CITY COUNCIL MEETING

Thursday, November 05, 2026 at 6:30 PM
Council Chambers, 60 West Main, Hyrum, Utah

AGENDA

Public notice is hereby given of a Hyrum City Council Meeting to be held in the Council Chambers, 60 West Main, Hyrum, Utah at 6:30 PM, November 05, 2026. The proposed agenda is as follows:

1. ROLL CALL

2. CALL TO ORDER

3. WELCOME

4. PLEDGE OF ALLEGIANCE

5. INVOCATION

6. APPROVAL OF MINUTES

7. AGENDA ADOPTION

8. PUBLIC COMMENT

9. SCHEDULED DELEGATIONS

A. **Brindley Darais** - To request a Home Occcupation Business License for Sunday Salon at 1450 East 480 South for hair styling services.

10. INTRODUCTION AND APPROVAL OF RESOLUTIONS AND ORDINANCES

A. **Resolution 26-28** - A resolution approving the Hyrum City Comprehensive Sewer Collection System Master Plan.

B. **Resolution 26-29** - A resolution setting the 2027 Hyrum City Recreation Fee Schedule.

C. **Ordinance 26-23** - An ordinance amending the 2026-2027 Hyrum City Compensation Schedule for Fire Fighter AEMT Full Time, Paramedic Part Time, and Fire Fighter AEMT Part Time.

11. OTHER BUSINESS

A. Consideration and award of sole source bid for switchgear protection and control design for Substation 3.

B. Mayor and City Council reports.

12. ADJOURNMENT

_____

Stephanie Fricke
City Recorder

Council Members may participate in the meeting via telephonic communication. If a Council Member does participate via telephonic communication, the Council Member will be on speakerphone. The speakerphone will be amplified so that the other Council Members and all other persons present in the Council Chambers will be able to hear all discussions. In compliance with the Americans with Disabilities Act, individuals needing special accommodations (including auxiliary communicative aids and services) during this meeting should notify Hyrum City at 435-245-6033 at least three working days before the meeting.

CERTIFICATE OF POSTING - The undersigned, duly appointed and acting City Recorder of Hyrum City, Utah, does hereby certify that a copy of the foregoing Notice was emailed to The Herald Journal, Logan, Utah, posted on the Utah Public Notice Website and Hyrum City's Website, provided to each member of the governing body, and posted at the City Offices, 60 West Main, Hyrum, Utah, this **2nd day of November, 2026**. Stephanie Fricke, MMC, City Recorder.

HYRUM CITY
Established 1860
60 West Main Street
Hyrum, Utah 84319
Ph. (435) 245-6033
www.hyrumcity.gov

City Council Agenda Information

To: Mayor Miller and City Council

From: Keesha Rinderknecht, Business License Specialist

Date: October 30, 2026

Subject: Consideration and Approval of a Home Occupation Business License

Summary: **Business License Clerk is recommending approval of the Home Occupation Business License for Sunday Salon.**

Summary:
The proposed application was submitted by Brindley Darais for Sunday Salon, a Salon business, to be located at 1450 East 480 South in Hyrum. Application has been reviewed by myself & Zoning Administrator Tony Ekins recommending the approval to build an out building on applicants property to operate proposed business once constructed.

Recommendation:
Business License Specialist Keesha Rinderknecht is recommending approval to the City Council with the following recommendations:

1. Applicant has submitted proper applications and meets the requirements of a Home Occupation Level 2 License.

City Council Meeting Details:
• Meeting Date: November 5, 2026 •
Council Role: Legislative with Vote

Attachments:

1. Business License Application
2. Home Occupation Business License Application

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BUSINESS LICENSE APPLICATION

For businesses with a permanent physical location in Hyrum City limits.

Business Name: Sunday Salon

"Doing Business As": Cosmetologist

Business Address: 1450 E 480 S Hyrum, UT 84319

Mailing Address: 1450 E 480 S Hyrum, UT 84319

Business Phone #: 208-569-5934

E-mail: brindleydarais@icloud.com

Website: N/A

Utah State Tax Commission Sales Tax #: N/A

State and/or Federal License #: 9035140-1101

Nature of Business: Providing hair styling services to clients

Owner Name: Brindley Darais

Manager Name: Brindley Darais Manager Phone #: 208-569-5934

Manager Address: 1450 E 480 S Hyrum, UT 84319

Businesses must register with the Utah Division of Corporations www.business.utah.gov/registration. Businesses involved with the sale of tangible goods must provide evidence of a State Sales Tax Number from the State Tax Commission. If your profession is regulated by the Utah Department of Occupational & Professional Licensing, a copy of that professional license must be provided.

I affirm that: I am authorized agent of the business for which application is being made, and the information on this form is both complete and accurate to the best of my knowledge.

Owner Signature	Printed Name	Date
[signature]	Brindley Darais	10/28/26

Office Use Only

Approved by: _____ Date Approved: _____ License #: _____

Date Paid: _____ Amount: _____ Receipt #: _____

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HOME OCCUPATION BUSINESS LICENSE APPLICATION

For businesses operating within a residence in Hyrum City limits.

Applicant(s) Name: Brindley Darais

Date Submitted: _____

Address: 1450 E 480 S Hyrum, UT 84319

Telephone #: 208-569-5834

Name of Business: Sunday Salon

1. What is the proposed home occupation? Salon for doing haircuts and colors
2. How many clients will be coming to the home at any one time during a daily interval? 1-2
3. What provisions are available for off street parking? 3 car driveway
4. What type of equipment, materials, machinery, tools, and merchandise stock are involved in the home occupation? Scissors, hair color, hot tools
5. What type of modifications to the residential structure are anticipated because of the home occupation? None

ALL HOME OCCUPATIONS MUST COMPLY WITH THE FOLLOWING REQUIREMENTS OF ZONING ORDINANCE 5.04.200 (please initial)

BD A. "Home occupation" means an occupation performed wholly within a residence or the yard and accessory buildings being a part of such residence. Home occupations shall not change the character of the residence or the residential neighborhood. A business license is required for some home occupations. They shall be issued for a one-year period and are renewable. The City Council may review a license in reaction to neighbor's complaints and may revoke it if evidence warrants this action.

BD B. Two levels of home occupations exist. Both are required to maintain all c standards of a home occupation business license. Because of the potential negative impact on residential area, the following businesses are prohibited as home occupations: auto/RV repairs, salvage yards, major appliance repair, or service.

BD C. Level one applicants are in occupation categories that the City Council has determined have virtually no negative impact on residential neighborhoods and do not require a license. Occasional businesses operated by a minor are not required to obtain a business license.

BD D. All applicants whose home occupations receive commercial delivery service, has signage advertising the business, performs services in view or hearing of the public, or has customers coming to the residence, are considered level two home occupations and require a license. They also may be required to meet with the City Council and explain how their home occupation is in conformance with the home occupation standards. The City Council may attach limitations or conditions to their licenses.

E. Home occupation standards:

BD 1. The exterior of the home will not be modified in any way to accommodate the home occupation (i.e. loading ramps, loading doors, etc).

BD 2. The occupation will be conducted entirely within the house, yard, and existing outbuildings.

BD 3. The home occupation license covers only residents of the home.

BD 4. No outside storage of goods or materials is permitted.

BD 5. Pedestrian and vehicular traffic will not be in excess of that normally associated with a residential neighborhood.

BD 6. One sign will be permitted on the property. It must meet the requirements of 17.72.010 "Name Plate".

BD 7. The home occupation must be operated in full conformity with fire, health, building, electrical, plumbing codes, and all State and City laws and ordinances.

BD 8. No noise, odor, light, vibrations or dust in excess of that normally associated with a residential neighborhood shall pass beyond the premises.

BD 10. State licenses will be required for "Professional Child Care".

BD F. The City Council may, at their discretion, waive certain of the above standards for the elderly or handicapped.

In order to guarantee that the Home Occupation, once authorized, will not become a nuisance to the neighbors, the City Council may impose other reasonable conditions initially and also subsequently to protect the public health, safety, peace, and welfare of the residents of the surrounding area.

Applicant's Affidavit: I (we), Brindley Darais, affirm that I (we) am (are) the owner(s) or authorized agent(s) of the owner of property involved in the attached application and that the statements and answers therein contained and the information provided in the attached plans and other exhibits are complete, to the best of my (our) knowledge and, that the statements and information above referred to are in all respects true and correct to the best of my (our) knowledge and belief.

Property Owner(s) Signature: BDarais

Applicants Signature: BDarais

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City Council Agenda Information

To: Mayor Miller and City Council

From: Angela Pritchett, Water Reclamation Manager

Date: 11/5/2026

Subject: Sewer Collection System Master Plan

Summary: A comprehensive Sewer Collection System Master Plan has been completed to provide the City with the strategic framework for managing its wastewater collection infrastructure. The Master Plan evaluates existing system conditions, identifies future infrastructure needs, and establishes priorities for capital improvement projects.

The purpose of the Master Plan is to guide City decision makers in planning and prioritizing future capital expenditures related to the sewer collection system. The plan serves as a critical tool for addressing both anticipated growth and the City's aging infrastructure while maintaining reliable service and regulatory compliance.

The Master Plan represents the first step in updating the City's sewer impact fees, which have not been comprehensively reviewed or revised in more than twenty years. Upon approval of the Master Plan, the City can proceed with evaluating and updating both sewer impact fees and rate structures to ensure sufficient funding for ongoing operations, maintenance, rehabilitation, replacement, and future system expansion.

It is important to note that this Master Plan is limited to the City's sewer collection system and does not include the Water Reclamation Facility (WRF). A separate WRF Plan is currently underway and is anticipated to be completed in the first quarter of 2027. The recommendations and financial needs identified in the future WRF Master Plan will be evaluated independently.

Recommendation:

Approve the Sewer Collection System Master Plan to guide future capital investments, impact fee update and rates for the sewer collection system.

City Council Meeting Details:
• Meeting Date: 11/5/2026
• Council Role: Approve Sewer Collection System Master Plan

Attachments:
1. Sewer Collection System Master Plan, Stamped 10/02/2026

RESOLUTION 26-28

A RESOLUTION APPROVING THE HYRUM CITY COMPREHENSIVE SEWER COLLECTION SYSTEM MASTER PLAN.

WHEREAS, Hyrum City recognizes the importance of maintaining, rehabilitating, replacing, and expanding its wastewater collection infrastructure to provide reliable sewer service to existing and future residents and businesses; and

WHEREAS, Aqua Engineering has completed a Comprehensive Sewer Collection System Master Plan for Hyrum City, dated October 2026, to provide a strategic framework for managing the City's wastewater collection infrastructure; and

WHEREAS, the Master Plan evaluates existing sewer collection system conditions, identifies anticipated future infrastructure needs, and establishes priorities for capital improvement projects; and

WHEREAS, the purpose of the Master Plan is to assist City officials in planning and prioritizing future capital expenditures related to the sewer collection system, addressing anticipated community growth and aging infrastructure while maintaining reliable service and regulatory compliance; and

WHEREAS, the Master Plan represents the first step in evaluating and updating the City's sewer impact fees, which have not been comprehensively reviewed or revised in more than twenty years; and

WHEREAS, following adoption of the Master Plan, the City intends to further evaluate its sewer impact fees and rate structures to ensure adequate funding for ongoing operations, maintenance, rehabilitation, replacement, and future expansion of the sewer collection system; and

WHEREAS, the City acknowledges that the Comprehensive Sewer Collection System Master Plan is limited to the City's sewer collection system and does not include the Water Reclamation Facility (WRF); and

WHEREAS, a separate Water Reclamation Facility Master Plan is currently underway and is anticipated to be completed during the first quarter of 2027, at which time its recommendations and financial needs will be evaluated independently by the City.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF HYRUM CITY, UTAH, AS FOLLOWS:

1. ADOPTION. The Hyrum City Council hereby adopts the Comprehensive Sewer Collection System Master Plan, prepared by Aqua Engineering and dated October 2026, as the City's guiding document for the planning and management of its sewer collection system. A copy of the Master Plan is attached hereto as Exhibit "A" and incorporated herein by reference.

2. PURPOSE AND USE. The Master Plan shall serve as a planning tool to guide future infrastructure improvements, capital improvement priorities, system rehabilitation, replacement, and expansion of the City's sewer collection system.

3. FUTURE FEES AND RATES. Adoption of this Master Plan does not establish or approve any changes to sewer impact fees, sewer rates, or other utility charges. Any proposed changes shall be evaluated separately and brought before the City Council for consideration and approval in accordance with applicable Utah law.

4. WATER RECLAMATION FACILITY EXCLUSION. This resolution does not adopt or approve any recommendations related to the Water Reclamation Facility. The WRF Master Plan, upon completion, shall be presented to the City Council for separate review and consideration.

5. EFFECTIVE DATE. This resolution shall take effect immediately upon adoption.

ADOPTED AND APPROVED by the Hyrum City Council of Hyrum City, Utah, this _____ day of _____, 2026.

HYRUM CITY

_____
Steve Miller
Mayor

ATTEST:

_____
Stephanie Fricke
City Recorder

Roll Call Vote -	**Aye**	**Nay**	**Absent**
Councilmember Rebecca Foulger	☐	☐	☐

Councilmember Michael Nelson	☐	☐	☐
Councilmember Nalyn Nelson	☐	☐	☐
Councilmember Craig Rasmussen	☐	☐	☐
Councilmember James L. Wright	☐	☐	☐

AQUA ENGINEERING

Sewer Collection System Master Plan



October 2026



aquaeng.com

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1. INTRODUCTION

1.1. BACKGROUND

In 2024 Hyrum City (City) embarked on the task of developing a Sewer Collection System Master Plan (master plan). The purpose of the master plan is to provide the City with a guidance document that will aid the decision-making process regarding capital expenditures for the sewer collection system over the 20-year planning window outlined in this report. This document will help guide the City as it strives to meet system demand requirements based on projected growth of the service area as it complies with standards established by the State of Utah and the level of service expectations. This report also addresses collection system impact fees and customer rates used to fund the capital projects outlined as well as system operation and maintenance.

To accomplish the tasks presented above, the City engaged the services of AQUA Engineering (AQUA) to provide the consulting engineering services and analyses required for this master plan. AQUA included Zions Public Finance Inc. (ZPFI) on the team to provide the detailed and highly specialized financial analysis task of the Impact Fee and Rate Study portions of the project.

1.2. SCOPE OF SERVICES

The scope of services for this master plan includes a study of the City's collection system and projected demand on the system over the 20-year planning window and further refined into 5-year increments (i.e. 5-year, 10-year, etc.). A projected build-out (50-year) growth and system demand scenario is also included. A list of tasks was developed to facilitate the progression of compiling this master plan. The following tasks outline this progression, with the ultimate goal of developing a recommended Capital Improvements Plan (CIP) that will serve the city as a guide to support operation, maintenance, and expansion of the City's collection system during the planning window timeframe:

Task 1: Project Management
Task 2: Resource Documents & Data Review
Task 3: Review Demand Estimates & Forecast
Task 4: Update System Hydraulic Model & GIS Mapping
Task 5: Calibrate System & Hydraulic Model
Task 6: Collection System Analysis
Task 7: System Graphics
Task 8: System Replacement & Improvement Program
Task 9: Capital Improvement Programs & System Master Plan

1.3. REPORT ASSUMPTIONS

As with all long-range planning documents, certain assumptions must be made relative to service area growth (or decline) and projected land use. This master plan is no different. The assumptions made for development patterns of Hyrum City relative to population growth, development densities, conservation efforts, usage demands, and annexations all have the potential to significantly impact the outcome of the modeling results and the recommendations of the master plan. Great effort was made to understand growth patterns and to determine the most reliable assumptions and projections for this report. The conclusions and recommendations of this study are limited by the accuracy and reliability of the development projections and assumptions used

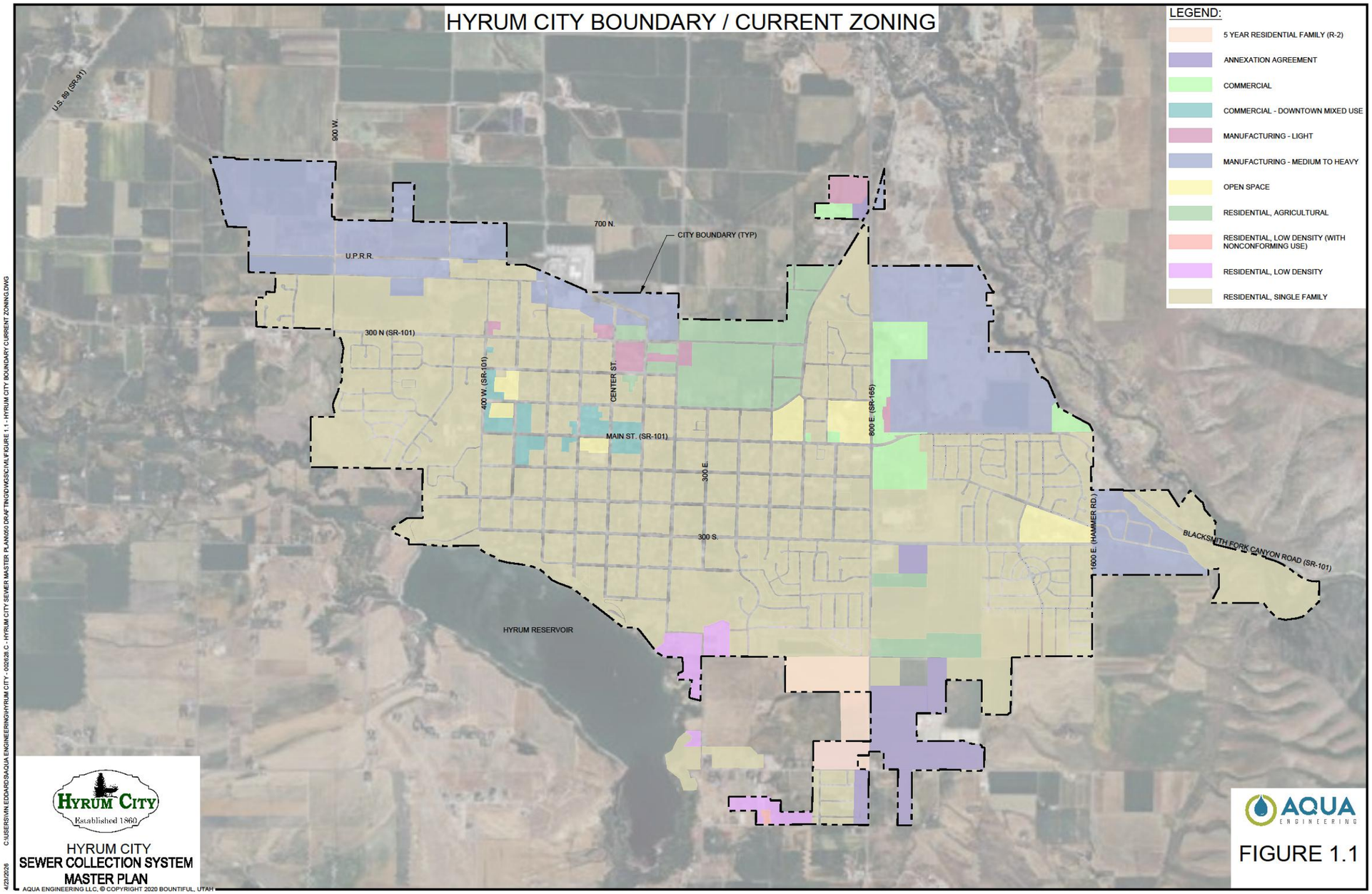
in preparing the study. Where applicable, descriptions of assumptions made and citation to data used is provided. It is expected and strongly encouraged that the City review and update this master plan on a periodic basis. A common periodic review and evaluation timeframe is at least on a yearly basis.

1.4. HYRUM CITY DEMOGRAPHICS

Hyrum City is a rural community in Northern Utah located approximately eight miles south of Logan, Utah. It is nestled between two mountain ranges in central Cache County -- the Wellsville Mountains on the west and a mountain range of the Cache National Forest on the east, from which the Blacksmith Fork River flows in a westerly direction through the northern boundary of Hyrum City. These mountains on the eastern end of Hyrum form the eastern boundary of the city while the town of Nibley bounds the city on the north. The town of Paradise and the Hyrum reservoir form the boundary to the south. Wellsville and Highway 89 form the city's boundary to the west. Hyrum City ranges in elevation from approximately 4,500 to 4,960 feet msl and generally slopes southeast to northwest. Figure 1.1 shows the current city boundary and its relationship with surrounding communities. There are open, unincorporated areas between the city boundary and adjacent city boundaries to the north, south and west. Additionally, there are areas east of Hyrum that are open space or agricultural ground before reaching the US National Forest boundary. These open areas have the potential to be developed and possibly annexed into Hyrum City. The approach for this report was to analyze these areas for future growth and service by sewer collection system.

There are aspects of the demographics in Hyrum City that have an influence on the sewer collection system. Each of these aspects is discussed in the following paragraphs and describes how they contribute to or have an influence on the collection system. The most notable aspects include: population, precipitation, temperature, and soil and groundwater.

Figure 1.1 Current City Boundary



1.4.1. Population

The 2020 U.S. Census showed a population in Hyrum at 9,362 while the 2010 Census was 7,609. This reflects a 23.1% growth for the decade, or 2.3% annually for the ten-year period. In the last four years (since 2020) Hyrum City planning staff have reported experiencing a slightly higher rate of growth at approximately 4.85% per year. Using the 4.85% growth rate per year since 2020 would place the current estimated population for Hyrum at 11,312 at the end of 2024.

The Kem C. Gardner Policy Institute of the David Eccles School of Business at the University of Utah performs population projections for the State of Utah, and also for each county within the State, but they do not break out the populations by individual municipalities or communities. However, they do have an estimated household density for Cache County estimated to be at 3.7 people per household in 2024.

The Utah Household and Job Forecaster has estimated the 2024 Hyrum City population to be 11,043. This is a difference of 269 persons from the U.S. Census calculation.

The Utah State Tax Commission sends population numbers to Hyrum City each year based on the Tax Commissions numbers of taxable properties and persons. Their estimated population numbers, yearly growth rate, and residential household density are presented in the following table, Table 1.1.

Table 1.1 Population

UTAH TAX COMMISSION			
YEAR	**POPULATION**	**GROWTH RATE**	**RESIDENTS/ HOUSEHOLD**
2018	8,932		3.50
2019	9,332	4.48%	2.94
2020	9,550	2.34%	2.77
2021	9,750	2.09%	3.09
2022	10,036	2.93%	3.09
2023	10,594	5.56%	2.78
2024	10,849	2.41%	3.02
2025	11,157	2.84%	2.90
Average:		3.24%	3.01

As seen from the preceding discussion, there are slight variances from differing agencies and institutions as to the exact number of people in a given population. The most accurate population number is often considered to be a thorough counting from each census cycle conducted by the U.S. Census Bureau. However, these are extensive, expensive, and somewhat difficult to conduct, and are only conducted once every 10 years. The individual years of the interim decade are only estimates but can come close to the actual number when done logically. Utah State Tax Commission population numbers are a reliable source and were reported each year through 2024 but has since discontinued this practice. The 2025 population estimate used in this master plan is from the Kem Gardner Policy Institute. Therefore, the base year for this master plan is 2025, for which the population is 11,157 with a residential density of 3.01 residents per household and an average annual growth rate of 3.24% per year.

The household density of 3.01 residents per household, being the average of the annual values

reported in Table 1.1 through 2025, is used throughout this report. It is the basis of the forward projections of Equivalent Residential Units (ERU) and of the cross-check against the State design flow of 100 gallons per capita per day discussed in Sections 4.2 and 6.3.

It should be noted that there are, and will continue to be, impacts to Hyrum City's demographics that are difficult to identify and quantify with great accuracy without spending an inordinate amount of resources, time, and budget to do so. The benefit from identifying, tracking, and analyzing these impacts would likely not warrant the time and expense to do so, however, a reasonable estimate should be made to include anticipated impacts to Hyrum City. Such estimates of impact to the sanitary sewer collection system might include impacts generated from recreational visits throughout the area, along with anomalies to the collection system in general.

1.4.2. Precipitation

The average precipitation received in Hyrum is approximately 25.5 inches per year with the majority falling in the winter and spring during the months of December through May. The month with the highest precipitation is typically April with an average rainfall of 3 inches.

Even though precipitation in Hyrum is considered low to moderate, the surrounding mountainous areas encompassing the valley can receive upwards of 50 inches of precipitation. The maximum precipitation is in the higher parts of the Bear River Range east of the valley. Most of the precipitation results from humid air masses that move toward the valley from the North Pacific Ocean during fall, winter, and spring. The runoff, which results mostly from melting snow, usually reaches its maximum during May or June. Snow usually covers the valley floor during December, January, and February.

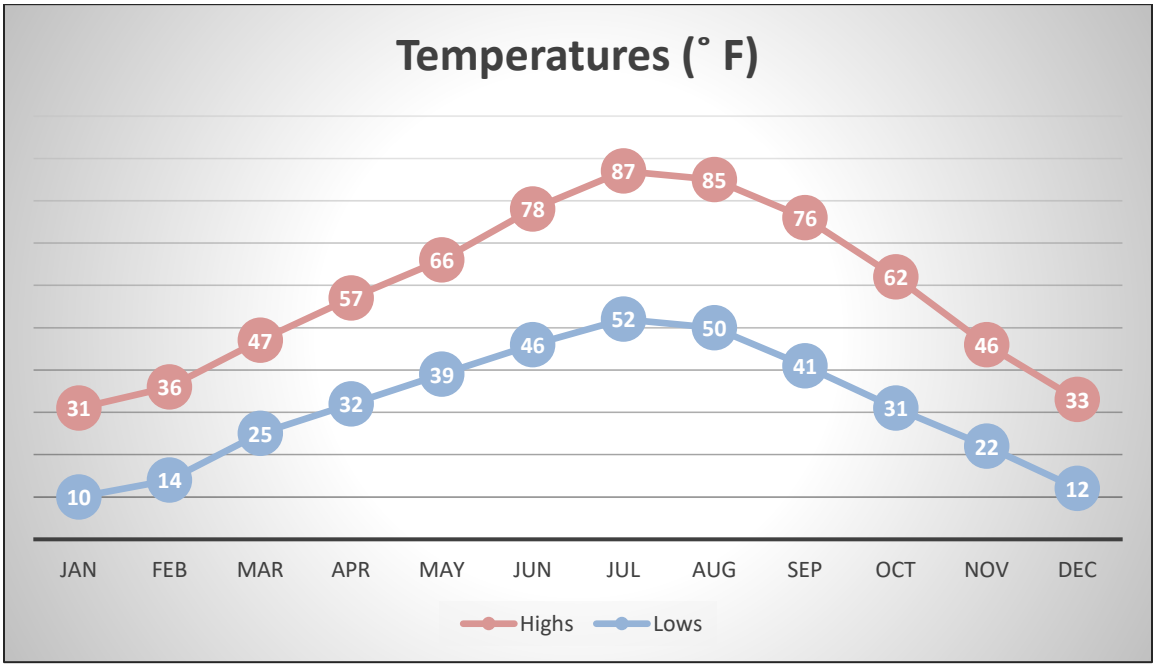
The precipitation in and around Hyrum City has a definite impact on the sewer collection system. When precipitation is high (December through May) a portion of the precipitation undoubtedly finds its way into the collection system. This not so uncommon phenomenon leaves the impression that the pipelines in which the precipitation or runoff finds its way into are operating at a greater capacity than what they otherwise would be if the artificial flows had not been introduced to the system. The extra flows entering the system often occurs through manhole covers, through "leaky" manhole wall joints, and also through compromised pipe joints, and/or cracks in the pipelines themselves. The City should be aware of the various situations that might allow unnecessary waters to enter the collection system and embark on an adopted plan to minimize such scenarios during construction projects whether they are new developments, or City sponsored repair and replacement projects. Even an adopted plan that aggressively attempts to minimize the more egregious leaks and culprits of introducing unwanted waters would be an option to consider. For purposes of this Master Plan, these types of flow are referred to as Infiltration and Inflow and are discussed in further detail in Section 4.3.2.

