Executive Summary

Introduction

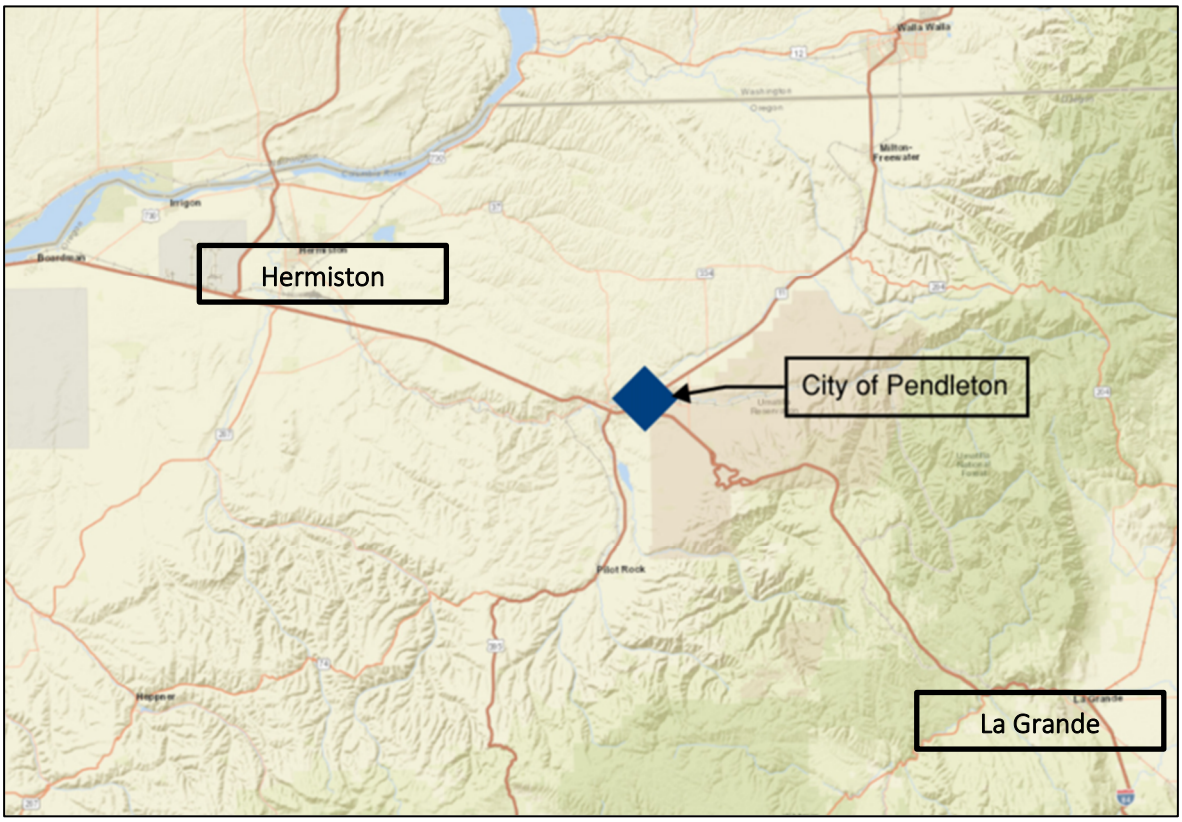
The purpose of this document is to evaluate the existing City of Pendleton (The City) Wastewater Treatment and Resource Recovery Facility (WWTRRF) and provide a 20-year plan to guide facility upgrade investments. The facility plan covers the following elements:

- Study Area Characteristics;
- Regulatory Requirements;
- Basis of Planning;
- Wastewater Characteristics;
- Existing WWTRRF Evaluation;
- Unit Process Option Evaluations;
- Combined Alternatives Evaluation; and
- Recommended Plan and Phased Implementation Plan.

Study Area Characteristics

The City is located in Umatilla County in the valley of the Umatilla River within the southeastern part of the Columbia Basin as shown in Figure ES-1. According to the 2010 United States Census Report, the City has a total area of 10.5 square miles. The altitude of Pendleton is 1,069 feet above mean sea level.

Figure ES-1
Vicinity Map



Regulatory Requirements

The City of Pendleton NPDES Permit #100982 was renewed February 3, 2005. Based on the City's inability to meet the permit requirements for temperature, the city entered upon a Mutual Agreement and Order (MAO) with the Oregon Department of Environmental Quality (DEQ). As part of the MAO and a modified NPDES Waste Discharge Permit issued on August 31, 2007, the City was required to develop a temperature management plan and to perform a mixing zone study to evaluate alternative discharge points. The mixing zone study was submitted to DEQ in 2009 to evaluate moving the outfall from McKay Creek upstream of the confluence (outfall 001) to an alternative outfall within the Umatilla River downstream of McKay and Umatilla confluence (outfall 002). Based on the mixing zone study results, the outfall 002 was installed in 2012.

NPDES Permit

Table ES-1 is a summary of estimated 2040 Pendleton WWTRRF BOD_5, TSS, and Ammonia mass loads discharged to the Umatilla River based on the Design 2040 ADWF, AWWF, or PDF of 3.18 MGD, 3.19 MGD and 4.22 MGD, respectively, and concentration limits as summarized. As shown, the estimated 2040 BOD_5, TSS, and ammonia mass loads are lower than the mass load limits included in the City's existing NPDES Permit. Based on these load projections for 2040, there is no

need for increasing the current permitted BOD, TSS, and Ammonia mass load limits included in the City's NPDES Permit. The most recent NPDES Permit expired on January 31, 2010 and has not been renewed. DEQ staff conveyed to City staff at the 2019 ACWA Conference that the City's permit may be reviewed and reissued within three years in 2022. The 2022 NPDES Permit Renewal timing has also been confirmed in the Oregon DEQ Statewide Permit Issuance Plan for Federal Fiscal Years 2020-2025.

