

# Facility Plan

Water Reclamation Facility

*City of Rapid City Project No. 14-2214*

*HDR Project No. 222360*

*Prepared for:*



*Rapid City Department of Public Works  
& Water Reclamation Facility*

February 16, 2016



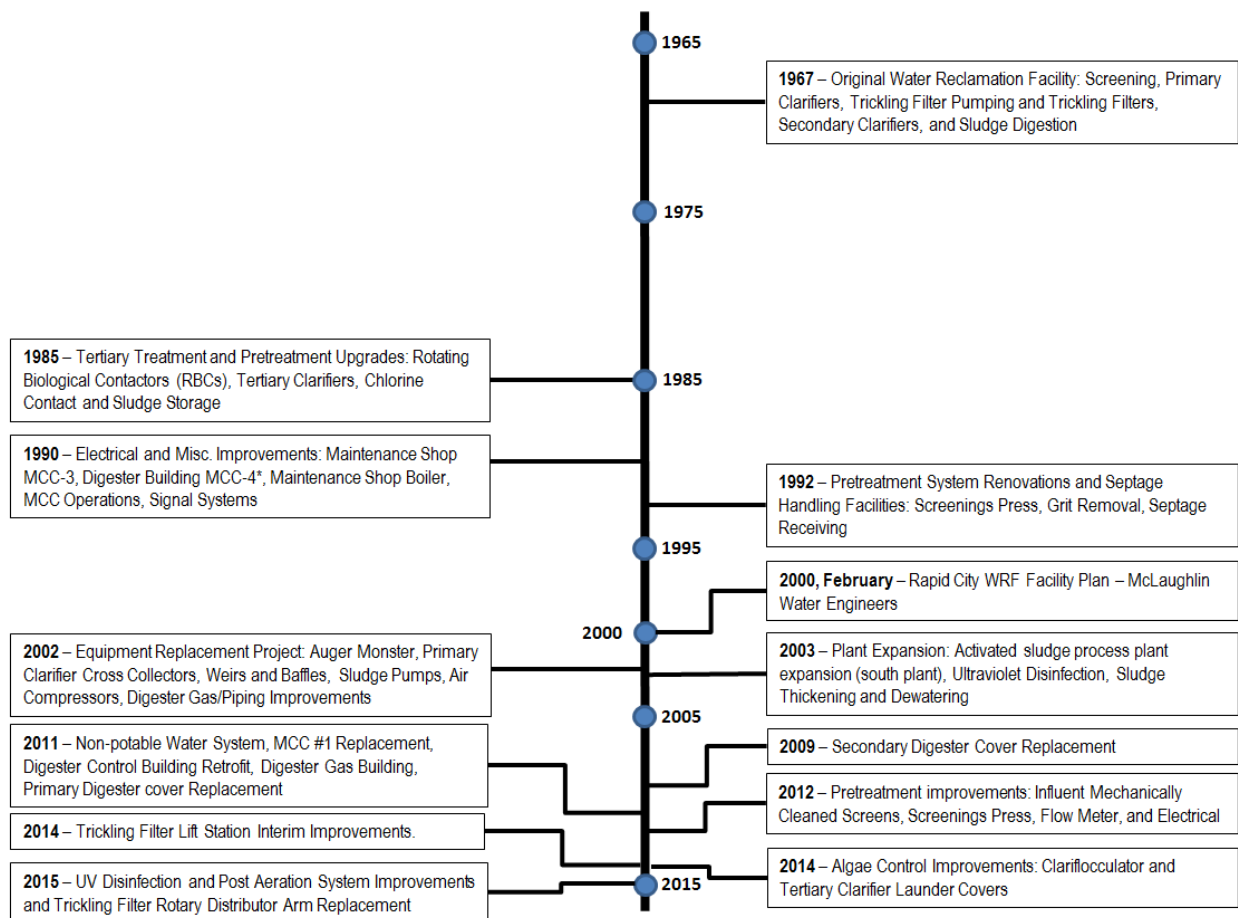


# Executive Summary

## Introduction

The City of Rapid City (City) Water Reclamation Facility (WRF) is located 5 miles east of the City in Pennington County, South Dakota. Rapid City provides wastewater treatment for all residential, commercial, and current industrial customers in the City of Rapid City and several regional customers. The WRF uses both a fixed film system (North Plant) and an activated sludge system (South Plant) that operate in parallel to treat wastewater from the facility's service area. The WRF is facing more restrictive discharge limits to Rapid Creek and serves a steadily increasing population base.

The original fixed film facility, referred to as the North Plant, was designed in 1965 and construction was completed in 1967. Improvements and upgrades have occurred regularly to replace worn equipment and to keep up with more restrictive effluent water quality requirements. Refer to Figure E.1 for the timeline of these major improvements.