It should be noted here that the dry months (June through November) should also be taken into consideration because the anticipated flows to be present in the pipelines of the collection system will have an impact on the recommended size or diameter of the pipeline. If, during the dry months the flow is very low, the resulting velocities may not be sufficient to keep the deposition of solids from occurring. The remedy for this is to utilize a smaller diameter pipeline, but the smaller size may not be adequate to handle all of the flow during the wet months if an inordinate amount of infiltration and inflow (I&I) water is introduced into the system. For this very reason, it is important for the City to note and understand the issues of both high and low flows in the collection system and when, where, or how the precipitation may influence the system.

1.4.3. Temperature

Temperatures are indicative of a high-elevation Utah town and vary from an average low of 21 °F to an average high of 73.9 °F. Extreme temperatures can dip below –5 °F and rise above 95 °F, respectively. The average daily temperature is 45.3 °F. Summer temperatures typically begin in June and end in September. The frost-free, or growing season, ordinarily lasts about 150 days from May through September. Climatological data are collected by the National Weather Service (formerly U.S. Weather Bureau) at three weather stations near Logan, Utah, and at a station in Preston, Idaho. A graph of the average monthly high and low temperatures for each individual month is depicted in the following Figure 1.2.

Figure 1.2 Average Monthly Temperature Highs and Lows



The significance of temperature fluctuations and variations in Hyrum should be considered when maintaining and operating the city's collection system. Even though the majority of the pipelines of the collection system are buried in the ground below the depth of the frost line, air temperatures at the surface greatly affect the rate at which accumulated snow might melt and enter the collection system through manholes in the streets. Extreme cold temperatures have the potential to freeze some of the more shallowly buried pipelines, especially those with a smaller diameter that may not have a very high flow rate passing through them. If icing occurs, it could possibly cause an ice plug or dam that would obstruct normal operation and would have to be delt with.

1.4.4. Soil & Groundwater

According to the Utah Department of Natural Resources (DNR), in cooperation with the United States Geological Survey (USGS), Cache Valley is a complex graben composed of downthrown fault blocks covered by rocks of Cenozoic age. Uplifted blocks surrounding the valley form mountain ranges that have a vertical displacement of the fault blocks exceeding 10,000 feet in parts of the valley. Interpretation of a gravity survey of Cache Valley indicates a maximum thickness of Cenozoic rocks of about 8,000 feet.

Most groundwater wells tap Quaternary valley fill (sand and gravel), and a few wells tap sandstone, conglomerate, and fanglomerate of the Salt Lake Formation of Tertiary age. The principal springs issue from Paleozoic rocks (mostly limestone and dolomite in the mountains and from Quaternary rocks in the valley. This is the principal water-bearing unit in the area. Artesian conditions exist in at least 200 square miles of the more than 660 Square miles of the northern-south trending structural valley of northern Utah and southeastern Idaho. The most productive aquifer system in Cache Valley is in the Hyrum-Wellsville area in the south end of Cache Valley.

Recharge to the ground-water reservoir in Cache Valley is mainly by infiltration of precipitation that falls directly on the valley, by seepage from streams and irrigation systems, and by subsurface inflow. Much of the reservoir is overflowing, and the annual change in storage therefore is assumed to be negligible; thus, the total recharge is regarded as about equal to the total discharge.

Historically, the agricultural uses for the soil in and around Hyrum have been predominantly for crops such as alfalfa, grains, corn, sugar beets, potatoes, fruit, and even local vegetable gardens. The adequacy of the soil for construction of individual homes, developments, and commercial and/or industrial uses is for the most part adequate for buildings or structures to support these types of industry and development. Some areas of concern that might impede structural construction yet still allow for agricultural usages would include those in which the groundwater table is shallow. Careful planning and consideration for areas that demonstrate a high-water table and/or are located in natural drainage areas such as along the Little Bear, and the Blacksmith Fork drainages should be developed in an adequate fashion to deal with the high-water table. The northwestern portion of Hyrum, situated in the lowest elevation of the city, also has a shallow groundwater table and accumulates much drainage in the winter and early spring. These areas pose a moderate constraint on consideration for development.

It is important to be aware of the variations of soil conditions in and around Hyrum and the nature of the existing groundwater conditions in the general area. As the city grows and new housing, roadways, businesses, parking lots, schools, churches, parks and open spaces, etc. are developed, they will all have to deal with either existing groundwater, or the potential for groundwater. The previous discussion highlighted the fact that the greatest aquifer production in Cache Valley is in the Hyrum-Wellsville area of the valley. This fact should be ever present as the area develops and grows and should be an important consideration during design of not only new infrastructure to be installed, but also of any rehabilitation or replacement efforts for older and existing infrastructure.

2. EXISTING WASTEWATER SYSTEM

2.1. SERVICE AREA

The Hyrum City wastewater collection system service area is shown in Figure 2.1. The total area encompassed by the city boundaries is currently 6.02 square miles. The system essentially serves all developed areas within the Hyrum City incorporated area. Two additional considerations add significant implications to this collection system master plan in terms of service area. The first such consideration is the amount of available land that could potentially be developed and add to the collection service area. Early in the Master Planning process, we met with city officials that directed us to consider all of the open unannexed areas surrounding the city as potentially becoming a part of the service area. Of course, this would require annexation of these areas by Hyrum City. It is known that these areas have competing interests to be annexed into other surrounding communities. However, the conservative approach was to consider the entire area as a possibility. These areas are shown in a later figure in this Master Plan (Figure 5.5), and coincides with the 50-year, or buildout, scenario of future projections. If the entire area of these potential developable areas were to be annexed into Hyrum City they would have the potential to more than double the service area by adding another 6.25 square miles of available land.

The second consideration that has a significant implication for the Hyrum service area is the agreement Hyrum City approved to allow the community of Millville, located north of Hyrum, to connect their collection system to the Hyrum City collection system and start redirecting their wastewater flows to the Hyrum City WRF. These non-Hyrum flows are capable of entering the Hyrum City wastewater collection system at the manhole located in 4600 South and 1200 West. The first phases of pipeline infrastructure have already been installed, and beginning in the fall of 2025 flows from Millville began entering the Hyrum City system. The process to fully receive all the flow from Millville will take a protracted amount of time, not because of the lack of outfall sewers and infrastructure to connect to Hyrum, but because of the time it will take for individual residences in Millville to go through the change-over process. It takes time to amass funding, secure contractors, and then perform the work to convert the existing septic sewer systems over to the public collection system. This conversion process is the responsibility of each individual homeowner, lengthening the amount of time for the anticipated change-over. For the purpose of this master plan, the service area of the Hyrum Collection system that will be impacted by this tie-in agreement was evaluated and the entire anticipated future flow from the community of Millville was applied. The portion of the Hyrum collection system that is impacted consists of the pipeline in 4600 North from the point where the flows are introduced to the Hyrum collection system at 1200 West, then on to the water reclamation facility.

2.2. EXISTING COLLECTION SYSTEM

The existing Hyrum City wastewater system consists of gravity pipes including laterals, collectors, interceptors and outfalls. The system also includes 6 lift stations and a water reclamation facility (WRF). This master plan evaluates only the wastewater collection system comprised of the pipelines and lift stations. It does not evaluate the treatment capacity of the reclamation facility nor its equipment and hydraulics through the plant. The existing wastewater collection system is shown on the following page in Figure 2.1. Data for the existing wastewater system has been provided by the City and includes data taken from:

- Sewer System Evaluation and Capacity Assurance Plan Update (2023) – JUB.

- Sewer System Evaluation and Capacity Assurance Plan (2017) – AQUA Engineering.
- Hyrum City GIS data – as provided by Cache County GIS Coordinator.
- Field Data collection (June – August of 2024)

2.2.1. Collection Network

The existing Hyrum City wastewater collection system consists of approximately 51 miles of pipeline. The first sewer mains were constructed in the 1970s. The pipe sizes range from 6-inch diameter to 24-inch diameter pipe.

2.2.2. Water Reclamation Facility

The wastewater from Hyrum City residents, businesses, and industry flows mostly by gravity in the collection network described above. The flows continue in the collection system until they reach the Water Reclamation Facility (WRF) where they are treated for discharge back into the waters of the State. The WRF is located at the southwest corner of the intersection of 4400 South and 1900 West, Cache County coordinates. The Hyrum City coordinates of the same intersection is 900 North 900 West. The flows from the Hyrum City wastewater collection system arriving at the WRF are delivered through one main 24-inch diameter pipe, or gravity sewer trunk line that runs north, parallel to 900 West, until it turns 90-degrees to the west into the headworks of the treatment facility. The WRF consists of grit removal, primary and secondary screening, with two anoxic basins and pre-aeration basin, and four membrane bioreactor (MBR) basins. The final process is Ultraviolet (UV) disinfection. The WRF has a current permit to treat a maximum of 2.0 MGD. Once the City's average daily flow reaches 1.5 MGD it is recommended that a Master Plan of the Reclamation Facility (treatment plant) be conducted. FIGURE 2.2 is a depiction of the overall reclamation facility plan, indicating major aspects of the facility, including the location of an ultrasonic flow measuring device and other treatment features and facilities as described herein.

Figure 2.1 Existing Sewer Collection System

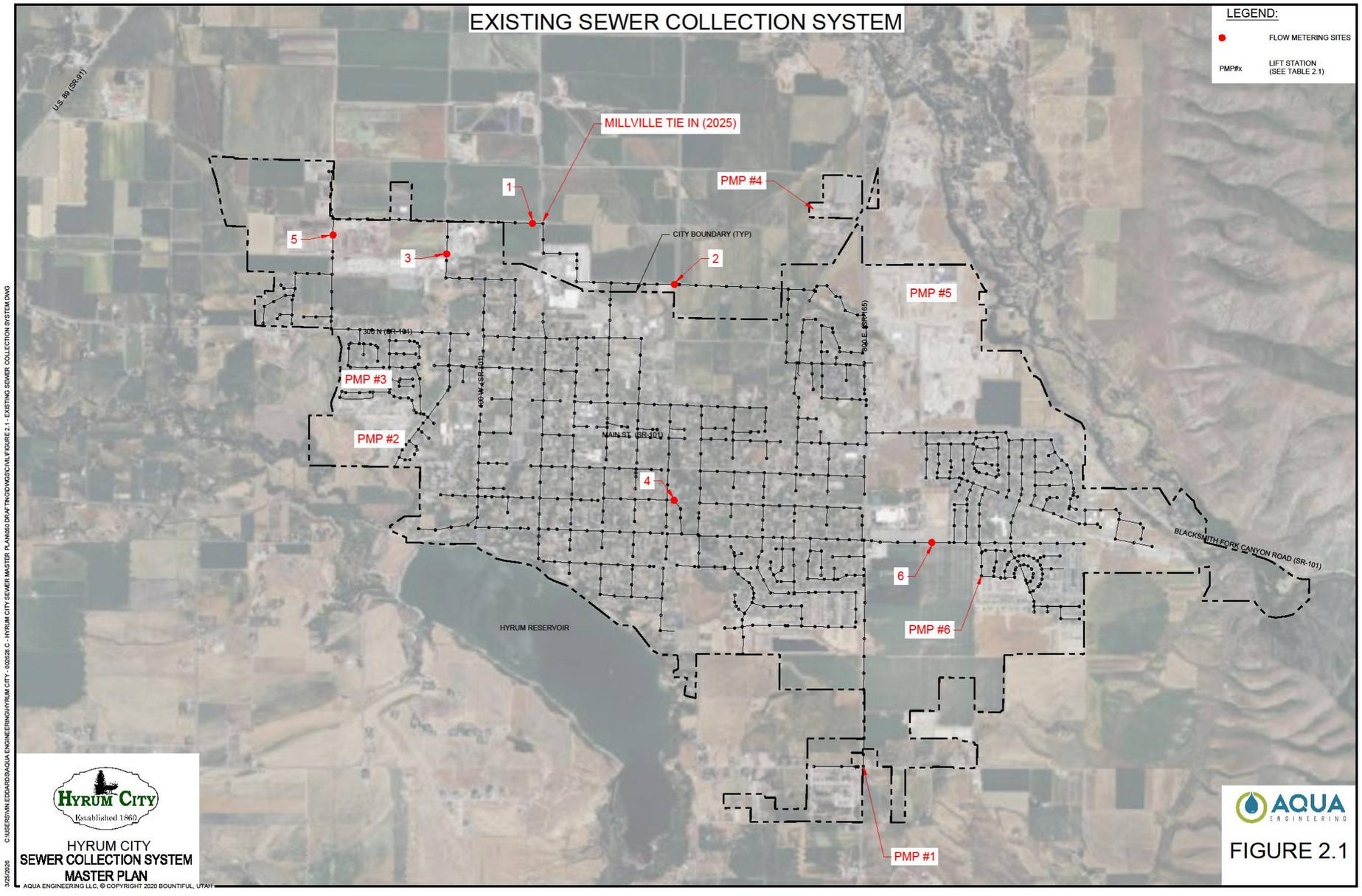
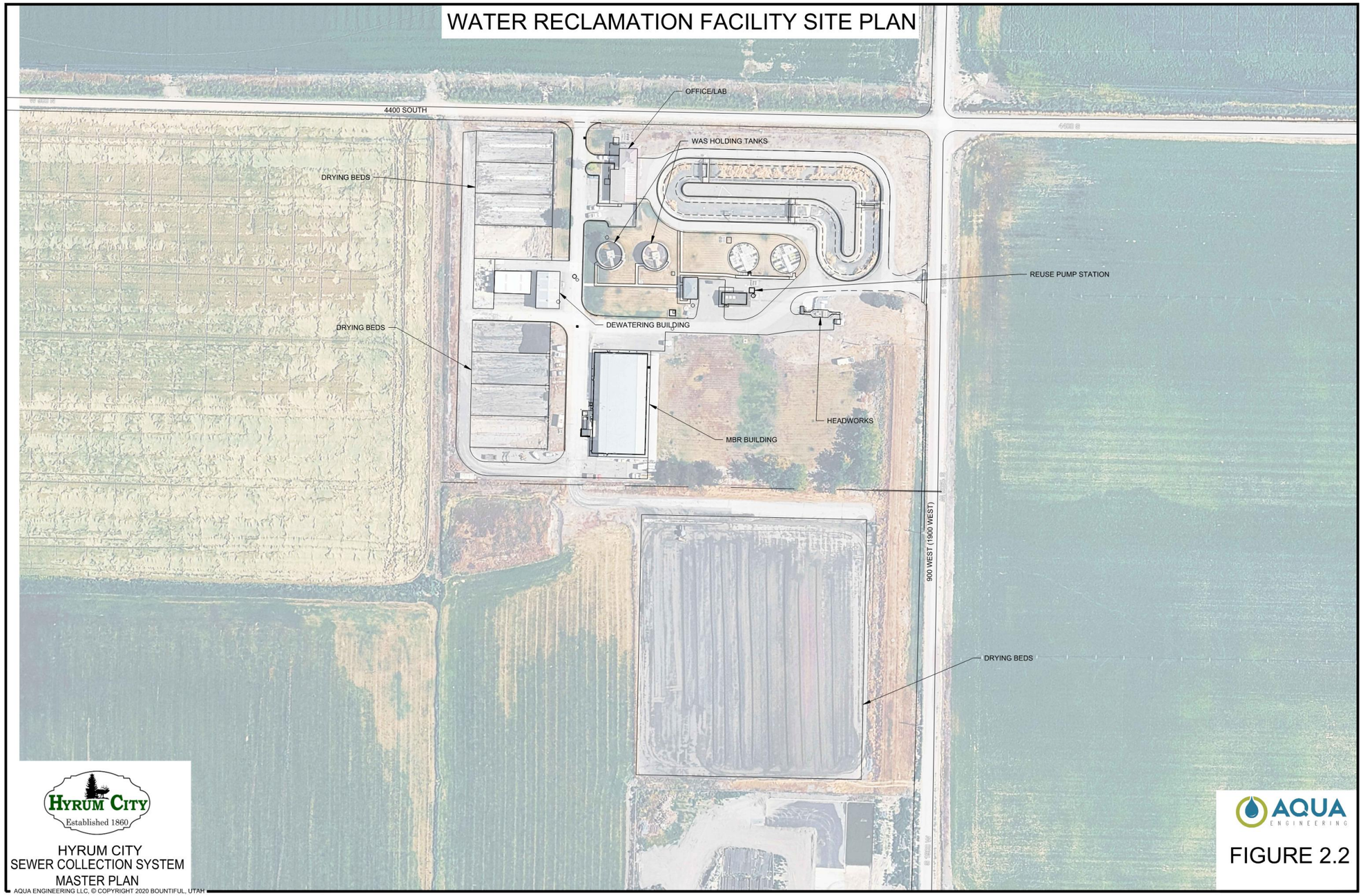


Figure 2.2 Water Reclamation Facility Site Plan



2.2.3. Lift Stations

As described above, the majority of wastewater in the Hyrum collection system flows by gravity throughout the system. However, as a result of relatively flat topography in portions of the City as well as being influenced by the patterns of development (sequencing of growth), it is necessary to use lift stations in various locations of the City to provide complete wastewater services throughout the system. Hyrum City owns and operates 6 lift stations to assist in conveyance of wastewater to the WRF. The operation of each of these lift stations is similar in nature and consists of lifting the collected wastewater from the bottom of the wet well to a sufficient height that will allow the flow to then discharge into the gravity collection system and flow via gravity to the treatment facility. Each of these configurations is entirely underground with access to the pumps, and other lift station equipment through manholes or hatches. The piping to and from the lift stations is directly buried in the same fashion as the piping of the entire collection system. Operating the lift stations as described avoids the necessity of having long runs of pressurized pipeline from the discharge of the lift station – commonly referred to as force mains. The locations of the lift stations are shown in FIGURE 2.1. Table 2.1 provides a list of lift stations with key characteristics for each.

Table 2.1 Lift Stations

Lift Station ID	Name	Address	Pump Model	Pump Capacity (gpm @ ft of elevation head)	# of Pumps	VFD	Backup Power
PMP #1	Canyon Estates	780 East 1100 South	KSB KRT F 80-200/34XG-S	297 gpm @ 18.7 ft	2	N	Y
PMP #2	Hidden Valley	785 West 85 South	KSB KRT F 80-200/34XG-S	104 gpm @ 52.7 ft	2	N	Y
PMP #3	Mount Sterling	843 West 50 North	KSB KRT F 80-200/34XG-S	135 gpm @ 50.1 ft	2	N	Y
PMP #4	Scenic Mountain	617 East 730 North	KSB KRT F 80-217/52XEG-S IE3	98.6 gpm @ 78.8 ft	2	N	Y
PMP #5	Cache County	Ridgecrest Drive	KSB KRT F 80-200/34XG-S	296 gpm @ 18.8 ft	2	N	Y
PMP #6	Non-Profit	1165 East 500 South	KSB KRT F 80-200/34XG-S	287 gpm @ 39.3 ft	2	N	Y

The City's long-term plan is to maintain and operate the existing lift stations, allowing for future lift stations only when required due to insufficient slope. Hydraulic modeling of the future development areas identified in this master plan indicates that gravity conveyance to the WRF is feasible for all areas once the recommended trunkline improvements of Chapter 6 are in place with the exception of one area on the west side of town discussed below. Gravity flow is desirous over new lift station construction; however, if grade and development configuration is such that a new lift station is the only way to service the growth it should be designed with the capacity to meet the flow demands of the proposed development, along with an analysis of the carrying capacity of the pipeline system all the way to the water reclamation facility.

For purposes of this master plan, all future growth and expansion is assumed to convey flows to the

WRF via gravity flow. As mentioned above, there exists an area of potential development located on the west side of town, primarily south of 300 North and west of approximately 900 West where the topography will likely dictate the requirement for a future lift station. It would be advisable to work with land owners/developers in the area to potentially regionalize lift station infrastructure to minimize multiple installations. Section 5.4.1 reports the measured average and peak daily flow at each of the six existing lift stations, together with the firm capacity and the resulting surplus capacity of each, in Table 5.2. None of the six stations is presently operating at its rated capacity.

3. FLOW MONITORING

The purpose of flow monitoring is to obtain flow data within the Hyrum City collection system to provide verification of the flow characteristics across the city, including defining the diurnal flow characterization within Hyrum, determining the peaking factors of the system, as well as obtaining information to utilize in the calibration of the model to more realistically represent in-field conditions.

3.1. COLLECTION SYSTEM MONITORING

Flow monitoring occurred at six strategic manhole sites throughout the City by Aqua Environmental Services (AES) during the month of July, 2024. The equipment used at each site was a Hach FloDar flowmeter. The City owns a FloDar flowmeter which was installed along with the AES owned FloDar flowmeters to capture an additional set of data at the sixth site. A Data Summary Report of the raw data collected for each site is included in Appendix B. After installing each flowmeter and calibrating them to the flow conditions at each manhole, AES set the gages to collect data in 15-minute intervals for the 30-day period. At one location (Gage #2) the increment was set to record the flow every minute. This gave an added advantage of capturing short-duration peak flows but had the disadvantage of battery life running out after a two-week period rather than lasting the full 30 days as was the case at the other five sites. Figure 2.1 (introduced earlier) also indicates the locations used for the installation of the six monitoring sites.

3.2. WATER RECLAMATION FACILITY FLOW MONITORING

In addition to the flow studies conducted by AES, the City provided AQUA with three years of metered total daily influent flow data at the WRF's headworks. The flows arriving at the WRF were analyzed for the seasonal variation of the flow volume. The model was calibrated to match the assumed peak flow at the treatment plant, including inflow and infiltration. Graphs showing the recorded flow data are found in Chapter 4. The WRF also has an effluent flow meter to monitor the discharge to outfall or to irrigation, depending on the season. The WRF receives a significant amount of flow from West Point Dairy that comes into the treatment plant through the outfall in 4600 South. This flow enters the manhole in 4600 South that is one manhole to the east of the intersection of 1500 West and 4600 South. It combines flows with other flows coming from the community at that manhole and then flows to the WRF. There has been discussion of an expansion of the West Point Dairy (WPD) production that could possibly increase flow conditions at this manhole. Without definitive plans from which to estimate loadings at this time, it was conservatively assumed that an additional loading might be as high as 100,000 gpd at this same manhole. When the city does undertake to perform a master plan for the WRF it is recommended to at least consider this increase in flow amongst the various options that WPD has at their disposal. Currently, the dairy has indicated they are considering the expansion and enhancement of the existing on-site treatment facilities of WPD itself to improve the loading characteristics that will subsequently be discharged to Hyrum City WRF. Another option under consideration is for WPD to obtain their own discharge permit from the State. This would require extensive investigation to the impacts on the receiving waters and an evaluation of the effluent parameters to meet the limit requirements. Also, under consideration is a modification to the existing treatment facilities to obtain permissible levels of discharge to the current location, which would then allow the bypassing of the Hyrum WRF, but would require additional infrastructure (ie: piping) to provide this bypass.

4. FLOW CHARACTERIZATION

4.1. METHODOLOGY

The purpose of flow characterization is to determine the flow patterns and variations that may be experienced by a wastewater system so that sewers, lift stations, and the treatment facility can be evaluated and sized appropriately. The flow characterization for the Hyrum City Wastewater Collection System Master Plan included evaluation of the following wastewater flow characteristics:

- Unit flows
- Daily Flow Variation
- Annual Flow Variation

4.2. UNIT FLOW & EQUIVALENT RESIDENTIAL CONNECTIONS (ERU)

Unit flows were estimated for Hyrum City and are expressed as Equivalent Residential Units (ERU). In other words, utilizing the "Unit Flow" approach, recommended by the State, uses a "Unit Flow" defined as one equivalent residential unit, or ERU. An ERU is defined as the average wastewater loading of a residential unit or household connected to the system. The amount of wastewater loading from one residential unit will vary from community to community depending on many of the factors discussed to this point in this report. It represents what an "average" unit or household would contribute to the system. The ERU is used to express all loadings by the same unit. Commercial, industrial and other types of development loading can be expressed by the same unit as residential usage. For example, a commercial development that produces a loading of 10 times the average residential loading will be designated with a 10 ERU loading.

Applying this approach to calendar year 2025 records provided by Hyrum City, the total commercial water usage including flow from West Point Dairy (WPD) Western Dairy Transport (WDT) was subtracted from the total metered influent at the Water Reclamation Facility (WRF) to calculate the residential contribution. This value was divided by the number of residential connections to calculate the unit flow per ERU. On this basis the adopted unit flow for the Hyrum City system is 300 gallons per day per ERU, and the total 2025 system demand is 4,872 ERUs. The unit flow and the distribution of that demand by user category are summarized in Table 4.1. On an assessment basis, under which each individual commercial account is rounded up to a whole unit, the same 2025 records yield 1,065 commercial ERUs and a system total of 4,911 ERUs. That basis is used for assessing individual accounts and is shown in the last column of Table 4.1, while the unrounded total of 4,872 ERUs is the figure that reconciles to the metered influent at the WRF and is therefore the basis of every flow calculation in this report.

Because this unit flow is derived from total metered influent at the WRF, it is inclusive of infiltration and inflow (I&I); the decomposition of the 300 gpd/ERU into its base sanitary and I&I components is presented in Section 9.4. For individual commercial accounts assessed for impact fees or user rates, commercial ERUs are rounded up to whole units. The complete calculation of unit flow and ERU is provided in Appendix D.

Two ERU totals are reported for calendar year 2025 and they are not interchangeable. The first is the unrounded total of 4,872 ERUs. It is obtained by dividing each user category's measured average daily flow by the 300 gpd/ERU unit flow and carrying the result to the fraction, which gives 3,846.0

residential, 280.9 metered commercial, 731.1 WPD, and 14.1 WDT ERUs. Because no value is rounded, the categories sum back exactly to the 534,146,201 gallons of metered influent at the WRF, equivalent to 1.46 MGD. The unrounded total is therefore the only total that can legitimately be used to derive a unit flow or to check an ERU count against measured flow, and it is the total carried through the flow projections and the level of service analysis of Chapter 9.

