily gravel with varying amounts of silt, sand, and cobbles. The fines content of the native soil generally decrease with depth. Soils are further described in the *Infiltration Evaluation* (Appendix C).

2.05.5 Surface Water

The predominant geographic feature in the surrounding area, and the primary draw to the Vantage area, is the Columbia River. The river is a major source of recreational and commercial opportunities. The Columbia River is classified as a shoreline of State significance and falls under the Shoreline Management Act of 1971, Chapter 90.58 RCW. Thus, use of the Columbia River must comply with all state requirements and laws which manage shorelines of statewide significance.

2.05.6 Groundwater

Vantage Bay's water supply is provided by a single groundwater well, Well No. 1. The well is rated for 150 gpm. The proposed WRF will return treated wastewater to the groundwater to recharge aquifers during periods where the wastewater is not being used for irrigation purposes. As a result, it is anticipated that the development's Water Reclamation Permit may require groundwater monitoring to assess any potential degradation of groundwater as a result of the discharge of treated wastewater to groundwater.

Per the *Infiltration Evaluation* (Appendix C), groundwater in the vicinity of the proposed WRF is more than 8 feet deep, as groundwater was not encountered during the excavation of the soil evaluation test pits. The groundwater level and potential impact of a groundwater discharge was further investigated in the *Technical Memo* (RH2, 2020) (Appendix G). As identified in the *Technical Memo*, it has been assumed that the basalt layers in the vicinity of the infiltration system will segregate treated flows from groundwater below, and therefore treated reuse water will not significantly infiltrate and comingle with groundwater below this basalt layer. Instead, it will diffuse radially and ultimately migrate to the Columbia River over a period of approximately six months. The depth of the Columbia River in this location can vary significantly over short periods of time due to the operation of Wanapum Dam and a nearby inlet to the River, which will result in a flushing action as treated reuse water flows out of the storage above native basalts and surface water from the Columbia River is forced into this storage when the headwater is above storage elevation.

2.05.7 Flood Hazard Areas

The FEMA maps for the surrounding area do not suggest that there are any flood hazard areas within the service area, aside from localized flooding potential due to low spots in site topography.

2.06 Domestic/Industrial Wastewater Treatment Facilities

Vantage Bay will not discharge treated wastewater to a receiving water that is shared by other entities due to the nature of the discharge to groundwater, which ultimately enters the Columbia River in a diffused, nonpoint manner. The closest domestic wastewater treatment facility is the Town of Vantage WWTF to the north, which is a conventional aeration basin facility with chlorine disinfection and surface discharge into the Columbia River.

During the initial planning for the Vantage Bay development in 2006, BCSCBN, Inc. made contact with Vantage staff and government to determine the feasibility of discharging wastewater to the Town's WWTF. At that time, Town staff reviewed the available treatment capacity at the WWTF and determined that upgrades to the WWTF would be required to accommodate flows from a development of Vantage Bay's size. After both parties investigated this potential partnership, Vantage determined that they were not able to procure the necessary funding for WWTF improvements and the potential partnership was no longer pursued. The possibility of partnering with Vantage was considered again in 2019, although a review of the discharge permit for the Vantage WWTF, WA-0050474, identifies a treatment capacity that is not sufficient to

accommodate the projected flows and loadings from the Vantage Bay development, and upgrades to that facility would likely require significant planning activities that are not congruent with Vantage Bay's development schedule. Furthermore, discharging wastewater to the Vantage WWTF would preclude the possibility of treating wastewater on-site and having a source of reclaimed water for commercial irrigation purposes. At this time, a potential partnership has not been considered further.

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3 Regulatory Requirements

3.01 Introduction

Regulatory requirements are used to develop design criteria as well as devise a long term strategy for discharge of treated liquid effluent and management of residual solids generated by the wastewater treatment process. This chapter identifies and summarizes the regulations that affect the planning, design, and approval of Vantage Bay's proposed WRF at the federal, state, and local regulatory levels.

3.02 Water Quality Standards for Ground Waters of the State of Washington, Chapter 173-200 WAC

WAC 173-200 establishes ground water quality standards for the State of Washington. The goal of Ground Water Quality Standards is to minimize the impact to background water quality by promoting the most effective and reasonable treatment and reduction of wastewater discharges. Since ground water in the State has not been fully characterized, especially the interconnection between aquifers, the State protects all ground water equally. Therefore, the standards do not differentiate between the ground water receiving a wastewater discharge because all ground water is classified as a potential source of drinking water and/or potentially interconnected with a potential source of drinking water.

Water quality standards have been developed for ground water for parameters such as fecal coliform, pH, nitrate, metals, and toxic, radioactive, and deleterious substances.

The State of Washington has interpreted the Ground Water Quality Standards in Washington State Department of Ecology Publication 96-02, *Implementation Guidance*, which has been used in identifying requirements and Vantage Bay's compliance with them.

3.02.1 Anti-Degradation Policy

The anti-degradation policy is designed to ensure the protection of the State's ground waters and natural environment. Anti-degradation protects background water quality and prevents the degradation of the State's waters beyond the criteria. The anti-degradation policy is based on RCW 90.48.010 (the Water Pollution Control Act) and RCW 90.54.020(3) (the Water Resource Act).

The anti-degradation policy has a two-tiered approach. The first tier requires that existing and future beneficial uses be protected. As a result, the ground water is protected as a potential source of drinking water.

The second tier requires that whenever ground waters are of a higher quality than State ground water criteria, the existing water quality shall be protected, and contaminants that would reduce the existing water quality will only be allowed to enter the ground water when

it is in the overriding public interest, and only when the contaminants are provided with all known, available, and reasonable methods of prevention, control, and treatment (AKART) prior to entry. Regardless of the quality of the receiving water, AKART must be applied to all wastes.

Based upon the limited groundwater monitoring data that Vantage Bay has collected during the development and approval of Well No. 1, it is assumed that the ground water in the vicinity of the WRF is of higher quality than the numerical criteria in WAC 173-200-040, although it is likely that additional sampling will be necessary during the development of the State Waste Discharge Permit. As a result, it is necessary to protect the quality of the ground water by reducing the discharge concentration of various contaminants. Table 3-1 summarizes the ground water criteria for which sampling efforts have identified a measurable value, along with the corresponding measured value.

TABLE 3-1
Ground Water Quality

Parameter	Ground Water Criteria (1)	Groundwater Concentration (2)
Barium (mg/L)	1.0	0.028
Fluoride (mg/L)	4	0.28
Total Nitrogen (mg/L)	10	4.18
Iron (mg/L)	0.30	1.22
Manganese (mg/L)	0.05	0.022
Chloride (mg/L)	250	86.8
Sulfate (mg/L)	250	50.9
Zinc (mg/L)	5.0	0.008
Total Dissolved Solids (mg/L)	500	497
pH (Standard Units)	6.5 – 8.5	6.1
Total Coliform Bacteria (# / 100 mL)	1	<1

(1) Per WAC 173-200-040 Table 1.
(2) Groundwater sample, 5/24/2018

It is noteworthy that iron and pH were measured at values outside of the acceptable range for these parameters, although due to the nature of a single sample having been taken, it is possible that these values were not typical for groundwater in the area, or an error was made in the sampling or analysis. As identified above, it is assumed that additional sampling will be undertaken during the development of the State Waste Discharge Permit.

3.02.2 Monitoring Plan

Some level of ground water monitoring is required for all water reclamation facilities which discharge effluent to ground water, which the proposed facility will do during periods where irrigation demands are lower than effluent flows. It is anticipated that ground water monitoring provisions will be included in the future State Waste Discharge Permit.

3.02.3 Discharge Permits

The primary means for achieving the water quality standards of WAC 173-200 is the issuance of discharge permits, such as a State Waste Discharge Permit issued by the Department of Ecology. It is unknown what the final effluent permits of a future permit will be, as the determination of these limits may be influenced by additional groundwater sample results. However, for planning purposes, a similar facility's Reclaimed Water Permit has been reviewed.

The City of Quincy produces Class A reclaimed water for groundwater recharge and other beneficial uses, including a reclaimed water and reuse water utility that serves the nearby data centers for cooling water and future irrigation uses. Reclaimed Water Permit ST 5278 defines the discharge limits for the Quincy WRF. Vantage Bay plans to produce an equivalent quality of effluent for irrigation purposes and discharging treated effluent to groundwater, therefore it is assumed that future discharge permit requirements will be similar. At this time, Vantage Bay is pursuing a State Waste Discharge Permit, but may consider transitioning to a Reclaimed Water Permit if the degree of water reuse requires it. Treated effluent limits anticipated for the future discharge permit are summarized in Table 3-2. BOD_5 and TSS limits are also assumed to include provisions that 85% of influent loading be removed, which may be more stringent than the concentration limits for some discharge conditions.

TABLE 3-2
Discharge Permit Final Effluent Limits (1)

Parameter	Average Monthly	Average Weekly	Sample Maximum
Reclaimed Water Limitations			
Biochemical Oxygen Demand (5-day)	10 mg/L	15 mg/L	
TSS	15 mg/L	23 mg/L	
Dissolved Oxygen	Measurably present in secondary effluent at all times		
Coagulated/Filtered Wastewater – Prior to Disinfection			
Turbidity (2)	2 NTU		5 NTU
Disinfected – Reclaimed Water			
Total Nitrogen as N	10 mg/L		15 mg/L
Total Coliform	2.2 MPN / 100 mL		23 MPN / 100 mL
pH	Shall be between 6 and 9 standard units at all times		

(1) Concentration limits equal to those of City of Quincy, Reclaimed Water Permit ST 5278.
(2) Turbidity limit assumed only for water discharged to irrigation services.

3.03 Reclaimed Water, Chapter 173-219 WAC

The purpose of WAC 173-219 is to encourage the use of reclaimed water to help meet the growing need for clean water across the state by establishing a regulatory framework for the generation, distribution, and use of reclaimed water for the beneficial uses established in Chapter 90.46 RCW. To assist proponents, applicants, permittees, owners, generators, distributors, design engineers and users regulated by these regulations, the State has developed the *Reclaimed Water Facilities Manual* (Purple Book) to better understand WAC 173-219. As stated previously, it is unknown at this time whether Vantage Bay will pursue a Reclaimed Water Permit in the future or simply irrigate with treated effluent through provisions in a State Waste Discharge Permit, but it is their intent to construct a treatment facility that can meet these provisions without additional upgrades, if so desired. For this reason, the Reclaimed Water requirements are reviewed herein.

3.03.1 Water Rights Considerations

Reclaimed water projects are interrelated with wastewater treatment and potable water use with respect to water rights. In the majority of cases, a treated wastewater effluent is returned to Waters of the State through a point discharge to surface water or ground water. This treated water is subsequently withdrawn by downstream water users to be used again. Through the development of a reclaimed water project, these point discharges are no longer provided, and the quantity of water available for downstream water users is diminished. For this reason, the Reclaimed Water Use Act prohibits the cessation of a wastewater discharge, for the purpose of reclaiming it and putting it to beneficial use, if doing so will cause an impairment to a downstream water right.

This project should not have an impact on downstream or downgradient water rights, as there is not an existing discharge of treated water being returned to ground water. Due to the proximity to the Columbia River, it is likely that a greater impact to ground water availability would have been using Vantage Bay's water rights to support a project that would discharge treated wastewater to the river in lieu of percolating treated water to ground water. The presence of a basalt layer above existing ground water may reduce the volume of treated reuse water that percolates to ground water, instead artificially storing a fraction of it above this layer.

Treated effluent will only be reused during approximately half of the year once the commercial vineyard is developed, while effluent will be discharged to ground water, and ultimately the Columbia River, during the remaining months. The reuse will also return water through percolation of irrigation water. Unlike surface water discharges where instream flows are a significant factor in how potable water is used, the timing of ground water returns have a minimal effect on available water supply, although flushing action of the Columbia River inlet may withdraw the treated reuse water in sync with the management of the Columbia River elevation at Wanapum Dam. For all of these reasons, it is assumed that this project will not impair existing water rights.

3.03.2 Specific Use-Based Requirements

There are two classes of reclaimed water: Class A and Class B. The differentiation between classes is defined to prevent the general public from having direct contact or use of water that could be a risk to public health. Class B reclaimed water is of lower quality and is limited to use with public access setbacks, whereas Class A requires additional treatment, but is allowable for public contact. As identified in WAC 173-219-390, Table 3, the reclaimed water produced for beneficial use in Vantage Bay would be required to be treated to Class A standards because it would be used for "Landscape irrigation with direct or indirect public access" and "Irrigation of food crops."

3.03.3 Operator Certification

All water reclamation facilities are required to be operated by an individual with a State of Washington operator certification equal to or greater than the classification of the facility. As identified in Table 5-7 of the *Purple Book*, an MBR facility producing Class A reclaimed water at less than 10 MGD is classified as a Level III facility.

Furthermore, Vantage Bay is proposing to operate a reclaimed water distribution system in the future that will maintain a pressurized source of reclaimed water to irrigation meters at the future commercial vineyard, public facility landscaping, and/or individual lots for lawn irrigation. Per page 68 of the *Purple Book*, the operator of this distribution system must maintain credentials for at least a Water Distribution Manager In-Training 2 (WSDM-IT 2).

Finally, due to the nature of operating a reclaimed water distribution system, there is a high likelihood for potential cross connections between reclaimed water and potable water piping, and therefor a Cross Connection Control Specialist (CCS) and Backflow Assembly Tester (BAT) will both be required for proper review and testing of the system on an ongoing basis. Vantage Bay has already contracted for these services as part of its process of developing the *Water System Plan*.

3.03.4 Chlorine Residual

Per page 94 of the *Purple Book*, maintenance of chlorine residual is required in distribution lines that convey reclaimed water from the treatment facility to the use area unless this requirement is waived by the lead agency (Ecology). For this project, treated wastewater will be stored in an open tank to be pumped to the commercial vineyard for irrigation (future) or pumped into the rapid infiltration drainfield for discharge to ground water. Treated wastewater will be circulated through the UV disinfection system, thus maintaining a disinfected state within the clean water cistern. As such, the treated wastewater will not be stored for significant periods of time in this tank, and it is unlikely that there will be a significant opportunity for algal growth and other water quality concerns. This is summarized by the first bullet point on page 94, which states that the lead agency might not require a chlorine residual "When the hydraulic retention time in the distribution system prevents significant deterioration in water quality from the point of compliance." Therefore,

it will be assumed for planning purposes that chlorine will not be injected into the force main serving the future commercial vineyard.

3.03.5 Distribution System Construction Standards

As identified in *Planning for the Distribution of Reclaimed Water* (American Water Works Association) and WAC 173-219-360(2), it is standard practice for all reclaimed water distribution piping to be purple in color and to have appropriate signage identifying the use of reclaimed water on the premises. Future piping to the commercial vineyard will comply with this standard.

WAC 51-56-1503.4 also identifies the need to utilize air gaps when potable water is used as makeup water for reclaimed water applications that do not have sufficient reclaimed water availability. This design standard will be adhered to in the future development of the commercial vineyard irrigation system, as it is highly likely that makeup water will be required at various times throughout irrigation season to address reclaimed water production shortfalls, particularly before the service area is completely built out.

Reclaimed water distribution piping must be designed with care to provide adequate separation from other utilities. In one respect it is similar to potable water in that it is a disinfected water with an expectation of water quality that must be maintained for ongoing use. As such, buried reclaimed water pipes are required to maintain a separation of 10 feet horizontally and 18 inches vertically from pipelines containing untreated or partially-treated wastewater is required where feasible. However, reclaimed water does not meet the water quality standards of potable water and is considered a potential pollutant for potable water distribution piping. Therefore, the same separation of 10 horizontal feet and 18 vertical inches is required from potable water distribution piping where feasible. Design standards further describing these separation requirements are contained in the Department of Ecology's *Criteria for Sewage Works Design* and Ecology's *Pipeline Separation Design and Installation Reference Guide*.

3.03.6 Reclaimed Water Contingency Plan

The proposed use for reclaimed water is to supplement or replace irrigation demands for a commercial vineyard, to be constructed after the initial phases of residential construction are complete. The approved *Water System Plan* identifies that reuse water from the WRF could conceivably replace customer irrigation throughout the development, but it was determined after approval of that plan that the future development of a commercial vineyard would provide a more straightforward use for the reclaimed water, would represent significantly fewer potential cross-connections, and substantially less reclaimed water pipe would be constructed. However, the *Water System Plan* capacity analysis also confirms that there is sufficient capacity in the water system to provide irrigation with potable water, and therefore the reuse water can be used for commercial purposes instead without having an impact on the water system.

An irrigation water analysis of the commercial vineyard has not been completed to date. As

addressed in the *Water System Plan*, a backup water source will be needed for the vineyard to provide irrigation water during periods where reuse water is unavailable due to WRF process upsets or low effluent flowrates due to the transient nature of the service population. The *Water System Plan* also identifies that the Vantage Bay water rights do not currently allow for commercial irrigation, and a change application would be required to allow for any potential irrigation water for the vineyard to be served by the Vantage Bay water system. It will be determined in the future if it is preferable to maintain a completely separate vineyard irrigation system with dedicated well and reuse water connection with backflow prevention, or if additional source capacity will be added to the Vantage Bay water system and the water rights are amended to allow for vineyard irrigation intertie with the water system.

As addressed herein, the Vantage Bay WRF may potentially discharge Class A reclaimed water for irrigation purposes during irrigation season and to a rapid infiltration drainfield for discharge to ground water the remainder of the time. The rapid infiltration drainfield will have sufficient capacity to operate in this manner indefinitely with a redundant basin to allow a portion of the drainfield to be removed from service for repairs or maintenance. For this reason, there is not a need for a contingency plan for how to discharge effluent during periods where there is no demand for reclaimed water; this will be a planned and regular operating condition for the WRF.

3.03.7 Reclaimed Water Reliability Standards

To protect public health, reclaimed water generators are required to meet the reliability standards identified in WAC 173-219-350. The required standards and intended means of addressing them are identified below.

3.03.7.1 Operational Reliability Requirements

Due to the transient nature of the service population, it is likely that the facility will be underloaded for its design capacity for a significant amount of time. As such, mechanical failure of equipment should not represent an immediate concern. The equipment used throughout the facility will be standardized to allow spare units to be maintained in inventory and replaced whenever necessary. For situations where a tank must be removed from service for a longer period of time, portable transfer pumps can be used to transfer flows as needed, and influent wastewater can be stored in the influent lift station wet well and equalization tanks as needed.

An operation and maintenance manual will be supplied for the facility, as required by WAC 173-219-350(a).

