Kennedy Jenks

1500 NE Irving Street, Suite 200
Portland, Oregon 97232
(503) 423-4000

Executive Summary and Key Appendices from the

Warrenton Wastewater Facility Plan

June 2023

REGISTERED PROFESSIONAL ENGINEER
58959PE
OREGON
June 14, 2007
SHAWN C. SPARGO
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EXPIRES: 6/30/2024

Prepared for

City of Warrenton
45 SW 2nd Street
Warrenton, Oregon 97146

KJ Project No. 2176013.00

Abbreviations

Dioxin	2,3,7,8-TCDD
DMR	daily monitoring report
EDU	equivalent dwelling units
EPA	United States Environmental Protection Agency
ES	executive summary
ETO	Energy Trust of Oregon
FRP	fiberglass reinforced plastic
ft	feet
GIS	Geographic Information System
GO	General Obligation
gpd	gallons per day
gpm	gallons per minute
HP	horsepower
HSOW	high-strength organic wastes
I&C	instrumentation and control
I&I	inflow and infiltration
IFA	Oregon Infrastructure Finance Authority
IGA	inter-governmental agreement
IO	input/output
IPPS	In-Plant Pump Station
Kcal	kilocalories
kcal/d	kilocalories per day
KJ	Kennedy Jenks
kWh	kilowatt/hour
LED	light-emitting diode
LF	linear feet
LOC	League of Oregon Cities
LOCAP	League of Oregon Cities Capital Asset Program
MBR	membrane bioreactor
MCC	motor control center
mg/L	milligrams per liter
MGD	million gallons per day
Mission	Mission Communications
mL	milliliters
mm	millimeters
MMDWF10	maximum monthly average dry-weather flow with a 10% probability of occurrence
MMWWF5	maximum monthly average wet-weather flows with a 20% probability of

	occurrence
NASSCO	National Association of Sewer Service Companies
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and maintenance
OAR	Oregon Adminstrative Rule
OSHA	Occupational Safety and Health Administration
P3	public-private-partnership
PACP	Pipeline Assessment and Certification Program
PCB	polychlorinated biphenyls
PDAF5	Peak Daily Average Flow associated with a 5-year storm
PFAS	Per- and polyfluoroalkyl substances
PIF5	Peak Instantaneous Flow, or Peak Hourly Flow attained during a 5-year PDAF
PLC	programmable logic controller
ppd	pounds per day
ppm	parts per million
PRC	Population Research Center
PSU	Portland State University
PSW	Pacific Seafoods-Warrenton
PVC	Polyvinyl Chloride
RMZ	resource management zoone
RPA	Reasonable Potential Analysis
SBR	sequencing batch reactor
SCADA	Supervisory control and data acquisition
TMDL	total maximum daily load
TSS	total suspended solids
UGB	Urban Growth Boundary
USDA-RUS	United States Department of Agriculture Rural Utilities Service
UV	ultraviolet
VFD	variable frequency drive
WAS	waste activated sludge
WIFIA	Water Infrastructure Finance and Innovation
WSDC	Wastewater System Development Charges
WWTP	wastewater treatment plant
ZID	zone of initial dilution

Executive Summary

The City of Warrenton (City), Oregon has experienced substantial population growth over the past several years, and that population growth is expected to continue. The City operates a Sequencing Batch Reactor (SBR) wastewater treatment plant (WWTP) that is rapidly nearing capacity due to increased flows associated with population growth. A condition assessment of the wastewater treatment facility revealed that some equipment is nearing the end of its useful life and needs to be replaced. For these reasons, the Warrenton WWTP needs an expansion and upgrade.

The City's wastewater collection system is also in need of upgrades. A condition assessment indicated that several sewer collection pipes have defects such as separated joints, holes, and root intrusion. Some manholes in the collection system also have damage. These defects contribute to inflow and infiltration (I&I) which increases peak flowrates to the WWTP and can negatively affect treatment efficiency. Given the City operates numerous pump stations within the sewer system, maintenance upgrades are ongoing and are recommended as part of this project for two pump stations.

Population projections from Portland State University's (PSU) Population Research Center (PRC) and United States Census data for Warrenton were used to project population through the 2043 plan year. It is estimated that Warrenton's population will increase by 2.32 percent (%) annually. This accounts for potential industrial growth in the service area. The 2043 population projection, flow projections, and loading projections are summarized in Table ES-1 below.