\*MCC – Motor Control Center

**Figure E.1. Rapid City WRF History of Major Improvements**



The City last completed a WRF facility plan in 2000. Anticipated permit conditions were discussed and treatment plant equipment and processes were evaluated through the planning year 2018. The 2000 Facility Plan recommended a number of capital improvements which have been implemented. A process addition of activated sludge was completed in 2003 for additional treatment flexibility. In addition, the recommendations for construction of sludge dewatering, replacement of the gas chlorine disinfection system with an ultraviolet (UV) disinfection system and additional administration facilities have been completed. As the planning period is nearing conclusion, a number of improvements have been made to the facility, equipment condition has changed, and potential new more stringent permit modifications have been identified. This coupled with changing wastewater flows and pending operational changes at the WRF led the City to have another WRF facility plan prepared to more accurately plan for the next 20+ years.

Even at the completion of this facility plan, the upcoming facility nutrient discharge criteria for the Rapid City WRF are not certain. However impending phases of upcoming nutrient discharge criteria for total nitrogen and phosphorus criteria have been defined from which associated facility requirements can be identified. In addition to nutrient removal evaluations, this facility plan evaluated the existing facilities and structures to update the condition of the entire facility to provide reliable treatment. Plant expansion and other improvements are addressed to meet anticipated facility needs to at least the planning year 2035. Numeric nutrient criteria are a critical tool for protecting and restoring a water body's designated uses related to nitrogen and phosphorus pollution.

This Executive Summary is followed by a facility plan General Summary chapter, which further summarizes the results of the current facility analysis, and a detailed facility plan which is presented in the subsequent sections. Age and condition related needs were determined by onsite condition assessment and are reflected in Chapter 1.1 Operations and Physical Condition Assessments. Operational improvements were discussed both in terms of physical operation of the plant in Chapter 1.1 and in terms of energy consumption in Chapter 1.2 Energy Assessment. Regulatory considerations are outlined in Chapter 2.2. Capacity related needs were determined and are reflected in Chapter 3.1 Plant Hydraulic Capacity and 3.2 Plant Organic Capacity. Finally, regulatory and capacity related needs were considered and projects were identified for secondary treatment and solids handling in Chapters 4.1 and 4.2, respectively. The results have been compiled and presented in Chapter 5.1 in the form of a preliminary capital improvements plan. A technical memorandum detailing septage receiving concerns, objectives, and proposed schematic layouts along with preliminary facility costs is contained in Appendix 5.1.A.

## Water Quality and Regulatory Requirements

The intent of this facility planning effort is to define the longer-term path forward to meet anticipated incoming capacity and regulatory discharge requirements so that shorter term modifications are consistent with the long term plan. The driving factor in this planning effort became the anticipated regulatory requirement of more strict ammonia and nutrient removal from the facility's discharge. A wider regional focus on nutrients is occurring because of the Gulf of Mexico hypoxia. Hypoxic zones are areas in the ocean of such low oxygen concentration



that animal life suffocates and dies, and as a result are sometimes called "dead zones. The focus on solving these environmental endangerments is driving efforts to reduce nutrient discharges throughout the Missouri River watershed, which includes discharges from the Rapid City WRF. In fact, due to the lack of progress on the part of the states, legislation has begun pushing the EPA to take primacy and implement these new nutrient standards on a federal level. To avoid more stringent limits directly enforced by the EPA, surrounding states including Minnesota, Wisconsin, Montana, and Colorado are in the process of incorporating nutrient discharge limits which indicates that any municipal wastewater treatment facility, such as the Rapid City WRF, should be prepared for new and/or more stringent nutrient limits for future discharge permits.

Several significant issues influence the wastewater facilities planning and discharge limitations for the City of Rapid City:

- New and future discharge permits with the greatest affect being ammonia and nutrient discharge limits.
- Increased design flow affecting permit limits and meet anti-backsliding requirements.

*(Anti-backsliding requirements are federal regulations regarding the renewal or reissue of discharge permits (for direct dischargers) and say that the effluent limitations, standards, or conditions in the renewed/reissued permit "must be at least as stringent" as the effluent limitations, standards, or conditions in the previous permit.)*

- Rapid Creek water quality
- Revised federal ammonia nitrogen criteria adopted in 2013, which will be incorporated into South Dakota water quality standards at the completion of the next triennial review in 2017 and implemented into permits.
- 40 CFR Part 503 regulation impacts on biosolids

Discussions with SD DENR and review of WRF influent and effluent data have identified the significant issues that are likely to be introduced in the new discharge permit, which include a new ammonia nitrogen discharge limit and new total nitrogen (TN) and total phosphorus (TP) limits, or nutrient limits. The ammonia limits are fairly well defined based on the new federal ammonia criteria. Many factors affect the future nutrient limits. At this time the nutrient numeric limits in the upcoming discharge permits are not definite numeric values. However, a progression of more stringent limits has been developed based on discussions with SD DENR and comparisons with how other similar Midwest states are dealing with implementing these pending EPA driven limits. The ammonia and nutrient limits have significant effects on treatment processes. The existing treatment processes will require modification/ expansion to meet these anticipated limits.