The second is the assessment total of 4,911 ERUs. Hyrum City assesses impact fees and user rates on whole equivalent residential units, so an account computing to 0.05 ERU and an account computing to 0.95 ERU are each assessed one ERU; no account connected to the system is assessed a fraction of the minimum unit of service. Applying that convention account by account to the same 2025 records raises the 60-plus metered commercial accounts from an aggregate 280.9 ERUs to 318 ERUs, West Point Dairy from 731.1 to 732 ERUs, and Western Dairy Transport from 14.1 to 15 ERUs, for a commercial total of 1,065 ERUs. Added to the 3,846 residential connections, the assessment total is 4,911 ERUs, which is 39 ERUs above the unrounded total. Because the 4,911 ERU total is built from rounded numbers, it must not be multiplied by the unit flow to produce a design flow, and it must not be used to re-derive gallons per day per ERU; doing either would overstate system flow by the amount of the rounding. Its proper use is limited to counting the units of service on which fees and rates are assessed. Both totals are shown in Table 4.1 and the full calculation is provided in Appendix D.

Table 4.1 2025 Unit Flow and System Demand

Adopted unit flow	**300 gallons per day per ERU (inclusive of I&I)**			
User Category	**Volume (gal/yr)**	**Average Daily Flow (gpd)**	**ERUs at 300 gpd/ERU (Unrounded Basis)**	**ERUs (Assessment Basis)**
Residential (3,846 connections)	421,773,758	1,155,545	3,846	3,846
Metered commercial accounts	30,762,857	84,282	281	318
West Point Dairy (WPD)	80,060,586	219,344	731	732
Western Dairy Transport (WDT)	1,549,000	4,244	14	15
Commercial subtotal	112,372,443	307,870	1,026	1,065
Total – 2025 system demand	**534,146,201**	**1,463,414**	**4,872**	**4,911**

Note to Table 4.1: the volumes and average daily flows shown are measured values and are identical on both bases. The unrounded ERU column carries each category to the fraction so that the categories reconcile to the metered influent, and it is the column used for all flow calculations in this report. The assessment ERU column applies the City's whole-unit convention to each individual account and is the column used for assessing impact fees and user rates. The 39 ERU difference between the two totals is rounding and nothing else.

4.3. VARIATION OF FLOW

4.3.1. Daily Variation – Peaking Factor

Flow in a wastewater collection system varies continuously throughout the day. Data were collected throughout each day on a 15-minute interval starting in late June and throughout July of 2024. Based on the data from residential manholes, a minimum flow occurs between 2 am and 8 am daily, and then the system experienced a relatively constant flow through the rest of the morning experiencing a slight increase until sometime around 11:00 am to noon. From this time

around noon to 11 pm there is a relatively constant flow with a maximum flow, or peak flow that occurs during the early afternoon between noon and 2:00 pm. Another peak flow occurs about 11 PM. This trend is somewhat unusual to collection systems in general, but it could be due to the fact that there is not an overabundance of large industrial facilities or activities that contribute to the system and the city is in a rural setting. The largest industrial facility (West Point Dairy) discharges wastewater effluent to the Hyrum City collection system at one manhole east of the manhole in 4600 South and 1500 West as was described earlier (Section 3.2).

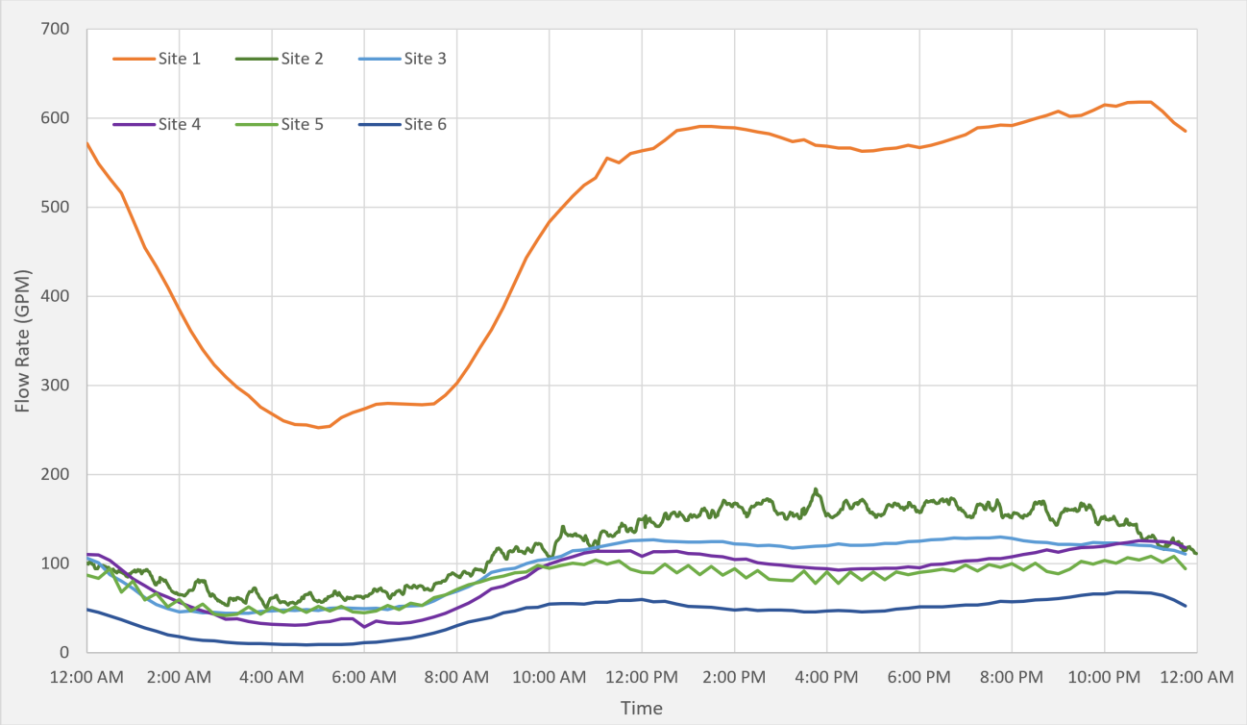
The 80,060,586 gallons per year attributed to WPD in this master plan is the metered effluent that the plant discharges to the Hyrum City collection system, and not the plant's culinary water consumption. The City's culinary water records report WPD consumptive use of 54,348,000 gallons per year, which is the lower of the two figures. The effluent volume is the correct basis for a wastewater analysis, and it is the volume carried through Section 4.2, Chapter 9, and Appendix D. The discharge exceeding the culinary purchase is expected at a dairy processing plant, where a portion of the discharge originates as water removed from raw milk and cream that is transported in tankers to the facility during processing and from on-site sources rather than as purchased culinary water; the City should confirm the split with the plant when the next set of records is obtained. The 80,060,586 gallons per year equates to 219,344 gallons per day, or 152 gpm, which is consistent with the range reported by the dairy.

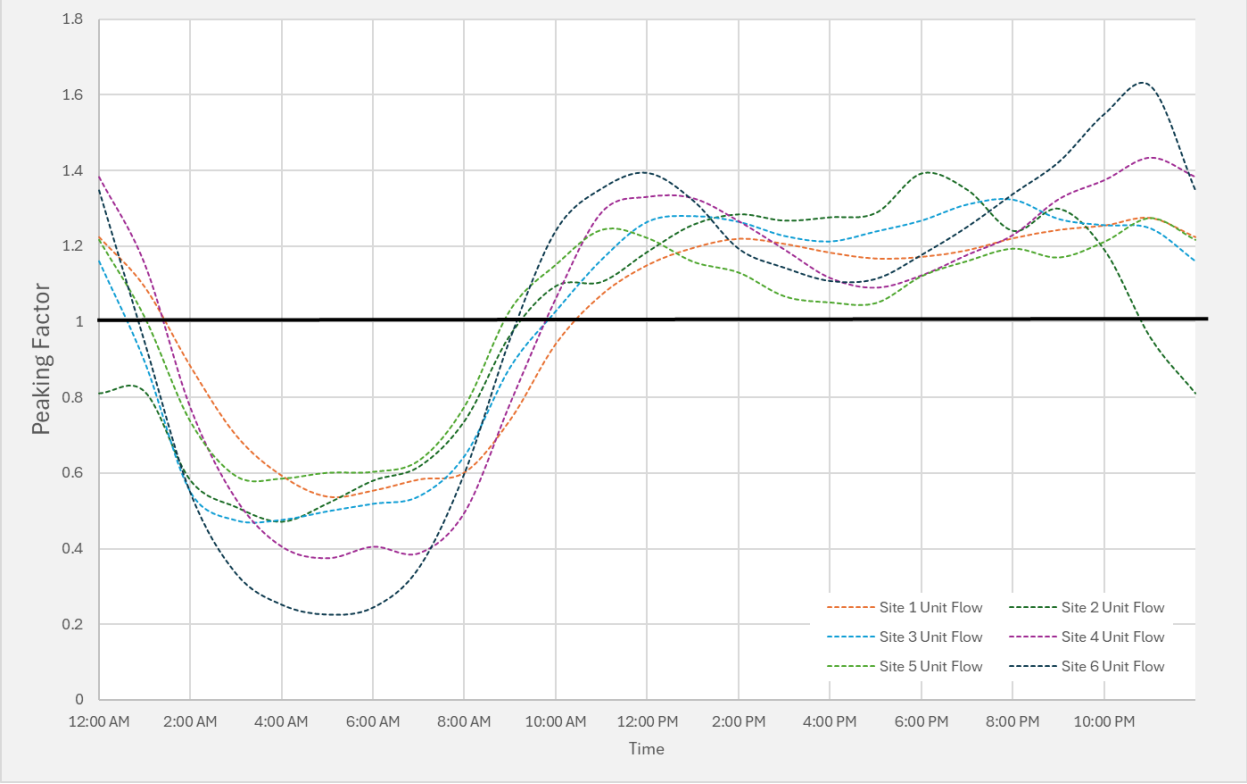
A second large industrial user of water is Western Dairy Transport located on 4600 South between 1500 West and 1900 West. In 2025 water consumptive use was 1,549,000 gallons per year, equating to 4,244 gallons per day, or just under 3 gallons per minute.

The other large industrial facility located in Hyrum City (JBS Beef Plant) does not discharge effluent to the Hyrum City WRF. JBS has their own capability to treat wastewater from their facility, at their own Water Reclamation Facility (WRF), including the wastewater piping system to convey the waste stream to the WRF. They have a separate State Permit to treat and discharge their wastewater flows. Their WRF is located just north of the JBS Beef Plant located along 1200 West. The beef plant itself is a large facility located between 350 North and 550 North and is partially located within the Hyrum City boundary limits. The JBS WRF is nearly another three quarters of a mile to the north from the main Beef Plant, along 1200 West in the unincorporated County.

Another factor to take into consideration when evaluating peak flows in the Hyrum collection system is that the peaks tend to attenuate (flatten out) and become less prominent the further they flow in distance. This phenomenon contributes to the discussion as to why there appears to be a "flattening" or constant flow through the system. In other words, the volume of flow in a pipe gets equalized the longer it flows in a pipe flow scenario. In this case, by the time it reaches the WRF. Figure 4.1 illustrates diurnal curves recorded from 6 sites during summer of 2024.

Figure 4.1 Flow Condition Residential June/July 2024





4.3.2. Infiltration and Inflow

Infiltration is defined as groundwater entering a wastewater collection system through pipe joints, cracks, and leaks in manholes or building connections. Infiltration may occur due to seasonal increases in groundwater level or due to precipitation. Inflow, on the other hand, is defined as surface water that enters a wastewater collection system through root leaders, yards, area drains, cooling water discharges, manhole covers, cross connections from storm drains, etc. This is typically related to, and directly influenced by, precipitation data. It can be observed during, or shortly after a rainfall event, and is most often independent of the typical diurnal curve that is seen from residential flow. The combination of Infiltration and Inflow analysis is often referred to as I&I, which sounds like just one type of flow, but in reality, there can be two separate and individual influences on the collection system. However, in standard practice they are quite often considered a combination of both.

Flows from infiltration and inflow (I&I) increases the total flow in sewer lines which can cause higher sewer treatment costs. If additional flows are significant, they may cause the flow to exceed the capacity of the pipelines, and on occasions even the capacity of the treatment plant. The original Hyrum City sanitary sewer system, much of which was installed in the 1970s, was likely constructed with caulked mortar joints and/or concrete pipe with gasketed joints. Both of these types of joints have been shown to develop leaks. Leaking joints like this can act as subsurface drains allowing groundwater to infiltrate into the sewer pipe network when the water table is higher than the pipes.

During analysis of the data set that was collected from the 6 monitoring sites (discussed in 3.1) where flow meters were installed, it became evident that there was an unaccounted quantity of flow that was entering the system. Because of the geometry of the collection system and where meter numbers 2 and 4 were located, the quantity of flow between these two meters should be able to be summed up and then included with a residential flow anticipated for the "unmetered" section in the area. The results should have been a total flow somewhat close to the total quantity of flow measured at meter location number 1. This, however, was not the case. There was a discrepancy of more than 100,000 gallons per day.

In attempting to duplicate this scenario in the model, we analyzed these contributing areas using the residential density of 3.01 persons per household and a unit flow of 300 gallons per day per ERU (equivalent to approximately 99.7 gallons per capita per day), with the known number of connections in the contributing areas being analyzed. With all of the modeling factors accounted for, the summed totals of Site 4 plus Site 2 plus the unmetered contributing area did not fully account for the total modeled flow at the manhole location of Site 1. The magnitude and the direction of that difference were consistent with the total flows measured in the field, which gave us confidence in our model development. It also provided further confidence in the assumption that a significant amount of I&I existed, particularly in this vicinity of the city, which is essentially some of the older sections of the city. This fact leads to the recommendation to conduct a detailed I&I analysis. Thus, in later sections of this master plan we have included cost estimates and budgeting recommendations for performing various I&I investigations, studies, and even recommend a few capital improvement projects to help mitigate this issue.

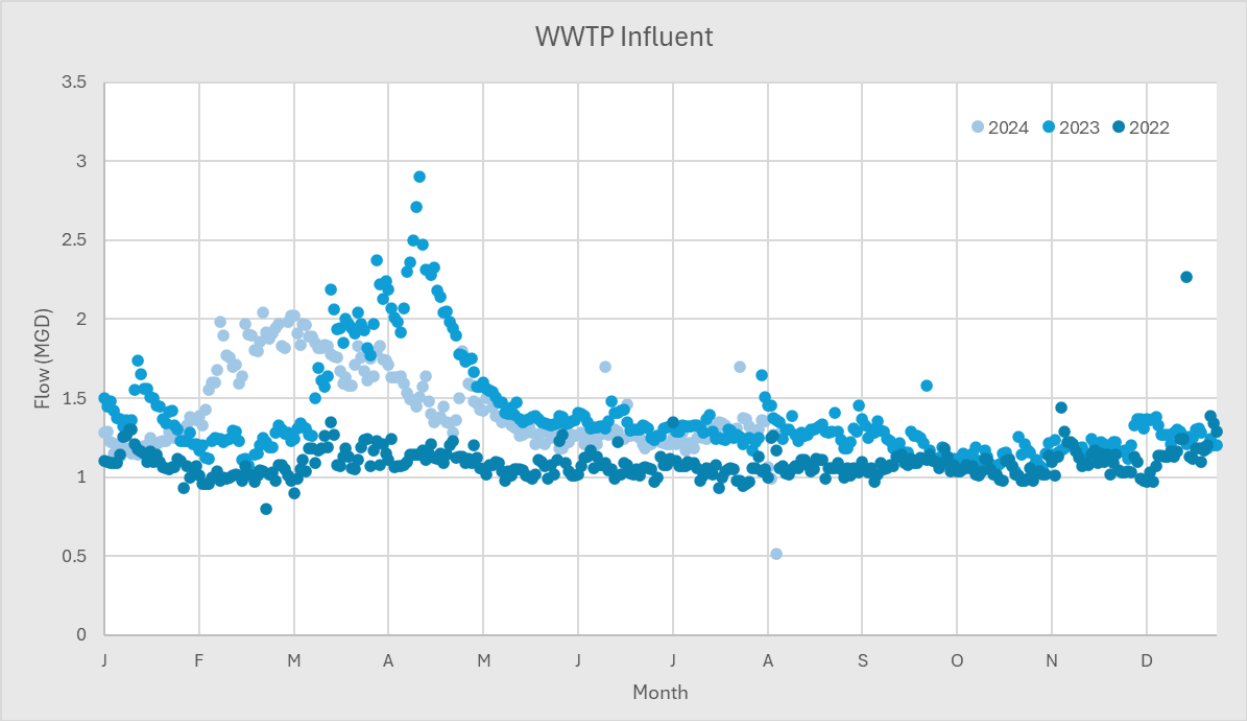
In examining the base flow of the data set, it appears that the base flow in this area of the collection system was higher due to the I&I and this assumption was made. This scenario was discussed with Hyrum City, and it was decided to account for system-wide I&I by modeling it as such at the rate of 0.3 MGD. Therefore, for purposes of this master plan, the model was

manipulated to account for I&I throughout each of the zones at a proportionate level.

4.3.3. Long Term Variation – Seasonal

AQUA has received daily flow records from the WRF for the last three years (mid-2021 through mid-2024). The records illustrate a seasonal fluctuation of the influent volume per day. The City's WRF sees a significant increase in influent volume during spring (between February and May). This is caused mostly by the spring runoff from land within the city as well as the nearby Mountains where the system receives mostly I&I water from the snow melt. The WRF sees an average daily flow of somewhere between 1.4 MGD and 1.5 MGD throughout the remainder of the year.

Figure 4.2 2022 – 2024 Daily Record Flows



4.4. EXISTING FLOW SUMMARY AND MODELING APPLICATION

After careful analysis of the flows from the modeling efforts, and adjusting them appropriately for I&I and comparing them against the State Code recommendations as well as the field-gathered data during the month of July, 2024, and then evaluating the results with the actual total flows aggregated at the treatment plant, we were confident with the numbers and ready to apply them to the model for projecting future flow rates. The process of applying these numbers to obtain the future flow projections is discussed in the following chapter and then followed by a discussion of the analysis of the collection system. To summarize: the flow to be utilized consists of a total average annual daily flow (based on the total metered flow at the WRF) of between 1.4 and 1.5 MGD. The calendar year 2025 metered influent of 534,146,201 gallons equates to an average annual daily flow of 1.46 MGD, and this value is the basis for the unit flow derivation of Section 4.2 and the level of service analysis of Chapter 9. For hydraulic modeling purposes, and to stay more to the conservative side, 1.5 MGD was used throughout this study. It should be noted that this is an average annual day flow and is not the average day, maximum month flow; the WRF experiences its highest monthly flows between February and May as described in Section

4.3.3. This flow will be distributed throughout the existing collection system utilizing the adopted unit flow per ERU and applied with a similar diurnal curve that was developed from analyzing the Hyrum City conditions.

5. WASTEWATER FLOW PROJECTION

5.1. PLANNING PERIOD

The wastewater collection system master planning periods were established in consultation and cooperation with Hyrum City Administration, Engineering and Public Works Departments. The growth areas, periods of analysis, and projection rates were established and then applied to the city's collection system using a hydraulic model that is discussed in the next chapter. The system was developed, then modeled for existing conditions, and then projected into the future to determine demands. The projections into the future were done in 5-year increments through the years 2030 and 2035, then modeled again for an increment of 25 years from current conditions to the year 2050. A final projection, 50 years hence was determined to be close to what could be classified as "final build-out" conditions and is provided for long-range planning efforts that carry the system analysis to the year 2075. It should be noted that once you approach projections that are 5 to 10 years out on the horizon, the projection quickly diminishes or fades in accuracy and significance. In fact, the State recommends, and even disallows, any financial projections beyond the 10-year mark. For this reason, anything beyond the 10-year mark is provided merely as a guidance as to direction and discussion of general terms. An actual analysis, correction, and adjustment should be made each year as the City grows and progresses forward, reflecting any of the actual changes, developments, and recommendations implemented (or not) during that previous year. For this master plan, growth areas within the next ten years were identified and modeled as isolated areas. This enabled the identification of projects that are needed within the 0-to-10-year timeframe. Cost estimations were assembled for capital projects that would be needed for these areas. However, it should be noted that the assumption followed the current City Development Requirements that new developments would be required to install their own infrastructure (including sewer collection systems) to serve their development. The capital projects projected for these newly developed areas were an estimate of what may, or may not, be required as a real and actual capital project to the City. A cost estimate for each capital project was developed in 2026 dollars and is presented in subsequent chapters for all projects needed within 20 years. However, only projects needed within the next 10 years are eligible to include in the assessment of impact fees.[1]

5.2. COLLECTION AREAS

For planning purposes of the master plan, it was assumed that the ultimate Hyrum City boundary would expand beyond the current boundary through annexations of the unincorporated areas between Hyrum City and the next adjacent city or limiting boundary (such as US Forest Service boundary, or the next adjacent City's current boundary, etc.). Those areas were assumed to develop at a density of the same zoning to the adjacent or surrounding zoned areas, with one exception to the area southeast of the city boundary, but within the potentially annexable area of the county. Because of elevation differences in this foothill area, it was assumed this area would develop as higher valued view lots, with a lower density of development. Because these are considered of higher value or at a premium, it was also assumed they would potentially develop as larger-lot sizes than those of the adjacent zoned areas, hence demonstrating a lower density of population and therefore a lower quantity of generated flows to the model. It was therefore assumed that east of Highway 165, and south of 6600 South, as development expands into the foothills of the mountains, the area would be zoned for larger residential view lots and classified as R-5, rather than R-2 or R-3, which is the classification in the surrounding areas.

5.3. GROWTH PROJECTIONS

The growth projections for each of the areas described above were assumed to fill in within the respective 5-year, 10-year, 20-year, and 50-year increments as outlined and shown in the future development maps. The existing land-use zones, as described, are shown in Figure 5.1. The projected 5-year, 10-year, 20-year, and 50-year projection maps are shown in the subsequent figures (Figures 5.2 through 5.5.) Each of these maps is color-coded to indicate the areas of expansion and growth for the corresponding projection year. It is obvious that the growth will occur that is closest to the infrastructure and facilities of the existing city and then will expand and grow in an outward fashion as the timeline progresses. The growth rate for the projected use was calculated at the 3.24% per year rate for each area (as discussed in 1.4.1 and shown in Table 1.1), applied to a 2025 base population of 11,157. Applying 3.24% per year to the 2025 base yields a projected population of 13,086 in 2030 and 15,347 in 2035, an increase of 4,190 persons over the ten-year planning horizon. Residential growth was computed by compounding the 3,846 existing residential connections at 3.24 percent per year over the ten-year horizon, giving 5,290 connections in 2035 and an increase of 1,444 residential ERUs. It should be noted that compounding an annual percentage growth rate is a reasonable basis over the 5-, 10-, and 20-year horizons but is not a reliable basis at 50 years; the 2075 buildout condition is therefore derived from the land use and density analysis of the annexable areas described above rather than from the compounded growth rate. Several of the design criteria and approach methods were determined at that meeting. From the projected increases in use and ERUs the accumulated flows for each of the new developed areas from the corresponding zone increases were accumulated and fed into the model to evaluate the adequacy of the existing system and to determine if there were areas requiring capital improvement projects.

5.4. FLOW PROJECTIONS

Flow projections were calculated for each of the development areas that were defined in the growth projection process. With the zoning defined and the densities determined, it was a simple matter to determine the total area of the individual developments and then apply the ERU flow for that area. The total flow for each area was subsequently determined and input into the computer model for evaluation.

5.4.1. Lift (Pump) Stations

As was discussed in Chapter 2.2.3 there are 6 existing lift stations currently in Hyrum City. For purposes of this master plan and the model flows, the wastewater flow projections for each lift station is essentially the flow rate of each pump station. The production of each pump station will be the capacity of the pump station's flow when the pump station is running. When it isn't running (i.e.: when the wet well is filling up but has not yet switched on) the flow production will be zero. To determine the "worst case" scenario, the system was evaluated with all of the lift stations running at capacity. Table 5.1 summarizes those capacities. Table 5.2 then compares those rated capacities with the flows actually recorded at each station.

Table 5.1 Lift Station Wastewater Production

Lift Station ID	Lift Station	Firm Capacity (gpm @ ft of elevation head)
PMP #1	Canyon Estates	297 gpm @ 18.7 ft
PMP #2	Hidden Valley	104 gpm @ 52.7 ft
PMP #3	Mount Sterling	135 gpm @ 50.1 ft
PMP #4	Scenic Mountain	98.6 gpm @ 78.8 ft
PMP #5	Cache County	296 gpm @ 18.8 ft

PMP #6	Non-Profit	287 gpm @ 39.3 ft

The model treats each lift station as operating at the firm capacity shown in Table 5.1, which is the conservative basis for evaluating the receiving gravity system downstream of each station, and that assumption has been retained. It does not, however, describe how the stations are actually loaded today. To report current loading and surplus capacity quantitatively, Hyrum City provided pump run time records for each station. Daily pumped volume was computed from the recorded run time and the rated pump capacity of each station, and the resulting average and peak daily flows are compared against firm capacity in Table 5.2.

Table 5.2 Existing Lift Station Flow, Firm Capacity, and Surplus Capacity

Lift Station ID	Lift Station	Year	Firm Capacity[3] (gpm)	Firm Capacity[3] (gpd)	Average Daily Flow[4] (gpd)	Peak Daily Flow[4] (gpd)	Surplus Capacity (gpd)	Surplus Capacity[5] (ERU)
PMP #1	Canyon Estates	2023	297	427,680	34,763	130,710	296,970	344
PMP #1	Canyon Estates	2025	297	427,680	20,427	27,532	400,148	464
PMP #2	Hidden Valley	2023	104	149,760	8,090	47,726	102,034	118
PMP #2	Hidden Valley	2025	104	149,760	11,406	119,350	30,410	35
PMP #3	Mount Sterling	2026[1]	135	194,400	10,915	14,000	180,400	209
PMP #4	Scenic Mountain	2023	98.6	141,984	11,766	55,009	86,975	101
PMP #4	Scenic Mountain	2025	98.6	141,984	9,718	35,959	106,025	123
PMP #5	Cache County	2023	296	426,240	1,327	10,834	415,406	482
PMP #5	Cache County	2025	296	426,240	1,047	8,081	418,159	485
PMP #6	Non-Profit	2023	287	413,280	8,666	13,805	399,475	463
PMP #6	Non-Profit	2025[2]	287	413,280	15,224	27,667	385,613	447

Notes to Table 5.2:
(1) The Mount Sterling record covers 41 days, 10 July through 19 August 2026; the station does not yet have a full year of record, so its values reflect summer conditions only and do not include spring snowmelt.
(2) The Non-Profit record covers 335 days, 31 January through 31 December 2025.
(3) Firm capacity is the rated output of the limiting pump running continuously for 24 hours, with the second pump held as standby; each station has two pumps, as listed in Table 2.1.
(4) Average and peak daily flows were computed from recorded pump run time multiplied by the rated pump capacity of the station. Where both pumps operate at the same time this method slightly overstates the volume pumped, because two pumps operating in parallel do not deliver twice the flow of a single pump on the system head curve.
(5) Surplus capacity in ERUs is the surplus daily capacity divided by the peak hour unit flow of 861 gpd/ERU, being the 300 gpd/ERU average annual day unit flow multiplied by the system-wide peak hour factor of 2.87 established in Section 4.3.1; peak hour flow, not average day flow, is the governing unit of demand for conveyance capacity.
(6) Stations are listed in lift station identification number order, consistent with Table 2.1.