Table ES-1: Warrenton 2043 Population, Flow, and Loading Projections Summary

Population	10,403
Flows in Million Gallons per Day (MGD)	
Annual Average Flow (AAF)	1.48
Peak Daily Average Flow ($PDAF_5$)	3.53
Maximum Monthly Wet Weather Flow (MMWWF)	3.53
Maximum Month Dry Weather Flow (MMDWF)	1.90
Peak Instantaneous Flow, or Peak Hourly Flow (PIF_5)	4.79
Loading in Pounds per Day (PPD)	
Peak Daily BOD_5	3470
Average Daily BOD_5	2540
Peak Daily TSS	5210
Average Daily TSS	2460

Using these flow and loading projections, five liquid stream treatment alternatives were developed to address plant capacity, operational challenges and more stringent effluent disinfection limits. The current plant is nearing capacity. As the flow capacity is exceeded by additional demand on the system, the effluent quality will diminish until the plant can no longer meet National Pollutant Discharge Elimination System (NPDES) permit limits. If the current mass load limits remain the same in future permit renewals, the plant will be required to produce a higher quality effluent to remain in compliance. This level of treatment may not be easily achieved using SBR treatment technology alone. In addition, the current SBR basin configuration leaves it vulnerable to birds foraging, causing suspended solids in the liquid stream, and windblown turbulence that reduces the plant's ability to adequately settle solids under high wind conditions. A higher effluent clarity or transmissivity combined with an ultraviolet (UV) disinfection system upgrade are needed to comply with more stringent fecal coliform and enterococci bacteria limits that the plant currently has difficulty meeting. Thus, the alternatives consider a higher effluent quality achieved through membrane or tertiary filtration technologies that are less susceptible to high wind. The liquid stream alternatives are summarized below:

- Alternative 1: Retrofit existing SBRs. Build two additional SBRs, add tertiary disk filters, and upgrade the UV disinfection system.
- Alternative 2: Convert existing SBR basins into deeper aeration basins and build two secondary clarifiers for a conventional activated sludge treatment facility. Add tertiary disk filters and upgrade UV disinfection system.
- Alternative 3: Convert existing SBR basins to membrane bioreactors (MBRs). Upgrade UV disinfection system.
- Alternative 4: Phased approach to increasing capacity of the existing SBRs. Build one new SBR basin to support 2032 projected flow and load (10-years of capacity) and build a second SBR basin in 2034 to support 2043 projections. Add tertiary disc filters.
- Alternative 5: Decommission the existing treatment facility. Build a new pump station and force main to convey flow to a different municipality's wastewater treatment facility.

These alternatives were compared based on capital cost, 20-year life cycle cost, regulatory compliance/permitting, expandability, operations and maintenance reliability/stability, and community impact. Alternative 3, convert the existing SBRs into MBRs, was found to be the most beneficial alternative by providing the highest quality treated effluent, the highest level of operational reliability to comply with current and future permit requirements. The initial capital cost for Alternative 3 is estimated to be **$28,600,000** and the 20-year life cycle cost is estimated to be **$37,800,000.** The capital costs include both costs to upgrade the plant, and improvements to the sewer collection system (pump stations and sewer piping). The 20-year life cycle cost accounts for inflation-adjusted operation and maintenance costs, energy consumption, and chemical costs.

The disadvantages of SBR operation at the Warrenton WWTP include the following:

- Birds foraging in the existing basins and windblown turbulence stir up sediment and cause settling issues in the SBR tanks. The existing tanks need to be covered to be used effectively. There is a significant cost to cover the SBR basins.

- SBRs take up a large footprint. Expansion of the existing SBR facility will require significant sludge removal and filling of the West Lagoon.

- SBR effluent quality may not meet permitted mass load limits as demand on the system increases over time.

The advantages of MBR operation at the Warrenton WWTP include the following:

- Solids are not removed by settling. Treated effluent quality relies on filtration and is consistent regardless of impact from wind or birds.

- Provides highest level of treatment of the alternatives evaluated to comply with future regulatory requirements/emerging contaminants of concern or potentially lower mass load limits.

- MBR treatment fits easily within the existing plant footprint, with the least amount of sludge lagoon infill.

- MBR is designed to handle estimated future peak flow and load.