Additional monitoring will be required in the upcoming discharge permit. Requirements are likely to include more complete effluent quality data with a focus on more intensive requirements for ammonia and nutrients.

Biosolids are affected by 40 CFR Part 503 regulation if the City moves away from landfilling or Co-composting the dewatered biosolids for all or part of the year. Depending on the use of biosolids and public contact, the biosolids would need to meet Class A or Class B requirements. As it stands now, both landfilling and processing biosolids through the Materials Recycle Facility



(MRF) Co-composting Facility meet federal guidelines and Rapid City does not intend to change biosolids management methods.

The process evaluations were based on meeting a “Level 1” Total Nitrogen (TN) requirement of less than 10 mg/l and a Total Phosphorus (TP) limit of 1 mg/l for nutrient limits. Level 1 can be achieved with equitable modifications to the conventional secondary treatment processes at the Rapid City WRF.

Table E.1 presents a summary of anticipated future Rapid City WRF discharge permit renewal dates and the anticipated limitations to be included in each permit. In addition, the corresponding recommended activity for the City is listed. The permit sequence is defined as follows:

- Current permit: Permit that is expected to be issued in 2016.
- Permit #1 – Compliance Schedule for New Ammonia Standards
- Permit #2 – New Ammonia Standards
- Permit #3 – New Nutrient Criteria Standards
- Permit #4 – More Stringent Nutrient Standards

**Table E.1. Projected Limitation with Corresponding Permit Recommended Activity Timing**

Permit Cycle (Year)	Projected Limitations	Recommended Activity
Current Permit 2016	New Ammonia Standards based on updated Rapid Creek water quality	Identify how to achieve reliable ammonia removals and improve plant serviceability and reliability. Establish schedule for construction – assume major projects are 5 years from study completion unless other justification (i.e. Trickling Filter Pump Station type trigger).
Permit #1 2020	Compliance Schedule for New Ammonia Standards based on 2013 EPA Ammonia Criteria	Begin design to construct modifications to achieve ammonia removals. Project to be constructed by 2025. Ammonia standards will become part of the SD Water Quality Standards After 2017 and new treatment process is required to meet proposed Ammonia limits.
Permit #2 2025	New Ammonia Standards	Assuming required improvements for ammonia removals complete. Begin design to construct modifications to achieve nutrient removal (TN 10 / TP 1) to be constructed by 2030.
Permit #3 2030	New Nutrient Standards : Total Nitrogen and Total Phosphorus Limits @ 8-10 mg/l TN and 0.5-1.0 mg/l P	Assuming modifications to achieve nutrient removal (TN 10 / TP 1) complete. Nutrient discharge limits have medium level of uncertainty. Track potential for more stringent nutrient standards.
Permit #4 2035	Potentially more Stringent TN and TP	Track potential for more stringent nutrient standards.



## Plant Hydraulic Capacity

Hydraulic capacity is defined as the ability of the treatment plant to handle the wastewater flow through the various treatment units. The hydraulic capacity of the WRF was evaluated as part of facility planning to help identify capital improvements required to meet current and long-term capacity needs at the WRF.

The hydraulic capacity of the WRF was determined through a combination of a unit process by unit process analysis and a hydraulic modeling of the entire WRF.

The current 2015 peak hour flow measured at the facility is 30.2 mgd. It is anticipated the peak hour hydraulic capacity in 2035 will be 43.5 mgd. Numerous process upgrades will be required to meet this peak flow. These improvements include: aeration basin improvements, an in-plant secondary pump station, headworks capacity improvements, south plant effluent piping improvements and additional clariflocculators.

The future influent flows shown in Table E.2 were calculated from the average per capita values multiplied by the projected wastewater service population. Industrial and commercial reserve is limited to the nature of the existing service area and was included in projected population growth loadings.

The current (2015) wastewater service population of 79,855 is expected to increase at a rate of approximately 1.9% per year to over 131,000 by 2045. The current average daily flow to the treatment facility is expected to increase from the current 9.51 mgd to nearly 16 mgd by 2045. Pollutant loadings, including BOD, TSS, ammonia and nutrients are all expected to increase from current levels in proportion to the expected wastewater flow increase in future years.