Table ES-1
Calculated BOD & TSS Mass Loads

Parameter	Permit Limit			Projections		
	Monthly Average Concentration (ppd)	Weekly Average Concentration (ppd)	Daily Maximum Concentration (ppd)	Monthly Average Load (ppd)	Weekly Average Load (ppd)	Daily Maximum Load (ppd)
Summer Season (May 1 through October 31)						
BOD_5	920	1,400	1,800	531	796	1,056
TSS	920	1,400	1,800	531	796	1,056
Ammonia	48	NA	96	27	NA	70
Winter Season (November 1 through April 30)						
BOD_5	1,400	2,100	2,800	799	1198	1585
TSS	1,400	2,100	2,800	799	1198	1585
Ammonia	140	NA	240	80	NA	183

Notes:
NA = Not applicable

Temperature Compliance

Effluent temperatures in the City's NPDES Permit were based on requirements in the current Oregon Temperature Standard and the Umatilla River Basin Temperature TMDL; however, the City was not able to meet the new temperature limits. In addition, a lawsuit by the Northwest Environmental Associates (NWEA) sued the EPA over the approved Temperature TMDL limits. Because City was unable to meet the permit criteria, the City and DEQ entered into a Mutual Agreement and Order, which allowed for temporary removal of the temperature limit.

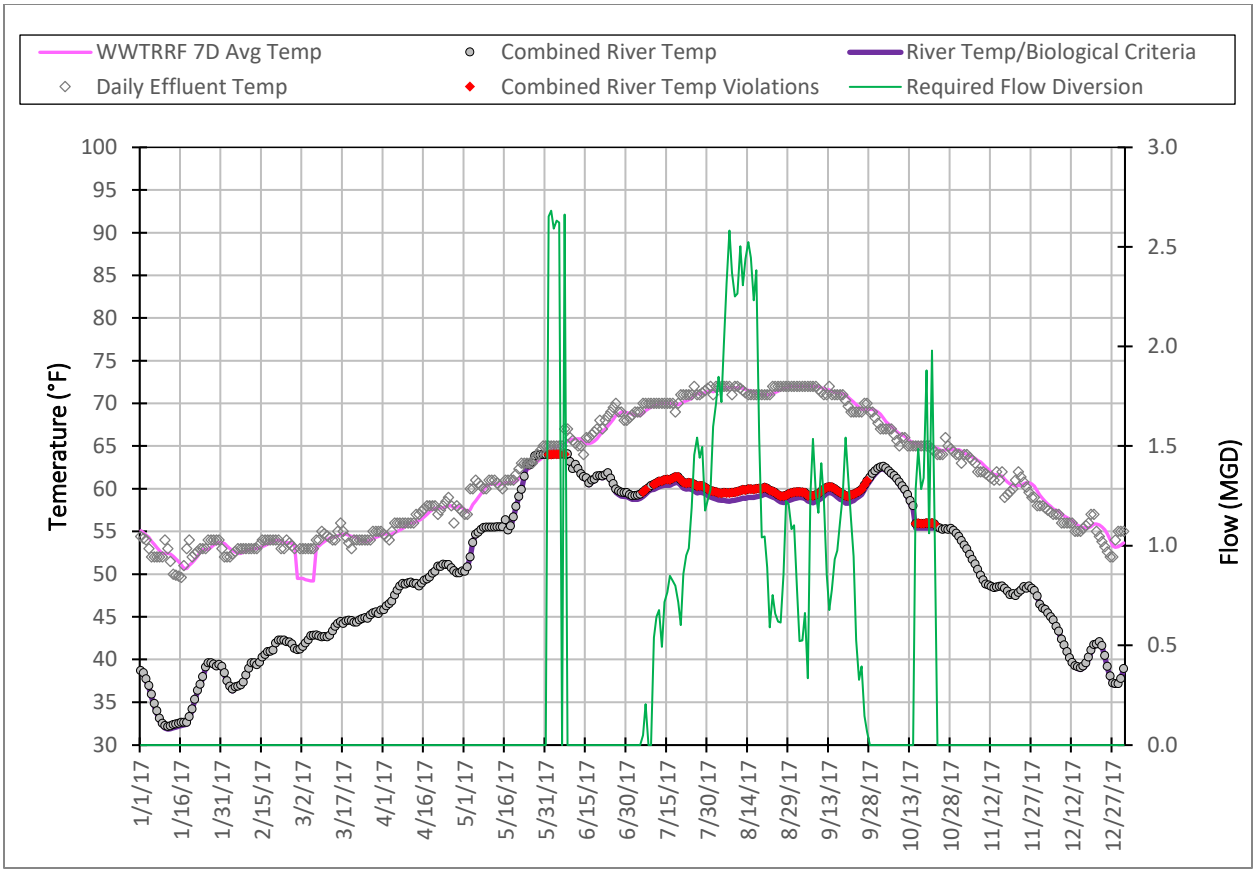
While the City does not currently have a temperature discharge criterion, a recent judge order requires DEQ to prepare new temperature TMDLs for all basins in Oregon in the next eight (8) years. The schedule for each basin is based on population, which puts the Umatilla Temperature TMDL update last on the list. The required completion date for the updated TMDL is November 28, 2027.

There is potential for effluent temperature requirements to be included in the City's next NPDES Permit renewal before the Umatilla Temperature TMDL is updated in 2027. Therefore, an analysis of the historical discharge data was completed the current Oregon Temperature Standard without the natural conditions criteria that has been the subject of the lawsuits driving the TMDL updates.