Appendix A: Location, Aerial, and Soil Maps

Path: H:\GIS_CloudProjects\Warrenton_OR\Events\Facility Plan Figures\Warrenton-Sewer-APPENDIXA_Figure_1.mxd Printed by: AllisonLukens

Kennedy/Jenks Consultants

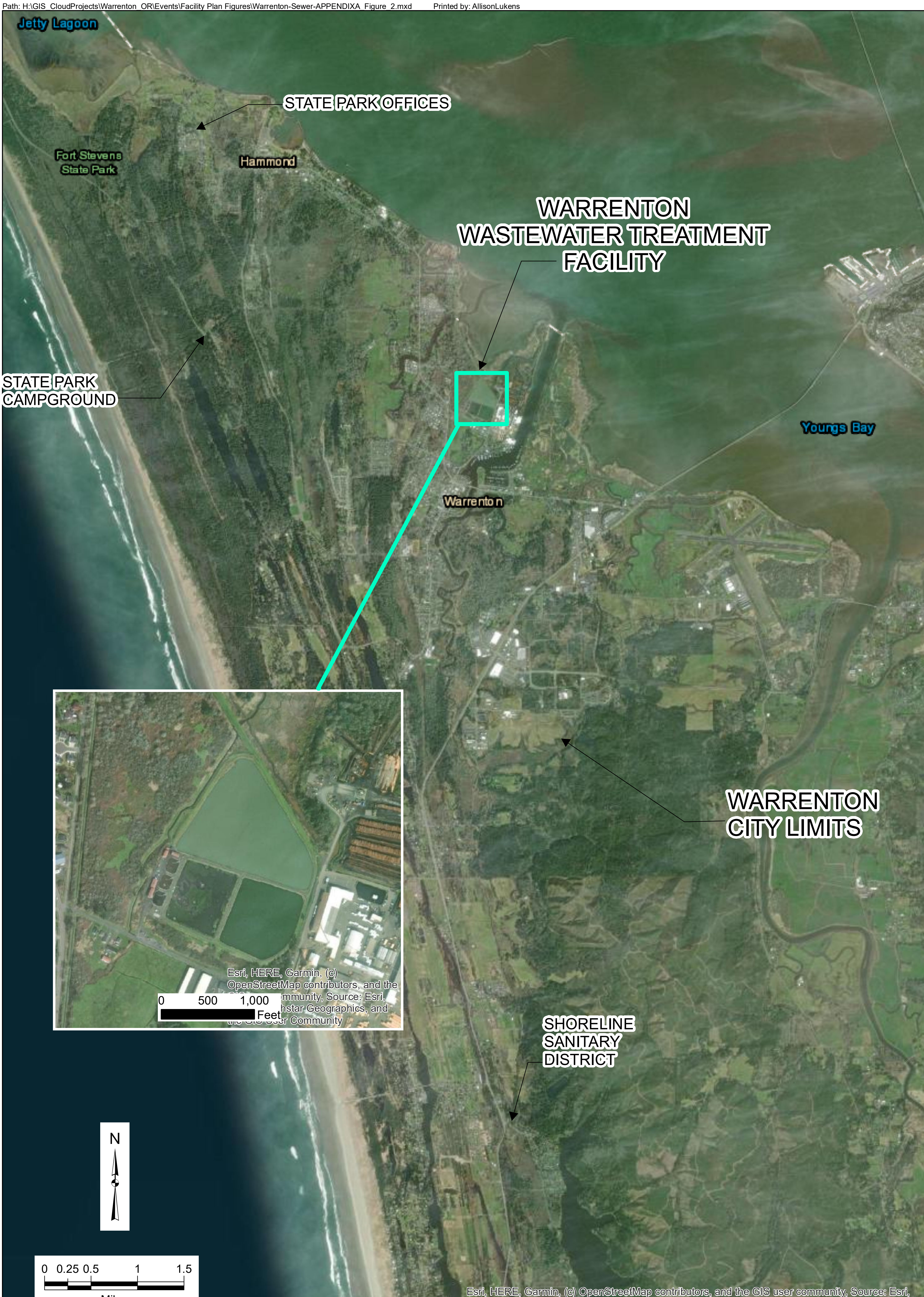
WASTEWATER FACILITY PLAN
CITY OF WARRENTON

SANITARY SEWER SYSTEM SERVICE AREA

KJ 2176013.00
MARCH 2023

APPENDIX A: FIGURE 1

Path: H:\GIS_CloudProjects\Warrenton_OR\Events\Facility Plan Figures\Warrenton-Sewer-APPENDIXA_Figure_2.mxd Printed by: AllisonLukens