3.03.7.2 Bypass Prohibition

As identified herein, the intended operation of the WRF will include generation of Class A reclaimed water at all times, but it will only be used as such during irrigation season. For the remaining months of the year, the reclaimed water will be discharged through a rapid infiltration drainfield to recharge ground water and diffuse flow into a storage layer that

ultimately recharges the Columbia River, a beneficial use that is not required to meet the same water quality standards as irrigation. The rapid infiltration drainfield will be sized to facilitate discharge indefinitely, and redundant drainfield area will be constructed to allow the drainfield to alternate flow and recover as needed. During periods where there are irrigation demands but the effluent does not meet Class A requirements, flow will be diverted to this drainfield.

The transmission main to the rapid infiltration drainfield will also serve as a portion of the transmission main to the commercial vineyards. At the point where these pipes diverge, a motorized valve will be installed on the line to the commercial vineyard. When it is determined that the WRF effluent does not meet Class A reclaimed water requirements, the valve will close and all flow will be discharged to the rapid infiltration drainfield. This determination will be made manually when the system operators determine that lab results require it, or automatically when the system control require it due to equipment errors or measurements from continuous monitoring equipment, including but not necessarily limited to turbidity. It is intended that the vineyard will also have a valve on this line to control whether it receives reclaimed water from the system, based upon their needs.

The procedures specifying when and how reclaimed water can resume being used by the commercial vineyard are anticipated to be summarized in the future Reclaimed Water Permit and coordinated with regulatory staff in advance of the facility beginning operation.

3.03.7.3 Removed Substances

Solids removed from the treatment processes, including screenings, grit, solids, sludge, and filter backwash will not be reintroduced into the treatment processes or finished reclaimed water. Screenings, grit, and solids removed by the influent fine screen will be automatically discharged into a trash receptacle. Similar material removed on a periodic basis from the influent pump station wet well and equalization tank by vactor truck or similar tank cleaning will be removed from site. As identified in Chapter 5, suspended biomass will be recycled through the process and wasted on a periodic basis as is typical for an activated sludge treatment process. There are not any filter backwash processes planned for the WRF, but solids will accumulate on the surface of the membrane filters over time, which will be discharged on a routine basis through air scouring. These solids will remain in the solids recycle loop, similar to all other solids that are not advanced to the next treatment step as membrane permeate.

3.03.7.4 Diversion Requirements

As identified in Section 3.03.7.2, diversion of reclaimed water to the rapid infiltration drainfield during periods where reclaimed water standards are not met will occur as a combination of manual and automatic controls. For alarm conditions and for parameters that are required to have continuous monitoring to ensure compliance with discharge requirements, those instantaneous measurements can be used to generate a signal that will close a motorized valve to the commercial vineyard for the duration of the alarm or inadequate treatment condition. When laboratory results are being used to make a

determination, the motorized valve will be closed, and eventually opened, through the SCADA system by the operator. The valve will be specified as a "failed-close" valve so that it will close automatically during a power outage to address WAC 173-219-350(4)(b).

3.03.7.5 Alarm Requirements

The process SCADA will provide alarms as identified by WAC 173-219-350(5)(a) and (c). The motorized valve that controls whether reclaimed water can be supplied to the future commercial vineyard will be "failed-close" so that if there is a power outage condition that results in the valve not being capable of operation, but inadequately-treated effluent is being pumped from the WRF, the valve will be closed and effluent will not be supplied to the commercial vineyard.

3.03.8 Reclaimed Water Public Outreach

The proposed use for reclaimed water is to supplement irrigation water demand at a future commercial vineyard. Due to the transient nature of the Vantage Bay community, WRF operations data will be required to determine how effluent flowrates fluctuate throughout the year and how these flowrates compare with the need for a stable irrigation supply. It is assumed that the irrigation demand for the future commercial vineyard will be sufficient to utilize the available reclaimed water produced by the WRF, and on-site storage at the vineyard may be required to stabilize the irrigation supply. For this reason, Vantage Bay does not have plans to provide reclaimed water to the remaining community or to other water or reclaimed water purveyors in the surrounding area. If potential partners are identified in the future, steps will be undertaken to perform outreach activities.

3.03.9 Interlocal Agreements

Vantage Bay does not anticipate that any interlocal agreements with existing agencies will be required to operate the reclaimed water system. Reclaimed water will be provided to a commercial vineyard, and an operations agreement will be executed with the operating entity upon development of the vineyard and establishment of that business. That operating agreement will include provisions for how reclaimed water will be supplied to the vineyard and contingencies for potable water supply if a separate water source is not developed by the vineyard and instead water rights and supply are developed by the Vantage Bay water system.

3.04 State of Washington Biosolids Regulations, WAC 173-308

WAC 173-308 is the basis for the statewide biosolids management program. Rather than applying for a permit, facilities that are subject to the permit program apply for coverage under the existing statewide general permit. Due to the minimal volume of biosolids being generated at the Vantage Bay WRF, a decision has been made to have solids removed from the site on a periodic basis, rather than further treat biosolids on site. This sludge hauling will be coordinated

by Ron Roduner, the contract operator, as part of the operations agreement for the WRF. Apple Valley Pumping, a licensed septage hauler located in East Wenatchee, has been contacted and has agreed to perform this function on an as-needed basis once the WRF begins operation.

3.05 Other Regulatory Requirements

3.05.1 National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) was established in 1969 and requires federal agencies to determine environmental impacts on all projects requiring federal funding or federal permits. If a project is determined to be environmentally insignificant, a Finding of No Significant Impact (FONSI) is issued; otherwise an Environmental Impact Statement (EIS) is required. NEPA is not applicable to projects that do not include a federal component. The funding for this project is completely private in nature; therefore a NEPA report will not be completed at this time.

3.05.2 State Environmental Policy Act (SEPA)

The State Environmental Policy Act (SEPA), as presented in WAC 197-11-960, requires all governmental agencies to ensure that applicable environmental concerns are addressed in the process of project planning and documentation. Projects that have potential environmental impacts must complete a SEPA Checklist to satisfy planning and disclosure requirements. A SEPA Checklist was completed during development of the Vantage Bay Master Plan and is included as Appendix A.

3.05.3 State Environmental Review Process (SERP)

Any funding administered through the Department of Ecology, whether it contains federal funding or not, requires the completion of the State Environmental Review Process (SERP). SERP is similar in scope to a NEPA, and consists of the SEPA process in conjunction with a biological assessment and a federal cross cutter report. The biological assessment consists of the identification of all endangered or threatened species in the project area and how the project in question would be projected to impact each species. The federal cross cutter report identifies the 13 federal environmental authorities, provides project documentation to each authority, and certifies that the project is in compliance with each authority.

Due to the length of time required to receive certification from each authority, the cross cutter process is typically started early in the project. Only the SEPA, biological assessment, and public meeting are required for approval of an Engineering Report. However, similar to the NEPA requirements identified above, this project is not expected to utilize Ecology funding, and therefore SERP requirements do not apply to this project.

3.05.4 Archeological and Cultural Resources Survey

In November 2005, the Governor of Washington signed Executive Order 05-05, which requires state agencies to review capital construction projects for potential impacts to cultural resources. This review is to be done in conjunction with the Department of Archeological and Historical Preservation (DAHP) and any affected Tribes. Any potential archeological or cultural resources review would be completed during the design phase of the project.

Executive Order 05-05 specifically applies to projects that utilize funds appropriated from State Capital Budget funds. At this time it is anticipated that the private funding for the project will not trigger a requirement for archeological or cultural resources review. However, due to the project site being located in the vicinity of the Columbia River, it is reasonable to assume that there could have been historic people groups in the area, and therefore a possibility for cultural resources to be buried in the vicinity. For this reason, it is possible that a cultural resources review may become necessary as Vantage Bay pursues permitting for the project and receives comments from Tribal groups during applicable comment periods. Similarly, cultural resources may potentially become necessary during construction if evidence of artifacts or similar items are identified during excavation activities.

3.05.5 Shoreline Permitting in the State of Washington

The Shoreline Management Program manages shorelines through planning for and supporting all reasonable and appropriate uses of shoreline areas. The Washington State Shoreline Management Act of 1971 (SMA) defines shorelines as including the following:

- Lakes of 20 acres or greater, including reservoirs,
- Streams with a mean annual flow greater than 20 cubic feet per second,
- Marine waters,
- Areas within 200 feet landward of surface waters described above,
- Marshes, bogs, swamps, and river deltas associated with the surface water described above.

Shoreline permits are required from the local jurisdiction for any sizable development or activity within the shoreline area. Kittitas County administers the local shoreline master program in the vicinity of Vantage Bay. The Vantage Bay Shoreline Substantial Development Permit for the project has been secured, and is included in Appendix B.

3.05.6 Stormwater Permitting in the State of Washington

As part of the Federal Clean Water Act, the Department of Ecology administers stormwater permitting for the State of Washington. Stormwater is considered a point source of water pollution and therefore an NPDES permit is required. The State of Washington has developed a General Permit for construction stormwater.

Stormwater permit coverage is required if the project disturbs more than one acre of land and if there is the possibility that stormwater runoff can enter waters of the state or conveyance systems that convey stormwater to waters of the state.

It is anticipated that the construction of the WRF will disturb more than one acre of land since the scope of the improvements includes construction of multiple structures. Furthermore, the construction of the WRF is part of the larger project to develop the roads and utilities for the Vantage bay development. A construction stormwater permit will be procured for the entire project.

3.05.7 Kittitas County Codes

It is anticipated that one or more of the following permits will be required to construct the WRF within Kittitas County:

- Building Permit
- Plumbing Permit
- Electrical Permit

3.06 Regulatory Summary

A summary of the regulatory requirements for construction of the WRF is presented in Table 3-3.

TABLE 3-3
Summary of Regulatory Requirements

Permit/Report	Agency	Comments
Reclaimed Water Permit	Ecology	Vantage Bay to apply for permit during design
Biosolids Permit	Ecology	Will be covered under General Permit.
NEPA	Federal Agency	No anticipation of federal funding, not required.
SEPA	Kittitas County	Completed. See Appendix A.
SERP	Ecology	No anticipation of federal funding, not required.
Cultural/Archeological Survey	DAHP	Unknown. Potential requirement based upon public comment of future permitting processes.
Shoreline Substantial Development Permit	Kittitas County	Completed. See Appendix B.
Construction Stormwater Permit	Ecology	Will be applied for as part of the overall Vantage Bay construction project.
Building Permit, Plumbing Permit, Electrical Permit	Kittitas County	To be determined.

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4 Wastewater Flows and Loadings

4.01 Introduction

This chapter provides information on projected hydraulic, organic, and solids loadings to Vantage Bay's proposed WRF through the 10-year planning period (2031). Quantifying these parameters is necessary to design the capacity of proposed wastewater treatment processes and provide sufficient infrastructure for buildout of the community. To remain consistent with Department of Ecology requirements, a 20-year planning period is also identified, although due to build out projections, the flows and loadings are projected to remain unchanged beyond 2031.

4.02 Projected Wastewater Flows and Loadings

Projected wastewater flows and loadings for the design year 2031 are based on typical per capita unit loadings for municipal wastewater systems and water demands developed in the *Water System Plan*. For design purposes, it has been assumed that the Vantage Bay community will grow to buildout, although there is a high probability that many of the housing units will be unoccupied for substantial periods of time due to the transient nature of the target population. Rather than estimate the community's occupancy rate, the WRF design will use phasing and a modular design approach to address the growing flows and loadings as development occurs.

4.02.1 Average Annual Flow (AAF)

Average annual flow (AAF) is the average flow over a one-year period. This flow rate is used to estimate annual operation and maintenance costs for collection system and treatment facilities, and is the basis for developing flow ratios used in collection treatment system designs.

Projected water demand for Vantage Bay is summarized in Tables 3.6 and 3.7 of the *Water System Plan* and subdivided into various categories. These categories include irrigation-specific uses that are assumed to be replaced with reclaimed water once that distribution system becomes operable. Regardless of whether reclaimed water is used in lieu of potable water, that water demand is not projected to result in a corresponding wastewater flow to the WRF. Additional demand is also included to account for distribution system leakage which will not be conveyed to the WRF. Per Table 3.7 of the *Water System Plan*, the buildout non-irrigation, non-leakage average daily water demand for Vantage Bay is projected to be 40,200 gpd.

In addition to WRF influent flows that are generated by the service population, nearly all gravity collection systems are expected to experience infiltration and inflow (I/I). I/I consists of relatively clean ground, surface, or storm water that does not require treatment to the same levels that domestic sewage does. For a new collection system utilizing modern construction methods, a conservative estimate of 10 percent I/I will be assumed. Therefore, the total buildout AAF for Vantage Bay is projected to be 44,200 gpd (40,200 gpd + 4,000 gpd).

As shown in Table 2-1, the projected 2031 buildout population is 473 people. This results in a per capita flowrate of 93 gpcd. This is a reasonable value for the transient service population.

4.02.2 Maximum Month Flow (MMF)

The maximum month flow (MMF) is defined as the greatest single average monthly flow during the year. The maximum month flow is used to size most of the unit processes in a wastewater treatment facility, and is used as the critical flow in determining effluent limits for toxic substances (e.g. nitrates, chlorine, and heavy metals) on the basis of chronic toxicity for a groundwater discharge. The maximum month flow is used by Ecology to establish the "permitted capacity" for the wastewater treatment facility. The permitted capacity is used to determine when 85 percent of the facility's capacity has been reached, at which time Ecology requires the permittee to develop a formal plan to maintain adequate capacity. For this facility, it is assumed that the phased construction of treatment modules will be the primary mechanism through which Vantage Bay increases treatment capacity for the WRF.

The *Water System Plan* does not develop a maximum month water use value that can be used for projecting a corresponding MMF. However, both AAF and MMF values have been calculated for a variety of communities throughout eastern Washington. The ratio of MMF/AAF often ranges between approximately 1.2 and 2.5, depending upon the severity of collection system I/I, demographics, and the presence of significant water users and industry that can either stabilize wastewater flows or add a volatile element. For design purposes, a MMF/AAF ratio of 1.5 is utilized herein, resulting in a projected MMF of 66,300 gpd.

4.02.3 Maximum Daily Flow (MDF)

Maximum daily flow (MGD) is defined as the largest total flow over a 24-hour period occurring in a single year. The MDF is used to size processes that are affected by diurnal flow curves for proper performance (e.g. RAS pumping and equalization basins).

Similar to the calculation for AAF, projected maximum daily water demand is summarized in the *Water System Plan.* Per Table 3.7 of the *Water System Plan*, the buildout non-irrigation, non-leakage maximum daily water demand for Vantage Bay is projected to be 103,300 gpd. Including a 10-percent I/I of 10,300 gpd results in a projected MDF of 113,600 gpd.

4.02.4 Peak Hour Flow

Peak hour flow (PHF) is the peak sustained flow rate occurring during a one-hour period in a single year. The peak hour flow is used for design of collection and interceptor sewers, pumping stations, piping, flow meters, and certain unit treatment processes such as disinfection systems and separation units.

PHF is projected for Vantage Bay based upon the ratio of non-irrigation, non-leakage peak hour water demand and maximum daily water demand. Per Table 3.7 of the *Water System Plan*, this ratio is 2.8 (289,400 / 103,300). The resulting PHF is therefore 220 gpm (113,600 gpd * 2.8 / 1440 min/d).

4.02.5 BOD_5 Loading

The BOD_5 loading represents the number of pounds per day of oxygen-demanding material that enters the WWTF. BOD_5 loadings are used to design and size the WRF biological treatment processes (i.e. aeration basin) and BOD_5 loadings are used by Ecology to establish the "permitted capacity" for the WRF. The permitted capacity is used to determine when 85 percent of the WRF capacity has been reached, at which time Ecology requires the permittee to develop a formal plan to maintain adequate capacity.

Because the permitted capacity applies to the maximum month, maximum month loadings are analyzed for design purposes. Annual average loading is also calculated and is important for determining biosolids production.

To project BOD_5 loading, multiple methods should be considered to determine the more conservative approach. The first method is to consider influent wastewater strength. Per Table 3-18 of *Wastewater Engineering* (Metcalf & Eddy, Fifth Edition), a typical medium strength for untreated domestic wastewater is 200 mg/L. This concentration is used in conjunction with the projected AAF and MMF to calculate a loading as follows:

Avg. Ann. BOD_5 Loading: 44,200 gpd * 200 mg/L * 8.34 ÷ 1,000,000 = 74 lb/d
Max. Mo. BOD_5 Loading: 66,300 gpd * 200 mg/L * 8.34 ÷ 1,000,000 = 111 lb/d

An alternative approach would be to consider the design loading from the various service connections, per Table G2-2 of the *Orange Book*. The maximum month BOD_5 loading using this method is summarized as follows:

Dwellings: 0.2 ppcd * 473 people = 95 lb/d
Restaurant (Winery): 5,250 gal/d ÷ 50 gpcd * 0.2 ppcd = 21 lb/d
Restaurant (Club House): 10,500 gal/d ÷ 50 gpcd * 0.2 ppcd = 42 lb/d
Total: 158 lb/d

The total loading method is more conservative, therefore the buildout maximum month BOD_5 loading will be 158 lb/d. It is further assumed that the ratio of MMF/AAF will be applicable for the ratio of maximum month and annual average BOD_5 loading, therefore the design annual average BOD_5 loading is calculated to be 105 lb/d.

4.02.6 TSS Loading

The TSS loading rate represents the number of pounds per day of suspended material that enters the WRF. TSS loadings are used to design the size of biological treatment processes. In municipal wastewater, BOD_5 and TSS loadings are typically of similar magnitude. TSS loadings are used by Ecology to establish the "permitted capacity" for the WRF. The permitted capacity is used to determine when 85 percent of the WRF capacity has been reached, at which time Ecology requires the permittee to develop a formal plan to maintain adequate capacity. Because the permitted capacity applies to the maximum month, maximum month loadings are analyzed for design purposes.

The two methods used to estimate BOD_5 loading above are available to estimate TSS loading. Furthermore, the design values that would be used from these methods are nearly identical to the values used for BOD_5 (195 mg/L vs. 200 mg/L for *Wastewater Engineering* and 0.2 ppcd for both parameters in the *Orange Book*), and the *Orange Book* method will govern. As such, the design values for TSS will be identical to the BOD_5 design values for planning purposes.

4.02.7 Nitrogen Loading

Total nitrogen is comprised of organic nitrogen, ammonia, nitrite, and nitrate. Organic nitrogen is determined by the Kjeldahl method. Total Kjeldahl nitrogen (TKN) is the total of the organic and ammonia nitrogen. TKN loadings are used to design and size the nitrogen removal processes at the WWTF.