Two results in Table 5.2 warrant specific attention. The Hidden Valley station recorded a peak day of 119,350 gpd on 1 March 2025, which is 80 percent of its firm capacity and roughly ten times its average day of 11,406 gpd. The timing and the magnitude of that event are characteristic of snowmelt-driven infiltration and inflow rather than of sanitary loading, and of the six stations Hidden Valley has, by a wide margin, the least remaining capacity. It should be the first station included in the infiltration and inflow investigation recommended in this master plan, and its surplus capacity of approximately 35 ERUs should be treated as the binding constraint on additional connections associated with it until the source of that wet weather flow is identified and corrected. At the other extreme, the Cache County station operates at a very small fraction of its rated capacity, recording no flow at all on 171 of the 365 days in 2025. That pattern reflects the small number of connections presently tributary to the station rather than any deficiency in the record, and it indicates that the station as equipped has substantial capacity available for the growth in its basin.

For planning purposes, any surplus capacity in the existing lift stations is assumed to be programmed for use by immediate growth and expansion that has already received city approval or is pending final

approval. In other words, the incremental increase in flow from immediate growth and loading on these lift stations is already approved and anticipated. Because individual developments may occasionally be configured such that a lift station is unavoidable, and because the loading on any such station depends on the development proposal itself, these situations are addressed on a case-by-case basis at the time of development review rather than projected here.

Figure 5.1 Current Conditions

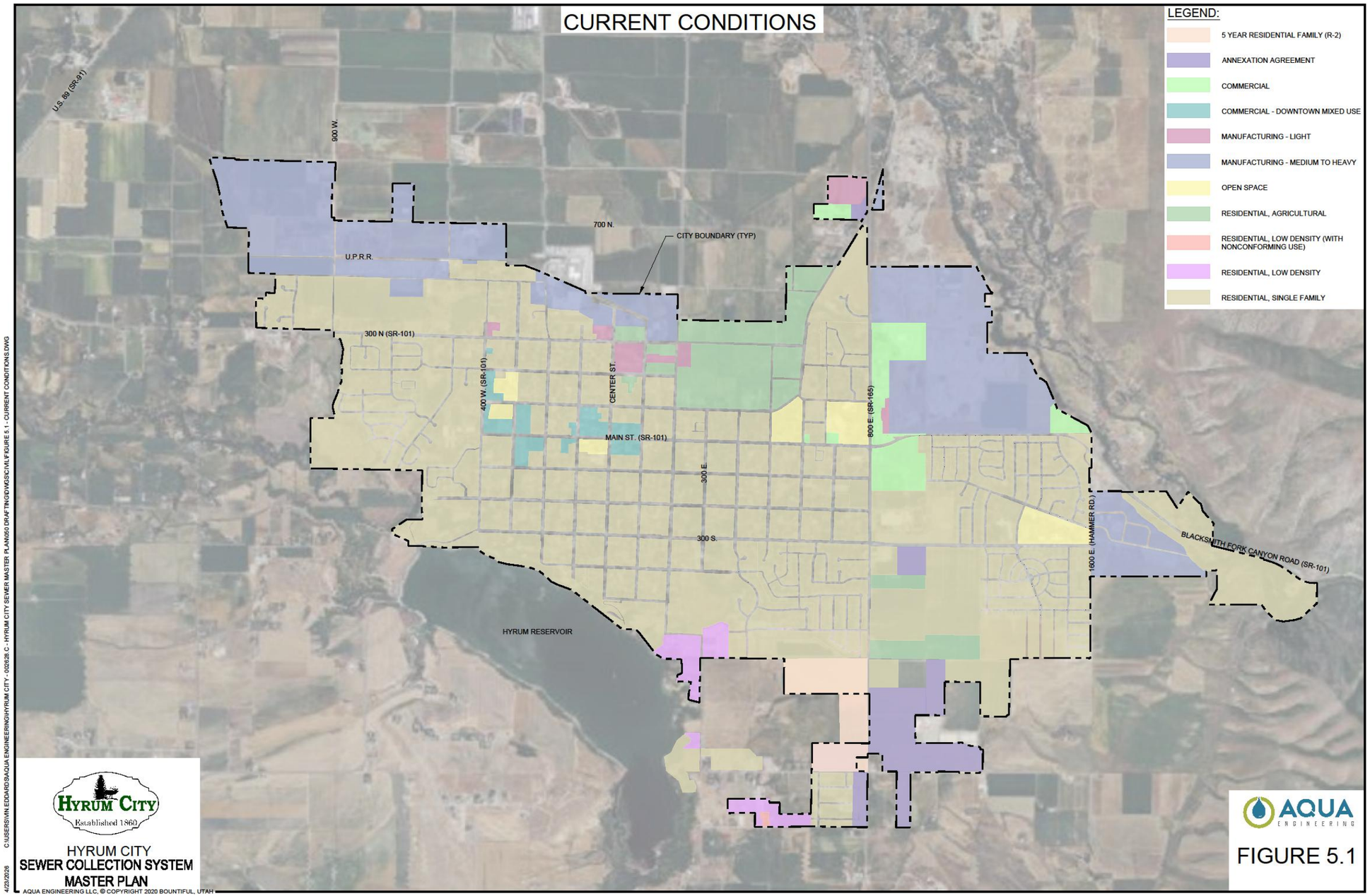


Figure 5.2 5 Year Projection

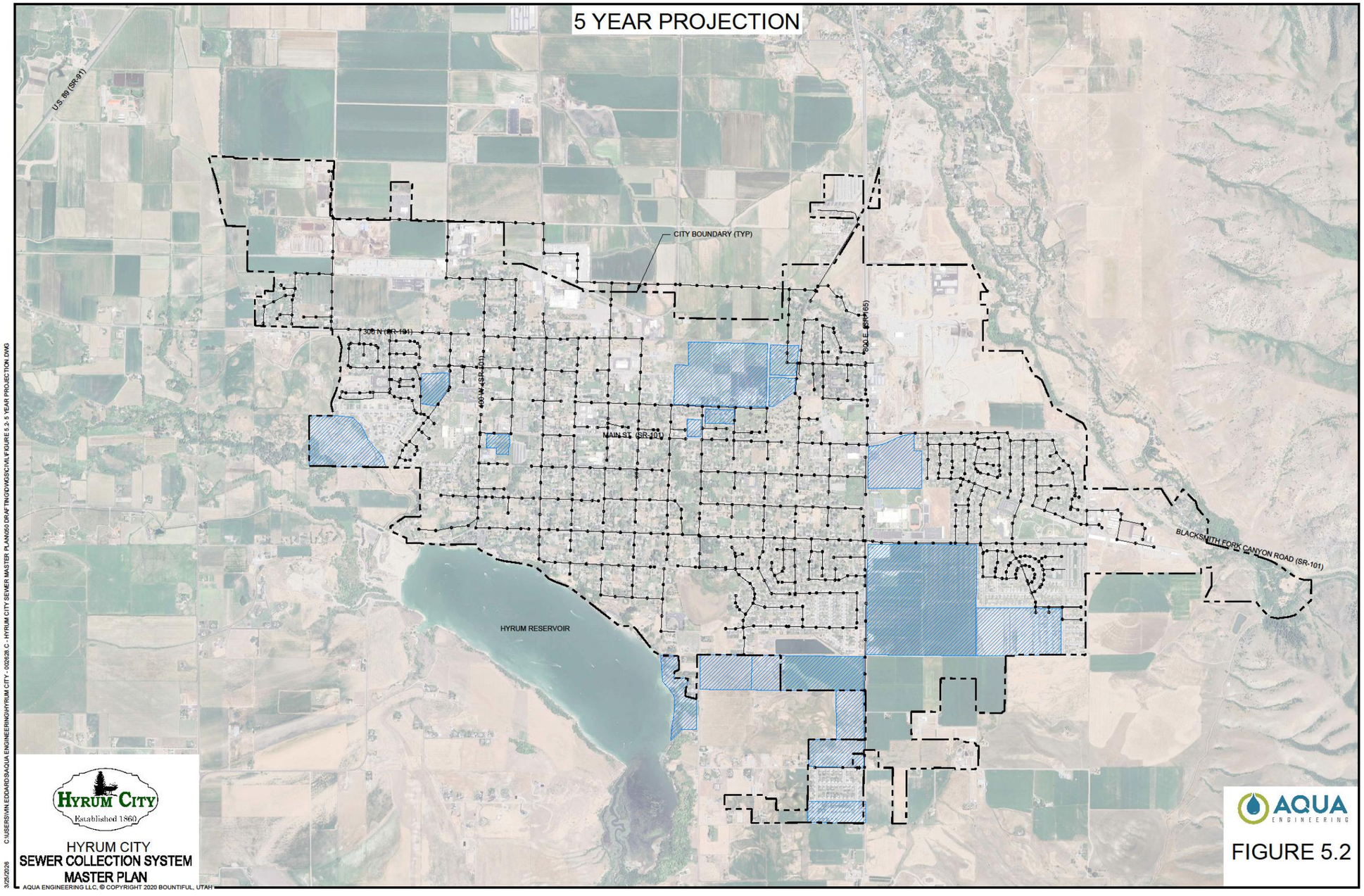


Figure 5.3 10 Year Projection

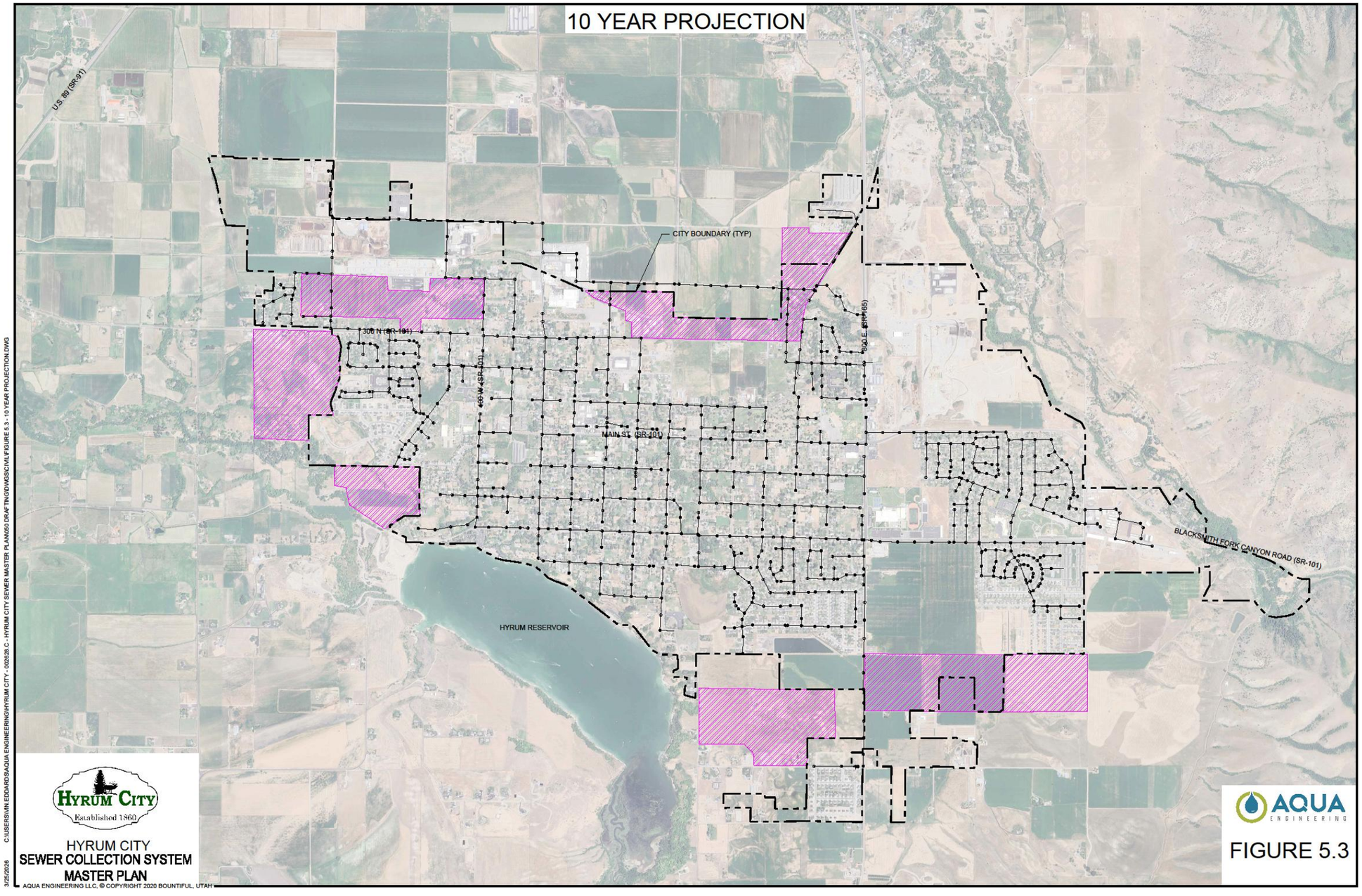


Figure 5.4 20 Year Projection

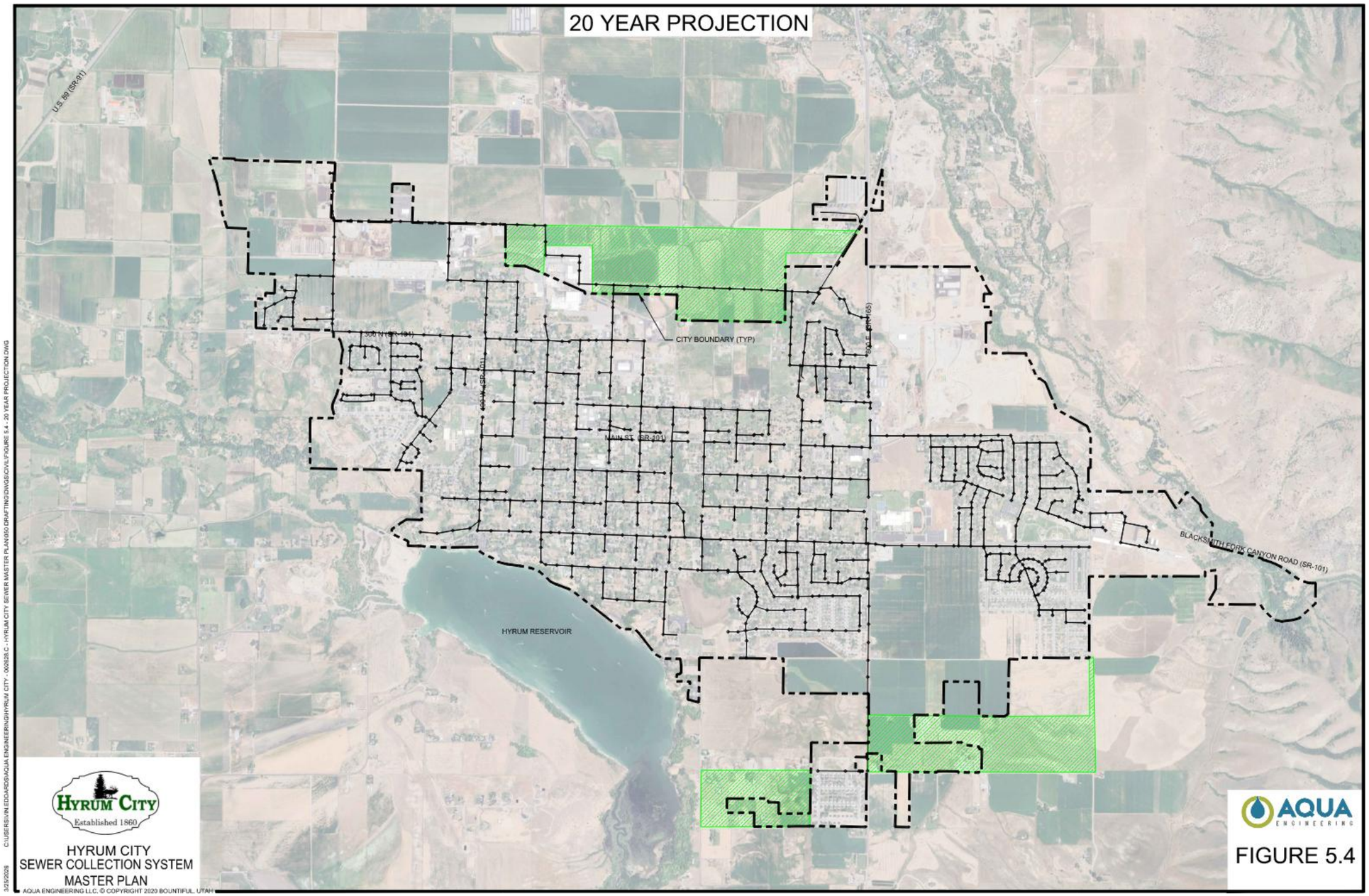
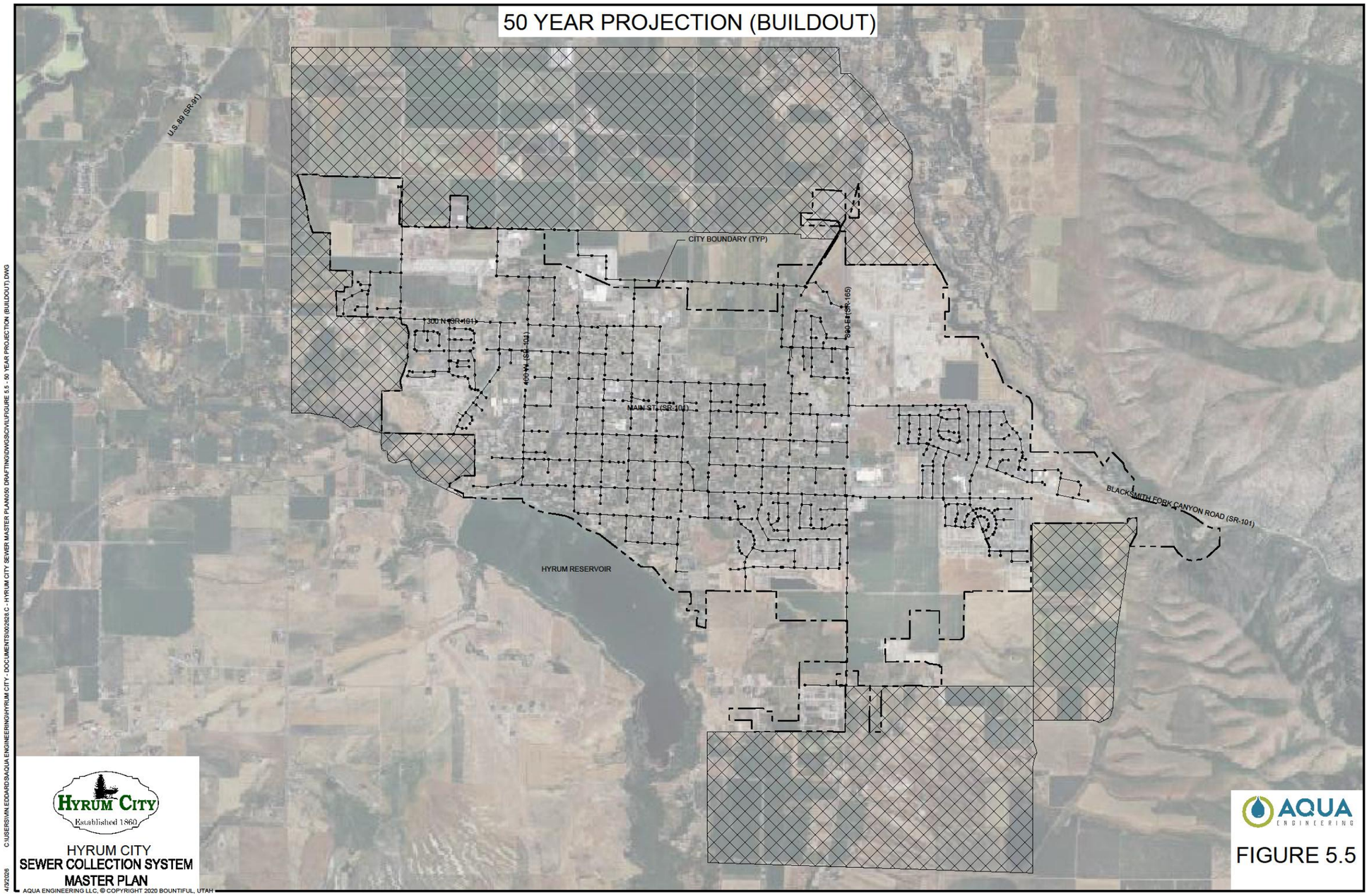


Figure 5.5 50 Year Projection (Buildout)



6. COLLECTION SYSTEM EVALUATION

There are two major aspects to evaluating any sewer collection system. The first is of course the actual physical condition evaluation of the system. This would include parameters such as age, structural condition, materials, and the observable capacity of individual components throughout the system. There are various methods to achieve this evaluation, and by nature it is, and should be, an on-going process. Each and every day when the system operators and staff are involved with any aspect of the system, they should be making mental notes, as well as physical documentation notes, when possible, of the system's condition. There are standard methods and procedures defined specifically to accomplish this task. The National Association of Sewer Service Companies (NASSCO) is one such standard by which many municipalities and sewer districts follow to track their system's physical condition. This organization is a not-for-profit North American trade organization, established in 1976 "to increase the awareness of aging underground infrastructure and to provide viable solutions through education, technical resources and industry advocacy". One method by which they meet their mission statement is through certification programs, such as PACP (Pipeline Assessment Certification Program), LACP (Lateral Assessment Certification Program), and MACP (Manhole Assessment Certification Program). These programs ensure consistent assessment and reporting using standardized coding systems. Hyrum City currently operates under the existing Sanitary Sewer Master Plan which defines the standards of inspecting all manholes and gathers Closed Circuit Television (CCTV) data on 10% of the collection system annually. Following this pattern the entire city is inspected each 10-year period. The goal for the city is to evaluate and assess the condition of the entire system and to track the condition of each pipeline, lateral, manhole, lift station, and other facilities throughout the system.

The second aspect of evaluating the collection system is more of a consideration of the system's capability to convey sewage flows from the point of origin (homes, businesses, industrial facilities, etc.) to the final destination (the WRF). This evaluation of the capability entails an evaluation of the capacity of the collection system. Not only the individual capacity of each component, but the overall capacity of each drainage trunkline with its corresponding contributing area, and also the collection system as a whole. The evaluation should include the carrying capacity, but also the excess capacity of the components and the system. This evaluation is primarily the reason for the development of this master plan, and the remainder of this chapter will discuss the steps utilized in evaluating the Hyrum City collection system.

6.1. MODEL USED

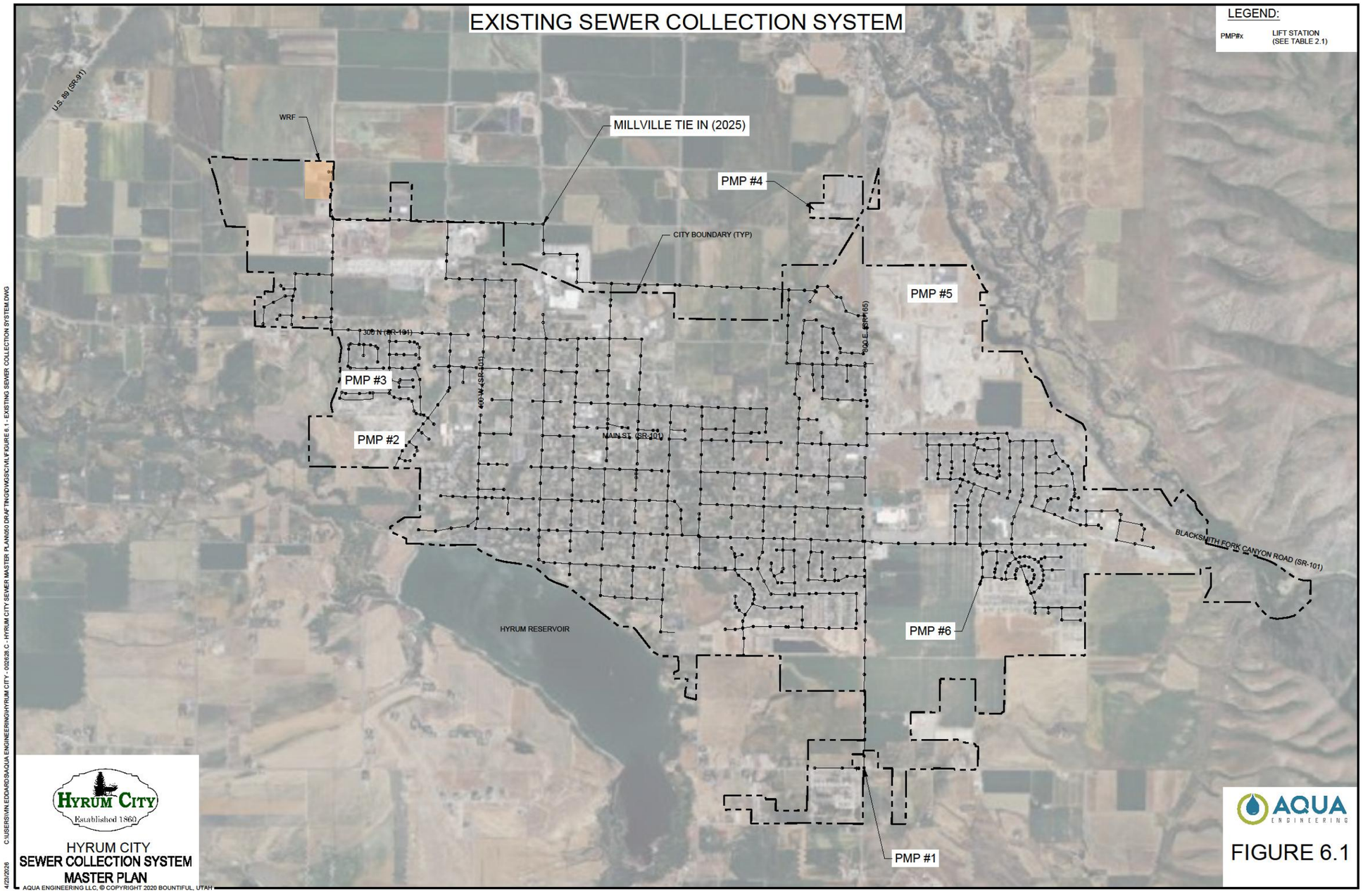
The software *InfoWorks ICM 2025.5 Standard* was used to create a computerized model to analyze the existing sewer collection system and determine the respective capacities in collector and interceptor lines. The purpose of using a hydraulic computer model is to digitally represent the physical features and characteristics of the collection system. Key physical components of the collection system (pipes and manholes) are represented by a set of user-defined parameters that represent the characteristics of the system. The computer model utilizes these parameters to mathematically simulate operating conditions of the collection system. Of course, as is the case with all computer models, the outcome or results of the simulation are only as good as the data and information going into the model. For this purpose, and to better define the flow characteristics we set up flow data collectors at six manholes strategically located throughout Hyrum City to help better define the flow characteristics of the collection system. A detailed description of this data collection process was discussed in paragraph 3.1.