Kennedy/Jenks Consultants

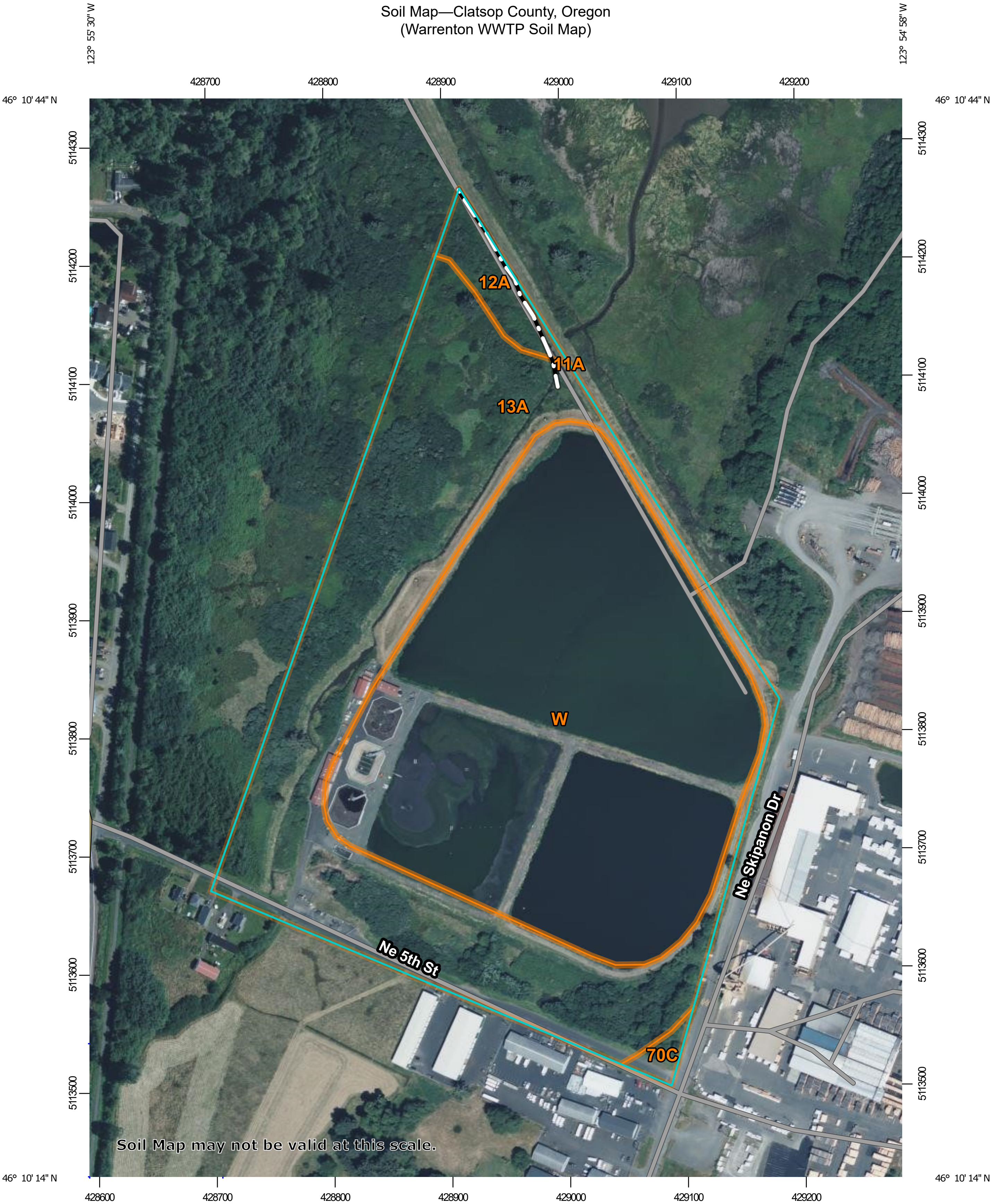
WASTEWATER FACILITY PLAN
CITY OF WARRENTON

AERIAL MAP OF CITY AND WWTP

KJ 2176013.00
MARCH 2023

APPENDIX A: FIGURE 2

Soil Map—Clatsop County, Oregon
(Warrenton WWTP Soil Map)



Map Scale: 1:4,440 if printed on A portrait (8.5" x 11") sheet.

N

0 50 100 200 300 Meters

0 200 400 800 1200 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

USDA **Natural Resources Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

KJ 2176013.00
MARCH 2023
APPENDIX A: FIGURE 3

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clatsop County, Oregon
Survey Area Data: Version 21, Sep 8, 2022