Due to the anticipated discharge of treated wastewater to ground water during periods where effluent flows exceed irrigation demand, total nitrogen concentration in the effluent is expected to be a primary design factor. Per *Wastewater Engineering*, a typical medium strength influent TKN concentration is approximately 35 mg/L. Comparing this to a typical BOD_5 concentration of 200 mg/L, the ratio of these values is 5.7. To be conservative and ensure that the biological treatment processes are adequately sized for nitrification and denitrification, a design ratio of 5.0 will be used. This results in an annual average TKN loading and maximum month TKN loading of 21 lb/d and 32 lb/d, respectively.

4.03 Summary of Projected Wastewater Flows and Loadings

A summary of the projected buildout design criteria for the Vantage Bay community for the years 2031 and 2041 is presented in Table 4-1. These values assume a 100-percent occupancy rate at full buildout to enable the facility to serve under these conditions. However, there is an understanding that partial occupancy could lead to an oversized facility, which would not be an economically responsible approach to construction, and could potentially decrease the overall level of treatment provided as a result. Furthermore, the packaged MBR system that is proposed for this project operates best under a peaking factor MDF/AAF of 2:1, which will result in building additional AAF capacity to meet the projected MDF. To address these conditions, the MBR will be constructed in three phases. Table 4-2 summarizes the design criteria for the three phases.

TABLE 4-1
Projected Buildout Wastewater Flows and Loadings

Flow Criteria	Design Year – 2031	Design Year – 2041
Average Annual Flow (gpd)	44,200	44,200
Maximum Month Flow (gpd)	66,300	66,300
Maximum Day Flow (gpd)	113,600	113,600
Peak Hour Flow (gpm)	220	220
Loading Criteria	**Design Year – 2031**	**Design Year – 2041**
Annual Average BOD_5 Loading (lb/d)	105	105
Maximum Month BOD_5 Loading (lb/d)	158	158
Annual Average TSS Loading (lb/d)	105	105
Maximum Month TSS Loading (lb/d)	158	158
Annual Average TKN Loading (lb/d)	21	21
Maximum Month TKN Loading (lb/d)	32	32

TABLE 4-2
Phased Wastewater Flows and Loadings

Flow Criteria	Phase 1 Criteria	Phase 2 Criteria	Phase 3 Criteria
Average Annual Flow (gpd)	25,000	41,000	57,000
Maximum Day Flow (gpd) (1)	50,000	82,000	114,000
Peak Hour Flow (gpm) (2)	100	160	220
Loading Criteria	**Phase 1 Criteria**	**Phase 2 Criteria**	**Phase 3 Criteria**
Annual Average BOD_5 Loading (lb/d) (3)	79	92	105
Maximum Month BOD_5 Loading (lb/d) (3)	119	138	158
Annual Average TSS Loading (lb/d) (3)	79	92	105
Maximum Month TSS Loading (lb/d) (3)	119	138	158
Annual Average TKN Loading (lb/d) (3)	16	19	21
Maximum Month TKN Loading (lb/d) (4)	24	28	32

(1) Maximum Day Flow = Average Annual Flow * 2.0 for biological treatment design purposes
(2) Peak Hour Flow = Table 4-1 Peak Hour Flow * Phase 1 Average Annual Flow ÷ Phase 3 Average Annual Flow
(3) Phase 1 BOD_5 and TSS Loadings are based upon concentrations of 285 mg/L per Table 4-1 flows and corresponding loadings.
(4) TKN Loading = BOD_5 Loading ÷ 5.

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5 Water Reclamation Facility Design

5.01 Alternative Analysis

The Vantage Bay development team has been pursuing this project for over fifteen years, and the preliminary plat was submitted and approved in 2006. During the ensuing time, the development team worked with various planners, engineers, municipalities, and regulatory agencies to follow the course that his has been determined for the overall development, and specifically the planning of the proposed WRF. A partial list of alternatives that were considered at various points during the planning process, and the subsequent rationale for no longer considering them, is summarized in the following sections. Other alternatives were likely considered in planning meetings or discussions that arose during the past fifteen years, but these alternatives were not formalized in reports or studies that are currently available.

5.01.1 Do Nothing

For many capital improvement projects, an evaluation of a "do nothing" alternative is undertaken to make a determination as to whether a project is necessary. For the Vantage Bay community, the "do nothing" alternative would consist of not constructing a wastewater collection and treatment system, and instead pursuing individual septic systems and drainfields for the properties. This would represent a significant departure from the plat that was approved by Kittitas County, as well as require revising the approved civil engineering plans for the roads and utilities within the development. Failure to pursue a centralized wastewater treatment facility would require the re-permitting of the plat, which the Vantage Bay development team would not consider at this time. Furthermore, reuse of treated effluent for irrigation purposes would no longer be feasible if wastewater were not collected and treated in a centralized location, and the proposed population density and lot sizes could not be supported without centralized treatment.

5.01.2 Discharge to Town of Vantage

The initial planning for Vantage Bay in 2006 was pursued with the expectation that the nearby Town of Vantage could treat the Vantage Bay wastewater. Town staff were contacted to pursue this approach, but it was determined that the Vantage WWTF did not have sufficient capacity to provide sewer service without significant upgrades. The cost of these upgrades would be borne by Vantage Bay, and combined with the required cost to build a lift station and force main between Vantage Bay and the Vantage WWTF site, this alternative was considered to be too expensive. An additional reason why this approach was not considered again in recent years was that discharge to the Vantage WWTF would result in effluent leaving the development and no longer being a future source of reclaimed water for irrigation purposes.

5.01.3 Construction of Evaporative Lagoons

This alternative would consist of constructing evaporative lagoons for storage and evaporation of effluent. The evaporative lagoon size would be based on local evaporation

rates. The average evaporation rates on a monthly basis for the nearby City of Quincy for the period 1941-2005 is identified in Table 2-2. The *Criteria for Sewage Works Design* states that a non-overflow lagoon impoundment shall be designed for the "wet" year in a 10-year recurrence interval with high precipitation. The evaporation rates identified in Table 2-2 are average rates. Therefore, for preliminary analysis the precipitation rates will be increased by 10 percent and the evaporation rates decreased by 5 percent to approximate a wet year. The "wet" year precipitation would be 8.4 in/yr and the evaporation rate would be 47.2 in/yr. If this alternative were selected, additional investigation into the evaporation and precipitation rates in the area could be performed to better refine these numbers.

For an evaporative lagoon to be a feasible means of wastewater disposal, the lagoon must be capable of evaporating the design annual flow of 16.1 million gallons (0.0442 MGD AAF * 365 days) between March and October. As stated above, the design net evaporation rate would be approximately 38.8 in/yr (47.2 in/yr evaporation – 8.4 in/hr precipitation) during this period. The calculations below summarize the required area of evaporative lagoons to adequately handle the design flow.

Required Area = 16.1 MG/yr ÷ 38.8 in/yr
= 2,160,000 ft^3/yr ÷ 3.2 ft/yr
= 675,000 ft^2
= 15.4 acres

As a means of comparison, the WRF site is significantly smaller than 1 acre. An evaporative lagoon would not fit in the space available, would have a negative environmental impact due to the likelihood of odors, and would not provide the possibility of reusing effluent for irrigation, as there would not be an effluent from the facility. For these reasons, this approach will not be considered further.

5.01.4 Construction of Conventional Activated Sludge Process

This alternative would consist of an activated sludge treatment process similar in scope to what is proposed for the Vantage Bay WRF, with the exception that a sedimentation step through the construction of secondary clarifiers would separate water from biosolids in lieu of the proposed membrane separation process. To meet redundancy requirements, two clarifiers would be required. Conventional activated sludge processes are typically operated at a mixed liquor suspended solids (MLSS) concentration of 3,000 – 5,000 mg/L, rather than the 12,000 mg/L proposed for the facility. This change would carry through the various biological treatment calculations, and would ultimately result in an increase in required treatment volume to maintain a similar biomass at a lower concentration.

The *Wastewater Engineering* recommends a maximum surface loading rate of 400-700 gpd/ft^2 for secondary clarifiers at maximum month flow and 1,000-1,600 gpd/ft^2 at peak hour flow for properly designed and operated clarifiers. *Wastewater Engineering* also recommends a solids loading rate of 24-36 lb/ft^2/d at maximum month flow and 43 lb/ft^2/d at peak hour flow. Assuming an operating MLSS concentration of 5,000 mg/L, these criteria would result in two secondary clarifiers, each with a diameter of approximately 20 ft. It is likely that the proposed WRF site could accommodate secondary clarifiers and larger treatment process tanks required due to a reduced MLSS concentration.

The construction cost required to construct the secondary clarifier tanks in place with reinforced concrete would approximately offset the savings from eliminating the membrane units, as the remaining treatment vessels will be delivered to the site, which is significantly more economical than cast-in-place concrete construction. During the design phase, the proposed treatment structures were transitioned from cast-in-place concrete to FRP tanks delivered to site, which reduced the cost of those structures by approximately 50-percent. For this reason, one of the primary reasons most often cited for not pursuing MBR treatment, high construction cost, does not apply to this installation. An additional filtration unit would also be required to meet reclaimed water treatment requirements, which further decreases the economic benefit to utilizing a conventional treatment process.

When compared to an MBR system, the development team determined that an MBR would be preferable because of the transient nature of the Vantage Bay service population. The flows and loadings to the facility are expected to vary more severely when compared to a more stable domestic population, and the resulting impacts on an activated sludge treatment plant are expected to be more severe, as well. These impacts often materialize in the form of poorly settling sludge and increased operator attention managing the facility to anticipate and react to flows and loadings variation. Process upsets are also highly undesirable as they will limit the volume of reclaimed water that can be produced by the facility due to insufficient treatment to Class A reclaimed water standards. Because the facility will be operated remotely on a contract basis, it is preferable to the development team to pursue a process design that is better capable of responding to variable influent flows and loadings, can be supplied by a single vendor, and is easily managed remotely.

5.01.5 Private Residence Irrigation

During the development of the *Water System Plan* in 2018 and 2019, it was assumed that the reclaimed water from the Vantage Bay WRF would be used for irrigation of shared public spaces such as parks, as well as individual irrigation systems for the various residential properties. However, as the development team reviewed the scope of that irrigation plan, it was determined that the construction of a reclaimed water distribution system within the development would require significantly more administrative management and a larger capital outlay than providing a single distribution main to the commercial vineyard site. It is assumed that the vineyard will have an irrigation water requirement that is greater than the volume of reclaimed water that the Vantage Bay WRF will produce, as well as a fairly stable demand. Therefore, it will be less expensive to supply one customer, rather than maintaining a more complex distribution system with hundreds of customers, service meters, and the corresponding administrative requirements of operating that utility.

5.01.6 Department of Health Permitted Large On-Site Sewage System

It was determined during the development of this Report that it may be feasible to pursue a Department of Health Large On-Site Sewage System (LOSS) permit for the portion of reclaimed water discharge that would be used for groundwater recharge. During preliminary discussions in pursuit of this approach, it was determined that the LOSS regulations would limit loading to 1 gpd/ft^2, with consideration of the high quality of water being limited to WAC 246-272B-06350(18)(c), which allows for a reduction in reserve area. As such, a

LOSS drainfield would be over 1.5 acres in size, which would be considerably more extensive and costly than a rapid infiltration drainfield designed based on hydraulics, as described later in this chapter. The DOH regulations are written under the assumption that treatment is required from the drainfield, whereas the Vantage Bay system already will provide sufficient treatment to meet ground water criteria without any further treatment from the soils. Therefore, this permitting avenue was not pursued further.

5.02 WRF Introduction

The proposed WRF will be constructed within Vantage Bay property and will include provisions for future expansion. A site plan depicting the proposed WRF and a proposed flow schematic are provided in Figures 5-1 and 5-2, respectively. The following sections will provide detailed descriptions and design criteria for each of the unit processes and other major structures. As identified throughout, the MBR design includes provisions for future expansion to accommodate a gradual increase in influent wastewater flows. Construction of a second and third phase will be necessary in the future to allow for overall buildout to full treatment capacity.

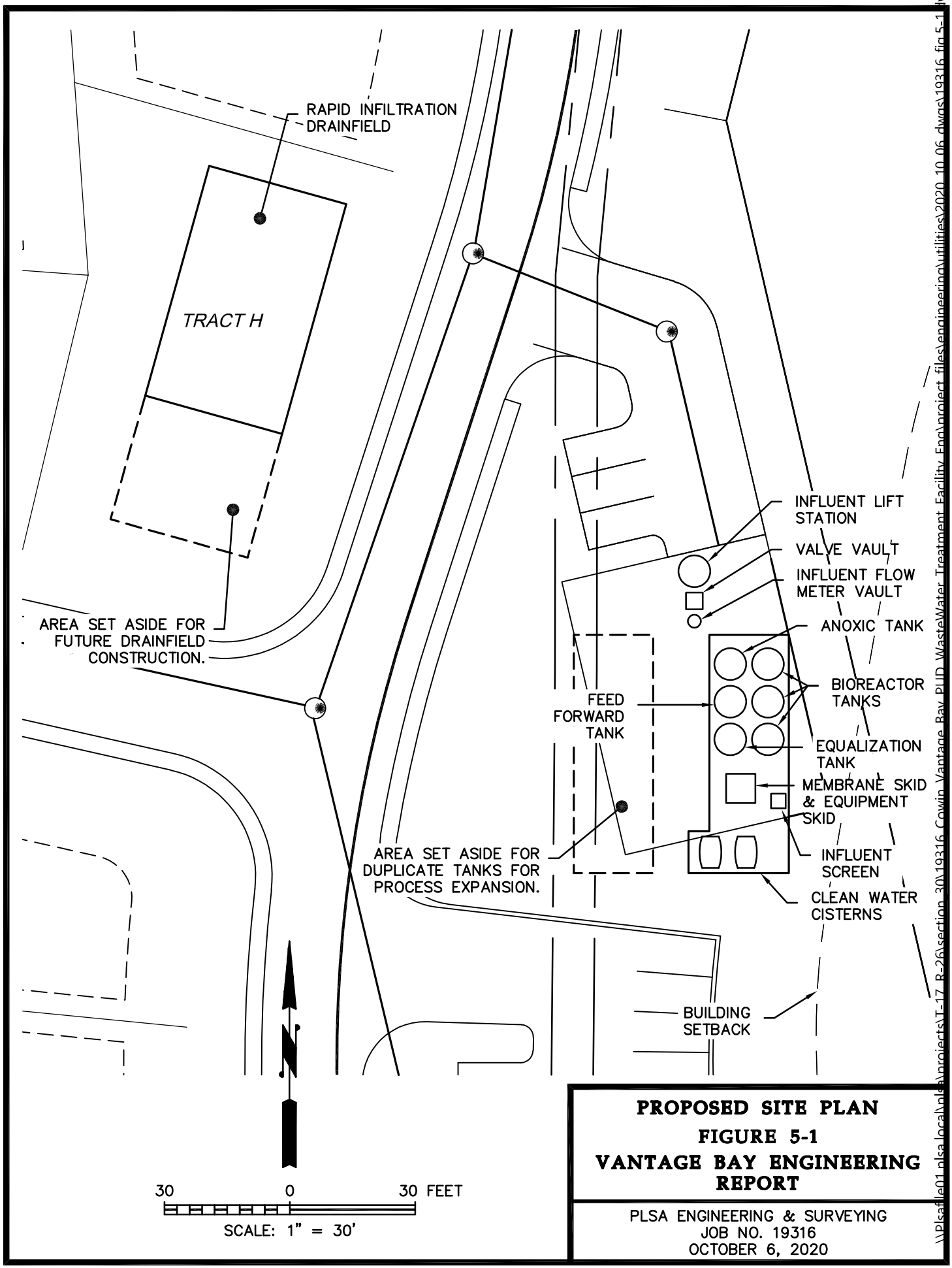
5.03 Wastewater Treatment

5.03.1 Influent Lift Station

Process Description

The design of the gravity sewer collection system throughout Vantage Bay is such that the influent line to the WRF will be between 7 and 8 feet deep. Although it may be feasible to construct deep basins that allow for water surfaces below grade to this extent, construction of such facilities would be needlessly expensive due to substantial excavations, and both operations and maintenance would be onerous for the facilities. Geotechnical investigations (Appendix C) have also indicated that there is bedrock and groundwater under influence from the Columbia River at depths of approximately 10 feet, which would complicate construction significantly. Therefore, a lift station will be constructed to elevate the water surface elevation within the MBR above existing grade, allowing treatment facilities to have water depths above 10 feet without excavating significantly into bedrock or groundwater. It would be beneficial to oversize the lift station to eliminate the need for the equalization basin described in the following section. However, there is not sufficient vertical separation from bedrock and groundwater to construct the required equalization volume in the available hydraulic profile, therefore the lift station will only serve to transfer wastewater into the MBR at peak flows, rather than equalize maximum day flows into the facility.

The lift station will consist of two interconnected FRP wetwells with two submersible centrifugal pumps installed. One pump will have sufficient capacity to pump the Phase 1 PHF, and the second pump will be redundant to allow the facility to adequately pump PHF if one pump is inoperable or removed from service for maintenance per *Orange Book* recommendations. To accommodate future growth of the MBR, piping will also be constructed to allow a third pump to be installed in the future to double lift station capacity.