6.2.SYSTEM LAYOUT

The layout of the Hyrum City collection system has grown organically throughout the years since Hyrum City has been in existence. This means that in terms of the wastewater collection system that after the City became incorporated and established an official mechanism of piping and collecting and then conveying the sanitary sewerage to the Water Reclamation Facility (WRF) to be treated, the basic "wastewater system" was in place. It started out somewhat smaller in area then the current service area but grew as the needs of the city grew. New homes were built with developments adding additional manholes and piping to the system as was required by planning and zoning requirements. Likewise, businesses sprang up as well as institutions, schools, churches, etc. to meet the needs and desires of the community. Along with each new addition, the infrastructure to support that particular addition was added to the collection system – be it additional piping, manholes, or whatever necessary infrastructure was required to provide adequate, and permitted sewerage services, until it reached the system as it exists today. This has been and will continue to be the "normal" (or organic) growth pattern of the system. Along with the expansion to the piping and layout of the collection system, came the need to expand the wastewater treatment capabilities. Each new home, business, school, church, or other institution added the necessary infrastructure (pipelines, manholes, etc.) to the system to meet the City's adopted standards of development so that the system could continue to collect and deliver sewerage to the WRF, but then in 2005 it was necessary to undergo a major upgrade and expansion to the treatment facility itself, and then again in 2021 it was expanded further to provide adequate capability to treat the increased flows. Figure 6.1 depicts the system as it currently exists. Part of the reason driving this collection system master plan is to help determine the projections for the future growth and timing for the need to further expand the treatment works facilities. As the City evaluates the increased flows anticipated from growth within the City itself, coupled with the recent addition of increased flows from Millville, they will need to determine the level of treatment service at the WRF and evaluate the timing to expand its capabilities.

The City's Geographic Information System (GIS) shows the collection system as far as the data has been kept current with the Cache County GIS coordinator. The GIS data contains some of the detailed attributes of the collection system, including pipe diameters, material type, manhole type and depth, invert elevations, lateral connectivity, etc. For purposes of the model, it was assumed that the geographic location of the manholes shown in the existing GIS was accurate enough to determine the length of pipeline connecting the manholes, and those that contained elevation and invert data were accurate enough to use also. As the collection system has grown and been added onto, the GIS information has not always been immediately transferred to Cache Valley to update the database in a timely manner to reflect these additions. Some of the missing data was provided by a team of graduate students from Utah State University who were hired to survey a portion of the missing data for the water master plan. Since it was a quick additional step to include shots on the sanitary sewer manhole lids in those areas where the crew was working, they did so. Therefore, in recently built subdivisions where the crew gathered water system data, they also gathered location data for the sewer manhole lids. During the GPS mapping of these subdivisions, data including valves, fire hydrant locations, meters, and sanitary sewer manholes were located by the data-gathering personnel tasked with gathering this data. This data was then transferred to the Cache County GIS database by the LTAP group from USU to reflect in the Hyrum City GPS mapping.

Figure 6.1 Existing Sewer Collection System



6.3. MODEL CRITERIA

The State of Utah has published minimum Standards for design of sewer systems. A copy of the State of Utah Administrative Rule R317-3-2 is included in the Appendix. The design requirements from the Administrative Code require that a new system be designed on the basis of an annual average rate of flow of 100 gallons per capita per day, unless there is data to indicate otherwise. This includes an allowance for infiltration, and the amount may be higher if there is probability of large amounts of infiltration entering the system. Design flow is calculated from this base flow plus a peaking factor. A peaking factor of 2.5 is used for interceptors and outfall sewers, and a peaking factor of 4.0 is used for laterals and collectors. Using the city's average household density of 3.01 people per household, as discussed earlier, equates to an Average Yearly flow of approximately 301 gpd per equivalent residential unit (ERU). The unit flow actually derived from Hyrum City metered records in Section 4.2 is 300 gpd/ERU, which agrees with the State basis to within one percent. The derived value of 300 gpd/ERU was used for this study.

The design criteria used in this study are summarized below. Note that the Average Yearly flow per ERU recommended by the State is 301 gpd/ERU, and the value derived from Hyrum City records and used in this study is 300 gpd/ERU.

- Flow:	Average Yearly	300 gpd/ERU
	o Peak Hour Collector Lines	Average Yearly x 4.0
	o Peak Hour Interceptor Lines	Average Yearly x 2.5
- Pipe Capacity >8inches	Maximum	85% of Full Capacity
- Pipe Capacity 8 inch	Maximum	75% of Full Capacity
- Pipe Sizes:	Minimum	8 inches
- Velocities:	Minimum	2 fps
	Maximum	15 fps

6.4. MODEL CALIBRATION

The digital computer model has the ability to adjust various parameters that are entered as input into this model. Doing so, is one method to "calibrate" the model to more closely represent what is actually occurring in the field. Other aspects of calibration of a model might be manipulating the input flows to represent specific known flows that exist in the model, or adjustments to some other aspect of the model. For this study, we made the calibrations to the flows as were observed from the field data collection exercised by AES (and discussed in Section 3.1 of Chapter 3). It was from the analysis of the model after making this calibration that we saw the discrepancy of flow that was attributed to I&I, as discussed in Section 4.3.2 of Chapter 4. The model was then calibrated to represent these I&I flows across the city and re-run to evaluate the system. Once we were as confident as we could be with the model, having updated the collection system to include the developments from the past 10 years, and adjusting the flows to closer depict those seen from the Flodar metering and data collection, we then had a model ready to use for the analysis of the future scenarios. It was a tool to help us analyze the collection system and determine the existing capacity and Level of Service (LOS). Future improvements needed to maintain the existing LOS were determined. This included developing recommendations to improve the collection system where needed to meet the projected population's sewer flow.

6.5. MODEL DEFICIENCIES/DESCREPANDIES

The accuracy and reliability of the model is only as good as the input data. Efforts to more accurately define system parameters result in a more accurate representation of real-world conditions, including

future flow projections and Level of Service (LOS). Likewise, as the City grows and additional information is added to the system, either through expansion or growth, or even from finding errors or omissions and then correcting them, will result in a more representative and accurate model of the collection system. For this reason, it benefits the city to maintain the model to the best of its ability and keep it as current as possible.

6.6. IMPROVEMENTS

After running the model, considering the condition of the collection system, discussing issues encountered by staff, and evaluating the entire system, AQUA Engineering, in conjunction with City Staff, has developed the following list of improvements and/or projects that are needed to keep the LOS current and/or address needed improvements to the system:

Table 6.1 Recommended Sewer Improvements

Improvement Type	Proposed Project Location	Description
Pipeline upgrade	900 W: from 900 N to 700 N then east to the first manhole to the east, plus the tie-in to the headworks @ WRF	Upgrade pipeline from 24" dia to 30" dia & headworks structure
Pipeline upgrade	300 S: 250 E to 800 E (incl leg to 200 N @ 250E)	Upgrade (from 12" & 15") to 18"
Pipeline upgrade	800 E: from 300 S to 900 S (6400 S)	Upgrade to 18"
New Pipeline	At 200 & 300 E: 600 S to 6600 S	Install new 8" pipeline
New Pipeline	800 E: 6600 S to 6800 S	New 10"
New Pipeline	700 S: 800 E to 1600 E	New 10"
New Pipeline	900 W: 4000 S to 4400 S	New 12"
New Pipeline	6600 S: 1200 E to 1600 E	New 10"
New Pipeline	6600 S: 800 E to 1200 E	New 10"
New Pipeline	300 N: 900 W to 1000 W	New 8"
New Pipeline	250 N: 800 E to apx. 1300 E	New 8"
Lift Station Refurbish/rehab	Refurbish/Rehab Lift Station	Rehab/Re-equip existing
Pipeline Lining	200 E: 200 S to 100 N	12" CIPP lining
Pipeline Lining	From 200 E & 100 N to Center St & 300 N (jogs)	18" CIPP lining
Pipeline Lining	From Center Street & 300 N to 1200 W & 700 N (jog in alignment through JBS)	21" CIPP lining
Pipeline Lining	700 N: 1200 W to 1500 W	21" CIPP lining
Equipment Purchase	Lift Station By-Pass Pump	Equipment Purchase (for emergency and/or temporary project bypassing)
Study/Report	SECAP Update	Update the 2023 Report
Study/Report	Collection System Master Plan Update	Update the 2025 MP
Study/Report	Collection System Master Plan Update	Update the 2030 MP
Study/Report	I&I Master Basin Study (General)	Define Basins & Major Basin Study
Study/Report	I&I Focused Study (detailed section evaluation)	Focused Study
Study/Report	I&I Focused Study (detailed section evaluation)	Focused Study
Study/Report	I&I Focused Study	Focused Study

Study/Report	I&I Focused Study	Focused Study
Study/Report	I&I Focused Study	Focused Study
Equipment Purchase	Camera Truck	Equipment Purchase
Equipment Purchase	Jet Trailer	Equipment Purchase
Manhole Rehabilitation	4’ Manhole Rehabilitation	Coating/lining of MHs
Manhole Rehabilitation	5’ Manhole Rehabilitation	Coating/lining of MHs

7. OPERATION AND MAINTENANCE RECOMMENDATIONS

Recommendations for key operation and maintenance procedures have been developed. Many of these recommendations are a continuation of procedures already in place. A discussion is included below, along with a recommendation for continued practice.

7.1. SYSTEMS AGE

Pipe age can be used to identify areas that might require more repairs. A typical design life for a sanitary sewer is between 50 and 100 years. Factors affecting design life may include pipe material, soil conditions and quality of construction. Hyrum City uses sewer video inspection technology to evaluate the structural integrity of the pipes in the collection network. Sewer video inspection is very useful at identifying cracks, holes, offset joints, erosion, low points in pipes, and areas that are experiencing significant inflow and infiltration. It is recommended that the City continue the video inspection as part of the maintenance schedule, so that the areas of network with problems can be identified and scheduled for replacement or repair work.

7.2. PIPELINE IMPROVEMENTS

7.2.1. Cleaning

The City has in place a cleaning program and it is recommended they continue following this existing schedule and program and to maintain a logging system that tracks the piping, manholes, and facilities that continually demonstrate the need for cleaning or repair. Instances to monitor closely might include those few areas where the slope of the pipeline is insufficient to provide adequate flow velocity. In these cases where the velocity drops below 2 feet per second, deposition of solids begins to occur. Solids deposition lessens pipe capacity over time. Any of the areas of the City that have pipelines with slopes less than is recommended for adequate flow are recommended to be monitored closely by the City.

7.2.2. Replacement

In general, pipe replacement is recommended when pipe capacity has been identified as being insufficient or the pipe material itself has deteriorated to a state of disrepair. AQUA did not find any area of the pipe that would immediately be insufficient in flow capacity, however, as stated in the previous paragraph under Cleaning, pipelines that are susceptible to inadequate flow velocities, as well as those that should be replaced due to inadequate quantity of flow capacity brought about by growth and increased demand, should be replaced to keep the adopted level of service intact. Specific areas and replacement projects are presented in the following chapter.

7.2.3. Bypass Sewers/Re-Routing Sewers

While replacement of an existing sewer may be appropriate when the existing sewer is structurally inadequate, construction of a bypass or parallel sewer to supplement the capacity of existing sewer is generally a less expensive alternative.

From time to time, it may be advantageous and/or more economical to consider re-routing of a sewer line alignment. For example, after a series of developments being installed over a period of time and all were utilizing one particular route for the collection system, the opportunity may present itself to re-route a new line along a different route with the most recent development coming in. This is not always going to be the case, but the possibility is always there and one should be aware of such opportunities.

It is also recommended that the City purchase a new bypass pump that is available for them to use when the need arises. It might seem like a frivolous purchase, especially when we hope there is never a need for one, but if a scenario were to arise where a line becomes plugged or damaged, or some other incident occurs that causes a backup in the system, the cost-savings of being able to bypass pump the wastewater would far outweigh the cost of damage to a flooded home(s) or inappropriate and/or illegal sewer discharge.

7.2.4. Infiltration and Inflow Improvements

As discussed previously in section 4.3.2, it is apparent that there is more than 10% of total flow that may be associated with infiltration and inflow for the City's collection network. Observing high flows in late evening or middle of the night where volume should be low, could be an indication of excessive infiltration. It is recommended that the City implement a systematic plan to inspect and locate the sources of Infiltration and Inflow in their sewer piping network.

Areas within the city that experience high seasonal or constant groundwater are suspect for infiltration and inflow into the sewer system. These areas include; 12-inch Main on 200 East, between 200 South and 100 North; 18-inch Main from 200 E. 100 N. to Center Street and 500 North; 21-inch Main from Center St. and 500 N. to 1500 West and 700 North; 24-inch Main from 1500 W and 700 N to WRF. Inspection of the pipelines, including video inspections, will provide the data necessary to design, locally repair, slip-line, or totally reconstruct the sewer pipeline(s) and/or manholes.

These improvements could reduce sewer flow and lower treatment costs. As the population grows the City should explore additional opportunities to reduce infiltration and inflow.

7.3. LIFT STATION IMPROVEMENTS

The 6 existing lift stations within the City were discussed in both sections 2.2.3 and 5.4.1. The City should plan to keep each of these lift stations in top operational condition and have backup, or standby capabilities in case there is a breakdown or issue at one of the lift stations. The backup capability should be considered as a temporary operation while the permanent lift station is repaired and/or replaced. Continual check-ups and maintenance routines for all the lift stations should be part of the daily operations and procedures.

Pump run time records provided by the City show that all six stations currently operate well below their firm capacity. The station-by-station values are given in Table 5.2 in Section 5.4.1. The Hidden Valley station is the exception that warrants monitoring, having reached 80 percent of its firm capacity during the March 2025 snowmelt period, and it is the logical first candidate both for the lift station refurbishment project carried in Table 8.2 and for the infiltration and inflow investigation recommended in this master plan.

For future development and growth, each new development proposed should be analyzed to determine its capability to flow by gravity to the WRF. Only in those extreme cases where gravity flow is not physically possible should any new lift stations be permitted. If, and when, a lift station is permitted, careful evaluation of the projected flow capacities should be reviewed and analyzed, and then a good, reliable design should be engineered to handle the projected flows.

8. CAPITAL IMPROVEMENTS PLAN

The recommended improvements presented in Chapter 6 (Table 6.1) are further developed here to represent the capital improvement plan. The recommended projects are assigned an estimated cost to construct/implement/develop as the case may be, and they are also assigned a suggested year off development to implement the project. In doing this, the Capital Improvement Plan (CIP) is developed.

8.1. PROJECT COST ESTIMATES

The following construction cost estimates for the installation of various facilities (shown in Table 8.1) indicate the value used for the installation costs. These costs, or rates are taken from current projects representative of this type of installation. However, they are only estimates that provide a sense of scope and relative range. Many factors, including construction resource availability, cost of material fluctuations, economic environment, and others, may greatly alter the costs presented in this table. When an individual project is ready to be implemented, a more refined and detailed cost estimate should be prepared.

Table 8.1 Unit Cost Summary

Item	Unit	Cost per Unit
8″ Sewer line	LF	$ 125.00
10″ Sewer line	LF	$ 175.00
12″ Sewer line	LF	$ 200.00
18″ Sewer line	LF	$ 250.00
24″ Sewer line	LF	$ 275.00
30″ Sewer line	LF	$ 350.00
8″ CIPP	LF	$ 75.00
10″ CIPP	LF	$ 90.60
12″ CIPP	LF	$ 110.00
18″ CIPP	LF	$ 125.00
21″ CIPP	LF	$ 140.00
24″ CIPP	LF	$ 150.00
Manhole Rehabilitation (4′ dia.)*	EA	$ 6,300.00
Manhole Rehabilitation (5′ dia.)*	EA	$ 7,880.00
Lift Station (new)	LS	$ 125,000.00
Lift Station rehabilitation	LS	$ 75,000.00
Asphalt road restoration	CF	$ 55.00
Roadway shoulder restoration/repair	LF	$ 25.00

* Based on $50.14 per vertical foot for an assumed 10-foot deep manhole

8.2. RECOMMENDED IMPROVEMENT PROJECTS

The recommended improvement projects presented in Chapter 6 are listed below with their estimated project costs for each project. The project costs are estimated using 2026 dollars but are estimated as budgetary level costs. The total sums up to $10,564,610. However, there are additional costs that should be factored to account for other project related costs. These costs are summarized as percentages of the total construction costs and are as follows:

Additional Associated Costs Percentages:

▪ Contingency	10%
▪ Design	7%
▪ Construction Management	5%
▪ Administrative & Legal	3%
▪ Total	25%

Therefore, the total sum of all the construction costs for capital improvements should be increased by another 25% to account for the additional project costs. This would then be:

1.25 x 10,564,610 = $13,205,762.50

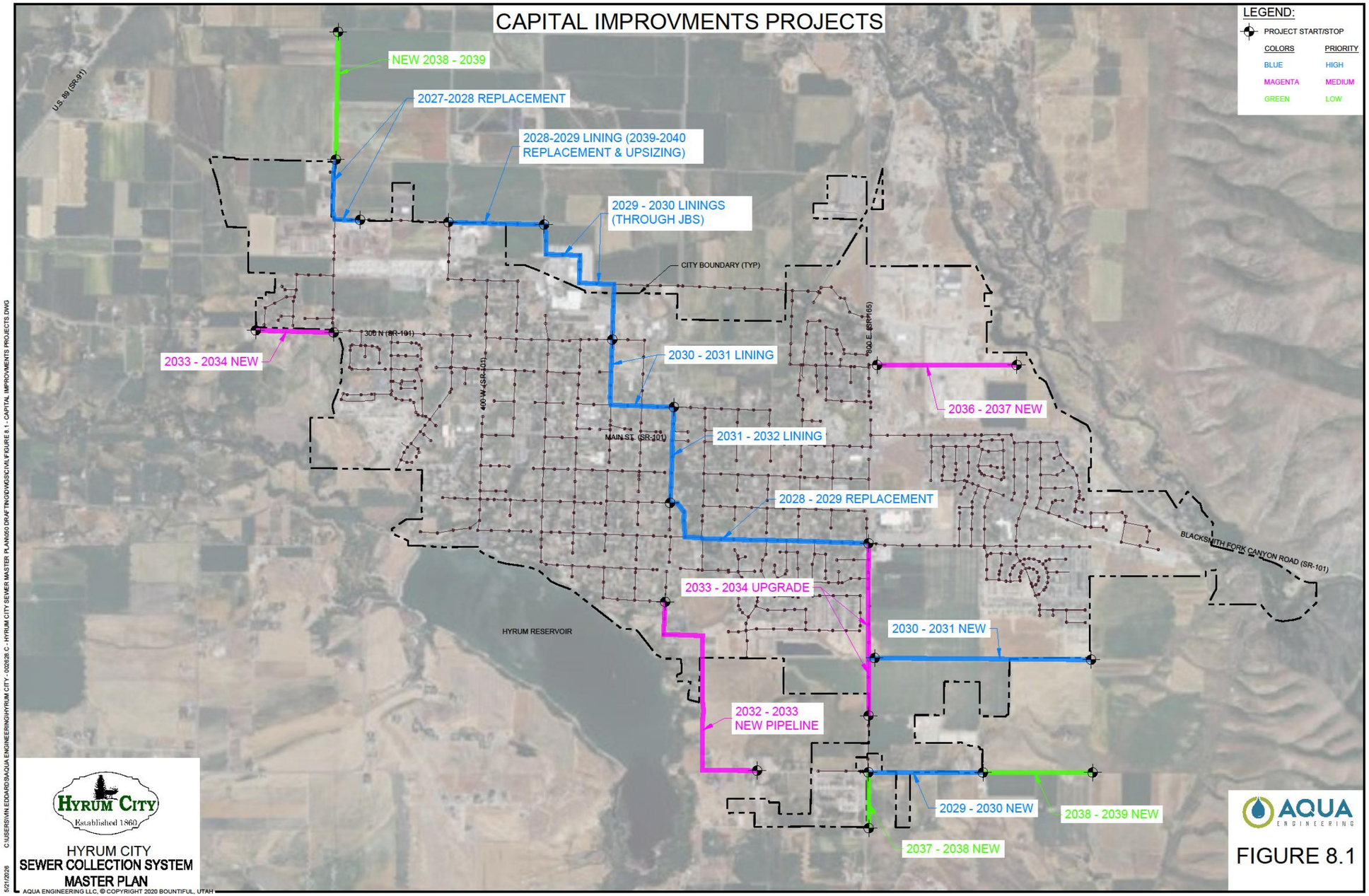
If an individual project cost estimate is desired, then the cost estimate for that individual Capital Improvement Project should similarly be multiplied by 1.25 to reflect the additional 25% costs that are associated with the project as discussed above.

The Capital Improvement Projects with their associated construction costs are listed here in Table 8.2.

Table 8.2 Capital Improvement Projects

Improvement Type	Project Location	Description	Qty	Unit	Total Cost	Priority	Year To Apply
Lift Station	Refurbish/Rehab Lift Station	Rehab/Re-equip existing	1	EA	75,000	High	2026-2027
Equipment Purchase	Lift Station By-Pass Pump	Equipment Purchase (for emergency and/or temporary project bypassing)	1	EA	40,000	High	2026-2027
Study/Report	I&I Master Basin Study (General)	I&I Major Basin Study	1	EA	30,000	High	2026-2027
Study/Report	SECAP Update	Update the 2023 Report	1	EA	50,000	High	2027-2028
Study/Report	I&I Focused Study (detailed section evaluation)	Focused Study	1	EA	100,000	High	2027-2028
Manhole Rehabilitation	Manhole Rehabilitation	Coating/lining of MHs	15	EA	94,500	High	2027-2028
Pipeline Upgrade	300 S: 250 E to 800 E (incl leg to 200 N @ 250E)	Upgrade (from 12” & 15”) to 18”	5394	LF	1,348,500	High	2028-2029
Pipeline Lining	700 N: 200 W to 500 W	21” CIPP lining	2300	LF	322,000	High	2028-2029
Study/Report	I&I Focused Study (detailed section evaluation)	Focused Study	1	EA	105,000	High	2028-2029
Equipment Purchase	Jet Trailer	Equipment Purchase	1	EA	100,000	High	2028-2029
Manhole Rehabilitation	Manhole Rehabilitation	Coating/lining of MHs	10	EA	78,800	High	2028-2029
Pipeline Upgrade	900 W: from 900 N to 700 N then east to first MH, plus tie-in to headworks at WRF (@ $ 100K)	Upgrade from 24” dia to 30” dia	2020	LF	807,000	High	2027-2028
New Pipeline	6600 S: 800 E to 1200 E	New 10”	2650	LF	463,750	High	2029-2030
Pipeline Lining	From Center Street & 300 N to 1200 W & 700 N (jog in alignment through JBS property)	21” CIPP lining	4,300	LF	602,000	High	2029-2030
Study/Report	I&I Focused Study	Focused Study	1	EA	110,250	High	2029-2030
New Pipeline	700 S: 800 E to 1600 E	New 10”	5,300	LF	927,500	High	2030-2031
Pipeline Lining	From 200 E & 100 N to Center St & 300 N (jogs)	18” CIPP lining	3,000	LF	375,000	High	2030-2031
Study/Report	Collection System Master Plan Update	Update the 2025 MP	1	EA	60,000	Medium	2030-2031
Study/Report	I&I Focused Study	Focused Study	1	EA	115,760	Medium	2030-2031
Equipment Purchase	Camera Truck	Equipment Purchase	1	EA	400,000	Medium	2030-2031
Pipeline Lining	200 E: 200 S to 100 N	12” CIPP lining	2,300	LF	253,000	Medium	2031-2032
Study/Report	I&I Focused Study	Focused Study	1	EA	121,550	Medium	2031-2032
New Pipeline	200 & 300 E: 600 S to 6600 S	New 8”	5400	LF	675,000	Medium	2032-2033
Pipeline Upgrade	800 E: from 300 S to 900 S (6400 S)	Upgrade to 18”	5500	LF	1,375,000	Medium	2033-2034
New Pipeline	300 N: 900 W to 1000 W	New 8”	1850	LF	231,250	Medium	2033-2034
Study/Report	Collection System Master Plan Update	Update the 2030 MP	1	EA	75,000	Medium	2033-2034
New Pipeline	250 N: 800 E to appx. 1300 E	New 8”	2700	LF	337,500	Low	2036-2037
New Pipeline	800 E: 6600 S to 6800 S	New 10”	1300	LF	227,500	Low	2037-2038
New Pipeline	900 W: 4000 S 4400 S	New 12”	3000	LF	600,000	Low	2038-2039
New Pipeline	6600 S: 1200 E to 1600 E	New 10”	2650	LF	463,750	Low	2038-2039
		Total			**$10,564,610**		

Figure 8.1 Capital Improvements



9. IMPACT FEE FACILITIES PLAN

9.1. INTRODUCTION

The purpose of the Sewer Impact Fee Facilities Plan (IFFP) is to identify demands placed on City facilities and infrastructure by future development and to evaluate how these demands will be met by the City. In so doing, it outlines the improvements that may be funded through impact fees.

Information for this IFFP is taken from the data prepared for the Hyrum City Master Plan. The analysis forming the basis should be considered in conjunction with the Master Plan.

9.2. SERVICE AREA

Defined, and graphically shown, in the Hyrum City Master Plan. It is considered one single service area. However, the city of Millville, geographically located north of Hyrum City entered into an agreement with Hyrum City to start delivering sanitary sewer flows to the major pipeline in 4600 South at 1200 West. The purpose of the agreement, which is now in effect (as of the fall of 2025), is to begin the transition of sending sanitary flows from Millville to the Hyrum City Water Reclamation Facility (WRF). As residents of Millville begin to eliminate their private septic systems and connect to the public wastewater collection system these flows will gradually increase over time. This arrangement, and the impacts on the Hyrum City system are discussed in further detail in the Hyrum City Master Plan. The impact to the Hyrum City wastewater collection system is only to the one trunkline from the point of connection (4600 South and 1200 W) through the existing 21-inch and 24-inch diameter pipeline to the WRF. These two cities, combined, and graphically described, make up the "service area" by definition for this IFFP, and where appropriate, the individual distinctions will be discussed.