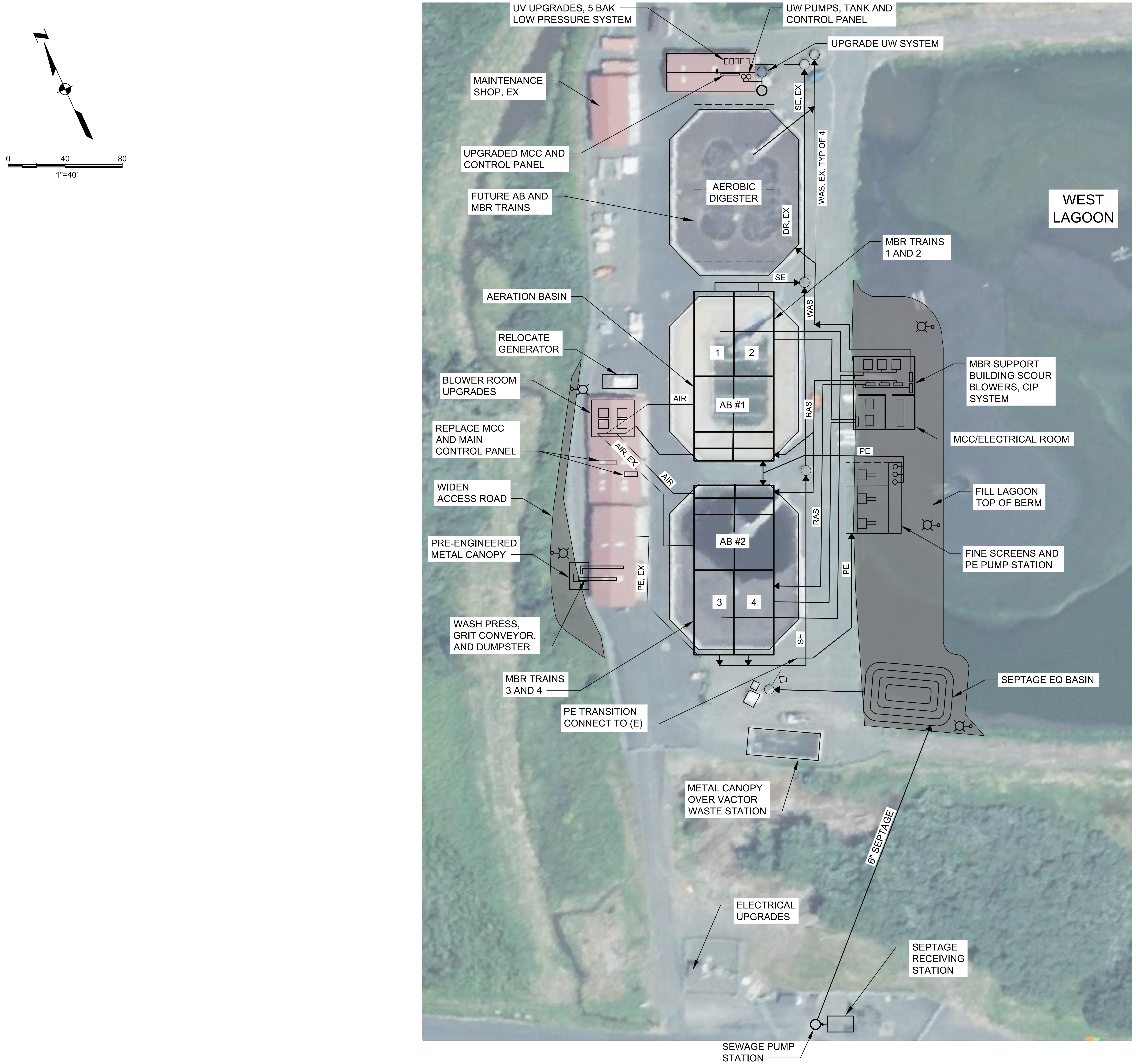
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 26, 2020—Jul 27, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Section Description	Water Surface Elevation
Upstream water level = 16.41	
Fine Screen w Auger	**18.78**
Theory used = Kirschmer	
Rack/screen invert = 16.5	
Rack/screen width = 24 ft	
Flow through rack = 4.7 mgd	
Bar width = 1 in	
Bar spacing = 1 in	
Bar shape = Rectangular	
Angle of inclination = 60 degrees	
Downstream depth = 2.28 ft	
Approach velocity = 0.13 ft/s	
Rack/screen head loss = 0 ft	
Main - Stop Gate 2	**18.76**
Opening type = rectangular gate	
Opening diameter/width = 24 in	
Gate height = 20.4 in	
Invert = 16.5	
Number of gates = 1	
Flow through gate(s) = 4.7 mgd	
Total area of opening(s) = 3.4 ft^2	
Velocity through gate(s) = 2.14 ft/s	

Appendix H: Alternative 3 Site Plan, Hydraulic Profile, and Modeling Results



LEGEND

————	PROPOSED DEVELOPMENT
– – – – –	FUTURE DEVELOPMENT
(symbol)	SITE LIGHTING
PE	PRIMARY EFFLUENT
SE	SECONDARY EFFLUENT
WAS	WASTE ACTIVATED SLUDGE
RAS	RETURN ACTIVATED SLUDGE
MBR	MEMBRANE BIOREACTOR
CIP	CLEAN IN PLACE
MCC	MOTOR CONTROL CENTER
UV	ULTRAVIOLET DISINFECTION

NO	REVISION	DATE	BY

SCALES
0 1"
0 25mm
IF THIS BAR IS NOT DIMENSION SHOWN, ADJUST SCALES ACCORDINGLY.