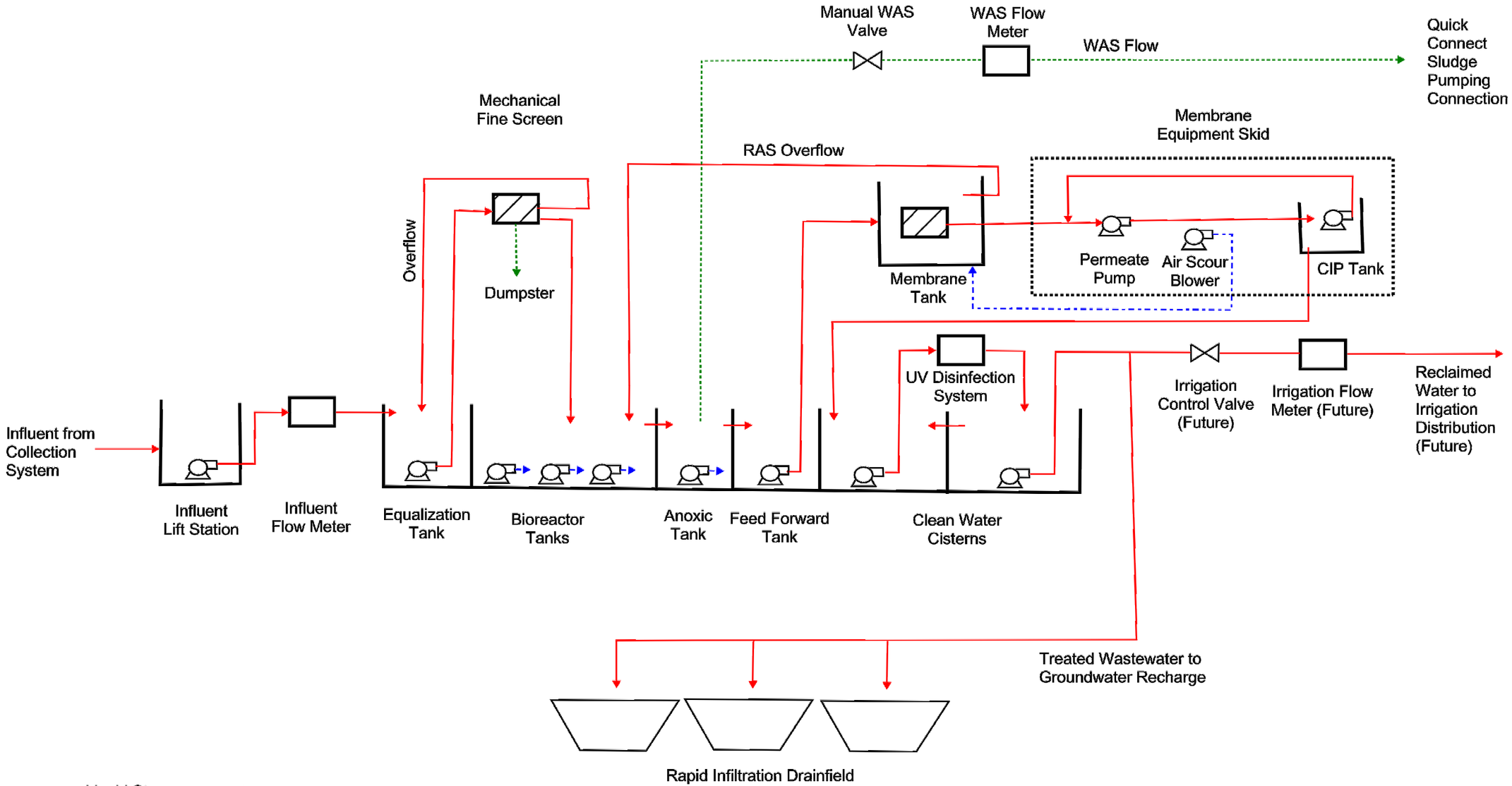


PROPOSED SITE PLAN

FIGURE 5-1

VANTAGE BAY ENGINEERING REPORT

PLSA ENGINEERING & SURVEYING
JOB NO. 19316
OCTOBER 6, 2020



PROPOSED PROCESS FLOW DIAGRAM
FIGURE 5-2
VANTAGE BAY ENGINEERING REPORT

PLSA ENGINEERING & SURVEYING
JOB NO. 19316
OCTOBER 06, 2020

However, expanding the operating volume of a lift station after it is in operation is not as straightforward, and the additional construction cost of providing buildout operating volume is anticipated to be significantly lower. For that reason, the complete buildout wet well volume will be provided in lieu of expanding in the future.

Influent flow measurement and sampling of influent wastewater will occur at the influent lift station. Flow measurement and sampling are necessary to calculate the loading of various constituents to verify that the WRF is providing adequate treatment and has sufficient capacity for ongoing operation. A magnetic flow meter will be installed on the influent lift station force main, and a refrigerated composite sampler will be installed to withdraw wastewater from the lift station wet well throughout the day to provide a representative sample of wastewater entering the WRF.

The influent lift station is expected to trap influent grit and solids over time, and periodic cleaning of the wet well will be required to maintain operating volume and minimize the pumping and carryover of inert solids into the treatment processes.

Process Control
The lift station will be operated with a series of float switches. When wastewater fills to the "Pump On" elevation, a float switch will activate and the lead pump will turn on. If the pump fails to activate, wastewater will continue to fill to the "High Level Alarm" elevation, at which point the lag pump will turn on. When a pump is in operation, the wastewater level will decline until the water level reaches the "Pump Off" elevation, at which point all pumps turn off. This control scheme will be governed with a Hand-Off-Auto switch in the "Auto" position. When the controls are in "Hand", either pump can be operated manually.

Structural
The lift station will consist of two FRP wetwells with aluminum hatches.

Capacity
Table 4-2 identifies a Phase I PHF of 100 gpm and a buildout PHF of 220 gpm. Therefore, each pump will be sized for a flow of 110 gpm to allow two pumps to discharge 220 gpm in the future. The lift station will be designed to operate each pump four times per two hours, or an average of twice per hour. This corresponds to four pump cycles per hour, or a pump cycle length of 15 minutes. The required operating volume is calculated as follows:

Operating Volume = (pump cycle length) * (PHF / 2)
= (15 min) * (220 gpm / 2)
= 825 gal

Table 5-1 presents the design criteria for the lift station.

TABLE 5-1
Design Criteria – Influent Lift Station

Influent Lift Station Pumps	
Quantity of Pumps, Phase I	2
Quantity of Pumps, Buildout	3
Redundancy	Redundant Pump
Pump Type	Submersible Centrifugal
Capacity, each	110 gpm
Wetwell	
Diameter	6 ft
Rim Elevation	585.7
Influent Gravity Line Invert	578.5
High Level Alarm Elevation	579.0
Pump On Elevation	578.0
Pump Off Elevation	575.8
Wetwell Floor	573.8
Influent Flow Meter	
Type	Magnetic
Calibrated Flow Range	0-220 gpm
Influent Sampler	
Type	Refrigerated, Composite

5.03.2 Equalization Tank

Process Description
Due to the presence of a lift station immediately upstream of the WRF processes, flow into the system will occur in a series of high flow, short duration pumping intervals followed by periods of no flow. Designing the treatment and pumping equipment within the WRF to process flows in this manner would result in structures and equipment designed to treat PHF, rather than the more reasonable MDF. Rather than oversize the facilities to process wastewater in this manner, an equalization basin will be constructed at the front of the treatment train to store wastewater and allow it to be pumped into the processes at a prolonged, constant rate. This will allow the instantaneous treatment capacity of the WRF to be reduced by over 60-percent. No treatment is assumed to occur within this process.

During normal operation, a submersible pump will transfer wastewater into the next process at ADF, and a second pump will transfer wastewater at a combined rate of MDF.

The equalization tank will also be expected to trap influent grit and solids over time, and periodic cleaning of the wet well will be required to maintain operating volume and minimize the pumping and carryover of inert solids into the treatment processes.

Process Control
The equalization tank operates similarly to the lift station. When the water level in the tank reaches a set elevation, the lead pump will activate and pump wastewater through the influent screen into the anoxic tank. If the water level continues to rise, the lag pump will activate and increase the flowrate out of the tank. Once the water level drops sufficiently, the pumps cease to operate. When the pumps are operating, the membrane modules described later in this chapter will operate their permeate cycle through the control of another float switch in this tank.

Structural
The equalization tank will be a cylindrical, partially-buried FRP tank. It will be installed adjacent to the remaining MBR treatment tanks.

Capacity
To allow the remainder of the WRF to operate at a maximum capacity of MDF instead of PHF, the equalization basin will be sized to accommodate sustained PHF for 1 hour during MDF conditions. The required volume is therefore:

Operating Volume = (PHF - MDF) * 60 min
= (100 gpm – 35 gpm) * (60 min)
= 3,900 gal

Table 5-2 presents the design criteria for the equalization tank.

TABLE 5-2
Design Criteria – Equalization Tank

Equalization Pumps	
Quantity of Pumps	1
Redundancy	Spare on Hand
Pump Type	Submersible Centrifugal
Capacity @ TDH, each	17 gpm
Equalization Tank	
Operating Volume	4,300 gal
Tank Diameter	7.5 ft
Sidewater Depth	13 ft

5.03.3 Influent Screening

Process Description
Pressurized wastewater flows from the equalization tank will be discharged through the influent fine screen. The influent screen consists of a rotating drum with grated surface. Wastewater passes through the drum, and solids are retained on the surface. Through the rotating action of the screen, solids are scraped off the surface and discharged through a chute. The screened wastewater enters a hopper below the drum where it discharges by gravity into the bioreactor tank, while solids from the chute are discharged to a hopper for periodic removal from the site. The screen requires a

source of potable water for the spray-cleaning system, and water for this purpose will be provided to the site through a reduced-pressure backflow assembly.

Process Control
The process of screening wastewater is passive, as the wastewater screening is a physical separation that occurs when the wastewater passes through the screen. However, the cleaning features must operate when the screen is receiving wastewater to prevent screen blinding. Therefore, the screen will operate when the equalization pumps operate.

Structural
The screen is a stainless steel piece of equipment that will require anchoring to a concrete pad adjacent to the MBR tanks. An insulated shelter will be installed around the screen to protect it from weather and limit odors.

Capacity
Influent screening of wastewater will be achieved using a new pad-mounted mechanically-cleaned fine screen with 2 mm perforations. The fine screen will have a capacity of 264 gpm and will discharge the screenings to a dumpster to collect the screenings for disposal.

Table 5-3 presents the design criteria for the influent screening.

TABLE 5-3
Design Criteria – Influent Screening

Mechanical Fine Screen	
Quantity	1
Redundancy	Not Required. Bypass Piping Provided.
Type	Rotary Grating Mesh Screen
Size Screen Opening	2 mm
Hydraulic Capacity	264 gpm
Motor	0.5 hp, 208V, 3 ph

5.03.4 Biological Treatment System

5.03.4.1 Anoxic Tank

Process Description
The anoxic tank is a portion of the biological treatment system volume that is designed to operate in an anoxic state, which is defined as having no freely availably dissolved oxygen for bacterial growth, but the presence of oxidized compounds such as nitrate and nitrite allow bacteria to break down these compounds to free up the oxygen for metabolic uses. Due to the anticipated effluent nitrate limit as a result of a ground water discharge and reclaimed water standards, the biological treatment system must reduce the nitrate that is oxidized in the bioreactor tank through a process referred to as denitrification. The nitrate developed during the aerobic processes is returned to the

anoxic tank during an ongoing recirculation of wastewater from the membrane tank to the bioreactor tanks.

Wastewater flows from the anoxic tank into the bioreactor tank by gravity and is maintained in suspension with a jet mixer.

Process Control
The jet mixer in the tank will operate continuously.

Structural
The anoxic tank will be a cyllindrical, partially-buried FRP structure. It will be constructed adjacent to the remaining MBR treatment tanks.

Capacity
The first step in designing the biological process is to calculate the maximum specific nitrifier growth rate ($\mu_{n,m}$), decay rate (k_{dn}), and ammonia half saturation coefficient (K_N) at a winter design temperature of 2°C. This is likely a conservative design estimate, although the presence of an equalization tank at the start of the MBR is expected to allow wastewater to cool substantially when compared to a steady-state treatment process. The calculation of these parameters uses the following equations:

$\mu_{n,m,2} = (\mu_{n,m}) \times (\Theta^{2-20}) = (0.90/d) \times (1.072^{2-20}) = 0.26/d$
$k_{dn,2} = (k_{dn,2}) \times (\Theta^{2-20}) = (0.17/d) \times (1.029^{2-20}) = 0.10/d$
$K_{N,2} = (K_{N,2}) \times (\Theta^{2-20}) = (0.74\ mg/L) \times (1.053^{2-20}) = 0.29\ mg/L$

The numerical values for the various parameters above are reasonable for domestic wastewater, although lower than typical due to the conservative design temperature.

Assuming an effluent ammonia concentration of 1 mg/L, a dissolved oxygen concentration (DO) of 2.0 mg/L, and an oxygen half-saturation coefficient (K_O) of 0.5 mg/L, the actual nitrifier growth rate is calculated as follows:

$\mu_n = (\mu_{n,m,2}) \times [(N)/(K_{N,2}+N)] \times [(DO)/(K_O+DO)] - k_{dn,2} = (0.26/d) \times [(1.0)/(0.29+1.0)] \times [(2.0)/(0.5+2.0)] - 0.10/d$

This yields a net specific nitrifier growth rate of 0.06/d, which is then used to calculate the required solids retention time (SRT) using the following equation:

$SRT = 1 / \mu_n = 17.3$ days

Applying a safety/peaking factor of 1.5 to this value, to account for daily fluctuations in ammonia loading, produces a required bioreactor tank SRT that rounds up to 26 days. This SRT is subsequently used to determine the specific denitrification rate (SDNR) within the anoxic tank with the following equations:

$SDNR = (0.175)(A_n) / [(Y_{net})(SRT)]$

A_n = $1.0 – 1.42Y + (1.42)(k_{d,2})(Y)(SRT) / [1 + (k_{d,2})(SRT)]$

Y_{net} = $(Y) / [1 + (k_{d,2})(SRT)]$

Where:

SDNR = specific denitrification rate, lb NO_3-N/lb biomass·d
Y_{net} = net yield for heterotrophic biomass, g VSS / g bCOD
A_n = net oxygen utilization coefficient, lb O_2 / lb bCOD removed
SRT = 26 days (from above)
$k_{d,t}$ = 0.059 (from below)
Y = 0.4 lb/lb bCOD (typical for domestic wastewater)

The values for $k_{d,t}$ can be determined as follows:

$k_{d,2}$ = $(k_{n,max})(\Theta^{2-20}) = (0.12/d)(1.04^{2-20}) = 0.059/d$

Therefore:

A_n = $1.0 – 1.42(0.4) + (1.42)(0.059)(0.4)(26) / [1 + (0.059)(26)] = 0.78$ lb/lb

Y_{net} = $(0.4) / [1 + (0.059)(26)] = 0.16$ lb/lb

SDNR = $(0.175)(0.78) / [(0.16)(26)] = 0.03$ lb NO_3-N/lb biomass/d

The conservative SDNR is used to determine the size of the anoxic tank. The amount of influent nitrogen that must be removed from the treatment process through denitrification is the remaining fraction after nitrogen in the WAS and effluent nitrogen are removed. In a typical MBR treatment process, 25% of the nitrogen is removed through WAS, and a target effluent nitrogen concentration of 8 mg/L at maximum design conditions will result in the following required denitrification loading:

Denitrification Loading = TKN – N in WAS – Effluent N

Where:

TKN = 57 mg/L = 23.7 lb/d @ 0.05 MGD
N in WAS = 25% of TKN = 5.9 lb/d
Effluent N = 8 mg/L = 3.3 lb/d @ 0.05 MGD

Therefore:

Denitrification Loading = 23.7 lb/d – 5.9 lb/d – 3.3 lb/d = 14.5 lb/d

It is assumed that the biological processes will be operated at a mixed liquor suspended solids (MLSS) concentration of 12,000 mg/L, and approximately 1/6 of that mass will be nonvolatile, resulting in an active biomass concentration of 10,000 mg/L. The required anoxic volume is therefore:

Volume = (Denitrification Loading) / [(SDNR)(10,000 mg/L)(1 lb/453,592 mg)(3.78 L/gal)

= (14.5 lb/d) / [(0.03 lb Nitrate/lb biomass)(10,000 mg/L)(1 lb/453,592 mg)(3.78 L/gal)

= 5,800 gal

This volume is provided between the dedicated anoxic tank volume of 4,300 gallons and a feed-forward tank that provides an additional 1,500 gallons to 2,100 gallons of storage, depending on operating setpoint.

5.03.4.2 Bioreactor Tanks

Process Description
The bioreactor tanks are a series of mixed tanks where fine air bubbles are introduced into the wastewater. The oxygen within the air is utilized along with organic matter in the wastewater to allow the suspended biomass within the tank to grow and multiply, thereby reducing the concentration of organics and other wastewater constituents in the process. The mixing and aeration are provided by a submersible pump with air intake tube which draws air into the mixed flow.

Wastewater flows into the bioreactor tank by two pathways. Fresh influent entering the MBR from the collection system is pumped from the equalization basin through the influent screen. Recirculated wastewater also flows by gravity from the anoxic tank into the bioreactor tank.

Process Control
The equipment within the bioreactor tanks consists of jet aerators and a recirculation pump. These pieces of equipment operate continuously without process controls. A float switch within the final bioreactor tank provides a high water level alarm in case influent flows are sufficiently in excess of permeate flows, and therefore wastewater is accumulating within the treatment system.

Structural
The bioreactor tanks will be cyllindrical, partially-buried FRP structures. They will be located adjacent to the remaining MBR treatment tanks.

Capacity
The key design considerations for the bioreactor tanks are the aerobic hydraulic retention time (HRT), sludge production, aeration requirements, and alkalinity consumption.

5.03.4.2.1 Aerobic Hydraulic Retention Time

Aerobic HRT is defined is the average time that a given droplet of wastewater is treated within the biological treatment system within an aerated environment, which means that the anoxic tank volume is not included in this calculation. There are dozens of wastewater treatment processes and configurations, and different configurations require varying HRTs to obtain the desired treatment. The proposed biological treatment system is identified in Section 8.7 of *Wastewater Engineering* as a MLE-Membrane Bioreactor Process. Systems of this variety are complete mix and have a recommended HRT of between 3 and 6 hours. Wastewater modeling of the system indicates that due to the concentrated wastewater loading of 285 mg/L BOD_5 and 57 mg/L TKN, the required HRT is approximately 7 hours. Therefore, the required aerobic treatment volume is calculated as:

Aerated Volume = (MDF)(HRT)
= (50,000 gal/d)(7.0 hr)(1 d / 24hr)
= 14,600 gal

This volume is provided through a combination of the three aerobic tanks and the membrane tank, which provide a combined volume of 14,700 gallons.