Based on the review of data from 2015 through 2017, there are 379 "potential" violations in 1096 days, or 35% of the evaluation period. **Figure ES-2** shows the results for 2017 which is typical for the study period of 2015-2017. The majority of the potential violations are during the summer months.

Based on Murraysmith's evaluation and the high potential cost of complying with temperature options long term, we have recommended the City proceed with the development of a water recycling program to produce Class A or Class C recycled water with summer season irrigation. Following this approach, the City would continue to discharge high quality water to the Umatilla River up to the allowable limit based on effluent temperature and the remaining flow would be irrigated locally. Options may include irrigating the I-84 highway median and then extending a pipeline up near the airport. An option could be to use the same site for biosolids land application and recycled water irrigation.

Figure ES-2
2017 Potential Temperature Standard Criteria Violation Results



Biosolids Management

The City's WWTRRF Biosolids Management Plan was updated in July 2005 and approved by the DEQ. The current Biosolids Management Plan provides for production of Class B Biosolids that is

land applied on sites authorized, primarily near the Pendleton Airport. Class B pathogen reduction and vector attraction reduction regulatory requirements are met through the existing anaerobic digesters followed by solids dewatering and additional drying in the existing solids drying beds. During 2017, pathogen reduction requirements were met with an average mean cell residence time of 42 days at an average temperature of 98 degrees F. Volatile solids reduction averaged 56 percent with the lowest average monthly reduction of 47 percent. This meets the minimum 38 percent volatile solids reduction requirements of 40 CFR §503.33(b)(1).

Because some of the City's land application sites are near the Eastern Oregon Regional Airport, the new UAS development restricts using this land for biosolids application in the future. As a result, Murraysmith recommends the City identify and obtain site authorization for new biosolids land application sites so that any future limitations related to the UAS development do not impact the City's ability to land apply biosolids. DEQ has recently started to allow additional site authorizations for Class B biosolids without needing a permit modification. Permit holders now no longer have to negotiate a change in land application sites as part of their permit renewal.

Future consideration is also recommended to produce Class A Biosolids, as there continues to be concern in Oregon about application of Class B Biosolids given emerging concerns about contaminants like per- and polyfluoroalkyl substances (PFAS) and other contaminants commonly present in municipal biosolids.

Wastewater Characteristics

WWTRRF daily operating data and monthly Discharge Monitoring Reports (DMRs) were reviewed to establish current flows for the WWTRRF. Current per capita flow factors are used to project estimated future flows. Future population projections have been multiplied with the per capita flow factors to develop estimates of future flow events in 5-year increments as presented below in Table ES-3.

Table ES-3
Future Projected Flows (MGD)

Flow Event	2017	2020	2025	2030	2035	2040
ADWF	2.14	2.51	2.78	2.91	3.05	3.18
AAF	2.15	2.51	2.79	2.92	3.05	3.18
AWWF	2.15	2.51	2.79	2.92	3.06	3.19
MMDWF	2.32	2.71	3.01	3.15	3.29	3.44
MMWWF	2.34	2.73	3.04	3.18	3.32	3.47
PWF	2.75	3.21	3.57	3.74	3.91	4.08
PDF	2.85	3.33	3.70	3.87	4.05	4.22
PIF	3.35	3.91	4.35	4.55	4.76	4.96

Like the current flow estimation methodology, WWTRRF DMRs were analyzed for monthly average and maximum month influent BOD_5 and TSS concentrations, and mass loads. The calculated

average and maximum monthly loads were divided by the 2017 population of 16,890 people to establish population loading factors for the Pendleton WWTRRF. Population loading factors developed and used in conjunction with estimated population projections for 2040 to estimate future BOD and TSS loads. These projected loads were converted to average and maximum monthly concentrations by using the projected 2040 ADWF and AWWF. **Table ES-4** presents the 2040 BOD and TSS loading projections for the summer (dry) and winter (wet) weather seasons.

Table ES-4
2040 BOD and TSS Loading Projections

Parameter	2040 Population	Flow (MGD)	Monthly Average		Monthly Maximum	
			Load Factor (ppcd)	Load (ppd)	Load Factor (ppcd)	Load (ppd)
Summer Season (May 1 through October 31)						
BOD_5	25,006	3.18	0.260	6,511	0.288	7,197
TSS	25,006	3.18	0.258	6,451	0.312	7,810
Winter Season (November 1 through April 30)						
BOD_5	25,006	3.19	0.246	6,155	0.271	6,766
TSS	25,006	3.19	0.232	5,812	0.265	6,620

Existing WWTRRF Evaluation

The Preliminary List of Recommended Improvements includes upgrades identified in the condition assessment to maintain facility performance and improve operations and maintenance at the facility. Recommended WWTRRF condition-related improvements were grouped into categories based on estimate cost and complexity. Categories ranged from smaller O&M related projects in categories A and B up to more complex and higher cost projects in category E.

Improvements identified in Category A and B are smaller O&M projects that could potentially be completed by City staff. The estimated total cost for these O&M projects is $4.4M, or approximately $220,000 per year over a 20-year planning period. These projects are included in the Recommended Plan as a line item for each year over the 20-year planning horizon. Examples include improvements to the hot water loop, utility water system, MCC power monitoring, and miscellaneous SCADA upgrades.

Slightly more involved or complex projects identified during the plant condition assessment are classified included in categories C and D and grouped as either O&M or CIP projects. The estimated total cost for these projects is $2.6M, with many of the projects being addressed as part of a larger CIP project included in the Recommended Plan. Projects falling in categories C and D that are not addressed a part of the Recommended Plan are included in the O&M Project List as part of the annual O&M upgrades.