**Table E.2. Projected Future Influent Flows**

Parameter	Flow Projections						
	Current	2020	2025	2030	Planning Year - 2035	2040	2045
Population WW Service Population	79,855	85,560	91,205	98,195	105,184	120,674	131,018
Influent Flow Annual Average Day	MGD 9.5	MGD 10.6	MGD 11.3	MGD 12.2	MGD 13.0	MGD 14.9	MGD 16.2
Peak Hour	30.0	35.4	37.7	40.6	43.5	49.9	54.2

## Treatment Capacity

The WRF’s ability to remove pollutants from the wastewater, as necessary to meet regulatory limits, is the facility’s treatment capacity. Note the capacity is presented based on flow; however, this represents an organic loading capacity evaluation based on the wastewater characterization. The system is limited to design flows based on the pollutant levels in the





wastewater in addition to the required improvements to allow the plant to pass peak hydraulic flows.

The existing WRF was modeled to test the critical flows and loads at which expansion of the system is needed for the system as a whole. The model results showed that the controlling regulatory condition for the organic capacity of the existing facility is based on meeting the permitted effluent ammonia concentration. Table E.3 summarizes the existing capacity analysis for both current (2016) permit limits and forthcoming Permit #2 –New Ammonia Standards based on mussel toxicity (2013 EPA Water Quality Rule).

Table E.3 indicates the total equivalent population treatment capacity is 91,155, with the current 2016 permit limitations, which would be reached in approximately year 2025. The 2000 Facility Plan projected the existing WRF had a population treatment capacity of 94,000 at the 2001 permit limits. It predicted this population would be reached in 2018. The capacity with more stringent ammonia limits is only 3.1% less from the 2000 estimate at a total equivalent population of 91,155.

At the Permit #2 –New Ammonia Standards limits, the equivalent population capacity would be 81,855, or approximately 2 years of growth from the 2014 base population of 79,855. Therefore, improvements would need to be in place and functioning when Permit #2 is issued. The existing plant cannot meet expected regulatory treatment requirements without treatment capacity expansion.

The whole plant capacity evaluation was also completed by integrating improvements to meet the Permit #2 – New Ammonia Standards. The expectation is that these limits could be incorporated into the City’s permit as early as 2025.

**Table E.3 Organic Capacity Summary of Existing WRF**

	Current Loadings	Capacity with 2016 Current Ammonia Permit Limits	Capacity with Permit #2 – New Ammonia Limits
BOD <sub>5</sub> , lb/day	16,600	17,600	15,900
TSS, lb/day	16,100	19,600	17,600
TKN, lb/day	2,810	3,210	2,880
Ammonia, lb/day	1,970	2,240	2,020
Population Equivalent	79,855	91,155	81,855

## Treatment Alternatives

Advanced treatment techniques using biological, chemical and physical processes were evaluated for removing nutrients from wastewater. Alternatives for removing nutrients were considered including: activated sludge, side-stream treatment and trickling filter wet weather treatment.

To meet Permit #2 (2025) requirements, additional activated sludge treatment capacity with additional clarifiers will be required as the RBCs that currently provide treatment capacity will no longer be utilized due to the process limitations and age and condition. To meet the Permit #3



(2030) requirement, additional facilities for chemical phosphorus removal and capacity will be required.

The recommended alternative is the expansion of the activated sludge system for additional treatment and flow capacity. This alternative is consistent with the 2000 Facility Plan as that plan recommended the activated sludge treatment for additional capacity with provisions for denitrification. The aging trickling filter/RBC treatment processes will be phased out of service as the new alternatives are constructed.

Treatment expansion improvements are divided into the phases triggered by the permit cycles. Phase 1 includes modifications required to achieve Permit #2 – New Ammonia Standards (constructed by 2025). The combination of Phase 1 and Phase 2 includes modifications to achieve both future ammonia removals and Biological Nutrient Removal (TN 10/TP 1) to be constructed by 2030. Refer to Figure E.3 for phased improvements.

The selected alternative of activated sludge expansion without the existing trickling filters is consistently the lowest cost alternative whether it be construction cost, energy cost, chemical cost, operations and maintenance cost, or overall present value. On a total present value basis, it is approximately \$6.5 million less than the next alternative.

## Solids Handling Evaluation

The Rapid City WRF currently processes approximately 490,000 gallons per week of sludge during a maximum month at the solids handling facilities. The solids handling facilities currently thicken sludge to 6 percent solids and dewater sludge to 25 percent solids. However, after reviewing the current Rapid City Regional Landfill composting operations, it was determined that moving forward with dewatering only (no thickening) will not adversely impact the Rapid City MRF Co-composting operations and therefore only dewatering system alternatives were evaluated for future solids handling at the Rapid City WRF. The most notable recommended technology-based change was the evaluation of options for dewatering to improve operability and reduce cost of the sludge handling operation.