5.03.4.2.2 Sludge Production

In order to calculate the aerobic mass required for the design SRT, the net sludge production for the treatment system must first be estimated. Assuming a cell yield of 0.4 lb VSS/lb biodegradable COD (bCOD), an influent wastewater and biomass VSS/TSS ratio of 0.85, and a design temperature of 2ºC, the total sludge production can be determined using the following equation:

$P_x = P_{x1} + P_{x2} + P_{x3} + X_{iVSS} + X_{iTSS}$
$P_{x1} = (Y)(S\text{-}S_o) / [1 + (k_{d,t})(SRT)(0.85)]$
$P_{x2} = (f_d)(k_{d,t})(Y)(S\text{-}S_o)(SRT) / [1 + (k_{d,t})(SRT)(0.85)]$
$P_{x3} = (Y_n)(NO_x) / [1 + (k_{dn,t})(SRT)(0.85)]$

Where:

P_x = Mass of waste activated sludge per day, lb/d (to be determined)
X_{iVSS} = Volatile nonbiodegradable solids, assuming VSS to be 85% of influent TSS, soluble BOD to be 35 percent of of influent BOD, and soluble COD equal to 35 percent of influent COD.
= 27 percent of influent VSS = 23 percent of influent TSS = 27 lb/d
X_{iTSS} = Influent nonvolatile suspended solids, taken as 15% of influent TSS = 18 lb/d
Y = Heterotrophic cell yield = 0.4 lb/lb bCOD (from above)
Y_n = Autotrophic cell yield = 0.12 lb/lb TKN (typical for domestic wastewater)
S = Mass influent bCOD = 2.0 x influent BOD_5 = 285 mg/L x 2 = 570 mg/L = 237 lb/d @ 0.05 MGD
S_o = Mass effluent bsCOD = assumed 1 mg/L for 30 mg/L effluent limit = 0.4 lb/d @ 0.05 MGD

f_d = Fraction of cell mass remaining as cell debris = 0.15 lb/lb (typical for domestic wastewater)
$k_{d,2}$ = Endogenous heterotrophic decay coefficient = 0.059 d^{-1} (from above)
$k_{dn,2}$ = Endogenous nitrogenous decay coefficient = 0.102 d^{-1} (from above)
SRT = Solids retention time = 26 days (from above)
NO_x = Amount of influent TKN oxidized to nitrate = 49 mg/L for effluent TN of 8 mg/L = 20.4 lb/d

The sludge production can then be calculated as follows:

P_{x1} = (0.4)(237-0.4) / [1 + (0.059)(26)(0.85)] = 41.1 lb/d
P_{x2} = (0.15)(0.059)(0.4)(237-0.4)(26) / [1 + (0.059)(26)(0.85)] = 9.5 lb/d
P_{x3} = (0.12)(20.4) / [1 + (0.102)(26)(0.85)] = 0.8 lb/d
P_x = 41.1 + 9.5 + 0.8 + 27 + 18 = 96.4 lb/d

Based upon an SRT of 26 days, the resulting required MLSS concentration in the MBR tankage is 14,440 mg/L based upon a total operating volume of 20,800 gallons (96.4 lb/d * 26 days)/(0.0208 * 8.345). This is higher than the typical operating MLSS of 12,000 mg/L, but is a reasonable value for an MBR system, and is only required during maximum day conditions. As a result, sludge may accumulate in the system to a minor degree during these conditions, but sludge wasting activities can easily account for this accumulation and react accordingly.

5.03.4.2.3 Aeration Requirements

To biologically oxidize the BOD_5 in the wastewater into bacteria and harmless end products, oxygen must be continually added to the bioreactor tank. The required amount of oxygen consists of a carbonaceous oxygen demand and a nitrogenous oxygen demand.

The carbonaceous oxygen demand is calculated as follows:

Carbonaceous O_2 Demand = $S - S_o - 1.42(P_{xbio})$

Where:

S = Mass influent bCOD = 237 lb/d (from above)
S_o = 0.4 lb/d (from above)
P_{xbio} = 0.85(Px – XiVSS – XiTSS) = 0.85(96.4 – 27 – 18) = 43.6 lb/d

Therefore, the carbonaceous oxygen demand is 175 lbs O_2/day. The nitrogenous oxygen demand is calculated by the amount of nitrogen oxidized to nitrate:

Nitrogenous O_2 Demand = $4.33(TKN_{in} - TKN_{eff} - 0.12(P_{xbio}))$

Where:

TKN_{in} = influent TKN = 23.7 lb/d (from above)

TKN_{eff} = effluent TKN = 3.3 lb/d (from above)
P_{xbio} = 43.6 lb/d (from above)

Therefore, the nitrogenous oxygen demand is 65 lbs O_2/day. One benefit of implementing denitrification is the use of oxygen included in the nitrates to partially offset the need for aeration. Denitrification in the anoxic tank will provide an oxygen credit of 2.86 lb of oxygen per lb of nitrates removed in the anoxic zone, or 41 lb/day (2.86 * 14.5). Therefore, the total oxygen demand is 198 lb/d.

Total O_2 Demand = 175 lb/d + 65 lb/d - 41 lb/d = 198 lb/d

Applying a safety factor of 1.25 to account for fluctuations in diurnal loads results in a design oxygen demand of 248 lb/d, or 10.3 lb/hr, the actual oxygen transfer rate (AOTR). Discussions with equipment manufacturers have determined that this AOTR can be provided by 3 jet aerators rated for an air flowrate of 20 scfm and designed to mix a tank with dimensions of 15 ft x 15 ft x 20 ft, which is larger than the proposed tanks. Therefore, this mixer should provide adequate mixing for the tanks.

5.03.4.2.4 Alkalinity Requirements

The stoichiometric reaction for the oxidation of ammonia nitrogen to nitrate shows that two moles of hydrogen are produced for every mole of ammonia nitrogen oxidized. In a wastewater treatment system, these hydrogen ions are neutralized by the wastewater's natural alkalinity (buffering capacity), preventing this acid condition from significantly reducing the pH within the treatment system. However, if the alkalinity present in the influent wastewater is not sufficient to neutralize the hydrogen ions released during nitrification, the pH within the system will begin to drop. This, in turn, can lead to low mixed liquor and effluent pH and a significant reduction in nitrification efficiency. An effluent pH value below 6.0 is expected to be a permit violation. Mixed liquor with pH readings outside the range from 7.2 to 8.0 can have an inhibitory effect on nitrifying organisms.

To determine whether the alkalinity in the wastewater is sufficient, a nitrogen mass balance must be performed, and is summarized in Table 5-4.

TABLE 5-4
Alkalinity and Nitrogen Mass Balance

Parameter	Buildout Value
Influent Flow, MGD	0.05
Influent TKN, lb/d (mg/L)	23.7 (57)
Effluent TKN, lb/d (mg/L)	3.3 (8)
WAS Org-N, lb/d	5.9
TKN_{OX}, lb/d	17.8
Effluent NO_3-N, lb/d (mg/L)	3.3 (8)
NO_3-N Denitrified, lb/d	14.5
Alkalinity Consumed, lb/d	127
Alkalinity Recovered, lb/d	52
Net Alkalinity Used, lb/d (mg/L)	75 (181)
Alkalinity Required, lb/d (mg/L)	109 (261)

As determined above, 17.8 lb/d of influent TKN will be nitrified to nitrate in the activated sludge system (TKN_{OX}). Of those 17.8 lb/d, it was calculated above that 14.5 lb/d of nitrate would be denitrified.

The amount of alkalinity consumed in the biological processes is calculated as follows:

$$\begin{aligned}\text{Consumption} &= (\text{Nitrif.})(7.14 \text{ mg } CaCO_3) - (\text{Denitrif.})(3.57 \text{ mg } CaCO_3) \\ &= (17.8)(7.14 \text{ mg } CaCO_3) - (14.5)(3.57 \text{ mg } CaCO_3 \\ &= 75 \text{ lb/d}\end{aligned}$$

The total alkalinity consumed is calculated as 75 lb/d or 181 mg/L at MDF of 0.05 MGD. An alkalinity of 80 mg/L is recommended to maintain a pH within optimal range for treatment. The total required alkalinity is 261 mg/L (181 mg/L + 80 mg/L). Historical water sampling associated with the development of the Vantage Bay water source (Hydrogeologic Report, RH2, October 2008) identified a hardness value of 160 mg/L within the basalt aquifer. It is therefore assumed that approximately 100 mg/L will need to be added to the wastewater to prevent alkalinity consumption from decreasing the pH below discharge levels and inhibiting biological treatment action. This will be determined on a case-by-case basis, and a sodium hydroxide feed pump will be added in the future if ongoing chemical feed becomes necessary.

5.03.4.2.5 Recirculation Pumping

The aerated, mixed wastewater within the bioreactor tank will continuously recirculate mixed liquor into the membrane tank through the use of a submersible centrifugal pump. This recirculation rate is significantly greater than the influent flowrate, and results in a continuous flowrate of treated wastewater to flow back to the biological treatment system by gravity. The portion of the pumped flow that returns to the anoxic tank by gravity is referred to as Return Activated Sludge, or RAS. The portion that is discharged from the membrane tank through the membranes is the permeate, or effluent flow.

The required recirculation flowrate is approximately 6 times the AAF. At Phase 1 conditions, this is equal to approximately 104 gpm.

5.03.4.3 Membrane Tank

Process Description
The purpose of the membrane tank is to separate treated wastewater from the biosolids suspended within it. Unlike the equalization tank, anoxic tank, and bioreactor tank, the membrane tank will be a standalone structure. Wastewater is pumped from the feed-forward tank into the membrane tank, which will have racks of membrane modules submerged in it. When skid-mounted permeate pumps are operating, wastewater is drawn through the membranes under suction and discharged into the clean water cistern. The remaining wastewater pumped into the tank will flow by gravity back to the biological treatment system to recycle biomass and return nitrates for denitrification. To address solids buildup on the surface of the membranes, a blower discharges pressurized air along the face of the membranes, simultaneously providing cleaning of the membrane surface and additional diffused air for biological oxidation of the wastewater.

Piping will be provided to allow treated wastewater to be pumped back through the permeate pipes to backflush the system and keep the piping clean and free of air bubbles. A dedicated submersible pump will be supplied for this purpose.

Process Control
When the water level is high enough in the equalization tank and membrane tank, the membrane tank operates a permeate cycle automatically. During this cycle, wastewater is drawn through the membrane racks by suction and filtered, leaving the suspended solids and biomass in the membrane tank and removing the cleaned wastewater. During the cycle, permeate is drawn for four minutes and then the process rests for one minute.

Structural
The membrane tank will be a self-contained, stainless steel tank anchored to a concrete pad adjacent to the remaining biological treatment system tanks. The various pumps, piping, blowers, and valving required to operate the permeate and self-cleaning processes will be located on this skid. An insulated shelter will be installed around the system to protect it from the weather.

Capacity
The membranes and permeate pump will be designed to discharge MDF, or 34 gpm.

Table 5-5 presents the design criteria for the biological treatment system.

TABLE 5-5
Design Criteria – Biological Treatment System

Anoxic Tank	
Operating Volume	4,300 gal
Tank Diameter	7.5 ft
Sidewater Depth	13 ft
Feed Forward Tank	
Operating Volume	2,100 gal
Tank Diameter	7.5 ft
Sidewater Depth	6.5 ft
Bioreactor Tank	
Number of Tanks	3
Operating Volume, each	4,300 gal
Tank Diameter	7.5 ft
Sidewater Depth	13 ft
Jet Aerator	
Quantity of Aerators	3
Redundancy	Spare on Hand
Capacity	20 scfm
Motor	7.5 hp, 208V, 3 phase
Recirculation Pump	
Quantity of Pumps	1
Redundancy	Spare on Hand
Pump Type	Submersible Centrifugal
Capacity	104 gpm
Motor	2 hp, 208V, 3 phase
Membrane Tank	
Operating Volume	1,800 gal
Tank Dimensions	6’6”L x 6’6” W
Sidewater Depth	5.7 ft
Permeate Pump	
Quantity of Pumps	1
Redundancy	Spare on Hand
Pump Type	Submersible Centrifugal
Capacity	35 gpm
Motor	1 hp, 120V, 1 phase
Air Scour Blower	
Quantity of Blowers	1
Redundancy	Spare on Hand
Blower Type	Double Stage Centrifugal
Motor	6 hp, 208V, 3 phase

CIP Pump	
Quantity of Pumps	1
Redundancy	Spare on Hand
Pump Type	Submersible Centrifugal
Capacity	20 gpm
Motor	1/3 hp, 120V, 1 phase

5.03.5 Clean Water Cistern

Process Description
The purpose of the clean water cistern is to serve as the withdrawal point for the effluent pumps. Treated wastewater will be discharged from the clean water cistern to either the rapid infiltration drainfield for recharging groundwater, the future reclaimed water distribution system for irrigation of landscaping and vineyards, or recirculated back to the clean water cistern. The effluent pumps will discharge through a UV disinfection system. The purpose of the UV disinfection system is to inactivate the potentially harmful (pathogenic) microorganisms in the WRF effluent. Disinfection is not the equivalent of sterilization, in which there is inactivation of all microorganisms; some microorganisms in the effluent may not be completely inactivated by the disinfection process. The UV disinfection equipment is located on the membrane equipment skid within the insulated enclosure. The disinfection chamber consists of a closed stainless steel vessel housing UV disinfection lamps with flanged pipe connections on both ends.

Process Control
The permeate process will operate intermittently, which will result in periods where no permeate is entering the clean water cistern. As a result, there could be corresponding periods where effluent from the WRF would drain the UV disinfection tank and the UV disinfection system would be required to turn off or overheat as no new effluent would be introduced through the system. Rather than have the UV disinfection system turn off and on, which accelerates the aging and need for UV disinfection lamp replacement, the recirculation pump will instead operate continuously to disinfect the contents of the clean water cistern. A separate pump will be used to discharge reclaimed water from the cistern.

Structural
The clean water cistern will be a pair of cylindrical, pad-mounted stainless steel tanks. They will be constructed adjacent to the membrane tank.

Capacity
The clean water cistern does not have a required capacity, as no treatment or processing occurs in this tank. It receives treated permeate from the membrane tank and serves as a sump for pumping effluent through the UV disinfection system to ultimately exit the WRF. The volume within the tank will be approximately 2,300 gallons. The effluent pump will be designed to discharge MDF, or 34 gpm. Therefore, the cistern has sufficient volume to store approximately 68 minutes of permeate at MDF conditions.

Table 5-6 presents the design criteria for the clean water cistern.

TABLE 5-6
Design Criteria – Clean Water Cistern

Clean Water Cistern	
Operating Volume	2,300 gal
Tank Dimensions	8 ft L x x 6 ft W x 8 ft D
Recirculation Pump	
Quantity of Pumps	1
Redundancy	Spare on Hand
Pump Type	Submersible Centrifugal
Capacity @ TDH	34 gpm
Discharge Pump	
Quantity of Pumps	1
Redundancy	Spare on Hand
Pump Type	Submersible Centrifugal
Capacity @ TDH	34 gpm
UV Disinfection System	
Capacity	35 gpm
Number of Lamps	2
Lamp Output, each	65W

5.03.6 Rapid Infiltration Drainfield

Process Description
The final effluent is pumped through a force main to a drainfield to allow flow to infiltrate to groundwater. The infiltration drainfield is similar to a septic system drainfield in that wastewater is pumped into buried, perforated pipe galleries bedded in pea gravel. Wastewater will percolate through the gravel into the native soils beneath the basins and subsequently to ground water. However, due to the high quality of treated wastewater being discharged to the drainfield, soil treatment is not required, and therefore the loading restrictions described by WAC 246-272B-3400 do not apply.

The drainfield will be constructed as a series of laterals that are valved to operate as distinct discharge sections 30'L x 10'W. Redundant piping will be constructed to allow half of the drainfield to be operated at any given time to allow the drainfield to be rotated and rested on a scheduled basis, and also allows half the drainfield to be taken offline for maintenance or repairs. As the community grows and additional capacity is required, drainfield area can be constructed adjacent to the drainfield in an area reserved for this purpose.

Process Control
The infiltration process is passive in nature. The only required control is manual valving that determines which laterals are active within the drainfield.

Structural
The pipe galleries will not have a structure. They will consist of perforated PVC pipe bedded in gravel to allow treated wastewater to drain freely.

Capacity
Per the project geotechnical report (Appendix C), the long term infiltration rate in the vicinity of the rapid infiltration basins is 3.8 in/hr. To infiltrate MDF, the required infiltration basin area is calculated as follows:

Required Area = Flow / Infiltration Rate
= (50,000 gal/d) / (3.8 in/hr) * (1 ft^3 / 7.48 gal) * (12 in / 1 ft) * (1 d / 24 hr)
= 880 ft^2

Guidelines for the design of drainfields within the State of Washington are summarized in *Pressure Distribution Systems* (Washington State Department of Health, 2012) (DOH Guidelines). As identified above, the drainfield will not be required to provide treatment and therefore some recommendations are not observed within this design, but the DOH Guidelines provide hydraulic design standards that will allow the drainfield to distribute effluent evenly and avoid plugging. The following is a list of guidelines that have been observed to size the Rapid Infiltration Drainfield:

- Maintain a pressure head > 2 feet ("squirt height") within laterals utilizing 3/16" orifices
- Per Table A-1, lateral length of 30 feet is less than the maximum 32.5 feet length identified for 1" lateral, 3/16" orifices, and 2.5' orifice spacing
- Per Table A-2, orifice discharge rate is 0.59 gpm/orifice for a 2' squirt height and 3/16" orifice diameter
- Per Table A-4-1, manifold length of 12 feet is less than the maximum 18 feet length identified for 2" manifold with 6' lateral spacing
- Orifices drilled in the 6 o'clock position to allow for complete drainage of the laterals between discharge pumping cycles to prevent freezing

Table 5-7 presents the design criteria for the rapid infiltration drainfield.

TABLE 5-7
Design Criteria – Rapid Infiltration Drainfield

Rapid Infiltration Drainfield	
Number of Drainfield Sections	6
Redundancy	200% Constructed Capacity
Area, each	300 ft^2
Dimensions, each	30 ft L x 10 ft W
Manifold Length, each	10 ft
Number of Laterals per Section	2
Lateral Length, each	30 ft
Manifold Diameter	2 in
Lateral Diameter	1 in
Lateral Spacing	5 ft
Orifice Size	3/16”
Orifice Spacing	3.0 ft
Section Capacity, each	11.8 gpm
Infiltration Rate	3.8 in/hr

5.04 Solids Treatment

5.04.1 Return Activated Sludge System

Process Description
Return activated sludge (RAS) is pumped from the bioreactor tank into the membrane tank by the recirculation pump, where it flows by gravity from the membrane tank to the anoxic tank to maintain a concentrated biomass in the biological treatment system and to return nitrates to the anoxic tank for denitrification. The RAS flowrate will vary between 4 times ADF and 6 times ADF, dependent upon whether permeate is being withdrawn from the membrane tank.

Process Control
As identified in the bioreactor tank section, the recirculation pump will operate continuously, and therefore the RAS system flowrate is not controlled.

Structural
The recirculation pump and return piping to the anoxic tank constitute the RAS structures.

Capacity
The recirculation pump is discussed in the bioreactor tank section above.

5.04.2 Waste Activate Sludge System

Process Description
Periodically, a portion of the sludge from the biological treatment process will need to be wasted from the system to maintain a constant MLSS concentration and to waste excess sludge production.