The most complex WWTRRF plant condition-related projects are classified in Category E and are larger CIP projects that are included in the Recommended Plan. Category E projects include:

- Major structural renovations of the Secondary Clarifier East;
- Major renovations of the Secondary Digester Complex, including possible expansion;
- Addition of digester gas storage and Cogeneration improvements;
- Possible addition of an alternate disinfection method;
- Major structural renovations of the Chlorine Contact Chamber;
- New automatic site entrance gate;
- Addition of a new building to house chemicals stored all over the site;
- Expand Main Shop for parts storage and relocated Welding Shop; and
- Update plantwide SCADA system.

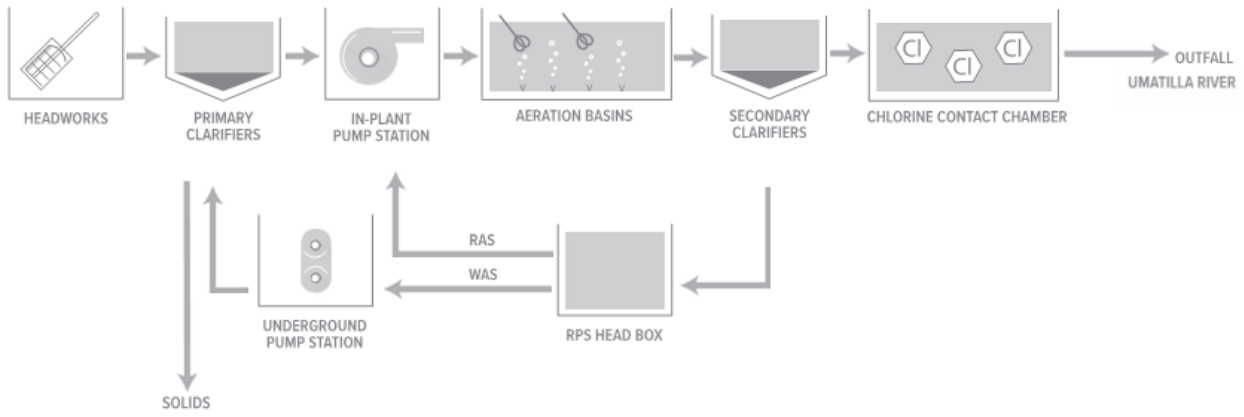
Unit Process Option Evaluations

Following is a summary of unit process options and evaluations completed as part of the facility plan update. The upgrades are broken out by liquids stream unit processes that produce the treated water that is ultimately discharge to the Umatilla River and the solids stream unit processes that produce the biosolids that is currently land applied locally.

Liquid Stream Unit Process Options

The liquid stream process flow diagram shown in **Figure ES-3** below highlights the existing WWTRRF unit processes evaluated as part of the liquids stream unit process options evaluations. Unit process summaries provide an overview of deficiencies and recommendations for each liquid stream unit process.

Figure ES-3
Existing Liquid Stream Process Flow Diagram



Headworks and Dewatering Building Heat

Improvements are needed to provide heat to the Headworks and Dewatering buildings to improve heating and prevent water lines from freezing during the winter. Options considered include

insulating and heat tracing water lines, adding additional natural gas/electric heating, or extending the hot water loop for heating. The recommended option is to use the hot water loop for heating.

The proposed system consists of skid-mounted makeup air units with a hot water coil for heat exchange, ducts, and blowers as necessary. The units will be installed on the building exterior, due to classified space restrictions, and connected to the hot water loop as the heat source.

RAS and IPPS Pump Stations

Alternatives to improve the Return Activated Sludge (RAS) and in-plant pump station (IPPS) hydraulics include replacing the existing RAS Pump Station (RPS) pumps, installing a new RPS force main, or conveying RAS back to the IPPS. The recommended option is to convey RAS back to the IPPS via gravity. The combined flow will be transferred to the headbox of the aeration basin using the existing force main. This upgrade eliminates the need for the RPS pumps and the headbox will be sealed to isolate the wet well.

Blower Upgrade

Multiple options for a blower upgrade were considered to achieve sufficient turndown of the aeration basin blowers during the winter months, to reduce energy consumption, and to adapt to seasonal oxygen demand fluctuations. Options include modifying the SCADA system, installing a new smaller blower, or installing a new smaller blower with a variable frequency drive (VFD).

The recommended option is to implement an independent SCADA system setting for the existing Aerzen hybrid blower to utilize the lower range of operation available and to install a second Aerzen hybrid blower as a redundant unit.

Disinfection Methods

Alternate methods for disinfecting final effluent are identified and evaluated for replacement of the existing chlorine gas system. The alternatives include maintaining the existing chlorine gas system, implementing onsite generation of sodium hypochlorite, switching to liquid sodium hypochlorite delivered in bulk, or converting to UV disinfection. The recommended alternative is to use to bulk liquid sodium hypochlorite.

WWTRRF Final Effluent Flow Measurement

A new effluent flow meter is necessary to more accurately measure effluent flow. Alternatives considered include a parshall flume, doppler radar-type flow meter or a magnetic flow meter. A 9-inch parshall flume flow meter with an ultrasonic level sensor connected to SCADA to record discharge flow rates is the recommended alternative.