Four dewatering technologies were reviewed for upgrading the existing solids handling facilities. These four technologies included centrifuges, screw presses, rotary fan presses, and volute presses.

Solids handling improvements are recommended as an immediate need. Alternative 4B: Three Volute Presses constructed in a new building, is included in the Rapid City WRF Capital Improvements Plan. A phased approach is provided to add additional units concurrent with Permit #2 (2025) liquid process train improvements.

## Age and Condition

A condition assessment of equipment and facilities was conducted to help determine the needs and timing for repair or replacement of existing facility components in the development of the long-range plans of the WRF. An operations assessment was conducted by an operations specialist, focusing on how the existing facility is being operated and maintained. A physical condition assessment was conducted by individuals with expertise in process equipment, architecture, structural engineering, mechanical engineering, electrical engineering, and





instrumentation engineering, focusing on the current physical condition analysis as a basis for estimating the remaining useful life of its components.

Each significant piece of process equipment was physically inspected and plant O&M staff was interviewed to discuss reliability and operational and condition issues. From a process equipment perspective, there are currently no major constraints on the WRF's ability to meet the current discharge permit limits under normal circumstances, due to the O&M staff's dedication to ongoing operation and maintenance of the facility.

A number of the treatment facilities are 30 to 50 years old and have reached their useful life to provide reliable service. Some plant components suffer from deteriorated condition, fail to comply with current codes or provide unsatisfactory and possibly unsafe working environments for the operations staff. The following have been incorporated as key cost components in the alternative life cycle evaluations:

- Trickling filter pumping improvements
- Sludge handling improvements
- New clariflocculator
- Aeration basin curtain replacement
- Aeration basin drain pumping
- North Plant primary scum and secondary clarifier sludge pumping replacement
- Mechanical HVAC, Structural and Architectural and Electrical Improvements

The specific improvements are designed to provide adequate capacity for the projected 20-year 2035 nominal flow of 13 mgd (peak flow of 43.5 mgd).

## Summary of Recommendations

Table E.4 provides a summary of the preliminary recommendations to upgrade the Rapid City WRF to reliably meet the new permit conditions. This table provides an overview of facility requirements, driving forces, urgency/timing considerations, and order of magnitude costs.

The summary of recommendation has been separated into the following categories:

- **Short-Term Capital Improvements**  
These are improvements required to reliably continue to treat the flow to meet the current permit. Short-term improvements are anticipated to be implemented within the next five years. These improvements address items such as treatment and hydraulic capacity items, reliability, operations and energy minimization. Priority 1 items are recommended to be completed in 2016 – 2018, and Priority 2 items completed by 2020.
- **Plant Modifications to meet 2025 Permit #2**  
These are improvements that will be necessary to meet the federally adopted ammonia criteria. These ammonia limits will be included in a future permit anticipated by 2025. These improvements primarily address treatment capacity upgrades.



- **Plant Modifications to meet 2030 Permit #3**

These are improvements that will be necessary to meet the future nutrient criteria limit of 10 mg/l TN and 1 mg/L phosphorus. These limits are planned for 2030; however these limits are the most uncertain with respect to schedule and numeric criteria. These improvements primarily focus on an expanded activated sludge system.

- **Plant Modifications to meet Other Needs**

These are improvements that are necessary to continue to meet the needs for the City of Rapid City to operate effectively and meet the effluent permit limits. These items have been given Priority 3, 4 or 5 designations. Priority 3 items are planned to be completed in 2020 – 2025 and Priority 4 and 5 items are planned for completion in 2025 – 2035.

Figure E.2 illustrates the recommended WRF facility improvements.