Wastewater activated sludge (WAS) is the fraction of the mixed liquor solids removed from the activated sludge system on a routine basis. The WAS line will be a gravity feed that tees from the RAS piping back to the biological treatment system. On a periodic basis, a licensed septage hauler will visit the site and withdraw WAS from the system into a truck for removal from the site. Apple Valley Pumping, a licensed septage hauler located in East Wenatchee, has been contacted and has agreed to perform this function on an as-needed basis once the WRF begins operation.

Process Control
Operation of the sludge wasting system is manually performed. A manual valve will be opened to divert a portion of the RAS flow through the WAS flow meter and into the septage hauler's tank. Once the desired WAS volume has been achieved, as measured by the WAS flow meter, the manual valve will close and sludge wasting will cease.

Structural
The WAS system consists of a diversion valve and flow meter, and no structures are included in this system.

Capacity
The WAS system consists of a diversion valve and flow meter, and no has no dedicated capacity.

5.05 Miscellaneous Facilities

5.05.1 Operations Building

The facility will be operated by a contract operator, and therefore there are no plans at this time for a dedicated operations building to support laboratory work or similar activities.

5.05.2 Electrical Service

A new electrical service will be installed at the WRF site. The electrical service will include redundant electrical feeds as required by code, and a manual transfer switch will be installed to allow the facility to be operated from a portable generator indefinitely during regional power outages.

5.05.3 SCADA System

It is the Owner's intent to have the facility operated by a contract operator, with the majority of plant operations occurring remotely. As a result, the control panel and control infrastructure will be established for remote viewing and to allow for adjustments to be made remotely.

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6 Financing

6.01 Introduction

This chapter presents a financial analysis of the proposed Vantage Bay wastewater system. In developing the financial forecast, revenue and various expense components were developed. Because the system is completely new, there are not historical operating records to include in this analysis, and instead estimates have been made based upon assumed man-hours spent in operations, preliminary discussions with a potential contract operator, and estimates of electrical draw and chemical use at similar facilities. The project will be independently financed by private investors, and the profitability of the project will be determined in part through the sale of improved property. However, wastewater utility rates will be required to maintain the ongoing operation and maintenance of the wastewater utility, and therefore the costs in this chapter will be used in part to determine the required utility rates to maintain the financial health of the system.

6.02 Operating Expenses

6.02.1 Labor Cost

The allocation of labor hours among various treatment plant tasks was estimated as outlined in the 1973 EPA manual, *Estimating Staffing for Municipal Wastewater Treatment Facilities*. Staffing estimation worksheets utilizing this method are included in Appendix D. Although the plant will not be operating at its rated capacity of 0.050 MGD initially, the EPA manual indicates that its use should be based upon maximum capacity of the facility, rather than average flows. The annual O&M labor hour estimates for 10 labor categories, based on the EPA method, are summarized in Table 6-1. Due to the highly automated nature of the packaged treatment system, it has been the experience of Enereau Systems Group that labor at their other facilities has been approximately half of the hours estimated through the EPA method. This is further explained by advances in the controls industry in recent decades. As the system is built out, labor hours will be reviewed to adjust sewer rates as needed if labor hours surpass expectations.

TABLE 6-1
Annual Labor Hours at Design Flow as Estimated by EPA Method [1]

No.	Labor Category	Estimated Annual O&M Hours at 0.050 MGD Flow
1	Raw Sewage Pumping	82
2	Screening & Grinding	4
3	Aeration	85
4	Membrane Separation [1]	45
5	UV Disinfection [2]	48
6	Rapid Infiltration Basin [3]	21
7	Aerobic Digestion	5
8	Supervisory/Administration	30
9	Laboratory	55
10	Yardwork	20
Total Hours		**395**

(1) All estimates are equal to 50-percent of EPA Method based upon Enereau Systems experience with their other packaged facilities.
(2) The EPA Method does not have a classification for membrane separation. It was assumed that this process would be equal to the required labor for secondary clarification.
(3) The EPA Method does not have a classification for UV disinfection. It was assumed that this process would be equal to the required labor for chlorination.
(4) The EPA Method does not have a classification for rapid infiltration basins. It was assumed that this process would be equal to the required labor for mixed media filtration.

It is further assumed that the cost for a contract operator to perform these services will be $50/hr, or approximately $20,000 per year.

It is assumed for planning purposes that the operation and maintenance of the collection system will require a similar labor expenditure. Therefore, the total labor cost for O&M is estimated to be $40,000 per year.

6.02.2 Electricity Cost

A significant operating cost for wastewater treatment facilities is electricity use. The equipment with significant electrical draw are listed below in Table 6-2. An assumption has been made for annual operating hours, which will correspond to an annual electrical consumption based upon motor size. Electricity rates through Kittitas County PUD are estimated to be $0.08/kWh. This corresponds to an annual electrical cost of $10,300, and is a conservative estimate as some equipment will operate at a reduced rate during initial buildout of the community, and therefore electrical costs will be lower. However, the equipment with the most significant electrical draw will operate continuously, and therefore influent flows will not have a significant effect on overall electrical costs.

TABLE 6-2
Annual Power Consumption at Water Reclamation Facility

Unit	Number Running	Power (kW)	Annual Operation (hrs)	Consumption (kWh/yr) (5)
Influent Lift Station Pumps	1	2.2	1,400 (1)	3,080
Equalization Pumps	1+	0.37	9,000 (1)	3,330
Mechanical Fine Screen	1	0.25	4,380 (2)	1,095
Jet Aerator	3	2.2	8,760 (3)	57,816
Recirculation Pump	1	1.5	8,760 (3)	13,140
Anoxic Tank Mixer	1	0.75	8,760 (3)	6,570
Feed Forward Pump	1	1.5	8,760 (3)	13,140
Permeate Pump	1	0.37	4,345 (2)	1,608
Air Scour Blower	1	3.0	8,760 (3)	26,280
CIP Pump	1	0.25	365 (4)	91
Effluent Pump	1	0.37	4,500 (2)	1,665
UV Disinfection System	1	0.13	8,760	1,139
TOTAL				**129,954**

(1) Annual operation assumes annual wastewater flow of 25,000 gpd and rated capacity of equipment. For equalization pumps, a second pump operates during periods of higher flow.
(2) Assumes 50% operation.
(3) Assumes continuous operation.
(4) Assumes 1 hour of operation per day.
(5) Consumption = Power * Annual Operation

6.02.3 Chemical Costs

A significant operating cost for wastewater utilities is chemical use. Chemicals are often an ongoing expense to address operations issues such as odors in the collection system and sludge management problems at the treatment facility such as those associated with bulking sludge or Nocardia foaming. At this time the degree of chemical use required to adequately operate the facilities is unknown. Based upon operating records for other treatment facilities in eastern Washington, a planning-level estimate of $5,000 will be included in this analysis.

6.02.4 Solids Removal Costs

On a periodic basis, a licensed septage hauler will visit the site and withdraw WAS from the anoxic tank for removal from the site. Apple Valley Pumping, a licensed septage hauler located in East Wenatchee, has been contacted and has agreed to perform this function on an as-needed basis once the WRF begins operations. Due to the transient nature of the service population, it is likely that WAS operations will not occur on a recurring schedule, as influent loading may vary significantly from week-to-week. A planning-level estimate of $5,000 will be included in this analysis.

6.03 Proposed Connection Charges and Utility Rates

Vantage Bay anticipates collecting revenue through a combination of connection charges and utility rates. Connection charges are one-time fees paid by new service connections to pay for its proportional share of the wastewater collection and treatment systems. Connection charges are used to recoup the cost of construction and to develop reserves for performing significant capital projects and improvements in the future. In many communities, the calculated potential connection charge to connect to a utility is often significantly higher than the actual charged connection charge for that utility. The reason for this is often strategic in nature, as elevated connection charges can discourage growth and development of that utility if the connection charges are lower in nearby areas. Therefore, a calculated decision is made to develop a connection charge that will maintain system growth.

As summarized in Appendix F, the estimated total construction cost for the WRF is $702,150, and the developer has procured a construction contract in the amount of $503,323 for construction of the collection system. Two future WRF expansions will become necessary once the MDF capacities of 50,000 gpd and 82,000 gpd have been surpassed, which is projected to occur in approximately 2025 and 2029. Per Appendix F, the estimated total construction costs for these expansions are $496,200 and $110,100. Therefore, the total cost to construct the wastewater utility is estimated to be $2,111,773. Per Table 3-7 of the *Water System Plan*, there are estimated to be 187 service connections in the collection system upon future buildout, or approximately $11,300 per connection. To address inflation without increasing the connection charge over time, an approximate connection charge of $11,300 will be established.

Similar to how connection charges are intended to recoup and address capital costs, utility rates are intended to offset ongoing operations costs. As addressed above, the estimated annual expenses for the wastewater utility are $60,300. The utility rates should therefore be established to provide ongoing revenues in excess of this amount to adequately operate and maintain the facilities and develop operational reserves to address emergencies, significant repairs, and the ongoing needs of the system. The *Water System Plan* identified that $5,000 will be set aside each year into an Emergency Reserve account, a CIP & Equipment Reserve account, and there will be a planned annual budget surplus of $5,000. Therefore, wastewater revenues will need to be at least $75,300 per year, in 2020 dollars, upon system buildout.

Due to the transient nature of the service population, the majority of the utility rate will need to be a fixed fee to ensure that revenues are stable enough to support operations during periods where residency may be low. Per the *Water System Plan*, it is anticipated that utility billing will be performed quarterly. The utility rates will be revisited in the future, but for planning purposes the utility rates will be equal to $90 per quarter ($30 per month) with a volumetric charge of $1.25 per 1,000 gallons of potable water used, or fraction thereof. Table 6-3 summarizes budget projections for the 10-year planning period using the growth assumptions identified herein. An annual inflation rate of 2.0% is applied to both expenditures and revenues to address inflation.

TABLE 6-3
Vantage Bay Budget Projections

SYSTEM	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Connections	14	31	48	65	82	99	116	133	150	167	187
Maximum Daily Flow	8,504	18,831	29,158	39,485	49,811	60,138	70,465	80,791	91,118	101,445	113,594
Fixed Utility Rate	$30.00	$30.60	$31.21	$31.84	$32.47	$33.12	$33.78	$34.46	$35.15	$35.85	$36.57
Volumetric Utility Rate	$1.25	$1.28	$1.30	$1.33	$1.35	$1.38	$1.41	$1.44	$1.46	$1.49	$1.52
Average Annual Utility Bill [(1)]	$467.84	$477.20	$486.74	$496.48	$506.41	$516.53	$526.86	$537.40	$548.15	$559.11	$570.30
REVENUES											
Utility Rate Payments	$6,500	$14,800	$23,400	$32,300	$41,500	$51,100	$61,100	$71,500	$82,200	$93,400	$106,600
Connection Charges	$140,000	$170,000	$170,000	$170,000	$170,000	$170,000	$170,000	$170,000	$170,000	$170,000	$200,000
Total Revenue	**$146,550**	**$184,793**	**$193,364**	**$202,271**	**$211,525**	**$221,137**	**$231,116**	**$241,474**	**$252,223**	**$263,372**	**$306,645**
EXPENSES											
Labor	$40,000	$40,800	$41,600	$42,400	$43,200	$44,100	$45,000	$45,900	$46,800	$47,700	$48,700
Electricity	$16,900	$17,200	$17,500	$17,900	$18,300	$18,700	$19,100	$19,500	$19,900	$20,300	$20,700
Chemicals	$5,000	$5,100	$5,200	$5,300	$5,400	$5,500	$5,600	$5,700	$5,800	$5,900	$6,000
Solids Removal	$5,000	$5,100	$5,200	$5,300	$5,400	$5,500	$5,600	$5,700	$5,800	$5,900	$6,000
Payment to Emergency Reserve	$5,000	$5,100	$5,200	$5,300	$5,400	$5,500	$5,600	$5,700	$5,800	$5,900	$6,000
Payment to CIP & Equipment Reserve	$5,000	$5,100	$5,200	$5,300	$5,400	$5,500	$5,600	$5,700	$5,800	$5,900	$6,000
Capital Improvement Project [(2)]	$1,205,473	$0	$0	$0	$537,100	$0	$0	$0	$129,000	$0	$0
Total Expenses	**$1,275,773**	**$71,700**	**$73,100**	**$74,500**	**$613,000**	**$77,400**	**$78,900**	**$80,400**	**$210,900**	**$83,400**	**$85,000**
TOTAL FUND BALANCES											
Total Payments from Reserves [(3)]	$63,750	$120,657	$170,393	$212,623	$246,997	$273,260	$291,044	$299,970	$299,647	$289,675	$268,030
Connection Charge Fund [(4)]	-$1,065,473	-$895,473	-$725,473	-$555,473	-$922,573	-$752,573	-$582,573	-$412,573	-$371,573	-$201,573	-$1,573
Emergency Reserve	$5,000	$10,100	$15,300	$20,600	$26,000	$31,500	$37,100	$42,800	$48,600	$54,500	$60,500
CIP & Equipment Reserve	$5,000	$10,100	$15,300	$20,600	$26,000	$31,500	$37,100	$42,800	$48,600	$54,500	$60,500

(1) Assumes 86,273 gal/yr per connection and the fixed and volumetric rates for the given year.
(2) Capital Improvement Project costs assume project costs will increase over time at 2% inflation rate.
(3) Total Payments from Reserves identifies the cumulative total of payments made from sales of lots to finance operations and maintenance of the utility while buildout occurs.
(4) Connection Charge Fund identifies the cumulative balance of total project cost compared to connection charges received by the developer.

As identified above, the utility is projected to require approximately $300,000 be invested into the utility by 2028 in order to operate it before buildout allows it to become self-sufficient. An alternate approach would be to establish a higher utility rate, but doing so would not be required for the long-term viability of the system. A connection charge of approximately $11,300 will allow the capital improvements to self-finance and be completed on the schedule shown above.

Appendices

Appendix A
SEPA Documents

KITTITAS COUNTY COMMUNITY DEVELOPMENT SERVICES
411 N. Ruby St., Suite 2, Ellensburg, WA 98926
CDS@CO.KITTITAS.WA.US
Office (509) 962-7506
Fax (509) 962-7682

SEPA
MITIGATED DETERMINATION OF NONSIGNIFICANCE

File: Vantage Bay Rezone (Z-06-25) and Preliminary Plat (P-06-26)

Description: 1. Vantage Bay Rezone, Z-06-25, from Forest and Range-20 to Planned Unit Development (PUD) and 2. Vantage Bay Preliminary Plat, P-06-26, which is a 315-lot subdivision.

Proponent: BCSBN Inc.
Skip Coddington
21828 87th Ave SE
Woodinville, WA 98072

Todd Lolkus Land Surveying, LLC, agent
1322 Basin St SW Suite A
Ephrata, WA 98823

Location: The subject property is approximately 75.61 acres and is located east of Huntzinger Road and south of Interstate-90 at Huntzinger Rd, Vantage, WA 98950 in a portion of the east half of Section 30, T17N., R23E., W.M. in Kittitas County. Parcel numbers 17-23-30010-0006, 17-23-30000-0001, and 17-23-30000-0003.

Lead Agency: Kittitas County Community Development Services

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030 (2) (c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request. The lead agency for this proposal has also determined that certain mitigation measures are necessary in order to issue a Determination of Non-Significance for this proposal. Failure to comply with the mitigation measures identified hereafter will result in the issuance of a Determination of Significance (DS) for this project. These mitigation measures include the following:

I. Transportation

A. The applicant shall adhere to all applicable regulations as set forth in the current Kittitas County Road Standards.
B. No direct access to I-90 or within the limited access boundaries of Huntzinger Road will be allowed per WSDOT requirements.
C. The north side of Tract "F" abuts WSDOT property on the north side. Access from the plat area to or across said WSDOT property shall be prohibited.
D. It is the developer's responsibility to dampen or deflect any I-90 traffic noise for the development.
E. Any outdoor advertising or motorist signage for this project shall comply with state criteria. The applicant shall contact Rick Gifford of the WSDOT South Central Regional office at (509)577-1985 for requirements.
F. Site grading shall be designed so as not to reduce flood storage or conveyance capacity.

G. Mail routes shall be approved by the postmaster. The postmaster shall also approve mailbox locations. Mailbox locations shall not create sight obstructions.

II. Light and Glare

A. Any proposed lighting should be shaded and directed down towards the site and away from I-90.

III. Water

A. Withdrawals of groundwater on the subject property shall be subject to the rules and regulations adopted and administrated by the Washington State Department of Ecology.
B. A minimum 80 foot buffer shall be maintained from the wetlands. Currently, the preliminary plat depicts a buffer that is over 120 feet from the wetlands. Proper signage shall be incorporated and maintained on-site to encourage the maintenance of the buffer and natural condition of the shoreline and wetlands. The signage shall be interpretive in matter, and explains about buffer integrity requirements and educates about the importance of the area for wildlife, etc. The applicant shall work with the Department of Ecology, and County to design and establish the signage and a buffer restoration plan. Wetlands locations and buffer boundaries shall be delineated on the final mylar. A plat note shall be included on the final mylar stating that *All development will need to comply with KCC 17A: Critical Areas.*
C. All development shall comply with the Kittitas County Shoreline Master Plan. Lots adjacent to wetland and shoreline areas shall be large enough to accommodate a building envelope which will not intrude into buffer areas or require a variance for build-out. Per Kittitas County Shoreline Master Program, all structures shall be setback a minimum of 100 feet from the Ordinary High Water Mark of all shorelines.
D. The project shall comply with all requirements of the Department of Ecology Storm Water Manual for Eastern Washington standards for stormwater and shall be collected, retained and disposed of on-site.
E. The project shall meet the requirements for a NPDES Construction Storm Water permit.
F. All development shall comply with Kittitas County Flood Code Title 14.08.
G. On-site drainage features associated with construction shall be designed such that wetlands are not dewatered or impacted.

IV. Noise

A. All county noise ordinances shall apply to the project.
B. Construction activities shall comply with KCC 9.45 (Noise).

V. Land Use

A. A final development plan pursuant to Kittitas County Code 17.36.040 shall be submitted for approval by the Board of County Commissioners.
B. All proposals of the applicant as contained in their application that are not in conflict with these mitigations shall be conditions of approval and shall be considered as mitigations.
C. Fencing and/or signage delineating private and public property on the easterly boundary shall be placed in order to prevent encroachment, and minimize ground disturbance and vegetation between the properties.
D. Prior to development of Phase 2, the proponent shall submit detailed PUD development drawings for review and approvals to Kittitas County.