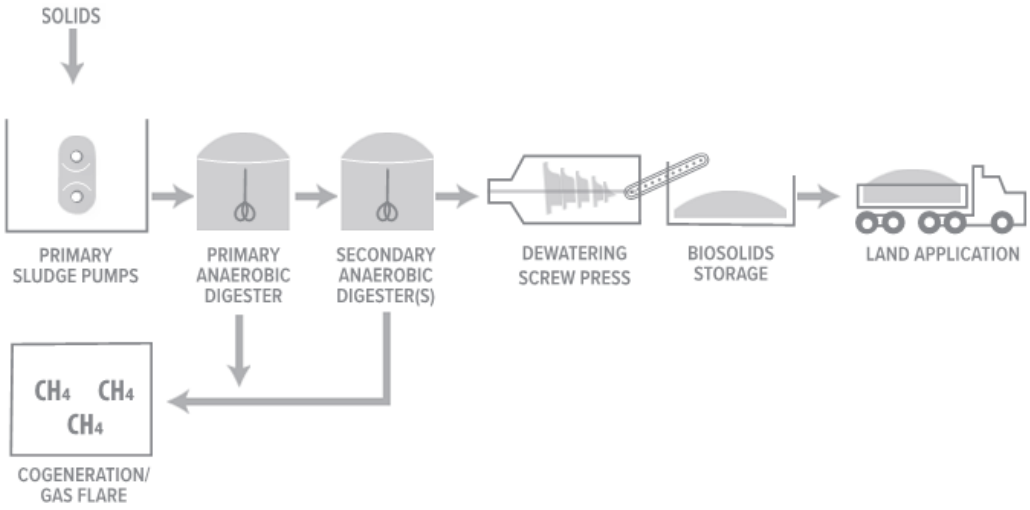
Long-term Temperature Compliance and Recycled Water Irrigation

Improvements may be needed to meet potential future permit conditions for discharging into the Umatilla River. Alternatives considered include an MBR conversion and reusing the secondary clarifiers for diurnal storage; hyporheic discharge; stage-based discharge with Class A or Class C recycled water; and mechanical cooling. The recommended option is the Class C recycled water program. Current prospective irrigation sites include the I-84 median and the airport industrial area.

Solids Stream Unit Process Options

The solids stream process flow diagram shown in **Figure ES-4** below highlights the existing WWTRRF unit processes evaluated as part of the solids stream unit process options evaluations. Unit process summaries provide an overview of deficiencies and recommendations for each solid stream unit process.

Figure ES-4
Existing Solids Stream Process Flow Diagram



Primary Sludge Pumps

Improvements to the primary sludge pump stations are needed to replace aging equipment and facilitate easier maintenance. Alternatives include rotary lobe pumps and raised floors or new progressive cavity pumps and a maintenance hoist. The recommended option are the new progressive cavity pumps, with flow meters, a maintenance hoist and roll-up doors to improve access for pump maintenance.

Primary Digester Complex

Required upgrades include storage improvements, redundancy for critical systems, and ferric chloride injection. A redundant primary digester mixing pump will be installed to ensure normal function of the primary digester. A permanent injection port will be installed in the pipe gallery to improve the process of ferric chloride dosing.

Secondary Digester Complex

Improvements are needed to replace aging equipment, ensure redundancy, and address equipment-SCADA connectivity limitations. An external pump mix system, ferric chloride injection, new boiler, new booster pump, new heat exchanger, and new piping and valves was recommended for this unit process upgrade.

Cogeneration System Optimization

Improvements to the cogeneration system are required to optimize gas and power production. Microturbine operation can be optimized through SCADA and other modifications as necessary to allow the use of natural gas as an alternate fuel supply or allow the microturbines to be left idle while the system accumulates digester biogas. Options for optimizing the cogeneration system include ground-based gas storage or the installation of a new digester gas holder cover.

The recommended option is the digester gas holder cover. The digester gas holding cover will be installed on the South Secondary Digester. Gas from the primary digester will be routed through a new underground line where it will be stored with gas generated in the secondary digester. The combined digester gas will be routed to the gas handling room through underground piping before being conditioned and then supplied to the microturbines or the flare, when necessary.

To reduce moisture and improve cogeneration performance enclosing the gas conditioning skid, a float drain trap, and gas drying equipment were considered. The recommended option is enclosing the gas conditioning skid. The skid will be fully enclosed with insulated wall panels and a roll-up door will be included for access to equipment. An electric unit heater is proposed to keep the space heated.

The existing digester gas flare will be removed, and a new flare will be installed in its place. The two pipes running between the flare and the digesters will be replaced, and a new flow meter will be installed to monitor digester gas usage at the flare.

Class A Biosolids Production Options

Class A biosolids production options include a new screw press designed to produce Class A Biosolids using a heated screw for pasteurization, installing a solar greenhouse in place of the existing drying beds, installing a composting facility, installing an indirect dryer, or extending the dewatering building to install a lime stabilization unit.

The recommended option is to install a solar greenhouse for drying and Class A biosolids production. The biosolids storage greenhouse includes construction of 5 bays installed over the current location of drying beds (1 through 4). A conveyor to transport dewatered cake from the existing screw press to the green house for drying will also be installed. A new tractor with a front bucket and snowblower attachment are included for manual turning of the dewatered cake.

Architectural Evaluation, Access Control, and Protective Systems

The following areas were identified as needing improvements:

- Admin/Lab Building – ADA compliance upgrades and space programming;
- New Admin Annex Building – Construction of a new building to accommodate functions lost in the existing Admin/Lab Building remodel;
- New Storage Building – Construction of a centralized storage building for parts, chemicals, lawn equipment, and safety equipment;
- Main Shop Expansion – Addition to Main Shop including three bays to store equipment displaced from demolishing the parts storage/welding shop;
- Site Access Control – Installation of an automatic entrance gate, upgrade security fencing around the WWTRRF site, and install security cameras; and
- Protective Systems – Addition of emergency eyewash and drench showers in hazardous chemical storage and point of use locations.