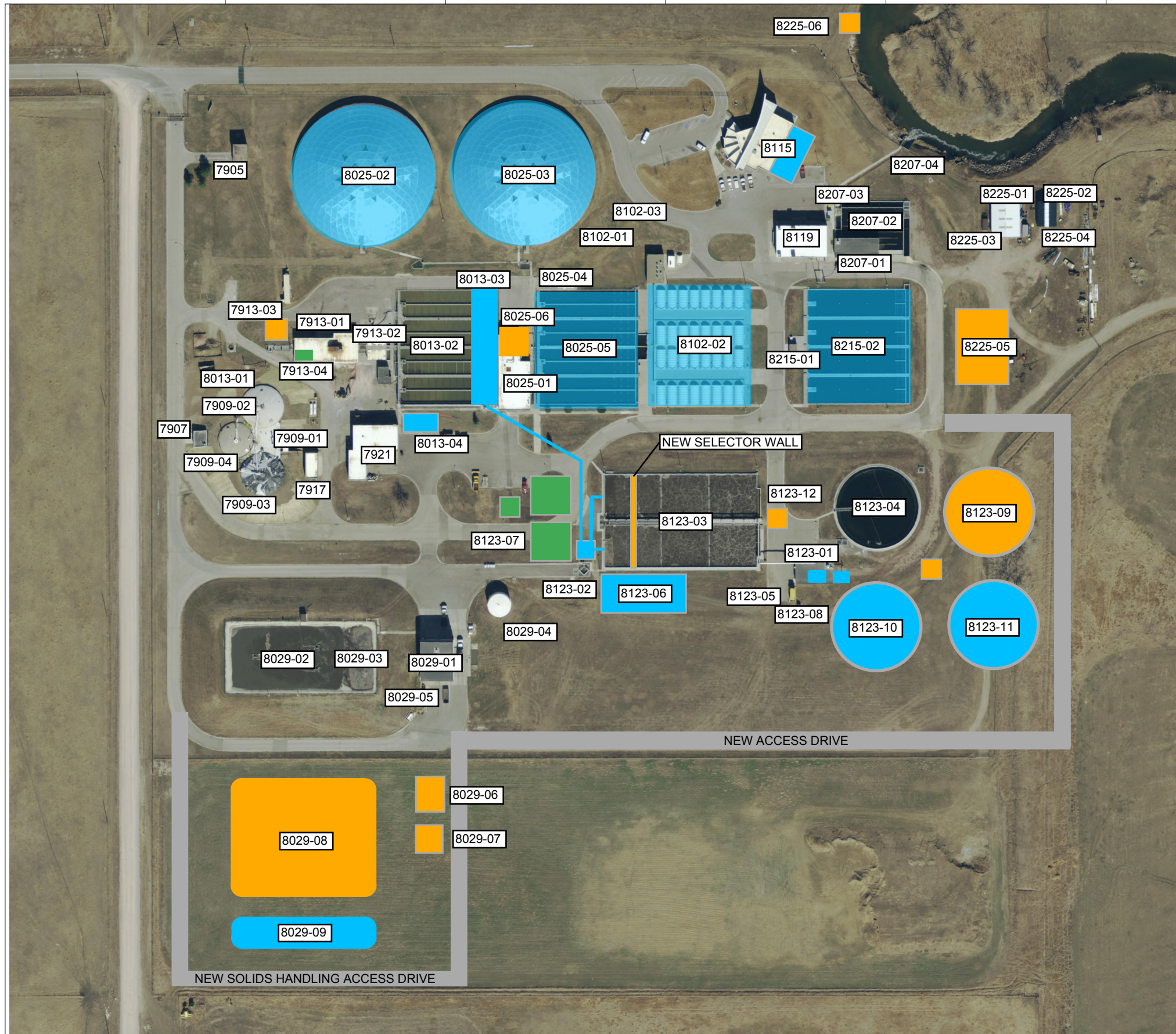
**Table E.4. Summary of Recommendations**

Component	Recommended Improvements	Implementation Date	Project Cost
<b>Short-Term Capital Improvements</b>			
<b>Priority 1</b>			
Activated Sludge Improvements	One new clariflocculator, curtain wall, drain pump	Priority 1 - 2016-2018	\$4,014,000
Trickling Filter Pump Sta. Improvements	New pumps with VFDs to handle flow range, and repair and recoat pump discharge piping.	Priority 1 - 2016-2018	\$2,410,000
Sludge Handling Project	Provide new dewatered sludge conveyance and storage equipment.	Priority 1 - 2016-2018	\$11,950,000
Misc. Preliminary Treatment Improvements	Screening bypass, septage safety and volume, misc.	Priority 1 - 2016-2019	\$150,000
Misc. Digester Improvements	Roof access, chemical feed and waste gas improvements.	Priority 1 - 2016-2018	\$106,000
Operations and Energy Improvement	Emergency operating plan, risk based SCADA and alarms and energy conservation measures	Priority 1 - 2016-2018	\$590,000
<b>Priority 1 Subtotal</b>			<b>\$19,180,000</b>
<b>Priority 2</b>			
Site work	Roadways, plant access, Gaging Station, and water well abandonment.	Priority 2 - 2018-2020	\$434,000
Primary Treatment	Scum pumps & piping, skimmers and gear boxes, sludge level sensors, pumping room HVAC, railing and misc. tuck pointing.	Priority 2 - 2018-2020	\$696,000
Secondary Clarification	Humus pumps, gear boxes, and clarifier railing.	Priority 2 - 2018-2020	\$264,000
RBCs and Generator	Repair RBC in-tank air piping, replace generator, and HVAC.	Priority 2 - 2018-2020	\$311,000
Tertiary Clarifiers and Pumping	Costs to Maintain existing pumps, drives and HVAC.	Priority 2 - 2018-2020	\$60,000
Activated Sludge Improvements	Splitter box gate actuators, Blower intakes/HVAC, generator controls and misc. architectural.	Priority 2 - 2018-2020	\$156,000
UV Disinfection/Post Aeration Improvements	Generator controls and misc. architectural	Priority 2 - 2018-2020	\$31,000
Digestion Area Improvements	Replace steel gas lines, boiler controls, electric modifications and misc. vac and architectural.	Priority 2 - 2018-2020	\$178,000
HVAC Improvements	Upgrade Secondary Building, Water Building, Maintenance Shop, and Metals Shop HVAC.	Priority 2 - 2018-2020	\$624,000
Instrumentation, Electrical and Misc. Improvements	Maintenance Shop MCC, Integration of PLCs, and Samplers.	Priority 2 - 2018-2020	\$321,000
Cold Storage Building and Misc. Architectural	Construct new cold storage building.	Priority 2 - 2018-2020	\$715,000
Operations and Energy Improvement	Equipment Asset Management Software Updates (EAM), O&M Manual, SCADA Integration Plan i.e. smart drive monitoring.	Priority 1 - 2016-2018	\$300,000
<b>Priority 2 Subtotal</b>			<b>\$4,092,000</b>
<b>Plant Modifications - 2025 Permit</b>			