VII. Utilities and Services

Index #16

A. A Class A Water System and wastewater management system shall be developed to serve the site in conformance with local and state health regulations.
B. Per the Kittitas County Shoreline Master Plan, there shall be a minimum setback of 100 feet from the Ordinary High Water Mark for all on-site sewage treatment systems.
C. The plat shall comply with International Fire Code (IFC) and appendices.
D. The subject property shall conform to the minimum requirements for fire apparatus access.
E. Water supplies and apparatus/equipment for fire suppression shall comply with the International Fire Code and NFPA, and shall be reviewed by Kittitas County and local jurisdictions.
F. The applicant shall coordinate with the local school district to provide for a safe location and passageway for a school bus stop. This shall be delineated on the final mylar.

This MDNS is issued under WAC 197-11-350. Any action to set aside, enjoin, review, or otherwise challenge this administrative SEPA action's procedural compliance with the provisions of Chapter 197-11 WAC shall be commenced on or before **September 12, 2006 @ 5:00 PM.**

Responsible Official: Joanna Valencia

Title: Staff Planner

Address: Kittitas County Community Development Services
411 North Ruby St., Suite 2
Ellensburg, WA 98926
(509) 962-7506 FAX 962-7682

Date: August 29, 2006

Pursuant to Chapter 15A.07 KCC, this MDNS may be appealed by submitting specific factual objections in writing with a fee of $300.00 to the Kittitas County Board of Commissioners, Kittitas County Courthouse Room 110, Ellensburg, WA 98926. Timely appeals must be received no later than September 12, 2006 @ 5:00PM. Aggrieved parties are encouraged to contact the Board at (509) 962-7508 for more information on appeal process.

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16

SEPA CHECKLIST

RCW 197-11-960 Environmental checklist.

Purpose of Checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for Applicants:
This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about government regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for non project proposals:
Complete this checklist for nonproject proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (PART D) for nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

For photocopying purposes please fill this form out in black ink or type. Thank you.

A. BACKGROUND

1. Name of proposed project, if applicable:
   VANTAGE BAY PLANNED UNIT DEVELOPMENT

2. Name and address of Applicant
   SKIP CODDINGTON
   BCSCBN INC.
   21828 87TH AVE SE
   WOODINVILLE, WA 98072

3. Name and address of contact person/agent (if applicable)
   TODD LOLKUS LAND SURVEYING, LLC. (509) 754-0135
   1322 BASIN STREET SW
   SUITE "A"
   EPHRATA, WA 98823

4. Date checklist prepared:
   5-31-06 (original), 12-18-08 (revised)

Note that the original SEPA Checklist resulted in a MDNS issued by Kittitas County on August 29, 2006. In August 2006, the applicant filed change applications for water rights with the Department of Ecology to serve the project. In 2008, during review of the proposed water right changes, Ecology identified additional environmental impacts associated with project. The applicant proposed mitigation to address these impacts. This checklist summarizes the additional impacts and mitigation proposed.

5. Agency requesting checklist:
   KITTITAS COUNTY (original), DEPARTMENT OF ECOLOGY (revised)

6. Proposed timing or schedule (including phasing, if applicable):
   AS SOON AS POSSIBLE

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes explain.
   NOT AT THIS TIME

8. List any environmental information you know that has been prepared, or will be prepared, directly related to this proposal.
   PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes explain.
   NO

10. List any government approvals or permits that will be needed for your proposal, if known.
    KITTITAS COUNTY, WASHINGTON STATE DEPARTMENT OF ECOLOGY (Change Application CS4-ADJ73029 and CS4-23192C, NPDES PERMIT), WASHINGTON STATE DEPARTMENT OF HEALTH

11. Give a brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page.
    PLEASE SEE ATTACHED PLANNED UNIT DEVELOPMENT APPLICATION DATA

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.
    PLEASE SEE ATTACHED VICINITY MAP

TO BE COMPLETED BY APPLICANT:

B. ENVIRONMENTAL ELEMENTS

1. EARTH

a. General description of the site (check one): flat, rolling, hilly, steep slopes, mountains, other (describe): FLAT AND SLOPES

b. What is the steepest slope on the site (approximate percent of slope)?
   26% ±

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.
   PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so describe.
PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.
THE SUBJECT SITE WILL BE EXCAVATED FOR NEW LOTS AND ROADS. IT IS LIKELY THAT ONSITE MATERIAL WILL BE USED FOR CONSTRUCTION. THE AMOUNT OF CUTTING AND FILLING WILL BE DETERMINED BY A LICENSED ENGINEER AT A LATER DATE.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.
UNLIKELY

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings?)
40-50%

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:
WATER DURING CONSTRUCTION, NORMAL OR REQUIRED CONSTRUCTION REQUIREMENTS

2. AIR

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.
DURING CONSTRUCTION: NORMAL EMISSIONS FROM DEVELOPMENT CONSTRUCTION FOR ROADS AND LAND LEVELING
AFTER: NORMAL EMMISSIONS FROM HOMESITES

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.
NO

c. Proposed measures to reduce or control emissions or other impacts to air, if any:
NONE

3. WATER

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.
COLUMBIA RIVER

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.
YES, PLEASE SEE ATTACHED DRAWINGS

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.
NONE

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.
NO

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.
A SMALL PORTION NEAR THE SOUTHEAST CORNER OF THE SUBJECT PARCEL

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.
~~NO~~YES. A WASTEWATER TREATMENT FACILITY WILL LIKELY BE CONSTRUCTED TO SERVE THE PROJECT AND WASTEWATER DISCHARGED TO THE COLUMBIA RIVER IN THE AMOUNT OF X GALLONS PER DAY [D1]. ADDITIONALLY, DURING TIMES WHEN INSTREAM FLOWS ARE NOT MET, GROUNDWATER STORED IN A MITIGATION POND MAY BE DISCHARGED TO THE COLUMBIA RIVER (OR TO THE WASTEWATER TREATMENT FACILITY) AT A RATE OF APPROXIMATELY 20 GPM FOR A PERIOD OF APPROXIMATLEY 3 WEEKS. WASTEWATER WILL BE TREATED TO THE STANDARDS REQUIRED BY WASHINGTON STATE LAW AND DISCHARGES WILL BE AUTHORIZED THROUGH AN NPDES PERMIT.

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

YES. A ~~POSSIBLE~~ WELL OR WELLS FOR A COMMUNITY WATER SYSTEM WILL BE CONSTRUCTED AND WATER WITHDRAWN ACCORDING TO CHANGE APPLICATIONS CS4-ADJ73029 and CS4-23192C. BASED ON THE AUTHORIZED SEASONS OF USE OF THESE WATER RIGHTS AND THE FREQUENCY AND DURATION OF HISTORIC DROUGHT EVENTS ON THE COLUMBIA RIVER, ECOLOGY HAS IDENTFIED THE FOLLOWING RISK OF INTERRUPTIBILITY FOR THE WATER RIGHTS.

1. CS4-ADJ73029 (EAGLE CREEK) IS EXPECTED TO BE INTERRUPTED FOR 4 WEEKS EVERY 26 YEARS.
2. CS4-23192C (MONSE) IS EXPECTED TO BE INTERRUPTED FOR 3 WEEKS EVERY 26 YEARS.

CONTINUED PUMPED DURING THIS TIME PERIOD WOULD IMPAIR THE STATE'S INSTREAM FLOW IDENTIFIED IN WAC 173-563. FAILURE TO PROVIDE WATER DURING PERIODS OF INTERRUPTION WOULD RESULT IN AN UNRELIABLE WATER SYSTEM. WHICH IS INCONSISTENT WITH DOH REGULATIONS.

THE APPLICANT HAS PROPOSED THE FOLLOWING **SOURCE RELIABILITY MITIGATION PLAN**. BEFORE SUBMITTING A WATER SYSTEM PLAN FOR THE PROJECT FOR REVIEW BY DOH AND ECOLOGY (WHICH IS REQUIRED BEFORE ANY HOMES CAN BE SERVED), THE APPLICANT WILL:

1. PROVIDE EVIDENCE OF THEIR ACQUISITION OF AN ADDITIONAL WATER RIGHT THAT IS NOT INTERRUPTIBLE FOR THE PERIODS IN QUESTION AND IS OF SUFFICIENT QUANTITIES TO PROVIDE RELIABLE SERVICE.

2. PROVIDE EVIDENCE OF THEIR ACQUISITION OF A BINDING AND PERMANENT CONTRACT WITH AN UPSTREAM MUNICIPAL ENTITY TO DELIVER WATER TO THE COLUMBIA RIVER IN THE AMOUNTS REQUIRED FOR MITIGATION OF CONTINUED PUMPING OF VANTAGE BAY'S WELLS.

3. DEVELOP DESIGN PLANS AND DOCUMENTED INTENT IN THE WATER SYSTEM PLAN TO CONSTRUCT A SURFACE STORAGE FACILITY OF SUFFICIENT SIZE AND WITH SUFFICIENT TELEMTRY OR CONTROLS TO DISCHARGE WATER TO THE COLUMBIA RIVER IN AMOUNTS EQUAL TO WITHDRAWALS OF THE WELLS. IT IS ESTIMATED THAT THE SIZE REQUIRED FOR MITIGATION IS APPROXIMATLEY 2 ACRE-FEET.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following

chemicals; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.
NONE KNOWN OF

c. Water Runoff (including storm water):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.
NORMAL RUNOFF FROM NEW ROADS. COLLECTION AND OR DISPOSAL SYSTEM WILL BE AN APPROVED AND ENGINEERED SYSTEM.

2) Could waste materials enter ground or surface waters? If so, generally describe.
UNLIKELY

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:
ENGINEERED COLLECTION AND OR DISPOSAL SYSTEM

4. PLANTS

a. Check or circle types of vegetation found on the site:
deciduous tree: alder, maple, aspen, other shrubs
evergreen tree: fir, cedar, pine, other ___
grass, crop or grain___ pasture
wet soil plants: Cattail, buttercup, bullrush, skunk cabbage, other
water plants: water lily, eelgrass, milfoil, other types of vegetation
PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

b. What kind and amount of vegetation will be removed or altered?
NATURAL VEGETATION. REMOVED: APPROXIMATELY 90%

c. List threatened or endangered species known to be on or near the site.
PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:
UKNOWN AT THIS TIME

NO

1) Describe special emergency services that might be required.
   NONE

2) Proposed measures to reduce or control environmental health hazards, if any:
   NONE

b. Noise

1) What type of noise exists in the area which may affect your project (for example: traffic, equipment, operation, other)?
   NONE

2) What types and levels of noise would be created by or associated with the project on a short-term or long-Term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.
   SHORT TERM: CONSTRUCTION NOISE
   LONG TERM: NORMAL NOISE FROM NEW HOMESITES

3) Proposed measures to reduce or control noise impacts, if any:
   NONE

8. LAND AND SHORELINE USE

a. What is the current use of the site and adjacent properties?
   SITE: OPEN, VACANT, PASTURE, HOME SITE

b. Has the site been used for agriculture? If so, describe.
   A SMALL PORTION (PASTURE)

c. Describe any structures on the site.
   SHOP / GARAGE / HOUSE / BARNS

d. Will any structure be demolished? If so, what.
   SHOP / GARAGE / POSSIBLY HOMES ON TRACT "D"

e. What is the current zoning classification of the site?
   FOREST & RANGE

f. What is the current comprehensive plan designation of the site?
   RURAL

5. ANIMALS

a. Check any birds and animals which have been observed on or near the site or are known to be on or near the site:
Birds: hawk, heron, eagle, songbirds, other:
Mammals: deer, bear, elk, beaver, other:
Fish: bass, salmon, trout, herring, shellfish, other:
PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

b. List any threatened or endangered species known to be on or near the site.
PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

c. Is the site part of a migration route? If so, explain.
PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

d. Proposed measures to preserve or enhance wildlife, if any:
PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

6. ENERGY AND NATURAL RESOURCES

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.
ELECTRICAL

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.
NOT LIKELY

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:
NO CONSERVATION FEATURES PROPOSED AT THIS TIME.

7. ENVIRONMENTAL HEALTH

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

g. If applicable, what is the current shoreline master program designation of the site?
RURAL

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.
PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

i. Approximately how many people would reside or work in the completed project?
RESIDE: APPROXIMATELY 310 FAMILIES, UKNOWN IF SEASONAL OR PERMANENT RESIDENCES

j. Approximately how many people would the completed project displace?
NONE KNOWN AT THE PROPOSED SITE. ~~NONE~~SOME REDUCED LAND USE OPPORTUNITIES WILL OCCUR IN CHELAN AND OKANOGAN COUNTIES, THE SOURCE OF THE WATER RIGHTS BEING TRANSFERRED.

k. Proposed measures to avoid or reduce displacement impacts, if any:
NONE

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:
APPROVAL BY KITTITAS COUNTY

9. HOUSING

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low- income housing.
UNITS: APPROXIMATELY 310

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low income housing.
NONE

c. Proposed measures to reduce or control housing impacts, if any:
NONE

10. AESTHETICS

a. What is the tallest height of any proposed structures(s), not including antennas; what is the principal exterior building material(s) proposed?
TALLEST HEIGHT: ASSUMED 2 TO 3 STORIES
MATERIAL: WOOD AND OTHER

b. What views in the immediate vicinity would be altered or obstructed?
NONE

c. Proposed measures to reduce or control aesthetic impacts, if any:
POSSIBLE DEVELOPMENT REGULATIONS SET BY PROPERTY OWNER

11. LIGHT AND GLARE

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?
LIGHT PRODUCED FROM NEW HOMES OCCURING DURING NIGHT

b. Could light or glare from the finished project be a safety hazard or interfere with views?
UNLIKELY

c. What existing off-site sources of light or glare may affect your proposal?
NONE

d. Proposed measures to reduce or control light and glare impacts, if any:
NONE

12. RECREATION

a. What designated and informal recreational opportunities are in the immediate vicinity?
BOATNG, FISHING, HUNTING

b. Would the proposed project displace any existing recreational uses? If so, describe.
NO

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:
COMMUNITY AREAS TO BE DESIGNATED WITHIN THE SUBJECT PROPERTY

13. HISTORIC AND CULTURAL PRESERVATIONS

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.
PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.
PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

c. Proposed measures to reduce or control impacts, if any:
PLEASE SEE BIOLOGICAL RESOURCE REVIEW REPORT PREPARED BY ENVIRONMENTAL ASSESSMENT SERVICES

14. TRANSPORTATION

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.
PLEASE SEE ATTACHED

b. Is site currently served by public transit? If not, what is the approximate distance to the existing street system? Show on site plans, if any.
NO

c. How many parking spaces would the completed project have? How many would the project eliminate?
310 PLUS PARKING SPACES FOR HOMESITES AND COMMUNITY AREAS

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).
NEW PRIVATE ROADS. PLEASE SEE REPORT PROVIDED BY "Transportation Engineering NorthWest (TENW)"

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.
PROJECT WILL OCCUR NEAR THE COLUMBIA RIVER

f. How many vehicular trips per day would be generated by the completed project? If known,

indicate when peak volumes would occur.
PLEASE SEE REPORT PROVIDED BY "Transportation Engineering NorthWest (TENW)"

g. Proposed measures to reduce or control transportation impacts, if any:
PLEASE SEE REPORT PROVIDED BY "Transportation Engineering NorthWest (TENW)"

15. PUBLIC SERVICES

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.
NOT LIKELY

b. Proposed measures to reduce or control direct impacts on public services, if any.
WATER SYSTEM FOR FIRE PROTECTION

16. UTILITIES

a. Check utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other:
ELECTRICAL, TELEPHONE

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.
ELECTRICAL: LOCAL PROVIDER
PHONE: LOCAL PROVIDER
WATER: NEW COMMUNITY WATER SYSTEM
SEWER: VANTAGE SEWER SYSTEM AND OR POSSIBLE NEWELY CONSTRUCTED SEWAGE TREATMENT / DISPOSAL FACILITY

c. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Date Submitted:

Signature:

C. TODD LOLKUS AS AGENT

Appendix B
Shoreline Substantial Development Permit

KITTITAS COUNTY COMMUNITY DEVELOPMENT SERVICES
411 N. Ruby St., Suite 2, Ellensburg, WA 98926
CDS@CO.KITTITAS.WA.US
Office (509) 962-7506
Fax (509) 962-7682
"Building Partnerships – Building Communities"

Vantage Bay Shoreline Substantial Development Permit
File Number SD-18-00002
FINDINGS OF FACT, DECISION AND CONDITIONS OF APPROVAL

I. GENERAL INFORMATION

Requested Action: The original Vantage Bay Rezone and Preliminary Plat were approved on December 5th, 2006 through authorizing ordinance number 2006-60. The rezone changed the project location from Forest and Range to PUD. The original project proposed two phases of development with phase one including a total of 315 lots on approximately 58.2 acres, and phase two including 17.4 acres reserved for future development.

The current revised proposal reduces the number of residential lots to 144, and adds a clubhouse to be developed as phase 1; and adds a 40 unit hotel, restaurant, winery, and vineyard as phase 2. Pursuant to Ordinance 2006-60, shoreline permitting is required if this project proposal includes any area within shoreline jurisdiction. This proposal is to allow a portion of a community garden and recreation area, which includes a small barn structure and pool, in the shoreline jurisdiction.

Location: PTN E1/2 (PTN parcels 1 & 2, B31/P154-155); SEC 30, TWP 17, RGE 23, WM in Kittitas County; Parcel numbers 622933 & 272933.

II. SITE INFORMATION

Total Property Size:	57.21 Acres
Number of Lots:	2
Domestic Water:	Private
Sewage Disposal:	Private
Power/Electricity:	N/A
Fire Protection:	Fire District 4
Irrigation District:	N/A

Site Characteristics:
North: State owned land, DOT
South: State owned land, Parks and Rec
East: Public owned land, Grant Co PUD
West: State owned land, Parks and Rec
Access: The site is accessed via Huntzinger Road.

Zoning and Development Standards: The subject properties are located on lands with a zoning designation of PUD Overlay and an underlying designation of Forest and Range. As stated above, these properties were rezoned as part of the project's preliminary approval. This permit is a requirement of the PUD preliminary approval, and needed to complete the PUD Final Development Plan for final approval.

Shoreline Master Program
KCC 17B.07.060 provides the criteria for approving a Shorelines Substantial Development permit:

"2. Substantial development permits. A substantial development permit shall be granted only when the applicant demonstrates all of the following:
   a. That the proposal is consistent with the policies and procedures in RCW Chapter 90.58 and WAC Chapter 173-27;
   b. That the proposal is consistent with the policies and procedures of the Master Program; and
   c. That the proposal has been appropriately conditioned where necessary to assure consistency of the project with the Act and the local Master Program"

III. ADMINISTRATIVE REVIEW

Deemed Complete: A Shorelines Substantial Development permit application was submitted to Kittitas County Community Development Services (CDS) on August 24, 2018. The application was deemed complete on September 7, 2018.