Electrical, Instrumentation, and Controls Options

The following areas were identified as needing improvements during the Electrical, Instrumentation, and Controls evaluation:

- Perform routine maintenance on all MCCs; and
- Upgrade SCADA system to include modern, fully redundant servers and networking hardware. Additionally, the software platform will be upgraded to modern platforms and architecture. This will allow for added reliability, security, and versatility. Operations staff will be able to remotely monitor and operate SCADA-connected systems via tablet technology.

Combined Alternatives Evaluation

Alternatives were developed to address the plant condition, NPDES Permit and TMDL, growth and other requirements identified as part of the facility planning process. The five combined alternatives evaluated are summarized as follows:

Alternative A – Conventional Activated Sludge (CAS) Expansion: Continue current conventional activated sludge process with upgrades to address deficiencies identified in the Condition Assessment and Class C recycled water production to address long-term temperature compliance concerns.

Alternative B – CAS/Membrane Bioreactor (MBR) Expansion: Partial conversion of the aeration basin to polymeric MBR to produce Class A recycled water to address long-term temperature compliance concerns with upgrades to address deficiencies identified in the Condition Assessment.

Alternative C1 – Polymeric MBR Conversion: A 3-train conversion of the aeration basin to polymeric MBR with diurnal storage in the secondary clarifiers and Class A recycled water production to address long-term temperature compliance with upgrades to address deficiencies identified in the Condition Assessment.

Alternative C2 – Ceramic MBR Conversion: A 2-train conversion of the aeration basin to ceramic MBR with diurnal storage in the secondary clarifiers and Class A recycled water production to address long-term temperature compliance with upgrades to address deficiencies identified in the Condition Assessment.

Alternative D – CAS/Tertiary Filtration: Addition of tertiary filtration to the chlorine contact chamber south train to produce Class A recycled water to address long-term temperature compliance concerns with upgrades to address deficiencies identified in the Condition Assessment.

Table ES-5 summarizes the capital and lifecycle costs for the five combined alternatives. As summarized previously, capital cost and lifecycle cost represent 30 percent and 20 percent weighting in the overall evaluation, respectively.

Table ES-5
Combined Alternative Capital and Lifecycle Costs

Cost Type	Alt A	Alt B	Alt C1	Alt C2	Alt D
Capital Cost	**$16.48 M**	**$19.30 M**	**$20.45 M**	**$26.21 M**	**$19.80 M**
20-yr NPV of Additional Labor	$2.64 M	$3.16 M	$2.94 M	$3.00 M	$3.33 M
20-yr NPV of O&M – Chemical	$1.15 M	$1.30 M	$1.46 M	$1.46 M	$1.46 M
20-yr NPV of O&M – Energy	$1.47 M	$1.84 M	$2.21 M	$2.21 M	$1.92 M
20-yr NPV of O&M – Major Replacement	$0.37 M	$0.94 M	$1.91 M	$0.86 M	$0.67 M
20-year Lifecycle Cost	**$22.11 M**	**$26.54 M**	**$28.97 M**	**$33.74 M**	**$27.17 M**

The combined alternative scoring summary is presented in **Table ES-6**. Based on the evaluation, Alternative A has the highest scoring and is recommended for implementation over the 20-year planning horizon.

Table ES-6
Combined Alternative Scoring

	Weight	Alt A	Alt B	Alt C1	Alt C2	Alt D
Capital Cost	30%	4.0	3.5	3.0	2.5	3.0
20-year Life-Cycle Cost	20%	4.0	3.0	2.5	3.0	3.0
Regulatory Compliance	30%	4.0	3.0	3.0	3.0	3.0
Constructability	20%	3.5	3.0	2.5	2.5	4.0
Total	**100%**	**3.9**	**3.2**	**2.8**	**2.8**	**3.2**

Recommended Plan and Phased Implementation Plan

Based on the combined alternatives evaluation summarized in the previous section, it appears the best long-term solution for the City is a departure from the previous facility plan recommendation to proceed with full-scale implementation of a membrane bioreactor. The primary issues for the City are the unknowns related to long term compliance with temperature regulations.

As a result, Murraysmith recommends the City proceed with Alternate A to upgrade the existing Conventional Activated Sludge (CAS) treatment process along with development of a Class C water recycling program. Figure ES-5 at the end of this section shows the overall Recommended Plan overlaid on the WWTRRF site plan. Under the recommended plan, the City would retain its current Umatilla River outfall and discharge effluent up to the limits of Umatilla River Temperature TMDL updated planned for completion by 2028. Prior to implementation of a full-scale water recycled program, this recommendation should be revisited based on the actual requirements of the future TMDL.

Because the future requirements for both Umatilla River discharge and biosolids land application are currently unknown, these upgrades are included in the recommended plan in the later years of the 20-year plan, with "triggers" assigned for implementation if the need should arise prior to the planning year. Recommended plan phases are summarized as follows:

- Phase 1A (2020-2022) includes repairs to failing solids stream unit processes and upgrades required to meet near-term regulatory requirements. Site access control measures, protective systems, expansion of the main shop, and electrical improvements are also included in this phase.

- Phase 1B (2025-2027) includes repairs to failing liquids stream unit processes, a new storage building, and SCADA improvements.

- Phase 2 (2030-2032) includes dewatering upgrades and installation of a biosolids storage greenhouse for Class A biosolids production capabilities. A new admin annex building and primary sludge pumps are also included in this phase.

- Phase 3 (2038-2040) includes unit process upgrades required for production of Class C recycled water, digester gas storage, and architectural improvements to the existing admin/lab building.

It is recommended the City proceed with implementation of Phases 1A and 1B early in the 20-year planning horizon, as these upgrades are needed to address ongoing plant condition and O&M issues. Phases 2 and 3 would then be implemented based on "triggers", as discussed in the following section.