Component	Recommended Improvements	Implementation Date	Project Cost
Activated Sludge System (Phase 1 Improvements)	Construct new aeration basin, blowers (2), and secondary clarifloculators and return sludge pumping station.	2025	<b>\$20,570,000</b>
<b>Plant Modifications - 2030 Permit</b>			
Activated Sludge System (Phase 2 Improvements)	Anoxic basins, recycle pumping	2035	<b>\$7,800,000</b>
<b>Plant Modifications - Other Needs</b>			
<b>Priority 3</b>			
Sludge Handling Project	Provide Phased sludge conveyance and storage.	Priority 3	\$1,220,000
Process	Includes equipment replacement and coating of the tanks.	Priority 3	\$647,000
Architectural	Administration Facilities Expansion -Building addition & site improvements.	Priority 3	\$990,000
Structural	Miscellaneous.		\$5,000
HVAC Improvements	AB Pump Room, UV Building.	Priority 3	\$37,500
Electrical, Instrumentation, and Misc. Improvements	Remote monitoring capabilities, CMMS replacement, on-line metering capabilities and Secondary standby generator.	Priority 3	\$185,000
Operation & Energy Total	SCADA/Remote Operations & Computerized Maintenance Management Software (CMMS) & On-line Monitoring.	Priority 3	\$290,000
<b>Priority 3 Subtotal</b>			<b>\$3,370,000</b>
<b>Priority 4</b>			
Sludge Handling Improvement	Phase 2 Sludge Handling Improvements.	Priority 4	\$3,460,000
Process	Miscellaneous process equipment replacement.	Priority 4	\$400,000
<b>Priority 4 Subtotal</b>			<b>\$3,860,000</b>
<b>Priority 5</b>			
Process Upgrades	Screen gear boxes, replace MCCs, grit classifier, gas flare and misc.	Priority 5	\$657,000
HVAC Improvements	Replace digester boilers	Priority 5	\$435,000
Electrical, Instrumentation, and Misc. Improvements		Priority 5	\$1,202,000
Odor Control	Construct odor control facilities for odor-related areas. Tie to odor sources and construct new facilities.	Priority 5	\$800,000
<b>Priority 5 Subtotal</b>			<b>\$3,090,000</b>
<b>Total</b>			<b>\$62,000,000</b>