PRELIMINARY NOT FOR CONSTRUCTION

DESIGNED AEL
DRAWN CEC
CHECKED SCS

CITY OF WARRENTON
WARRENTON CITY, OREGON
WASTEWATER FACILITIES MASTER PLAN

Kennedy Jenks

FIGURE H.1 - ALTERNATIVE 3
CONCEPTUAL SITE PLAN
CONVENTIONAL ACITIVATED SLUDGE

SCALE 1"=40'
JOB NO 2176013.00
DATE OCTOBER 2022
SHEET --- OF ---

GENERAL SHEET NOTES

ELEVATION DATUM
NATIONAL GEODETIC VERTICAL DATUM (NGVD) AS DETERMINED FROM U.S.C. & G.S. BENCH MARK "TIDAL *" HAVING A PUBLISHED ELEVATION OF 8.228 FEET NGVD. THIS DATUM IS LOCATED AT THE NW SKIPANON BRIDGE ABUTMENT ON HARBOR DRIVE.

COLUMBIA RIVER AT OUTFALL

CONDITION	MLLW	NGVD
EXTREME HIGH WATER	12.1'	8.4'
MEAN HIGHER HIGH WATER	8.3'	4.6'
EXTREME LOW WATER	0'	-3.7'

DIFFUSER ELEVATION IE - 41.8' TO -45.3' NGVD

GENERAL LEGEND

WS (WATER SURFACE) AT PEAK FLOW (5 MGD)

SHEET KEYNOTES

A. FINE SCREEN, TYP OF 2.
B. PUMP STATION
C. ANOXIC BASIN, TYP OF 2.
D. SWING BASIN, TYP OF 2.
E. ML FEED CHANNEL, GATES
F. FEED FORWARD PUMP
G. WSE = 6.33'

NO	REVISION	DATE	BY

SCALES
0 — 1"
0 — 25mm
IF THIS BAR IS NOT DIMENSION SHOWN, ADJUST SCALES ACCORDINGLY.

PRELIMINARY NOT FOR CONSTRUCTION

DESIGNED AEL
DRAWN CEC
CHECKED SCS

CITY OF WARRENTON
WARRENTON CITY, OREGON
WASTEWATER FACILITIES MASTER PLAN

Kennedy Jenks

CITY OF WARRENTON, OR
FACILITY PLAN
FIGURE H.2 - ALT 3
PRELIMINARY HYDRAULIC PROFILE

SCALE NO SCALE
JOB NO 2176013.00
DATE OCTOBER 2022
SHEET --- OF ---
-

Appendix K: Complete Cost Estimates, 20-Year Life Cycle Costs, and Weighted Evaluation Criteria Table

Appendix K, Table 1

City of Warrenton, WW Facility Plan Capital Improvement Alternatives and 20-year Lifecycle Costs

KENNEDY/JENKS CONSULTANTS

Prepared By:	SCS
Date Prepared:	1/24/2023
K/J Proj. No.	2276010*00
Current at ENR	1%
Escalated to ENR	2%
Months to Midpoint of Construct	36