"Triggers" for Recommended Plan Phases

While the estimated timing for these phases has been provided in order to develop the 20-year WWTRRF CIP, the actual triggers for each phase, or portions thereof, will be as follows:

- O&M Upgrades (2020-2040): The recommended plan includes a separate budget line item that incorporates smaller annual O&M related projects.

- Phase 1A (2020-2022) and 1B (2025-2027) Immediate Needs: These upgrades are triggered by failing equipment and immediate operational needs. For example, secondary digester complex upgrades in Phase 1A are triggered by near-term operating requirements for redundancy and improved chemical dosing. Less immediate upgrades have been included in Phase 1B that could be triggered earlier than planned depending on O&M needs.

- Phase 2 (2030-2032) Biosolids Greenhouse and Dewatering Upgrades: The dewatering upgrades and greenhouse for Class A biosolids would be triggered by loss of local Class B biosolids land application sites and changes in biosolids management regulatory requirements. The City is unable to utilize approximately 1,426 acres of the existing 1,700 acres of approved Class B land application sites due to development or other restrictions at the Eastern Oregon Regional Airport and the Airport Industrial Park. Additional biosolids land application sites will need to be authorized in the near term to continue the City's Class B Biosolids land application program. If additional Class B sites are not secured the City would likely need to proceed with WWTRRF upgrades to produce higher quality Class A Biosolids.

- Phase 2 (2030-2032) Building Upgrades and Renovations: Construction of the new Administration Annex Building will be triggered by loss of the County lab and the need to provide a location for local testing of water quality for private wells and other private lab services re-established locally using the WWTRRF laboratory.

- Phase 3 (2038-2040) WWTRRF Recycled Water Expansion: Upgrades to produce Class C Recycled Water and implement a water recycling program would be triggered by an update of the Umatilla River Temperature TMDL eliminating the NCC criteria and potentially resulting in a much lower excess thermal load limit than currently anticipated. It is anticipated the Umatilla Temperature TMDL will be updated in the next 8 years, after

which new temperature limits would be included in the City's next NPDES permit renewal.

Table ES-7 summarizes the Phased Implementation Plan with improvements tied to phases and associated project costs. Table ES-8 at the end of this section details the yearly costs by project and phase.

Table ES-7
Phased Implementation Plan Summary

WWTRRF CIP	Phase 1A (2020-2022)	Phase 1B (2025-2027)	Phase 2 (2030-2032)	Phase 3 (2038-2040)
O&M Upgrades[1]		$220,000 per year		
Headworks and Dewatering Building Heat	$ -	$ -	$ -	$ 160,000
Primary Clarifiers	$ -	$ 284,000	$ -	$ -
RPS and IPPS	$ 120,000	$ -	$ -	$ -
New Smaller Blower w/ VFD	$ 136,000	$ -	$ -	$ -
Secondary Clarifiers	$ -	$ 1,504,000	$ -	$ -
Disinfection Conversion	$ 84,000	$ -	$ -	$ -
Chlorine Contact Chamber	$ -	$ 368,000	$ -	$ -
Final Effluent Flow Measurement	$ -	$ -	$ -	$ 88,000
Class C Recycled Water	$ -	$ -	$ -	$ 3,256,000
Primary Sludge Pumps	$ -	$ -	$ 272,000	$ -
Primary Digester Complex	$ 136,000	$ -	$ -	$ -
Secondary Digester Complex	$ 1,016,000	$ -	$ -	$ -
Digester Gas Storage	$ -	$ -	$ -	$ 1,032,000
Digester Gas Moisture Reduction	$ -	$ -	$ -	$ 92,000
Digester Gas Flare	$ -	$ -	$ -	$ 568,000
Dewatering Upgrades	$ -	$ -	$ 1,243,000	$ -
Biosolids Storage Greenhouse	$ -	$ -	$ 2,292,000	$ -
Admin/Lab Remodel	$ -	$ -	$ -	$ 776,000
Admin Annex Building	$ -	$ -	$ 1,348,000	$ -
New Storage Building	$ -	$ 748,000	$ -	$ -
Main Shop Expansion	$ 280,000	$ -	$ -	$ -
Site Access Control and Protective Systems	$ 136,000	$ -	$ -	$ -
Electrical Improvements	$ 48,000	$ -	$ -	$ -
SCADA Upgrades	$ -	$ 488,000	$ -	$ -
Totals	**$ 1,956,000**	**$ 3,392,000**	**$ 5,155,000**	**$ 5,972,000**

1. O&M upgrades include $220,000 per year. See Table ES-8 for a complete CIP summary.

PHASE 1A

1. RPS AND IPPS
2. NEW SMALLER BLOWER W/ VFD
3. DISINFECTION CONVERSION
4. PRIMARY DIGESTER COMPLEX
5. SECONDARY DIGESTER COMPLEX
6. MAIN SHOP EXPANSION
7. SITE ACCESS CONTROL AND PROTECTIVE SYSTEMS
8. ELECTRICAL IMPROVEMENTS

PHASE 1B

9. PRIMARY CLARIFIERS
10. SECONDARY CLARIFIERS
11. CHLORINE CONTACT CHAMBER
12. NEW STORAGE BUILDING
13. SCADA UPGRADES

PHASE 2

14. PRIMARY SLUDGE PUMPS
15. DEWATERING UPGRADES
16. BIOSOLIDS STORAGE GREENHOUSE
17. ADMIN ANNEX BUILDING

PHASE 3

18. HEADWORKS AND DEWATERING BUILDING HEAT
19. FINAL EFFLUENT FLOW MEASUREMENT
20. CLASS C RECYCLED WATER
21. DIGESTER GAS STORAGE
22. DIGESTER GAS MOISTURE REDUCTION
23. DIGESTER GAS FLARE
24. ADMIN/LAB REMODEL