9.3. IFFP COMPONENTS

Requirements for the preparation of an IFFP are outlined in *Title 11, Chapter 36a* of the *Utah Code Annotated* (the Impact Fees Act). The act requires that an IFFP shall accomplish the following for each facility:

1. Identify the existing level of service
2. Establish a proposed level of service
3. Identify excess capacity to accommodate future growth at the proposed level of service
4. Identify demands placed upon existing public facilities by new development
5. Identify the means by which demands from new development will be met
6. Consider the following additional issues:
    a. revenue sources to finance required system improvements
    b. necessity of improvements to maintain the proposed level of service
    c. need for facilities relative to planned locations of schools

The following sections of this report have been organized to address each of these requirements.

9.4. EXISTING LEVEL OF SERVICE (UTAH CODE ANNOTATED 11-36a-302(1)(a)(i)

Level of service is defined in the Impact Fees Act as "the defined performance standard or unit of demand for each capital component of a public facility within a service area." This section discusses the level of service currently being provided to existing users.

9.4.1. Unit of Demand

For purposes of this analysis, it is useful to define the various demands in terms of Equivalent Residential Units (ERUs). An ERU represents the demand that a typical single-family residence places on the system. An equivalent residential unit was developed from the calendar year 2025 metered influent at the WRF together with commercial water use records and connection counts provided by Hyrum City. A summary analysis is presented in Section 4.2 with a detailed calculation provided in Appendix D and yields a unit of demand of 300 gpd/ERU and an existing system total of 4,872 ERUs, comprising 3,846 residential ERUs and 1,026 commercial ERUs. The number of current connections defined as "domestic" connections was provided by Hyrum City and is included in the following table. Because the 300 gpd/ERU unit flow is derived from total metered influent, it is inclusive of I&I. For this analysis it is broken into a base sanitary component of 238 gpd/ERU and an I&I component of 62 gpd/ERU, the latter reflecting the 0.30 MGD system-wide I&I allowance established in Section 4.3.2 distributed across the 4,872 existing ERUs. The two components sum to the derived 300 gpd/ERU, so the total does not double-count I&I. Growth in ERUs was projected by applying the 3.24% annual growth rate established in Sections 1.4.1 and 5.3 to the 2025 ERU base, with commercial ERUs projected to grow in the same proportion to residential ERUs as exists today (1,026 to 3,846, or 26.7%). This yields 1,830 additional ERUs over the ten-year horizon, of which 1,444 are residential and 386 are commercial. Residential growth was computed by compounding the 3,846 existing residential connections at 3.24 percent per year over the ten-year horizon, giving 5,290 connections in 2035 and an increase of 1,444 residential ERUs. This information is summarized along with other pertinent data here in Table 9.1. The corresponding assessment-basis total, in which each individual commercial account is rounded up to a whole unit, is 4,911 ERUs, comprising 3,846 residential and 1,065 commercial ERUs. The unrounded total of 4,872 ERUs is retained throughout this chapter because it is the value that reconciles to the 1.46 MGD of metered influent and is therefore the value consistent with the flows reported in Tables 9.1 and 9.6.

Table 9.1 Service Area Historic Flows and Definition of an ERU

Item	Value for Existing Conditions	Value for 10-Year Growth	Total 10-Year Conditions
Equivalent Residential Units (ERU)	4,872	1,830	6,702
Base Sanitary Wastewater Production (mgd)	1.160	0.436	1.595
Infiltration Allowance (mgd)	0.30	0.113	0.413
Average Annual Day Flow (mgd)	1.46	0.55	2.01
Peak Hour Flow* (mgd)	4.20	1.58	5.77
Flows per ERU			
Base Sanitary Wastewater Production (gpd/ERU)	238	238	238
Average Annual Day Flow (gpd/ERU)	300	300	300
Peak Hour Flow (gpd/ERU)	861	861	861
State Design Basis, 100 gpcd (gpd/ERU)	301	301	301

Note: the ERU counts in this table are on the unrounded basis, under which the 2025 system total is 4,872 ERUs. That is the basis which reconciles to the 1.46 MGD of metered influent at the WRF and it is therefore the basis consistent with every flow reported in this chapter. The assessment basis, under which each individual commercial account is rounded up to a whole ERU, totals 4,911 ERUs for 2025; see Section 4.2, the last column of Table 4.1, and Appendix D.

Included in the table is the definition of an existing ERU in terms of both average and peak flows. The projected flow used to design and evaluate system components will vary depending on the nature of each component. For example, most wastewater treatment facility processes are designed based on average day, maximum month flow. Conversely, conveyance pipelines must be designed based on peak hour flow (function of daily flow and diurnal flow variation). It should be noted that peak hour

flow reported here is based on a system-wide peaking factor of 2.87 and reflects the effects of flow attenuation and offsetting peaks throughout the collection system. Peaking factors (and corresponding peak flows) will be higher for individual connections and pipelines higher in the system. This philosophy and concept is seen in the requirements for sewer design stipulated in R317-3-2. Sewers. In paragraph 2.2.B.2 Design Flow, where it requires that "a. laterals and collectors sewers shall be designed for 400 gallons per capita per day," which the laterals and collector sewers generally are "higher in the system" and in subparagraph "b. Interceptors and outfall sewers shall be designed for 250 gallons per capita per day," which the interceptors and outfalls are lower, or further downstream, in the system where the peak flows are more attenuated.

Also included in the table is a projection of future flows. Projected design flows associated with future connections carry the same I&I component per ERU as the existing system, 62 gpd/ERU. This is the conservative treatment and is consistent with Utah Administrative Code R317-3-2, under which the 100 gallons per capita per day design basis is itself stated to include an allowance for infiltration. Only the infiltration directly associated with new growth is included against new connections; any additional infiltration associated with older pipe materials or deferred system maintenance is attributable to existing users and is specifically excluded from the future growth calculations and from the impact fee basis. Should the City elect to claim a reduced I&I rate for new construction on the basis of modern materials and installation methods, the growth-related infiltration allowance and the resulting impact fee basis would both decrease; that reduction has not been taken here.

9.4.2. Performance Standard

Performance standards are those standards that are used to design and evaluate the performance of facilities. This section discusses the existing performance standards for the city.

To improve the accuracy of the analysis, this Impact Fee Facilities Plan has divided the system into three components (pipeline capacity, treatment capacity, and general assets). Each of these components has its own set of performance standards:

9.4.2.1. Pipeline Capacity

City engineering standards require that all sewer mains be designed such that the peak flow in the pipe is less than or equal to 75 percent of the pipe's full (Utah Code Annotated R317-3) capacity using a Manning's roughness factor of 0.013. This design standard was used as the level of service for system evaluation.

9.4.2.2. Treatment Capacity

Hyrum City discharges collected wastewater to one large trunkline that feeds into the WRF. Additionally, as of November 2025, wastewater flows from Millville began to also feed into the Hyrum City WRF through the same large trunkline feeding the WR. These flows from Millville will continue to increase with the passage of time, as individual residents within the boundaries of Millville make the conversion from their private septic systems over to the collection system infrastructure of Millville City. It is anticipated that this changeover will be on-going for some time as the changeout is a slow-moving process.

Hyrum City attributes a portion of their impact fees to the growth and expansion needs of the treatment facilities, which is included in the User Charge system as new users connect to the system. However, this study and analysis is only for the collection system and does not include that portion of the fees attributable to the WRF treatment works. The scope of work necessary to determine treatment capacity for the City should be included as part of the Treatment Facility Master Plan to be performed by the City at a future date.

9.4.2.3. General Assets

In addition to the sewer system's physical piping (collection system) and treatment (WRF) needs, Hyrum City personnel need to be able to provide administrative, operation, and maintenance functions for the city to satisfy a level of service for customers. The City's current administrative and service facilities are composed of a number of different components, including office space, open storage space, maintenance bays, etc., and does not have a specific performance standard. However, it is expected that the City's existing facilities will be satisfactory to provide space for personnel through the City's buildout planning window. This means there is currently excess capacity available today to support the needs of future users. Thus, it is proposed that both existing and future users pay for these facilities in proportion to their overall use in the system at buildout. This will result in the level of service provided by the facility being the same for existing and new users.

9.4.3. Existing Level of Service Summary

Existing level of service has been divided into the same three categories as identified for the system performance standard (pipeline capacity, treatment capacity, and general assets). Existing level of service values are summarized in Table 9.2 below.

The hydraulic model used to evaluate existing and future pipeline capacities is a trunkline model. This is partly due to limited available survey data in the City's GIS system as well as a focus on simulating only those pipelines that are likely to have flows above the capacity of pipes built at State standard slopes. Trunkline models only include elements of the collection system that a) have sufficient upstream wastewater production to approach the pipeline capacity, or b) are larger than the minimum 8-inch diameter size for gravity sewer main lines. Generally, 8-inch sewer pipelines that do not have significant upstream wastewater production are in built-out areas with little growth potential. Thus, focusing on relevant trunklines excludes existing facilities that are ineligible for funding from impact fee revenues anyway.

The pipeline capacity level of service is a design standard rather than a flow rate. It is the requirement that peak hour flow in any sewer main not exceed 75 percent of the pipe's full-flow capacity computed with a Manning's roughness coefficient of 0.013, consistent with Utah Administrative Code R317-3. Compliance was evaluated by running the calibrated hydraulic model for existing conditions and comparing the computed peak hour flow in each modeled trunkline against 75 percent of that pipe's full-flow capacity. All modeled trunklines meet the standard under existing conditions, which is the basis for the 100 percent figure reported in Table 9.2. Peak hour flow was computed by applying the system-wide peaking factor of 2.87 developed from the July 2024 flow monitoring described in Section 4.3.1 to the average annual day flow.

The treatment capacity level of service is reported as a unit flow of 300 gpd/ERU, being the average annual day flow per ERU derived in Section 4.2 and confirmed against the 2025 metered influent of 1.46 MGD across 4,872 ERUs. This value is inclusive of I&I. It should be noted that this is an average annual day flow and not an average day, maximum month flow. Section 4.3.3 documents that the WRF experiences materially higher influent between February and May, so the average day, maximum month unit flow is higher than 300 gpd/ERU. Because the collection system is governed by peak hour flow rather than by maximum month flow, the absence of this value does not affect the pipeline sizing, the capital improvements plan, or the impact fee allocations in this report. It would, however, be required input to the treatment facility master plan recommended in Section 2.2.2.

The proposed level of service established in Section 9.5 is identical to the existing level of service in every component. No increase in level of service is proposed, and accordingly no portion of any capital project in this plan is attributable to raising the level of service for existing users, consistent with Utah Code Annotated 11-36a-302(1)(a)(ii) and the certification in Section 9.11.

Table 9.2 Existing Level of Service for Various System Requirement

Capacity	Existing LOS
Pipeline Capacity	
Maximum Ratio of Flow* to Pipeline Capacity	0.75
Percent of System Trunklines that Currently Meets the Standard	100%
Treatment Capacity	
Capacity Required for Existing Connections	Sufficient
Average Annual Day Flow (gpd/ERU)	300
General Assets	
Adequacy of Existing Facilities to Serve Customers	Sufficient

In most cases, there is excess capacity in City pipes that may be considered for use by increased flows from future growth. Excess capacity and curing of deficiencies will be discussed in subsequent sections of this report. Costs for projects to correct deficiencies that do not meet the required level of service will not be included as part of the impact fee, consistent with the Impact Fee Act.

9.5. PROPOSED LEVEL OF SERVICE – UTAH CODE ANNOTATED 11-36a-302(1)(a)(ii)

The proposed level of service is the performance standard used to evaluate system needs in the future. The Impact Fee Act indicates that the proposed level of service may:

1. Diminish or equal the existing level of service; or
2. Exceed the existing level of service if, independent of the use of impact fees, the City implements and maintains the means to increase the level of service for existing demand within six years of the date on which new growth is charged for the proposed level of service.

In the case of this IFFP, no changes are proposed to the existing level of service for design standards. Thus, future growth will essentially be evaluated based on the same design standards level of service as identified for existing.

9.5.1. Proposed Level of Service Summary

The resulting proposed level of service for various systems for the City is summarized here in Table 9.3:

Table 9.3 Proposed Level of Service for Various Systems

Capacity	Proposed Level of Service
Pipeline Capacity	
Maximum Ratio of Flow* to Pipeline Capacity	0.75
Percent of Collection System that Meets the Standard	100%
Treatment Capacity	
Capacity Required for Future Connections	Sufficient
Average Annual Day Flow (gpd/ERU)	300
General Assets	
Adequacy of Existing Facilities to Serve Customers	Sufficient

9.6. EXCESS CAPACITY TO ACCOMMODATE FUTURE GROWTH – UTAH CODE ANNOTATED 11-36a-302(1)(a)(iii)

Because most of the sewer collection facilities within the City have adequate or excess capacity through the long-term planning horizon of the City, capacity for most future growth will be met through available excess capacity in existing facilities. There are two components of assets to discuss within the City: collection system facilities and treatment facilities. Excess capacity in the collection system and treatment facilities are described as follows:

9.6.1. Collection

To calculate the percentage of existing capacity to be used by future growth in existing facilities, existing and future flows were examined in the system model for each collection pipeline.
The method used to calculate excess capacity available for use by future flows is as follows:

1. **Calculate Flows** – The peak flow in each facility was calculated in the model for both existing and future flows and compared to the pipeline performance standard of a 0.75 peak flow to capacity ratio.

2. **Identify Available Capacity** – Where a facility has capacity in excess of projected flows at buildout, the available capacity in the facility was defined as the difference between existing flows and buildout flows. Where the facility has capacity less than projected flows at buildout, the available capacity in the facility was defined as the difference between existing flows and the facility's maximum capacity.

3. **Eliminate Facilities without Excess Capacity** – For the 10-year planning horizon period, the projected growth in flow was compared against the facility's available capacity. Where the future flow exceeded the capacity of the facility, the available excess was assumed to be zero. By definition, this corresponds to those facilities with deficiencies that are identified for replacement in the facilities plan. By assigning a capacity of zero to new users, this eliminated double counting those facilities against new users.

4. **Calculate Percent of Excess Capacity Used in Remaining Facilities** – Where the future flow was less than the capacity of the facility, the percent of excess capacity being used in each facility was calculated by dividing the growth in flow in the facility (future flow less existing flow) by the total capacity (existing flow plus available capacity).

5. **Calculate Excess Capacity for the system as a Whole** – Each pipeline in the system has a different quantity of excess capacity to be used by future growth. To develop an estimate of excess capacity on a system-wide basis, the capacities of each of these pipelines and their contribution to the system as a whole must be considered. To do this, each pipeline must first be weighted based on its relative cost. The excess capacity in the system as a whole can then be calculated as the sum of the weighted capacity used by future growth divided by the sum of total weighted capacity in the system.

In some cases, where new facilities are needed for future growth but are not needed for existing users, growth is assigned its portion of cost based on the capacity needed before combining with existing users to calculate the overall proportion of costs. Based on the method described above, the amount of excess capacity in existing facilities available to accommodate future growth and the

demands placed on the existing facilities by new development activity has been calculated for each element in the system. This is summarized in Table 9.4.

Table 9.4 Collection System Trunklines Excess Capacity

Use Category	City Area Percent Use
Existing Use	52.75%
Use By 10-Year Growth	21.55%
Use By Growth Beyond 10 years	25.70%
Total	**100.00%**

9.6.2. Treatment

As discussed above, the City's treatment facilities will be handled under a separate treatment Master Plan with an associated IFFP and Rate Study analyses specifically for the treatment facilities. The impact fees determined from those efforts can then be added to the impact fees of the collection system, or addressed separately, depending on the direction of City Council.

9.6.3. General Assets

As Discussed under the existing and proposed level of service sections, Hyrum City's general assets have sufficient capacity through the City's long-term planning window. Thus, excess capacity can be simply calculated based on proportional use per ERU as shown in Table 9.5.

Table 9.5 General Assets Excess Capacity

Use Category	City Area ERUs	City Area Percent Use
Existing Use	4,872	30.90%
Use by 10-Year Growth	1,830	11.61%
Use by Growth Beyond 10 years	9,067	57.49%
Total	15,769	**100.0%**

Note: the ERU counts in this table are on the unrounded basis, under which the 2025 system total is 4,872 ERUs. That is the basis which reconciles to the 1.46 MGD of metered influent at the WRF and it is therefore the basis consistent with every flow reported in this chapter. The assessment basis, under which each individual commercial account is rounded up to a whole ERU, totals 4,911 ERUs for 2025; see Section 4.2, the last column of Table 4.1, and Appendix D.

9.7. DEMANDS PLACED ON FACILITIES BY NEW DEVELOPMENT – UTAH CODE ANNOTATED 11-36a-302(a)(iv)

Growth within the City's service area, and projections of sewer flows resulting from said growth is discussed in Chapter 5 of the Collection System Master Plan. Growth in terms of both Equivalent Residential Units (ERUs) and corresponding sewer flows are summarized in Table 9.6.

Table 9.6 City Projections of Growth

Year	ERU	Base Sanitary Wastewater	Infiltration Allowance (MGD)	Total Average Annual Day	Peak Hour* Wastewater Production

		Production (MGD)		Flow (MGD)	(MGD)
2025	4,872	1.160	0.302	1.46	4.20
2030	5,714	1.360	0.354	1.71	4.92
2035	6,702	1.595	0.416	2.01	5.77
2040	7,860	1.871	0.487	2.36	6.77
2045	9,219	2.194	0.572	2.77	7.94
2075	15,769	3.753	0.978	4.73	13.58

Note: the ERU counts in this table are on the unrounded basis, under which the 2025 system total is 4,872 ERUs. That is the basis which reconciles to the 1.46 MGD of metered influent at the WRF and it is therefore the basis consistent with every flow reported in this chapter. The assessment basis, under which each individual commercial account is rounded up to a whole ERU, totals 4,911 ERUs for 2025; see Section 4.2, the last column of Table 4.1, and Appendix D.

9.8. INFRASTRUCTURE REQUIRED TO MEET DEMANDS OF NEW DEVELOPMENT – UTAH CODE ANNOTATED 11-36a-302(1)(a)(v)

To satisfy the requirements of state law, demands placed upon existing system facilities by future development were projected using the process outlined below. Each of the steps were completed as part of this plan's development:

1. **Existing Demand** – The demand existing development places on the City's system was estimated based on historic water use and flow records.
2. **Existing Capacity** – The capacities of existing collection system facilities were estimated using size data provided by the City, gathered field data, and a hydraulic computer model.
3. **Existing Deficiencies** - Existing deficiencies in the system were identified by comparing defined levels of service against calculated capacities. A few deficiencies were identified as a result of experience with existing field conditions.
4. **Future Demand** – The demand future development will place on the system was estimated based on development projections (discussed in the Master Plan).
5. **Future Deficiencies** – Future deficiencies in the collection system (portions of the system that are inadequate to accommodate the demand created by future growth) were identified using the defined level of service and results from a hydraulic computer model.
6. **Recommended Improvements** – Needed system improvements were identified to meet demands associated with future development.

The steps listed above "identify demands placed upon existing public facilities by new development activity at the proposed level of service; and … the means by which the political subdivision or private entity will meet those growth demands" (Section 11-36a-302(1)(a) of the Utah Code Annotated).

9.8.1. 10-Year Improvement Plan

In the City's Sewer Collection System Master Plan, capital facility projects needed to provide service to customers of the City were identified. Some of the projects identified in the plan will not be needed within the next 10 years. Only infrastructure to be constructed within a 10-year horizon will be considered in the calculation of impact fees to avoid uncertainty surrounding improvements further into the future. Table 9.7 summarizes the components of projects identified in the capital facilities plan that will need to be constructed within the next 10 years.

Table 9.7 Project Costs Allocated to Projected Development, 10-Year Planning Horizon

Project ID	Year*	Project	Project Cost	Percent to Existing	Percent to 10-Year Growth	Percent to Growth Beyond 10-Year	Cost to Existing	Cost to 10-Year Growth	Cost to Growth Beyond 10-Year	Impact Fee Eligible
1	2026-2027-(13)	Refurbish/Rehab Lift Station	75,000	100%	-	-	75,000	-	-	Yes
2	2026-2027-(18)	Lift Station Bypass Pump (equip. purchase)	40,000	75%	20%	5%	30,000	8,000	2,000	Yes
3	2028-2029-(2)	300 S: 250 E to 800 E (incl leg to 200 N @ 250 E)	1,348,500	25%	35%	40%	337,125	471,975	539,400	Yes
4	2028-2029-(17)	CIPP Lining 700 N: 1200 W to 1500 W	322,000	52%	32%	16%	167,440	103,040	51,520	Yes
5	2026-2027-(22)	I&I Master Basin Study	30,000	58%	24%	18%	17,400	7,200	5,400	Yes
6	2029-2030-(16)	CIPP Lining From Center St & 300 N to 1200 W & 700 N (jog in alignment through JBS property)	602,000	52%	32%	16%	313,040	192,640	96,320	Yes
7	2027-2028-(19)	SECAP Update (to the 2023 report)	50,000	25%	40%	35%	12,500	20,000	17,500	Yes
8	2027-2028-(23)	I&I Focused Study (detailed section evaluation)	100,000	58%	24%	18%	58,000	24,000	18,000	Yes
9	2028-2029-(29)	Jet Trailor (equip. purchase)	100,000	40%	30%	30%	40,000	30,000	30,000	Yes
10	2030-2031-(15)	CIPP Lining from 200 E & 100 N to Center St & 300 N (jogs)	375,000	52%	32%	16%	195,000	120,000	60,000	Yes
11	2028-2029-(24)	I&I Focused Study (detailed section evaluation)	105,000	58%	24%	18%	60,900	25,200	18,900	Yes
12	2032-2033-(5)	200 & 300 E: 600 S to 6600 S	675,000	54%	19%	27%	364,500	128,250	182,250	Yes
13	2031-2032-(14)	CIPP Lining 200 E: 200 S to 100 N	253,000	52%	32%	16%	131,560	80,960	40,480	Yes
14	2030-2031-(20)	Collection System Master Plan Update to the 2025 MP	60,000	25%	40%	35%	15,000	24,000	21,000	No
15	2029-2030-(25)	I&I Focused Study	110,250	58%	24%	18%	63,945	26,460	19,845	Yes
16	2027-2028-(30)	4' Manhole Rehabilitation	94,500	95%	5%	-	89,775	4,725	-	Yes
17	2027-2028-(1)	900 W: from 900 N to 700 N then east to first MH plus the tie-in to the headworks of the WRF	807,000	20%	35%	45%	161,400	282,450	363,150	Yes
18	2030-2031-(28)	Camera Truck (equip. Purchase)	400,000	90%	10%	-	360,000	40,000	-	Yes
19	2028-2029-(31)	5' Manhole Rehabilitation	78,800	95%	5%	-	74,860	3,940	-	Yes
20	2030-2031-(7)	700 S: 800 E to 1600 E	927,500	-	85%	15%	-	788,375	139,125	Yes
21	2033-2034-(4)	800 E: from 300 S to 900 S (6400 S)	1,375,000	50%	30%	20%	687,500	412,500	275,000	Yes
22	2038-2039-(10)	6600 S: 1200 E to 1600 E	463,750	-	75%	25%	-	347,813	115,937	No
23	2033-2034-(11)	300 N: 900 W to 1000 W	231,250	10%	65%	25%	23,125	150,312	57,813	Yes
24	2036-2037-(12)	250 N: 800 E to appx. 1300 E	337,500	20%	65%	15%	67,500	219,375	50,625	No
25	2037-2038-(6)	800 E: 6600 S to 6800 S	227,500	-	-	100%	-	-	227,500	No
26	2038-2039-(8)	900 W: 4000 S to 4400 W	600,000	-	-	100%	-	-	600,000	No
27	2029-2030-(9)	6600 S: 800 E to 1200 E	463,750	-	-	100%	-	-	463,750	Yes
28	2033-2034-(21)	Collection System Master Plan Update to the 2030 MP	75,000	20%	40%	40%	15,000	30,000	30,000	No
29	2030-2031-(26)	I&I Focused Study	115,760	50%	25%	25%	57,880	28,940	28,940	Yes
30	2031-2032-(27)	I&I Focused Study	121,550	40%	30%	30%	48,620	36,465	36,465	Yes
		Impact Fee Eligible Subtotal (24 Projects)	**$8,800,860**				**$3,369,570**	**$2,985,432.50**	**$2,445,857.50**	**Yes**
		Not Impact Fee Eligible Subtotal (6 Projects)	**$1,763,750**				**$97,500**	**$621,187.50**	**$1,045,062.50**	**No**
		TOTAL – All 30 Projects	**$10,564,610**				**$3,467,070**	**$3,606,620**	**$3,490,920**	

* Year shown is recommended for implementation. The number in parenthesis is the original number sequence before the priority was established.

9.8.2. Project Cost Attributable to Future Growth

To satisfy the requirements of state law, Table 9.7 provides a breakdown of the capital facility projects and the percentage of the project costs attributed to existing and future users. As defined in Utah Code Annotated 11-36a-102(15), the Impact Fee Facilities Plan should only include the proportionate share of "the cost of public facilities that are roughly proportionate and reasonably related to the service demands and needs of any development activity." Some projects identified in the table are required solely to meet future growth, but some projects also provide a benefit to existing users. Projects that benefit existing users include those projects addressing existing capacity needs and maintenance related projects.

For many projects, the division of costs between existing and future users is easy because 100 percent of the project costs can be attributed to one category or the other (e.g. infrastructure needed solely to serve new development can be 100 percent attributed to new growth, while projects related to existing condition or capacity deficiencies can be 100 percent attributed to existing user needs.) For projects needed to address both existing deficiencies and new growth or where a higher level of service is being proposed, costs have been divided proportionally between existing and future users based on their use of the facility. Examples include:

- Projects 1, 2, 3 & 4 – Pipes for these projects are already deficient for existing conditions. As a result, the proportionate share of costs for these projects are split based on the proportion of the flow used by existing, 10-year growth, and growth beyond the 10-year window.
- Projects 6, 8, 9, 10 & 11 – These projects are only required as a result of future growth. Future users are assigned their proportion of the costs needed to build capacity for their projected flows. However, where existing and future flows will be combined in facilities for convenience, existing users pay any costs above those required to serve new growth.
- Projects 16, 17, 18 & 19 – These projects are not pipe replacement projects, rather CIPP Lining projects that benefit both existing and future users. Therefore, these types of projects assign a proportionate share of the cost-of-benefit to each category of existing, future to 10-year growth and percent growth beyond 10-year growth.

Not all of the projects listed in Table 9.7 are eligible for impact fee funding. Six projects are identified as ineligible and are shaded in Table 9.7 and marked "No" in the Impact Fee Eligible column: Project 14 (Collection System Master Plan Update to the 2025 MP), Project 22 (6600 S: 1200 E to 1600 E), Project 24 (250 N: 800 E to appx. 1300 E), Project 25 (800 E: 6600 S to 6800 S), Project 26 (900 W: 4000 S to 4400 W), and Project 28 (Collection System Master Plan Update to the 2030 MP). Projects 22, 24, 25, and 26 are scheduled for construction beyond the 10-year planning horizon, and Projects 14 and 28 are master plan updates that do not themselves add capacity to the system. Excluding these six projects, the impact fee eligible project costs total $8,800,860, of which $3,369,570 is attributable to existing users, $2,985,432.50 to 10-year growth, and $2,445,857.50 to growth beyond 10 years. The six ineligible projects account for the remaining $1,763,750, bringing the total of all 30 projects to $10,564,610.