Area	Item	Unit	Alternative #1 Two New SBR Basins, Rehab Three Existing Basins	Alternative #2 Three New Aeration Basins and Secondary Clarifiers	Alternative #3 Four MBR Basins	Alternative #4: Phase 1 One New SBR	Alternative #4: Phase 2 Second SBR and One EQ Basin	Alternative #5 Pumpstation and Forcemain to Seaside WWTP
100	5th Avenue Pump Station Electrical [1]	LS	$75,162	$75,162	$75,162	$75,162	--	--
200	Headworks Improvements	LS	$926,449	$926,449	$926,449	$926,449	--	--
105	Earthwork, Site Piping	LS	$1,874,176	$2,015,987	$1,609,656	$1,248,522	$509,222	--
120	Septage Receiving Improvements	LS	$730,826	$730,826	$730,826	$730,826	--	--
130	Vactor Waste Upgrades, PEMB	LS	$245,652	$245,652	$245,652	$245,652	--	--
220	Fine Screens	LS	--	--	$1,311,602	--	--	--
320	Membrane Basin	LS	--	--	$6,651,255	--	--	--
330	MBR Support Building	LS	--	--	$1,011,615	--	--	--
400	Blower Room Rehab	LS	$560,483	$1,492,891	$536,750	$504,702	$56,200	--
220	Generator with sub base tank	LS	$337,461	$337,461	$337,461		$337,461	--
300	2 New SBRs & Post EQ Basin and Pumps	LS	$3,033,200	--	--	--	$2,542,606	--
300	1 New SBR	LS	--	--	--	$1,604,119	--	--
330	Existing SBR Cover with Steel Buildings	LS	$3,217,500	--	--	$3,217,500	$0	--
340	Rehab Existing SBR Units	LS	$886,358	--	--	$886,358	$0	--
	Underdrain/ basin drain sewer	LS						--
300	Aeration Basins, 3 at 90' x 90'	LS	--	$5,613,998	--	--	--	--
310	Secondary Distribution Structure	LS	--	$173,682	--	--	--	--
320	Secondary Clarifiers, 2 at 55' dia.	LS	--	$2,565,017	--	--	--	--
500	RAS/WAS Pump Station	LS	--	$476,111	--	--	--	--
520	WAS Manhole Improvements	LS	$55,088	$55,088	--	--	$55,088	--
600	New Tertiary Filters	LS	$955,908	$955,908	--	$927,234	$24,000	--
700	Replace UV System, In Channel	LS	$379,063	$379,063	$175,000	$303,250	$539,003	--
720	Utility Water System Upgrades	LS	$179,227	$179,227	$179,227	$179,227	--	--
800	Collections 1 - Pump Station Rehab	LS	$552,062	$552,062	$552,062	--	$552,062	$552,062
800	Collections 2 - I/I Reduction, Sewer Rehab	LS	$850,000	$850,000	$850,000	--	$850,000	$850,000
800	Seaside Piping and Pump Stations	LS	--	--	--	--	--	$17,702,934
800	Seaside Plant Expansion SDCs	LS	--	--	--	--	--	$5,184,268
	Project Total		$14,858,614	$17,624,583	$15,192,717	$10,849,000	$5,465,642	$24,289,264
	Div 1 Costs	12%	$1,783,034	$2,114,950	$1,823,126	$1,301,880	$655,877	$2,914,712
	Subtotal		$16,641,648	$19,739,533	$17,015,843	$12,150,880	$6,121,519	$27,203,976
	Contractor Overhead and Profit	15%	$2,496,247	$2,960,930	$2,552,376	$1,822,632	$918,228	$4,080,596
	Subtotal		$19,137,895	$22,700,463	$19,568,219	$13,973,512	$7,039,747	$31,284,572
	Contingency	20%	$3,827,579	$4,540,093	$3,913,644	$2,794,702	$1,407,949	$6,256,914
	Total Construction Cost with Markups		$22,966,000	$27,241,000	$23,482,000	$16,769,000	$8,448,000	$37,542,000
	Escalation		$1,377,960	$1,634,460	$1,408,920	$1,006,140		$2,252,520
	Collection System Project Cost		$1,410,000	$1,410,000	$1,410,000	$0	$1,410,000	$1,410,000
	Construction Subtotal		$14,860,000	$17,630,000	$15,200,000	$10,850,000	$5,470,000	$24,290,000
	Total Construction Cost with markups and escalation [2]		$24,400,000	$28,900,000	$24,900,000	$17,800,000	$8,500,000	$39,800,000
	Engineering and Construction Admin.	15%	$3,660,000	$4,335,000	$3,735,000	$2,670,000	$1,275,000	$5,970,000
	Total Project Cost [2]		**$28,100,000**	**$33,200,000**	**$28,600,000**	**$20,500,000**	**$9,800,000**	**$45,800,000**
	20-year Lifecycle Costs [3]		**$38,000,000**	**$41,100,000**	**$37,800,000**	**$37,700,000**		**$49,600,000**

Notes:

1. The major electrical upgrades include replacement of the plant MCC located in the existing laboratory. Covered by EI&C percentages in each alternative.
2. Costs rounded to the nearest $100,000 to represent overall level of estimate accuracy. Capital cost represents 2023 dollars.
3. 20-year Lifecycle Costs represent the total cost of operation including, capital, labor, electricity replacement parts and chemicals in 2023 dollars.