N

40 20 0 40 80
SCALE IN FEET

FIGURE ES-5

CITY OF PENDLETON INCORPORATED 1880 OREGON

WWTRRF Facility Plan Update

Recommended Plan
WWTRRF Site Plan

OCTOBER 2019

murraysmith

17-2019.403

\\ad.msa-ep.com\Portland\PDX_Projects\17_2019 - Pendleton TO I WWTRRF Facilities Plan Update\CAD\Figures\6.2_Recommended Plan\Figure 9-1.dwg FIG 9-1 10/15/2019 8:19 AM BERNADEL.GARSTECKI 23.0s (LMS Tech)

City of Pendleton

WWTRRF Facility Plan Update

Table ES-8

Capital Improvements Program Summary

Description	O&M Upgrades	Phase 1 A Subtotal	Phase 1 B Subtotal	Phase 2 Subtotal	Phase 3 Subtotal	Total CIP Cost Estimate	Phase 1 A			Phase 1 B					Phase 2								Phase 3		
							2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Annual Condition Assessment O&M Upgrades	$ 4,620,000					$ 4,620,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000
Headworks and Dewatering Building Heat		$ -	$ -	$ -	$ 160,000	$ 160,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 40,000	$ 60,000	$ 60,000
Primary Clarifiers		$ -	$ 284,000	$ -	$ -	$ 284,000	$ -	$ -	$ -	$ -	$ -	$ 71,000	$ 106,500	$ 106,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
RPS and IPPS		$ 120,000	$ -	$ -	$ -	$ 120,000	$ 30,000	$ 45,000	$ 45,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
New Smaller Blower w/ VFD		$ 136,000	$ -	$ -	$ -	$ 136,000	$ 34,000	$ 51,000	$ 51,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Secondary Clarifiers		$ -	$ 1,504,000	$ -	$ -	$ 1,504,000	$ -	$ -	$ -	$ -	$ -	$ 376,000	$ 564,000	$ 564,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Disinfection Conversion		$ 84,000	$ -	$ -	$ -	$ 84,000	$ 21,000	$ 31,500	$ 31,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Chlorine Contact Chamber		$ -	$ 368,000	$ -	$ -	$ 368,000	$ -	$ -	$ -	$ -	$ -	$ 92,000	$ 138,000	$ 138,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Final Effluent Flow Measurement		$ -	$ -	$ -	$ 88,000	$ 88,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 22,000	$ 33,000	$ 33,000
Class C Recycled Water		$ -	$ -	$ -	$ 3,256,000	$ 3,256,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 814,000	$ 1,221,000	$ 1,221,000
Primary Sludge Pumps		$ -	$ -	$ 272,000	$ -	$ 272,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 68,000	$ 102,000	$ 102,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Primary Digester Complex		$ 136,000	$ -	$ -	$ -	$ 136,000	$ 34,000	$ 51,000	$ 51,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Secondary Digester Complex		$ 1,016,000	$ -	$ -	$ -	$ 1,016,000	$ 254,000	$ 381,000	$ 381,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Digester Gas Storage		$ -	$ -	$ -	$ 1,032,000	$ 1,032,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 258,000	$ 387,000	$ 387,000
Digester Gas Moisture Reduction		$ -	$ -	$ -	$ 92,000	$ 92,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 23,000	$ 34,500	$ 34,500
Digester Gas Flare		$ -	$ -	$ -	$ 568,000	$ 568,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 142,000	$ 213,000	$ 213,000
Dewatering Upgrades		$ -	$ -	$ 1,243,000	$ -	$ 1,243,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 310,750	$ 466,125	$ 466,125	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Biosolids Storage Greenhouse		$ -	$ -	$ 2,292,000	$ -	$ 2,292,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 573,000	$ 859,500	$ 859,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Admin/Lab Remodel		$ -	$ -	$ -	$ 776,000	$ 776,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 194,000	$ 291,000	$ 291,000
Admin Annex Building		$ -	$ -	$ 1,348,000	$ -	$ 1,348,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 337,000	$ 505,500	$ 505,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
New Storage Building		$ -	$ 748,000	$ -	$ -	$ 748,000	$ -	$ -	$ -	$ -	$ -	$ 187,000	$ 280,500	$ 280,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main Shop Expansion		$ 280,000	$ -	$ -	$ -	$ 280,000	$ 70,000	$ 105,000	$ 105,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Site Access Control and Protective Systems		$ 136,000	$ -	$ -	$ -	$ 136,000	$ 34,000	$ 51,000	$ 51,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Electrical Improvements		$ 48,000	$ -	$ -	$ -	$ 48,000	$ 12,000	$ 18,000	$ 18,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
SCADA Upgrades		$ -	$ 488,000	$ -	$ -	$ 488,000	$ -	$ -	$ -	$ -	$ -	$ 122,000	$ 183,000	$ 183,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Totals	$ 4,620,000	$ 1,956,000	$ 3,392,000	$ 5,155,000	$ 5,972,000	$ 21,095,000	$ 709,000	$ 953,500	$ 953,500	$ 220,000	$ 220,000	$ 1,068,000	$ 1,492,000	$ 1,492,000	$ 220,000	$ 220,000	$ 1,508,750	$ 2,153,125	$ 2,153,125	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 1,713,000	$ 2,459,500	$ 2,459,500

Notes:

- *All costs in 2019 dollars*
- *For planning purposes, future costs should be increased for cost escalation (inflation) based on Engineering News Record - Construction Cost Index or other index preferred by the City.*
- *Cost estimates represent a Class 5 budget estimate in 2019 dollars, as established by the American Association of Cost Engineers (AACE), with a level of accuracy range between -30 to +50 percent.*