The project costs shown in Table 9.7 are construction costs only. Consistent with Section 8.1, an additional 25 percent is applied to account for contingency (10 percent), design (7 percent), construction management (5 percent), and administrative and legal costs (3 percent). Applying this factor to the impact fee eligible costs yields $4,211,962.50 attributable to existing users,

$3,731,790.62 to 10-year growth, and $3,057,321.88 to growth beyond 10 years, for an impact fee eligible total of $11,001,075. The corresponding figure for all 30 projects, reported in Section 8.1, is $13,205,762.50.

9.8.3. Project Cost Attributable to 10 Year Growth

Included in Table 9.7 is a breakdown of capacity use associated with growth both through buildout and through the next 10 years. This is necessary because the projects identified in the tables will be built with capacity to accommodate flows beyond the 10-year growth horizon. This has been done following the same general process as described above.

9.8.4. Basis of Construction Cost Estimates

The cost of pipe, lining, and planning projects have been based on engineering cost estimates contained in Chapter 8 of this Collection System Master Plan. Additional details regarding the basis of these estimates can be found in the Appendix - ADDITIONAL CONSIDERATIONS.

9.8.5. Manner of Financing– Utah Code Annotated 11-36a-302(2)

The City may fund the infrastructure identified in this IFFP through a combination of different revenue sources.

9.8.5.1. Federal and State Grants and Donations

Impact fees cannot reimburse costs funded or expected to be funded through federal grants and other funds that the City has received for capital improvements without an obligation to repay. Grants and donations are not currently contemplated in this analysis. If grants become available for constructing facilities, impact fees will need to be recalculated, and an appropriate credit given. Any existing infrastructure funded through past grants will be removed from the system value during the impact fee analysis.

9.8.5.2. Bonds

None of the costs contained in this IFFP include the cost of bonding. The cost of bonding required to finance impact fee eligible improvements identified in the IFFP may be added to the calculation of the impact fee. This will be considered in the impact fee analysis.

9.8.5.3. User Rate Revenue

Because infrastructure must generally be built ahead of growth, there often arises situations in which projects must be funded ahead of expected impact fee revenues. In some cases, the solution to this issue will be bonding. In other cases, funds from existing user rate revenue will be used to complete initial construction of impact fee eligible projects and will be reimbursed later as impact fees are received. Consideration of potential use of user rate revenue to pay for impact fee eligible expenditures will be included in the impact fee analysis and should also be considered in subsequent accounting of impact fee expenditures.

9.8.5.4. Impact Fees

It is recommended that impact fees be used to fund growth-related capital projects as they help to maintain the proposed level of service and prevent existing users from subsidizing the capital needs of new growth. Based on this IFFP, an impact fee analysis will be able to calculate a fair and legal fee that new growth should pay to fund the portion of the existing and new facilities that will benefit new development.

9.8.5.5. Developer Dedications and Exactions

Developer exactions may be considered in the inventory of current and future infrastructure. However, developer dedications and exactions are not the same as grants and should not be treated as such. If

a developer constructs facilities or dedicates land within the development for the construction of facilities identified in this IFFP, the value of the dedication is credited against that particular developer's impact fee liability.

If the value of the dedication/exaction is less than the developer's impact fee liability, the developer will owe the balance of the liability to the City. If the value of the improvements dedicated is worth more than the development's impact fee liability, the City must reimburse the difference to the developer from impact fee revenues collected from other developments.

It should be emphasized that the concept of impact fee credits pertains to system level improvements only. For project level improvements (i.e. projects not identified in the impact fee facility plan), developers will be responsible for the construction of the improvements without credit against the impact fee.

9.9. NECESSITY OF IMPROVEMENTS TO MAINTAIN LEVEL OF SERVICE – UTAH CODE ANNOTATED 11-36a-302(3)

According to State statute, impact fees cannot be used to correct deficiencies in the City's system and must be necessary to maintain the proposed level of service established for all users. Only those facilities or portions of facilities that are required to maintain the proposed level of service for future growth have been included in this IFFP. This will result in an equitable fee as future users will not be expected to fund any portion of the facilities that will benefit existing residents.

9.10. SCHOOL RELATED INFRASTRUCTURE – UTAH CODE ANNOTATED 11-36a-302(2)

As of the preparation of this plan, information was not available regarding the specific location of future school or charter school development. However, an allowance has been included in the growth projections for future school facilities. Therefore, the impact fee facility plan does include required public facilities to serve future school related development. Where the City becomes aware of planned locations for schools, adjustments may need to be made to infrastructure recommendations to accommodate the proposed growth.

9.11. NOTICE OF ADOPTION REQUIREMENTS – UTAH CODE ANNOTATED 11-36a-502

The Impact Fees Act requires that entities must publish a notice of intent to prepare or modify any IFFP. If an entity prepares an independent IFFP rather than include a capital facilities element in the general plan, the actual IFFP must be adopted by enactment. Before the IFFP can be adopted, a reasonable notice of the public hearing must be published on the Utah Public Notice Website at least 10 days before the actual hearing. A copy of the proposed IFFP must be made available in each public library within the City during the 10-day noticing period for public review and inspection. Utah Code requires that the City must post a copy of the ordinance in at least three places. These places may include the City offices and the public libraries within the City's jurisdiction. Following the 10-day noticing period, a public hearing will be held, after which the City may adopt, amend and adopt, or reject the proposed IFFP.

The IFFP has been prepared in accordance with Utah Code Annotated Title 11, Chapter 36a (the "Impact Fees Act"), which prescribes the laws pertaining to the imposition of impact fees in Utah. The accuracy of this IFFP relies in part upon planning, engineering, and other source data provided by the City and its designated representatives.

In accordance with Utah Code Annotated, 11-36a-306(1), AQUA Engineering makes the following certification:

I certify that the attached Impact Fee Facilities Plan:

1. Includes only the costs of public facilities that are:
    a. allowed under the Impact Fees Act; and
    b. actually incurred; or
    c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid;
2. does not include:
    a. costs of operation and maintenance of public facilities;
    b. cost for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents; and
3. complies in each and every relevant respect with the Impact Fees Act.

10. REFERENCES

- Utah State Tax Commission
- Utah Administrative Code R317-3-2
- Utah Administrative Code R309-500 (4 through 7)
- United States Census Bureau
- Kem C. Gardner Policy Institute | David Eccles School of Business, University of Utah, 2024
- Hydrology of Cache Valley, Cache County, Utah, and Adjacent Part of Idaho, with Emphasis on Simulation of Ground-Water Flow: Kim A. Kariya, D. Michael Roark, and Karen M. Hanson; State of Utah Department of Natural Resources, Technical Publication No. 108, in cooperation with United States Geological Survey

Appendix A ZPFI Impact Fee Analysis

Appendix B Flow Data

WRF

MILLVILLE TIE IN (2025)

Westpoint Dairy

PMP #1

PMP #2

PMP #3

PMP #4

PMP #5

PMP #6

1

2

3

4

5

6

HYRUM CITY
ESTABLISHED 1860

LEGEND

PIPE DIAMETER

- 24-INCH
- 21-INCH
- 18-INCH
- 15-INCH
- 12-INCH
- 10-INCH
- 8-INCH

PROPOSED FLOW METER

Legend

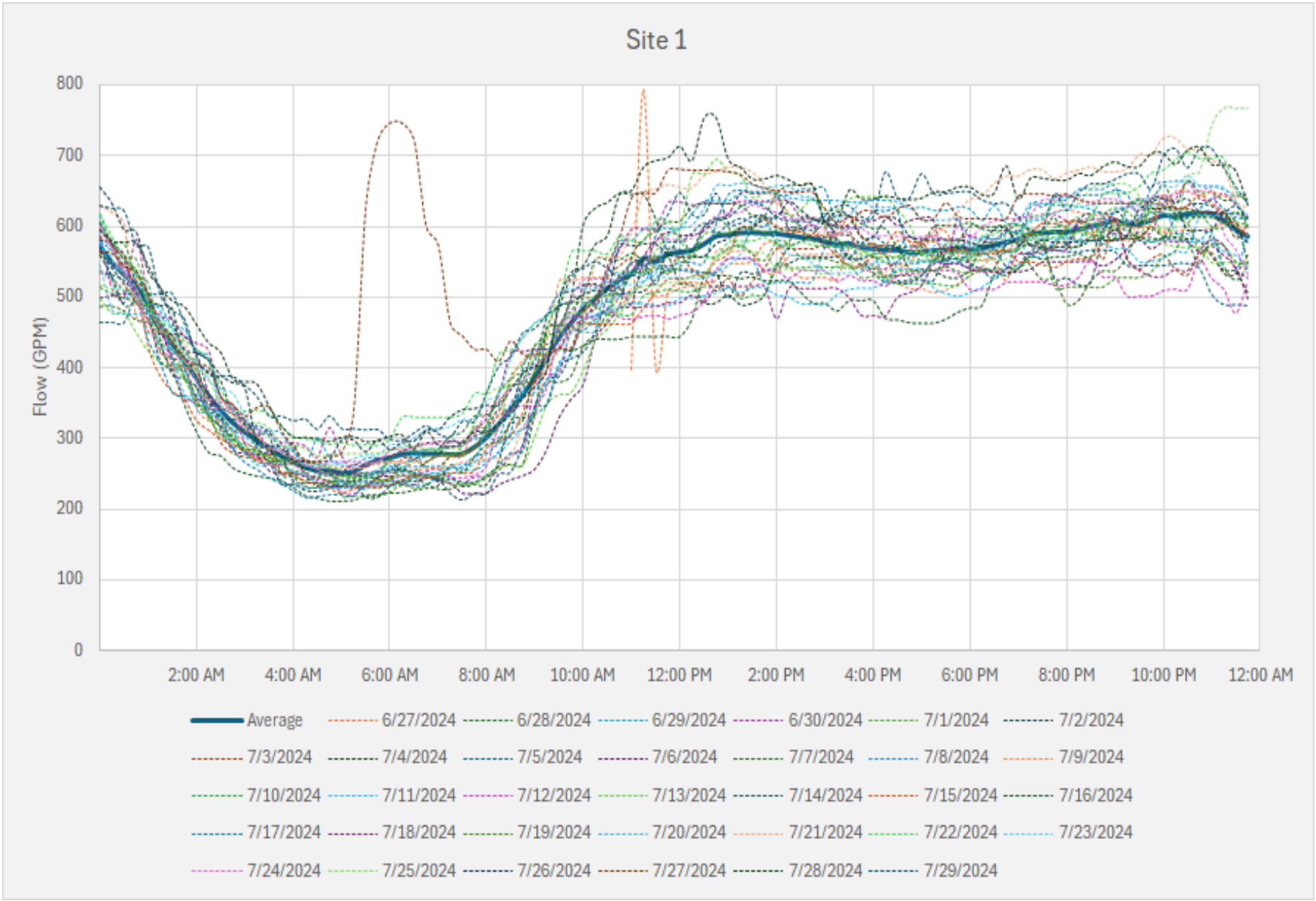
Hyrum Zoning

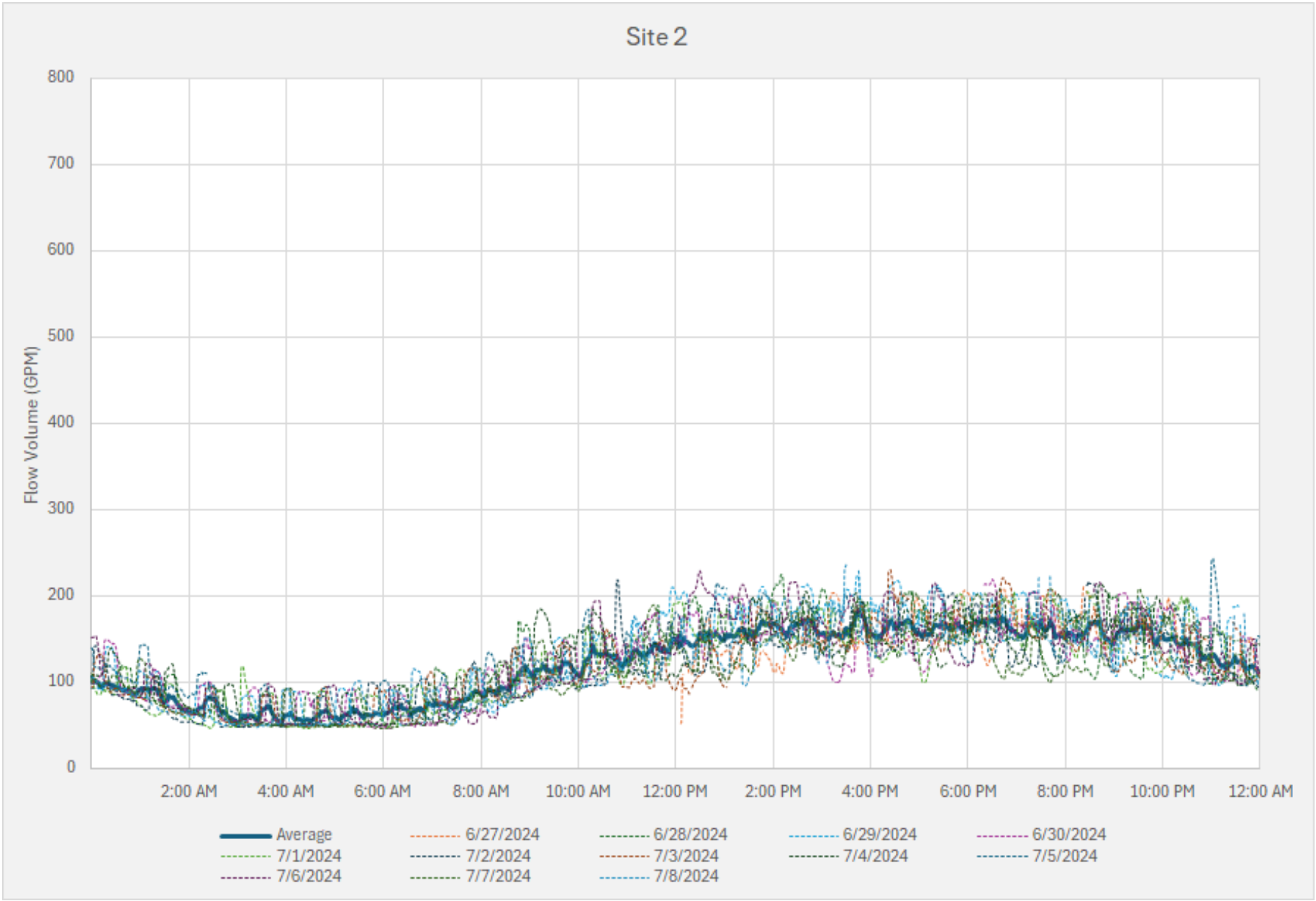
Zone Type

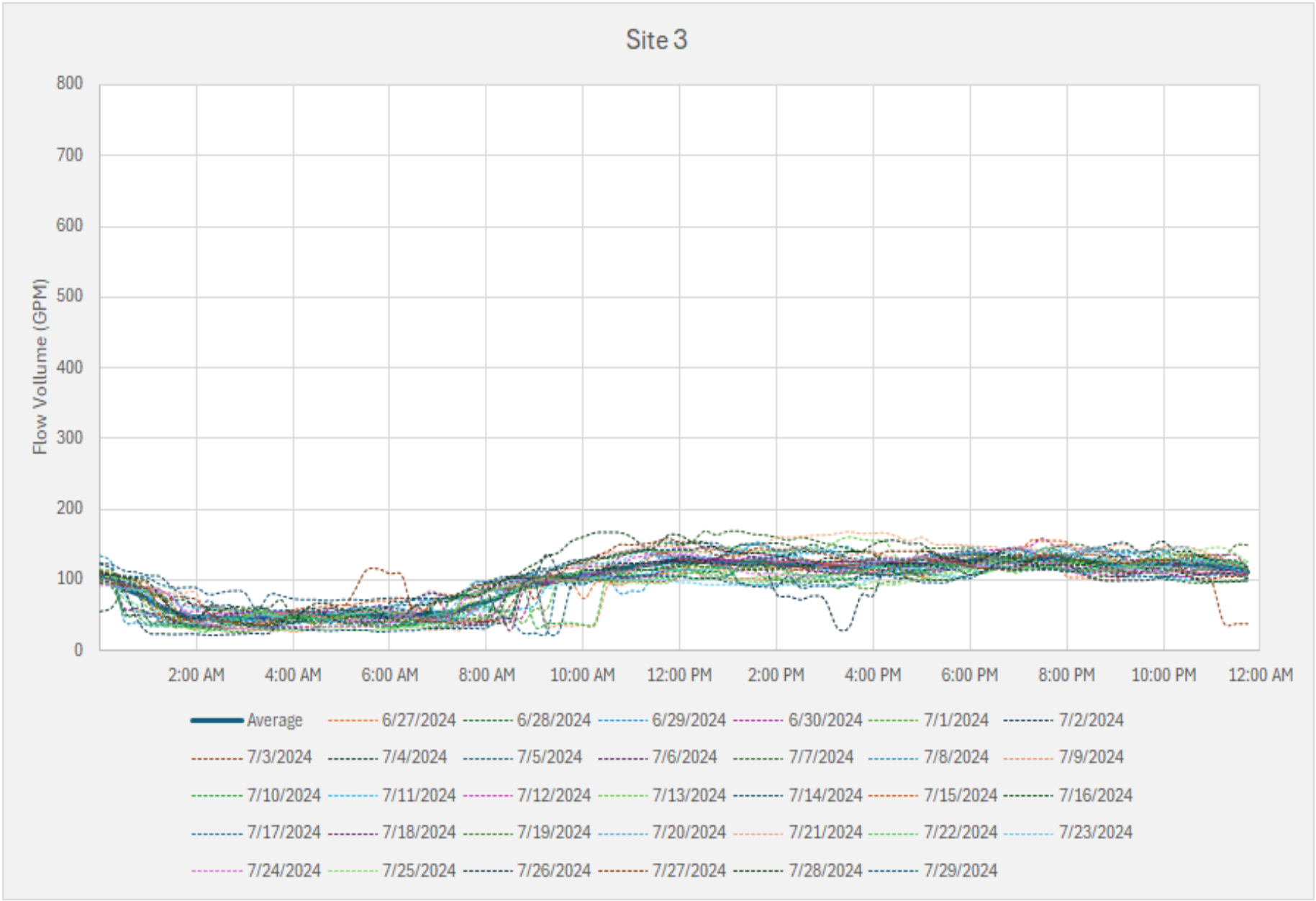
- OPEN SPACE - OS
- RESIDENTIAL SINGLE FAMILY - R-1
- RESIDENTIAL FAMILY - R-2
- RESIDENTIAL 1/2 ACRE LOTS - R-3
- RESIDENTIAL 1 ACRE LOTS - R-5
- RURAL AGRICULTURE - RA
- COMMERCIAL - HWY 165 - C-1
- COMMERCIAL - DOWNTOWN - C-2
- MANUFACTURING - LIGHT - M-1
- MANUFACTURING - MEDIUM TO HEAVY - M-2
- PROFESSIONAL TECHNOLOGY PARK - PT
- Subdivisions

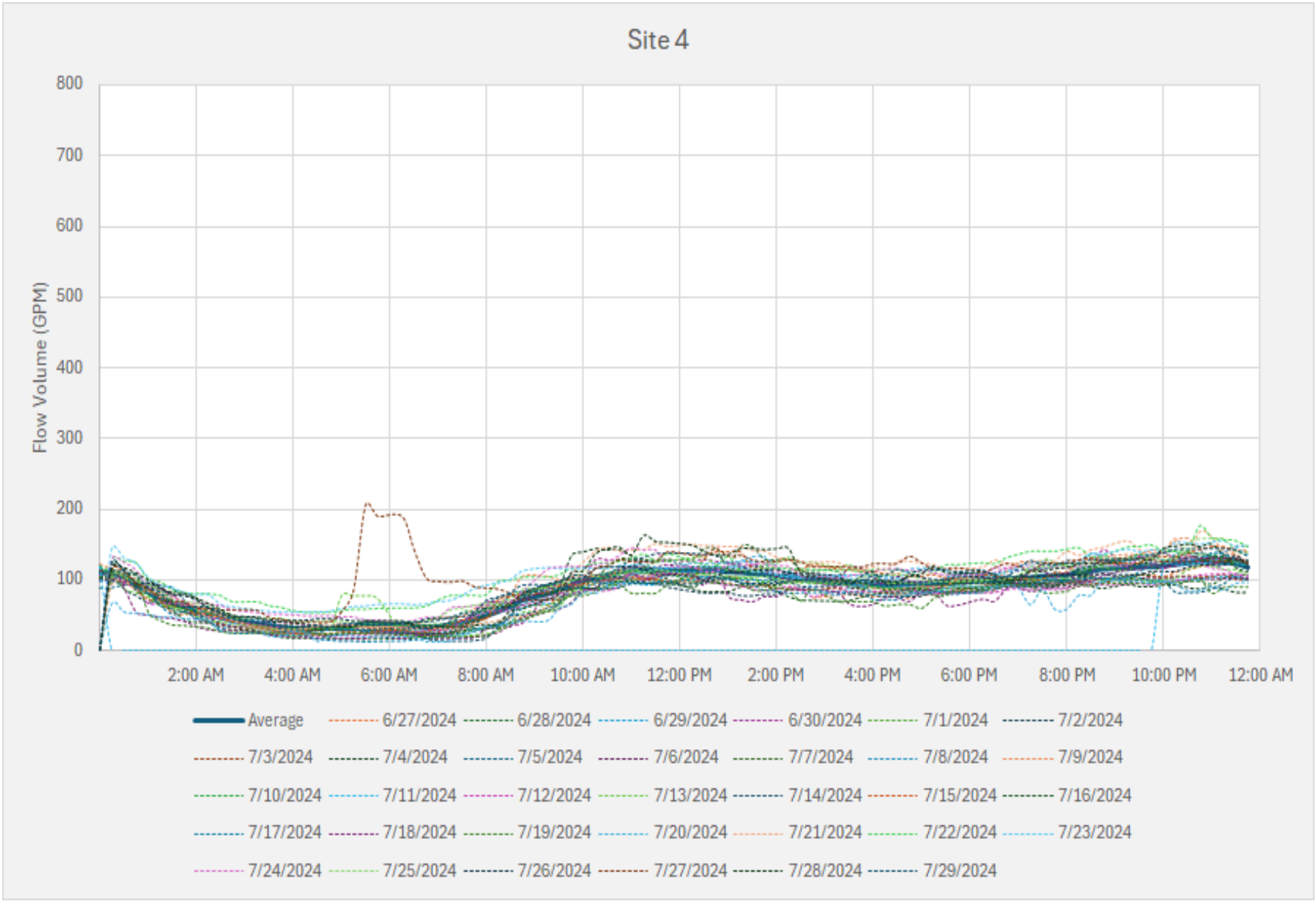
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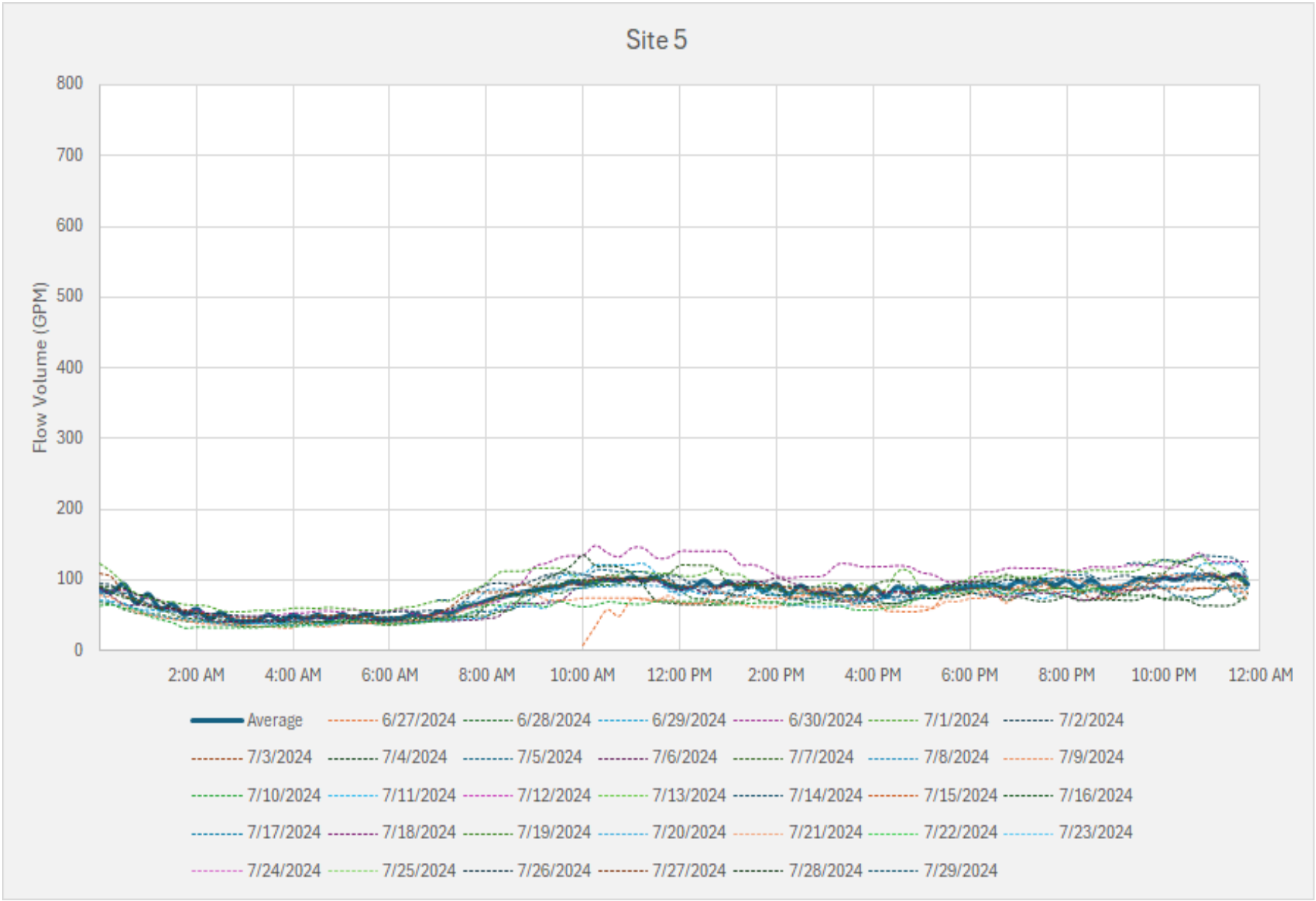
Date: 9/30/2022