Notice of Application A Notice of Application was mailed to all state and local agencies/departments with potential interest in the project as required by KCC 17B.07.070 and KCC 15A.03.060, as well as to adjacent landowners located within five hundred (500) feet of any portion of the boundary of the proposal's tax parcels on September 13, 2018. The comment period for this notice ended on October 15, 2018.

IV. ENVIRONMENTAL REVIEW

Pursuant to WAC 197-11-600(4)(a) on September 26, 2018 the County adopted the SEPA MDNS issued on August 29, 2006 as part of the Preliminary Approval for the Vantage Bay PUD Rezone. A copy of the threshold determination may be obtained from the County.

V. AGENCY AND PUBLIC COMMENTS

Applicable agencies, adjacent property owners, and interested parties have been given the opportunity to review this proposal. All comments are on file and available for public review. The following are a summary of the substantive comments submitted.

September 27, 2018 DAHP – Dennis Wardlaw expressed concern over the close proximity of known archaeological sites to the proposed project, and outlined possible additional environmental review processes.

Staff Response: A cultural survey was completed as part of the preliminary approval for the PUD and Rezone. This survey can be found as part of the RZ-06-00025 documents. Additionally, this permit has been conditioned to address any resources or artifacts discovered during construction.

October 1, 2018 WA State Department of Transportation – Paul Gonseth stated that the revised proposal does not affect the comments already submitted by DOT through the original preliminary approval of the project.

Staff Response: DOT concerns were addressed in the preliminary approval. All original conditions of the PUD/ Rezone still apply to the project.

October 3, 2018 Yakima Training Center – Robert Bright expressed concern with light pollution from having a large project so close to the installation which could encroach on the mission of the military.

Staff Response: Glare/light mitigation was addressed through Ordinance 2006-60.

October 4, 2018 Kittitas Co. Public Health – Tristen Lamb stated "For project SD-18-00002, all Environmental Public Health comments have been outlined in Ordinance No. 2006-60 for

the Vantage Bay Rezone (Z-06-25) and Preliminary Plat (P-06-26)."

Staff Response: Public Health concerns were addressed in the preliminary approval. All original conditions of the PUD/ Rezone still apply to the project.

October 8, 2018 Kittitas Co. Public Works – Mark Cook referenced the preliminary approval documents for the Vantage Bay PUD and Rezone, and encouraged the applicant to review the conditions as they related to stormwater.

Staff Response: Public Works concerns were addressed in the preliminary approval. All original conditions of the PUD/ Rezone still apply to the project.

October 8, 2018 WA State Department of Fish and Wildlife – Scott Downes discussed the displacement of priority habitat, wildlife and the need for mitigation.

Staff Response: As conditioned the proposed development in the shoreline jurisdiction meets all required buffers and setbacks to protect critical areas as required pursuant to the Kittitas County Master Shoreline Program.

October 10, 2018 Department of Ecology – Gwen Clear requested that an updated wetland delineation be completed as the original was completed more than 5 years ago and missing elements required by the federal wetland delineation manual. DOE also discussed water quality requirements for the development.

Staff Response: On January 18, 2019 county staff sent a request letter asking the applicant to provide and updated wetland delineation per comments provided by DOE. On May 20, 2019 staff received an updated wetland delineation and site plan. These materials were transmitted to DOE on June 13, 2019.

October 15, 2018 Grant County PUD – Sheryl Dotson expressed concern over public access to PUD owned property and maintaining existing recreational activities.

Staff Response: Comments have been transmitted to the applicant, and added to the record.

October 15, 2018 Yakima Training Center – William Cantral noted a security concern of having residential development in close proximity to the Yakima Training Center along with notation of military traffic on Huntzinger Road.

Staff Response: Comments have been transmitted to the applicant, and added to the record. The PUD/Rezone was previously approved on December 5, 2006. This shoreline permit does not further increase residential development beyond what has already been approved.

VI. PROJECT ANALYSIS

In review of this proposal the Kittitas County Shorelines Master Program, the Goals, Policies and Objectives (GPO) of the Comprehensive Plan, Kittitas County Code, public and agency comments, any identified environmental concerns, and state and federal requirements were considered. Identified below is planning staff's analysis and consistency review for the subject application.

Consistency with the Kittitas County Shoreline Master Program:

In compliance with the Shorelines Management Act, Kittitas County has adopted Title 17B Shorelines. KCC 17B.07.060 requires that the applicant must demonstrate:

a. That the proposal is consistent with the policies and procedures in RCW Chapter 90.58 and WAC Chapter 173-27;

Staff Response: The proposal is consistent with both RCW 90.58 and WAC 173-27. The project as conditioned meets the requirements of the local shoreline program which was developed in accordance with state shoreline regulations.

b. That the proposal is consistent with the policies and procedures of the Master Program;

Staff Response: The Kittitas County Shoreline Master Program Chapter 3 outlines goals and objectives of the program. The proposed project meets the intent of the SMP pursuant to the goals and objectives, and the appropriate permit process procedures have been followed.

c. That the proposal has been appropriately conditioned where necessary to assure consistency of the project with the Act and the local Master Program.

Staff Response: This project has been reviewed and conditioned to ensure that it meets the intent and standards of the Shoreline Management Act and Kittitas County Shoreline Master Program.

The Following Goals and Objectives of the Shoreline Master Program are applicable:

SMP Goals

3.1(A)(2) Protect the ecological functions and values of the shoreline areas to ensure no net loss.

3.1(A)(3) Protect fragile natural areas and resources

3.2(A)(1)Consider the use and development of shorelines and adjacent land areas for public and private land uses in relation to the natural environment.

3.3(A)(2) Support uses that contribute to the region's economy while maintaining the qualities and functions of the shoreline, flood prone areas and channel migration zones.

3.4(A)(1) Develop and maintain a network of safe, convenient and diversified access opportunities for the public to enjoy the physical and aesthetic qualities of thee shorelines of Kittitas County.

Staff Response: This project has been reviewed and conditioned to ensure that it meets the intent of the SMP Goals identified above. The project contributes to the region economy through the proposed recreational, residential, and commercial uses while protects existing shoreline function and fragile areas through the use of buffers and identified trails.

SMP Objectives

3.2(B)(1) Give shoreline use preference to single-family residential uses, ports, shoreline recreational uses, and water-dependent commercial or industrial developments that are consistent with preservation of shoreline ecological functions and processes.

3.2(B)(4) Locate, design, and manage shoreline uses to prevent a net loss of shoreline ecological functions and processes over time. Where adverse impacts are unavoidable, require mitigation to ensure no net loss of shoreline ecological functions.

3.2(B)(5) Ensure proposed residential developments are compatible with or enhance the aesthetic quality of the shoreline area.

3.4(B)(2) Encourage incorporation of shoreline access into private and public shoreline use and development proposals. Allow private access developed for residential development to be limited to owners within that development.

> *Staff Response: As proposed, the project fulfills these Objectives. As described in the application this project is a residential development with inclusion of recreational and commercial uses outside of the shoreline jurisdiction. Adequate construction buffers have been established to ensure no net loss of shoreline function and maintain the existing aesthetic appeal. The project provides new access through the development in the form of trails to allow for continued use of neighboring public lands for recreational use.*

Consistency with the Comprehensive Plan:

In the intervening time since the submittal of the permit application for the proposed tower, an update to the Kittitas County Comprehensive Plan was adopted. Numbers identifying corresponding Goals and Policies in the updated Plan are shown in parentheses.

Chapter 2 section 5 of the Kittitas County Comprehensive Plan states that "the 2016 Kittitas County Shoreline Master Program goals and policies are adopted by reference into this comprehensive plan.

Staff Consistency Statement: As conditioned, this project meets and conforms to the Shoreline Master Program. Therefor staff finds this project consistent with the comprehensive plan. See "Consistency with the Shoreline Master Program" above.

GPO 8.14C (NE-P4) Development shall be located distances from streams, rivers, lakes, wetlands, critical areas determined necessary and as outlined within existing Shorelines Management Program, the Critical Areas Ordinance and other adopted resource ordinances in order to protect ground and surface waters.

Staff Consistency Statement: The proposed project has been mitigated during the preliminary approval process to protect all associated resources and critical areas. Furthermore it meets the requirements of the Shoreline Master Program and KCC Title 17B.

Consistency with KCC 15, Environmental Policy:

Pursuant to WAC 197-11-600(4)(a) the County has adopted the SEPA MDNS issued on August 29, 2006 as part of the Preliminary Approval for the Vantage Bay PUD Rezone. A copy of the threshold determination may be obtained from the County.

Consistency with the provisions of KCC 17A, Critical Areas:

An administrative critical area site analysis was completed by staff in compliance with Title 17A: Critical Areas. The site falls within the Shorelines of the State under the Rural Conservancy designation. In order to address concerns related to Critical Areas, the applicant has applied for a Shorelines Substantial Development Permit.

Based upon the critical areas analysis and report, the proposed use is consistent and in compliance with the Critical Areas Ordinance (and code) of Kittitas County (KCC 17A).

Consistency with the provision of KCC 17.15, Allowed Uses:

As stated above, these properties were rezoned as part of the project's preliminary approval. This permit is a requirement of the PUD preliminary approval, and needed to complete the PUD Final Development Plan for final approval. Therefor is consistent with KCC 17.15.

Consistency with the provision of KCC Title 12, Roads and Bridges:

As described above in section I, the project was reviewed through the PUD/rezone preliminary approval process in 2006. As approved, it was and remains consistent with the provisions of KCC Title 12.

Consistency with the Kittitas County Flood Damage Prevention:

The proposed project is not subject to flood requirements as no portion of the project is in any flood zones.

Consistency with the provisions of KCC Title 20, Fire and Life Safety:

As described above in section I, the project was reviewed through the PUD/rezone preliminary approval process in 2006. As approved, it was and remains consistent with the provisions of KCC Title 20.

VII. FINDINGS OF FACT

1. This proposal is to allow a portion of a community garden and recreation area which includes a small barn structure and pool in the shoreline jurisdiction. The original Vantage Bay Rezone and Preliminary Plat were approved on December 5th, 2006 through authorizing ordinance number 2006-60. This permit is required as a condition of the preliminary approval pursuant to ordinance 2006-60.

2. The proposed site is located approximately 25 miles East of the City of Ellensburg, located at PTN E1/2 (PTN parcels 1 & 2, B31/P154-155); SEC 30, TWP 17, RGE 23, WM in Kittitas County; Parcel numbers 622933 & 272933.

3. Site Information:

Total Property Size:	57.21 Acres
Number of Lots:	2
Domestic Water:	Private
Sewage Disposal:	Private
Power/Electricity:	N/A
Fire Protection:	Fire District 4
Irrigation District:	N/A

4. Site Characteristics:

North:	State owned land, DOT
South:	State owned land, Parks and Rec
East:	Public owned land, Grant Co PUD
West:	State owned land, Parks and Rec
Access:	The site is accessed via Huntzinger Road

5. The subject properties are located on lands with a zoning designation of PUD Overlay and an underlying designation of Forest and Range.

6. A Shorelines Substantial Development permit application was submitted to Kittitas County Community

Development Services (CDS) on August 24, 2018. The application was deemed complete on September 7, 2018.

7. A Notice of Application was mailed to all state and local agencies/departments with potential interest in the project as required by KCC 17B.07.070 and KCC 15A.03.060, as well as to adjacent landowners located within five hundred (500) feet of any portion of the boundary of the proposal's tax parcels on September 13, 2018. The comment period for this notice ended on October 15, 2018.

8. Pursuant to WAC 197-11-600(4)(a) on September 26, 2018 the County adopted the SEPA MDNS issued on August 29, 2006 as part of the Preliminary Approval for the Vantage Bay PUD Rezone.

9. The following agencies provided comments during the comment period: DAHP, WA State Department of Transportation, Yakima Training Center, Kittitas Co. Public Health, Kittitas Co. Public Works, WA State Department of Fish and Wildlife, Department of Ecology, Grant County PUD.

10. No Public Comments were received.

11. The proposal is consistent with the provisions of KCC 17B, Shoreline Master Program as conditioned.

12. The proposal is consistent with the goals and policies of the Kittitas County Comprehensive Plan.

13. The proposal is consistent with the provisions of KCC 15, Environmental Policy.

14. The proposal is consistent with the provisions of KCC 17A, Critical Areas.

15. The proposal is consistent with the provision of KCC 17.15, Allowed Uses.

16. The proposal is consistent with the provisions of KCC Title 12, Roads and Bridges as conditioned.

17. The proposal is consistent with the provisions of Kittitas County Flood Damage Prevention as conditioned.

18. The proposal is consistent with KCC 20, Fire Life and Safety.

VIII. CONCLUSIONS

1. As conditioned, the proposal meets the goals, policies and implementation recommendations as set forth in the Kittitas County Comprehensive Plan.

2. As conditioned, this proposal is consistent with applicable federal and state laws and regulations.

3. The proposal meets the criteria outlined in KCC 17B Shorelines.

4. As conditioned, the proposal is consistent with Kittitas County Code Title 12 Roads and Bridges, Title 17 Zoning, and Title 17A Critical Areas.

IX. DECISION & CONDITIONS OF APPROVAL

From these conclusions and findings, the proposed Shorelines Substantial Development Permit is **approved** with the following conditions:

1. Development shall occur in substantial conformance with the updated plan and Critical Area materials dated May 20, 2019 on file with Kittitas County Community Development Services. Any alterations to this site

plan shall be reviewed by Kittitas County prior to construction to ensure it still meets the requirements of all applicable regulations.

2. Environmental and statutory review shall be required for all future development, construction, and improvements; the applicant is responsible for compliance with all applicable local, state, and federal rules, codes, and regulations, and must obtain all appropriate permits and approvals. Failure to do so may result in the revocation of the shorelines substantial development permit.

3. Should ground disturbing or other activities related to the proposed conditional use permit result in the inadvertent discovery of cultural or archaeological materials, work shall be stopped in the immediate area and contact be made with the Washington State Department of Archaeology and Historic Preservation (DAHP). Work shall remain suspended until the find is assessed and appropriate consultation is conducted. Should human remains be inadvertently discovered, as dictated by Washington State RCW 27.44.055, work shall be immediately halted in the area and contact made with the coroner and local law enforcement in the most expeditious manner possible.

This decision can be appealed to the Shorelines Hearings Board within 21 days of the date of filing with the Washington State Department of Ecology pursuant to RCW 90.58.180.

Responsible Staff 

Chelsea Benner
Planner 1

Address: Kittitas County Community Development Services
411 N. Ruby Street, Suite 2
Ellensburg, WA. 98926
Phone: (509) 962-7506

Date: July 17, 2019

KITTITAS COUNTY COMMUNITY DEVELOPMENT SERVICES
411 N. Ruby St., Suite 2, Ellensburg, WA 98926
CDS@CO.KITTITAS.WA.US
Office (509) 962-7506
Fax (509) 962-7682
"Building Partnerships – Building Communities"

September 26, 2018

BSCCBN Inc.
Attn: Bill Cowin
21828 87th Ave SE. Ste. 200
Woodinville, WA 98072

Subject: Adoption of Project Specific SEPA MDNS
Vantage Bay (SD-18-00002)

All interested parties:

A SEPA MDNS determination was issued for the Vantage Bay PUD rezone (RZ-06-25) and preliminary plat (P-06-26) on August 29, 2006 by Kittitas County. Per WAC 197-11-600(4) Kittitas County can adopt the project specific existing MDNS document for all necessary permits (Shoreline Substantial Development Permit SD-18-00002).

Kittitas County has determined no further environmental review is required and hereby adopts the Vantage Bay PUD rezone (RZ-06-25) and preliminary plat (P-06-26) MDNS.

An electronic copy of the MDNS is available in the County project file and on the CDS website.

If you have any questions regarding this matter, please contact me at (509) 962-7046, or by e-mail at Lindsey.ozbolt@co.kittitas.wa.us.

Sincerely,

Lindsey Ozbolt
Planning Official & SEPA Responsible Official

cc: Matt Reider, matt.reider@esmcivil.com via email

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
1250 W Alder St • Union Gap, WA 98903-0009 • (509) 575-2490

July 30, 2019

BCSCBN Inc.
Attn: Bill Cowin
21828 87th Ave., Suite 200
Woodinville, WA 98072

Re: Kittitas County Permit SD-18-00002 - Approved
BCSCBN Inc. - Applicant
Shoreline Substantial Development Permit (SDP) #4226

Dear Bill Cowin:

On July 18, 2019, the Department of Ecology received notice that Kittitas County approved your application for an SDP. Your permit is to construct the following within the shoreline jurisdiction of the Columbia River: community garden, barn, and pool, as part of a planned unit development (PUD) given preliminary approval in 2006.

By law, local governments must review all SDPs for compliance with:

- The Shoreline Management Act (Chapter 90.58 RCW)
- Ecology's Substantial Development Permit approval criteria (Chapter 173-27-150 WAC)
- The Kittitas County Local Shoreline Master Program.

Local governments, after reviewing SDPs for compliance, are required to submit them to Ecology. Your approved SDP has been received by Ecology.

What Happens Next?
Before you begin activities authorized by this permit, the law requires you wait at least 21 days from July 18, 2019, the "date of filing." This waiting period allows anyone (including you) who disagrees with any aspect of this permit to appeal the decision to the state Shorelines Hearings Board. You must wait for the conclusion of an appeal before you can begin the activities authorized by this permit.

We recommend contacting the Shorelines Hearings Board at (360) 664-9160 before beginning permit activities to ensure that no appeal has been filed. Information on appeals is also posted at http://www.eluho.wa.gov/Decision/Search_Cases. Select "Shorelines Hearings Board" from the

drop down menu labeled "Board" and enter "Search." The most current appeal will appear on top.

If **you** want to appeal this decision, you can find appeal instructions (Chapter 461-08 WAC) at the Shorelines Hearings Board website above. They are also posted on the website of the Washington State Legislature at: http://apps.leg.wa.gov/wac.

Other federal, state, and local permits may be required in addition to this shoreline permit.

If you have any questions about this letter, please contact Lori White at (509) 575-2616.

Sincerely,

Lori White, Shoreline Specialist
Shorelands and Environmental Assistance Program

ec: Chelsea Benner, Kittitas County
Matt Reider, ESM Consulting Engineers, LLC
Scott Downes, WDFW