Appendix K, Table 2

Treatment Alternative Weighted Matrix Comparison											
		Alternative 1: SBR Treatment Expansion		Alternative 2: Aeration Basin and Secondary Clarifiers		Alternative 3: Membrane Bioreactor		Alternative 4: Phased SBR Projects		Alternative 5: Pump to Seaside WRF	
	Weight	Score	Description	Score	Description	Score	Description	Score	Description	Score	Description
Capital Cost	**25%**	4	This alternative has the second-lowest initial capital cost.	2	This alternative has the second-highest initial capital cost.	3	This alternative has the middle-ranking initial capital cost.	4	This alternative has the lowest initial capital cost for the first phase of the expansion, but does not provide the full 20-year capacity required.	1	This alternative has the highest initial capital cost.
20-Yr Life Cycle Cost	**25%**	4	This alternative has the second-lowest 20-year life cycle cost.	2	This alternative has the second-highest 20-year lifecycle cost.	3	This alternative has the middle-ranking 20-year life cycle cost	5	This alternative has the lowest 20-year life cycle cost.	1	This alternative has the highest 20-year lifecycle cost.
Regulatory Compliance / Permitting	**20%**	3	SBRs will require disk filters to meet today's regulatory limits. This alternative may have difficulty meeting increased standards in the future.	3	Activated sludge treatment will require disk filters to meet today's regulatory limits. This alternative may have difficulty meeting increased standards in the future.	5	An MBR provides a significantly higher level of treatment than an SBR or aeration basin and secondary clarifier without a tertiary filtration system. The effluent quality from an MBR is comparable to effluent quality from a disk filter. This technology is likely to be suitable for increased regulations in the future.	3	SBRs will require disk filters to meet today's regulatory limits. This alternative may have difficulty meeting increased standards in the future.	3	This alternative will likely provide adequate treatment for today's standards, but may have difficulty meeting increased standards in the future.
Expandability	**15%**	3	This alternative is easily expandable, but expansion after 2042 would require additional dewatering and filling of the west lagoon. Additional SBRs cover a significant footprint.	3	This alternative is easily expandable, but expansion would require additional dewatering and filling of the west lagoon. Future expansion after the 2042 expansion would likely include an additional disk filter, aeration basin, and secondary clarifier. These items have larger footprints.	5	This alternative is the easiest to expand. MBRs have the smallest footprint of all four alternatives. Expansion of this alternative post-2042 would not require additional dewatering of the west lagoon, but converting the northernmost SBR into an MBR.	3	This alternative is easily expandable, but expansion after 2042 would require additional dewatering and filling of the east lagoon. Additional SBRs cover a significant footprint.	2	Expanding this alternative after 2042 would include both expanding the Seaside wastewater treatment facility and upsizing the Warrenton pump station and forcemain. This alternative would be the largest effort and likely the most costly to expand.
Operations and Maintenance Reliability/Stability	**10%**	2	SBRs have been difficult to operate at the facility and this is not the most reliable option. Birds come into contact with water in the SBR, which causes settling issues. Nets have mitigated this issue somewhat, but the nets can freeze during extreme weather events and cause operational difficulties. The heavy wind in Warrenton also causes settling issues. Installation of covers over existing SBRs mitigates this.	3	Aeration basins and secondary clarifiers are generally easy to operate and maintain. This technology consumes significant chemicals.	4	The MBR technology is the most reliable alternative, and the easiest to operate. Most of the MBR process is automated. MBRs are not susceptible to settling issues or impacts from birds because the basins are covered, as opposed to SBRs. MBRs require regular cleaning and consume significant chemicals.	2	SBRs have been difficult to operate at the facility and is not the most reliable option. Birds come into contact with water in the SBR, which causes settling issues. Nets have mitigated this issue somewhat, but the nets can freeze during extreme weather events and cause operational difficulties. The heavy wind in Warrenton also causes settling issues. Installation of aluminum covers over existing MBRs mitigates this.	5	This alternative would significantly reduce the operations and maintenance duties of Warrenton.
Community Impact	**5%**	4	This design is compatible with surrounding land use and plans for a future regional biosolids solution. Odors will not likely increase.	4	This design is compatible with surrounding land use and plans for a future regional biosolids solution. Odors will not likely increase.	4	This design is compatible with surrounding land use. The high level of treatment that MBRs provide will benefit future development plans for a regional biosolids solution.	4	This design is compatible with surrounding land use and plans for a future regional biosolids solution. Odors will not likely increase.	5	This alternative would result in the least community impact to the Warrenton area. Discontinuing the Warrenton Wastewater Treatment facility would reduce odor in the vicinity of the plant and free up the site for other public uses.
Total Score		20		13		20		17		12	
Weighted Score		**3.5**		**2.6**		**3.9**		**3.7**		**2.2**	

FAVORABLE/BENEFICIAL | NEUTRAL/MODERATE | UNFAVORABLE/DIFFICULT