**KEY PLAN: WATER RECLAMATION FACILITY**



- Pretreatment**  
 7913-01 PRETREATMENT BUILDING  
 7913-02 SEPTAGE RECEIVING  
**7913-03 VACTOR RECEIVING STATION**  
**7913-04 POTENTIAL NEW SCREEN**
- North Fixed Film Plant**  
 8013-01 PRIMARY SLUDGE PUMP BUILDING  
 8013-02 PRIMARY CLARIFIERS  
**8013-03 PRIMARY CLARIFIER EFFLUENT IMPROVEMENTS**  
**8013-04 IN-PLANT PEAK FLOW PUMP STATION**  
 8025-01 SECONDARY BUILDING  
**8025-02 WEST TRICKLING FILTER - REPURPOSE**  
**8025-03 EAST TRICKLING FILTER - REPURPOSE**  
 8025-04 GENERATOR -SECONDARY  
**8025-05 SECONDARY CLARIFIERS - REPURPOSE**  
**8025-06 IMPROVEMENTS TO TRICKLING FILTER PUMP STATION**  
 8102-01 RBC BLOWER BUILDING  
**8102-02 RBC's - REPURPOSE, POTENTIAL SLUDGE STORAGE**  
 8102-03 GENERATOR - RBC's  
 8215-01 TERTIARY PUMP PIT  
**8215-02 TERTIARY CLARIFIERS - REPURPOSE, POTENTIAL SLUDGE STORAGE**
- South Activated Sludge Plant**  
 8123-01 AB BLOWER / PUMP BUILDING  
 8123-02 ACTIVATED SLUDGE - DISTRIBUTION BOX  
 8123-03 ACTIVATED SLUDGE - AERATION BASINS  
 8123-04 ACTIVATED SLUDGE - CLARIFLOCCULATOR  
 8123-05 GENERATOR -SOUTH PLANT ACTIVATED SLUDGE  
**8123-06 ACTIVATED SLUDGE - AERATION BASIN WITH SPLITTER BOX**  
**8123-07 ANOXIC BASINS WITH SPLITTER BOX**  
**8123-08 RAS PUMPS AND AERATION BLOWERS**  
**8123-09 ACTIVATED SLUDGE - CLARIFLOCCULATOR WITH SPLITTER BOX**  
**8123-10 ACTIVATED SLUDGE - CLARIFLOCCULATOR**  
**8123-11 ACTIVATED SLUDGE - CLARIFLOCCULATOR**  
**8123-12 ACTIVATED SLUDGE - EFFLUENT BOX**
- Disinfection**  
 8207-01 UV DISINFECTION BUILDING  
 8207-02 RE-AERATION BASIN  
 8207-03 GENERATOR UV/ADMIN  
 8207-04 Outfall
- Digestion**  
 7907 GAS BLOWER BLDG  
 7909-01 PUMP/BOILER BLDG  
 7909-02 NORTH DIGESTER  
 7909-03 SOUTH DIGESTER  
 7909-04 WEST DIGESTER
- Solids Handling**  
 8029-01 SOLIDS HANDLING BUILDING  
 8029-02 750K WEST SLUDGE HOLDING POND  
 8029-03 50K EAST SLUDGE HOLDING POND  
 8029-04 CENTRATE STORAGE TANK  
 8029-05 GENERATOR SOLIDS HANDLING  
**8029-06 SOLIDS HANDLING BUILDING**  
**8029-07 DEWATERD SLUDGE STORAGE**  
**8029-08 SOLIDS HOLDING POND**  
**8029-09 SOLIDS HOLDING POND**
- Other**  
**8115 ADMINISTRATION BUILDING WITH EXPANSION**  
 7905 WATER PLANT BUILDING  
 7917 OIL STORAGE  
 7921 WASTEWATER MAINTENANCE SHOP  
 8119 METAL FABRICATION SHOP  
 8225-01 COLD STORAGE NO. 1  
 8225-02 SOFT SIDED COLD STORAGE NO. 2  
 8225-03 WEST WOODEN STORAGE SHED  
 8225-04 EAST WOODEN STORAGE SHED  
**8225-05 COLD STORAGE**  
**8225-06 RIVER GAUGING STATION (LOCATED UPSTREAM)**

**NOTE: UNITS SHOWN IN BOLD ARE PROPOSED OR MODIFIED.**



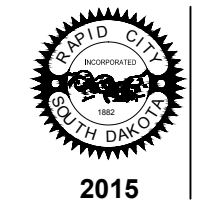
**KEY PLAN: FACILITY IMPROVEMENT PHASING**

- IMMEDIATE NEED
- PHASE 1 IMPROVEMENTS - 2025
- PHASE 2 IMPROVEMENTS - 2035





SCALE IN FEET

**WATER RECLAMATION FACILITY  
 FACILITY PLAN  
 RAPID CITY, SOUTH DAKOTA**



RECOMMENDED ALTERNATIVE A1  
 MAJOR IMPROVEMENTS



SCALE

FILENAME: ALT A1 IMPROVEMENTS.DWG | FIGURE: S.6





## Consequences of Inaction

Failure to implement the recommended improvements in a timely manner could have significant adverse impacts on the City of Rapid City WRF, including:

- Non-compliance with discharge permit requirements
- Raw sewage spills, and associated public health impacts
- Water quality impairment of Rapid Creek
- Inability to handle wastewater generated by the community

These consequences would likely lead to regulatory enforcement actions and fines, and may result in a moratorium on construction within the City's service area.