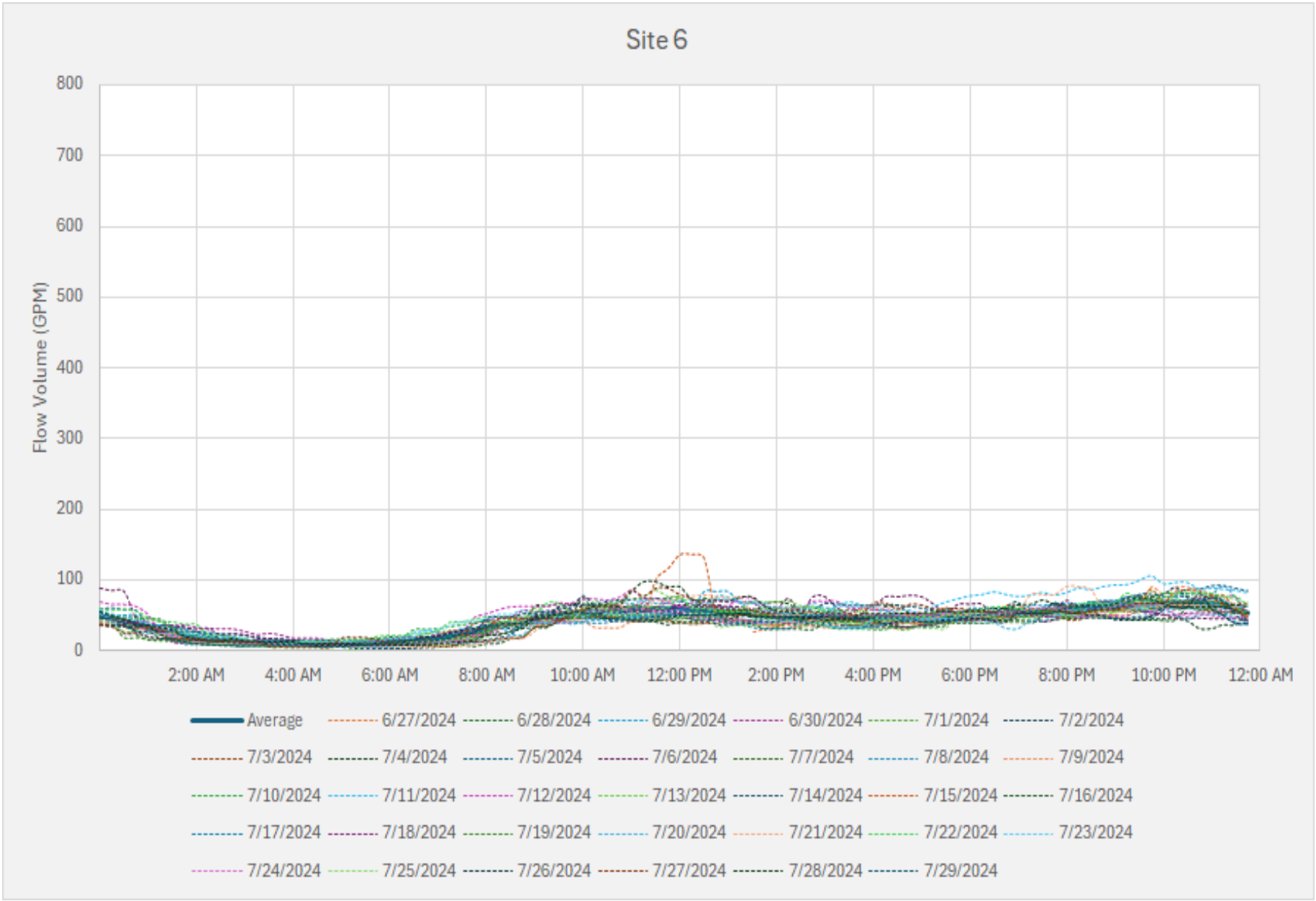

Site 1
Flow (GPM)
800
700
600
500
400
300
200
100
0
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
12:00 AM
Average
6/27/2024
6/28/2024
6/29/2024
6/30/2024
7/1/2024
7/2/2024
7/3/2024
7/4/2024
7/5/2024
7/6/2024
7/7/2024
7/8/2024
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7/23/2024
7/24/2024
7/25/2024
7/26/2024
7/27/2024
7/28/2024
7/29/2024


Site 2
Flow Volume (GPM)
800
700
600
500
400
300
200
100
0
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
12:00 AM
Average
6/27/2024
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6/29/2024
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7/2/2024
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7/4/2024
7/5/2024
7/6/2024
7/7/2024
7/8/2024


Site 3
Flow Vollume (GPM)
800
700
600
500
400
300
200
100
0
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
12:00 AM
Average
6/27/2024
6/28/2024
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6/30/2024
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7/29/2024


Site 4
Flow Volume (GPM)
800
700
600
500
400
300
200
100
0
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
12:00 AM
Average
6/27/2024
6/28/2024
6/29/2024
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7/1/2024
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7/28/2024
7/29/2024


Site 5
Flow Volume (GPM)
800
700
600
500
400
300
200
100
0
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
12:00 AM
Average
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7/29/2024


Site 6
Flow Volume (GPM)
800
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300
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4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
12:00 AM
Average
6/27/2024
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Appendix C State Regulations for Sewer Design

R317. Environmental Quality, Water Quality.
R317-3. Design Requirements for Wastewater Collection, Treatment and Disposal Systems.
R317-3-1. Technical and Procedural Requirements.

1.1. Scope of This Rule

A. General. This rule is intended to aid the logical development, from feasibility study, through startup, to operation of a wastewater collection, treatment and disposal project.

B. Authority. Construction and operating permits and approvals are issued pursuant to the provisions of Sections 19-5-104, 19-5-107 and 19-5-108. Violation of these permit(s) or approval(s) including compliance with the conditions thereof, or beginning of construction, or modification without the Director's approval, is subject to the penalties provided in Section 19-5-115.

C. Applicability

1. This rule applies to:

a. communities, sewerage agencies, industries, and federal or state agencies (hereinafter referred to as the applicant), and

b. i. construction, installation, modification or operation of any treatment works or part thereof or any extension or addition thereto, or

ii. construction, installation, modification or operation of any establishment or any extension or modification or addition to it, the operation of which would probably result in a discharge.

2. The applicant must not advertise the project for bids and must not begin construction without receiving a construction permit.

D. Requirements

1. The design requirements in this rule are for collection, treatment and disposal of wastewater largely originating from domestic sources. These criteria are intended to be limiting values for items upon which an evaluation of such plans and specifications will be made and to establish, as far as practicable, uniformity of practice. This rule also provides for a mechanism to apply water pollution control research and recommendations for further evaluation by the design engineer.

2. Communities, and the engineering profession should discuss with the staff of the Director possible combinations of wastewater treatment and disposal processes or situations not covered in detail by this rule.

E. Construction Permit and Approvals

1. When a Permit or an Approval is Issued. A construction permit or an approval is issued when the applicant has met all requirements of this rule, including any additional requirements of funding programs administered by the Director. The applicant or the designee or the consultant should meet with the staff of the Director to discuss the plan of study before undertaking extensive engineering studies for construction of treatment works. A permit for construction of a new treatment works or a sewerage system, or modifications to an existing treatment works or sewerage system for multiple units under separate ownership will be issued only if the treatment works or sewerage system are under the sponsorship of a body politic as defined in R317-1-1.

2. Variance. The Director may grant a variance from the minimum requirements stated in this rule, subject to site-specific consideration and justification, but not overriding safeguarding of public health or protection of water quality or engineering practice. The applicant must submit pertinent and relevant material in support of a variance from the minimum requirements.

3. Limitations

a. The issuance of a construction permit does not relieve in any way the applicant of the obligation to obtain other approvals and permits, i.e., ground water discharge permit, clearances etc., from other agencies which may have jurisdiction over the project.

b. The permit will expire at the end of one year from the date of issuance if the approved project is not under substantial construction. Plans and specifications must be resubmitted for review and reissuance of the expired permit.

F. Operating Permits

1. Scope

Permits are issued to any wastewater treatment works covered under R317-3 with the following exceptions:

a. Any wastewater treatment permitted under Ground Water Quality Protection R317-6.

b. Any wastewater treatment permitted under Underground Injection Control (UIC) Program R317-7.

c. Any wastewater treatment permitted under Utah Pollutant Discharge Elimination System (UPDES) R317-8.

d. Any wastewater treatment permitted under Approvals and Permits for a Water Reuse Project R317-13.

2. Facilities requiring operating permits that treat domestic waste will typically be issued a general permit rather than individual permits. General permits may be issued, modified, revoked and reissued, or terminated in accordance with applicable requirements of R317-8-5 and R317-8-6. General permits shall be effective for a fixed term not to exceed 5 years.

3. Facilities requiring operating permits that treat non-domestic waste will be issued individual permits. Individual permits may be issued, modified, revoked and reissued, or terminated in accordance with applicable requirements of R317-8-5 and R317-8-6. Individual permits shall be effective for a fixed term not to exceed 5 years.

4. Application requirements.

a. Facilities currently in operation shall submit to the Director a written notice of intent to be covered by the general permit or by an individual permit no later than January 1, 2010. New facilities must submit a written notice of intent prior to

commencing operation. A facility that fails to submit a notice of intent in accordance with the terms of the permit is not authorized to operate.

b. The notice of intent shall include:

i. the legal name and address of the owner.

ii. the facility name and address.

iii. design flow, actual flow, and type of waste treated.

iv. disposal method, effluent quality (if applicable).

v. location of nearest public drinking water well.

vi. diagram of system showing major components.

5. Requirements for recording and reporting monitoring results. All permits shall specify:

a. Requirements concerning the proper use, maintenance, and installation, when appropriate, of monitoring equipment or methods, (including biological monitoring methods when appropriate);

b. Required monitoring including type, intervals, and frequency sufficient to yield data which are representative of the monitored activity including, when appropriate, continuous monitoring;

c. Reporting shall be monthly in accordance with R317-1-2.4.

G. Definitions

1. The annual average daily rate of flow is defined as:

a. an average of daily rates of flow over a period of not less than one year; or

b. the rate of flow equal to or greater than 50 percent of the daily flow rate data.

2. The average design rate of flow or the average peak-monthly rate of flow is defined as:

a. a moving average of daily rates of flow over a thirty consecutive days; or over a period of month whichever produces a higher rate of flow; or

b. the rate of flow equal to or greater than 92 percent of the daily flow rate data.

3. The maximum design rate of flow or peak-daily rate of flow is defined as:

a. the maximum rates of flow over a 24 hour period; or

b. the rate of flow equal to or greater than 99.7 percent of the daily flow data.

4. The peak design rate of flow or peak-hourly rate of flow is defined as:

a. the maximum rate of flow over a 60-minute period; or

b. the rate of flow equal to or greater than 99.9 percent of the daily flow data.

5. The minimum daily rate of flow is defined as the minimum rate of flow over a twenty-four hour period.

6. Industrial waste flow is defined as the maximum rate of flow for each of industries tributary to the sewer system.

7. Other Definitions. Other definition of terms and their use in this rule is intended to be in accordance with:

a. R317-1 (Definitions and General Requirements), and

b. Glossary - Water and Wastewater Control Engineering, jointly prepared by American Public Health Association (APHA), American Society of Civil Engineers (ASCE), American Water Works Association (AWWA), and Water Pollution Control Federation (WPCF).

8. Units of Expression The units of expression used are in accordance with those recommended in WPCF Manual of Practice Number 6, Units of Expression for Wastewater Treatment.

9. Terms

a. The term shall is used where practice is standardized to permit specific delineation of requirements or where safeguarding of the public health or protection of water quality justifies such definite action.

b. Other terms, such as should, recommended, preferred, indicate desirable procedures or methods, with deviations subject to individual consideration and justification, but not overriding safeguarding of public health or protection of water quality or engineering practice.

c. Desirable procedures or methods may be mandatory requirements for projects using state or federal funds.

1.2. Engineering Report

A. The Scope of the Report

1. The applicant or the applicant's consulting engineer should submit an engineering report to the Director at least 60 days before the date when action by the Director is desired. The report shall be prepared under the direction of a registered professional engineer licensed to practice in the State of Utah. The report must establish the need, scope, basis and viability for:

a. all projects involving innovative treatment and disposal processes, and

b. collection and pumping systems handling flows in excess of 1 million gallons per day (3,785 cubic meters per day).

2. The documents submitted for formal approval should include all pertinent and relevant material to aid in the review of the submitted reports.

B. What is Required in the Report

1. The magnitude and complexity of the project will determine the scope of the report.

2. The report must provide basic information; criteria and assumptions; evaluation of alternate projects, with preliminary layouts and cost estimates; assessment of environmental factors; financing methods, anticipated charges for users; organizational and staffing requirements; conclusions or recommendations with a proposed project for consideration; and an outline of official actions and procedures required to implement the project.

3. The report should detail various concepts (including process description and sizing), factual data, and controlling assumptions and considerations for the functional planning of sewerage facilities. These data form the continuing technical basis for the detailed design and preparation of construction plans and specifications.

4. The report should include preliminary architectural, structural, mechanical, and electrical designs, sketches and outline specifications of process units, special equipment, etc.

5. The applicant or the consultant must address specific program and funding requirements in the report.

6. A detailed topical outline is available from the division.

C. Supplemental Requirements for Lagoons and Land Application. The engineer's report shall contain pertinent information on location, geology, hydrology, hydrogeology, soil conditions, area for expansion and any other factors that will affect the feasibility and acceptability of the proposed lagoon and land application projects.

1. Project Location. The engineer's report shall include on a 7.5-minute US Geological Survey topographic map showing the following within two mile (3.22 kilometers) radius of the proposed project site:

a. the location and direction of all residences, commercial developments, parks, recreational areas, land requirements for future additional treatment units and increased waste loadings, and land use zoning of area;

b. elevations and contours of the site and adjacent area;

c. watercourses and water supplies (including a log of each well, unless waived by the Director);

d. location, depth, and discharge point of any field tile in the immediate area of the proposed site;

e. buffer zones;

f. limits of all flood plains, public drinking water supply watersheds and inland wetlands; and

g. natural site drainage zones.

2. Soil Borings and Geology. The applicant must determine representative subsurface soil characteristics and geology of the project site using a number of soil borings logged by an independent soil testing laboratory. At least one boring shall be a minimum of 25 feet (7.6 meters) in depth or into bedrock, whichever is shallower. The borings shall be filled and sealed. The report must address the following items as a minimum:

a. depth, type and texture of soil, all confirmed field data by the Soil Conservation Service (US Department of Agriculture);

b. hydraulic conductivity of the project site or the lagoon bottom as determined in the field, and lagoon bottom materials;

c. soil chemical properties such as, pH, nutrient levels, cation exchange capacity, etc.;

d. depth to bedrock;

e. bedrock type;

f. geologic discontinuities - faults, fractures, sinkholes;

g. jointing and permeability of rock.

3. Ground Water Issues

a. ground water depth confirmed by field investigations, for various seasons, including data from the period between March and May;

b. location of perched water tables;

c. ground water contours;

d. direction of ground water movement and flow;

e. ground water points of discharge;

f. available analyses of site ground water quality and drinking water wells in the vicinity, including but not limited to: coliform bacteria, pH, nitrates, total nitrogen, chlorides, sulfates, and total hardness;

g. a description of the depth and type of all water supply wells within two-mile (3.22 kilometers) radius of the proposed project site;

h. ground water monitoring needs using a system of wells or lysimeters around the perimeter of the project site; and

i. compliance with the requirements of R317-6 (Ground Water Quality Protection Rules) including securing a ground water discharge permit.

4. Climate Data

a. total precipitation for each month;

b. mean number of days per year with temperatures less than or equal to 32 degrees Fahrenheit (0 degree Centigrade);

c. wind velocities and direction;

d. evapotranspiration data.

D. Reports on Supplementary Investigations. Reports on soils, foundation, geological and hydrogeological investigations must be submitted by the applicant or the consultant, to the Director. These reports are supplementary to a proposal, predesign or design report, plans and specifications for all projects. The reports must focus on any existing site conditions which may affect feasibility or constructibility of the project. If such problems do exist, mitigative and remedial measures thereto must be recommended by the applicant's consultant. The basis of conclusions reached should be supported with relevant and detailed information, graphically and narratively. The recommendations must be incorporated in the design.

1.3. Predesign Report

A. A predesign report must be prepared for the projects designed to:

1. treat domestic sewage flow in excess of 5 million gallons per day (18,900 cubic meters per day); or

2. incorporate emerging, innovative and alternative technologies.

B. The report must be submitted for review and approval by the Director. The report shall include a summary of process design criteria, the basis of design, process and hydraulic profiles, outline of all appurtenant facilities, and supporting information.

C. Approval of a predesign report represents an agreement-in-principle subject to receipt, review and approval of satisfactory engineering plans and specifications. Such agreement-in-principle will be modified or revised in light of new information that may become available later. Also, an approval of prefinal documents is not an authorization to advertise the project for bids or to begin construction; but allows the applicant to proceed with preparing final engineering drawings and specifications.

1.4. Construction Plans

A. General. A complete set of construction drawings covering all disciplines shall be submitted for review in fulfillment of the requirements of this rule. The size, complexity and nature of the project will determine the extent of involvement of various disciplines. Such disciplines are, but not necessarily limited to, Civil, Structural, Mechanical, Architectural, Mechanical, Electrical, Geotechnical, Instrumentation, Heating, Ventilating and Air Conditioning etc. All designs shall be in accordance with the requirements of applicable local, state and federal rules or regulations, the latest recognized practice standards including the Uniform Building Code, the National Electrical Code, the Uniform Mechanical Code, the Uniform Plumbing Code and other industry standards. The plans shall be clear, legible and suitable for microfilming or image processing.

1. Standard Information

a. Plans shall show a suitable project title, the name of municipality, sewer district, sewerage agency, sponsoring institution or industry, current revision date, and the name of engineer in charge of the project, engineer's registration number, an imprint of registration seal and signature.

b. Plans shall be drawn to a scale which will permit all necessary information to be plainly shown. Numerical and graphical scales in foot-pound-second (FPS or English) system shall be shown. The use of the international system (metric or MKS or meter-kilogram-second) of units is encouraged.

c. All plan views shall indicate a north point, preferably in a standardized direction. A suitable geographical reference for the project shall also be shown. Topographical and elevation data should be presented on a recognized standard datum. Such datum should be clearly indicated.

2. Vicinity and Location Plans. A large scale vicinity map should be provided for a suitable geographical reference to the project. It should also indicate vehicular access to the project.

3. General Site Work Plans.

a. A site plan showing the project lay out should be included to establish a reference to the existing features. Similarly, a reduced-scale site or key plan should be drawn on all drawings to provide the context of work shown on the drawing to the site.

b. For the entire project site, information shall be provided on topography, survey data, location of test borings, limits of work, staging area for contractors, areas of project related site work, and other work that may overlap the areas of concentrated work activities. Information shall be compiled to the extent practicable on utility locations, above and below ground utilities which might interfere with the proposed construction, particularly water mains, gas mains, storm drains, and telephone and power conduits, outside piping, all known existing structures, security improvements, roads, signage, lighting, and other site improvements. Compiled information should be shown on plans.

4. Detailed Plans. Construction to be performed in areas of concentrated work such as individual installations, buildings, rooms or assemblies shall be shown on the detailed plans. Such plans shall show plan views, elevations, sections and supplementary views which, together with the specifications and general layouts, provide the working information for the contract and construction of the works. They shall also include detailed design data in all applicable disciplines, dimensions and relative elevations of structures, the location and outline form of equipment, location size of piping, water levels, water surface and hydraulic profiles, and ground elevations.

B. Plans for Sewers. Construction plans are required to be submitted for projects involving new sewer systems. Projects for substantial additions to the existing systems are required to be submitted only in fulfillment of the requirements of the funding agency. These plans must detail the following information:

1. Geographical Features

a. Topography and elevations. Existing or proposed improvements, streets, the boundaries of all streams and water impoundments, and water surfaces shall be clearly shown. Contour lines at suitable intervals should be included.

b. Streams. The direction of flow in all natural or artificial streams, and high and low water elevations of all water surfaces at sewer outlets shall be shown.

2. Boundaries. The boundary lines of the municipality or the sewer district, and the area to be sewered, shall be shown.

3. Sewers. The plan shall show the location, size and direction of flow of all existing and proposed sanitary sewers draining to the treatment works concerned.

4. Plans and Profiles. Detailed plans and profiles shall be submitted. Profiles should have a horizontal scale of not more than 100 feet to the inch and vertical scale of not more than 10 feet to the inch. Plan views should be drawn to a corresponding horizontal scale and preferably be shown on the same sheet. Plans and profiles shall show:

a. Location of streets and sewers;

b. ground surface; size of pipe; length between manholes; manhole identifiers, such as numbers etc.; invert and surface elevation at each manhole; and grade of sewer between each two adjacent manholes;

c. the elevation and location of the basement floor on the profile of the sewer, showing feasibility to serve adjacent basements except where otherwise noted on the plans; and

d. Locations of all special features such as inverted siphons, concrete encasements, elevated sewers, special construction to implement proper separation from water mains etc.

5. Detailed drawings, made to a scale to clearly show the nature of the design, shall be furnished to show the following particulars:

a. all stream crossings and sewer outlets, with elevations of the stream bed and of normal and extreme high and low water levels;

b. details of all special sewer joints, pipeline construction or installation, and cross-sections; and

c. details of all sewer appurtenances such as manholes, inspection chambers, inverted siphons, regulators, flow measurement or control stations and elevated sewers.

C. Plans for Pumping Stations. Construction plans shall be submitted for construction or modifications of pumping stations having the installed capacity in excess of 1 million gallons per day (3,785 cubic meters per day). These plans must detail the following information besides vicinity, site and location, and engineering information required:

1. Vicinity, Site and General Site Work Plans

a. the location and extent of the tributary area;

b. any municipal boundaries within the tributary area;

c. the location of the pumping station and force main, and pertinent elevations; and

d. availability of power sources, including alternative sources.

2. Detailed Plans. Detailed plans shall be submitted showing the following:

a. topography of the site with all pertinent elevations;

b. soils or foundation report;

c. existing pumping station with all adjacent improvements;

d. proposed pumping station, including provisions for installation of future pumps or ejectors, emergency power generation, and other reliability features;

e. maximum hydraulic gradient including calculations in downstream gravity sewers when all installed pumps are in operation; and

f. elevation of high water at the site, and maximum elevation of sewage in the collection system upon occasion of power failure.

D. Plans for Treatment Plants. Construction plans shall be submitted for construction or modifications of treatment plants. These plans must detail the following information besides vicinity, site and location, and engineering information required:

1. Location Plan. A plan shall be submitted showing the treatment plant in relation to the remainder of the system.

2. General Layout. Layouts of the proposed treatment plant shall be submitted, showing:

a. topography of the site;

b. size and location of plant structures, and adjacent improvements;

c. schematic flow diagram(s), including mass balance, showing the flow through various plant units, and showing utility systems serving the plant processes;

d. outside or yard piping, including any arrangements for bypassing individual units (Materials handled and direction of flow through pipes shall be shown.); and

e. hydraulic profiles, including calculations, showing the flow of the major liquid or solid process streams including raw or treated sewage, supernatant liquor, scum and sludge.

3. Detailed Plans. Detailed plans shall show the following:

a. location, dimensions, and elevations of all existing and proposed plant facilities;

b. elevations of a 100-year water level of the body of water to which the plant effluent is to be discharged;

c. type, size, pertinent features, and operating capacity of all pumps, blowers, motors, and other mechanical devices;

d. schematics, sectional or isometric views of all process and utility piping not shown on the General Site Work Plans;

e. hydraulic profile at the minimum, average, and maximum rate of flow; and

f. description of any features not otherwise covered by other drawings or specifications or engineer's report.

1.5. Technical Specifications. Complete technical specifications for the construction of sewers, pumping stations, treatment plants, and all other appurtenances, shall accompany the plans. The specifications accompanying construction drawings shall include all construction information not shown on the drawings which is necessary to inform the builder in detail of the design requirements for the quality of materials, workmanship and fabrication of the project. They shall also include: the type, size strength, operating characteristics, and rating of equipment; allowable infiltration; the complete requirements for all mechanical and electrical equipment, including machinery, valves, piping, and jointing of pipe; electrical apparatus, wiring, instrumentation, and meters; laboratory fixtures and equipment; operating tools, construction materials; special filter materials, such as, stone, sand, gravel, or slag; miscellaneous appurtenances; chemicals when used; instructions for testing materials and equipment as necessary to meet design standards; and performance tests for the completed work and component units. Performance tests must be conducted at design load conditions wherever practical.

1.6. Revisions to the Approved Plans and Specifications. Any changes, such as addenda, change orders, field change etc., to the approved plans or specifications affecting capacity, flow, operation of units, or point or quality of discharge shall be submitted for review and approval before any such change is made in either contract documents or construction. Plans or specifications proposed to be so revised must, therefore, be submitted at least 30 days in advance of any construction work which will be affected by such changes to permit sufficient time for review and approval. Changes under emergency conditions may be communicated verbally, and then submitted in writing. Structural revisions or other minor changes not affecting capacities, flows, or operation are to be permitted during construction without approval.

1.7. Construction Supervision. The applicant must demonstrate that adequate and competent inspection will be provided during construction. It is the responsibility of the applicant to provide frequent and comprehensive inspection of the project.

1.8. Plan of Operation

A. Submittal. A plan of operation must be prepared at the mid-point of construction, but no later than at the time of 80 percent completion of construction, unless waived by the Director on the basis of funding program requirements, and the scope and the complexity of the project.

B. Contents of the Plan. The plan of operation must provide a concise, sequential description of and implementation schedule for the following activities:

1. hiring and training of operators;
2. start-up schedules and services;
3. safety programs, plans and procedures;
4. emergency operations procedures and plan;
5. process monitoring program;
6. laboratory and testing services;
7. user charge and pretreatment program, necessary to assure cost-effective, efficient and reliable startup and operation of the facility, future expansion and upgrade; and
8. maintenance of water quality and public health.

1.9. Operation and Maintenance Manual

A. Submittal. A draft of the manual must be submitted at the mid-point of construction, unless waived by the Director on the basis of funding program requirements, and the scope and the complexity of the project. Final draft must be submitted for review and approval, no later than at the 90 percent stage of construction in the final form or 30 days prior to startup, whichever occurs first.

B. Contents of the Manual

1. The manual presents procedures to facilitate operation and maintenance of the plant under all conditions, technical guidance for troubleshooting, and requirements for compliance with the permits and approvals issued. The manual must address the needs of the system being employed and must be directed toward the level of training required of the operating staff.
2. The manual must include all information pertinent for the facilities besides information from manufacturers' catalogs or brochures.

1.10. Start-up

A. Certificate of Completion. The engineer in charge of construction management or inspection of the approved project or facilities shall submit a certificate, bearing the seal of the professional engineer, to the effect that the facilities were constructed in accordance with approved plans, specifications, addenda and change orders to the owner with a copy thereof to the division.

B. Authorization to Operate. The applicant will request a final inspection the division upon receipt of the certificate of completion. No facilities may be placed in service before the final inspection by the division, and authorization to operate the facility is issued in writing by the Director.

C. As-built or Record Drawings.

1. Within 30 days of acceptance by the owner of wastewater or industrial waste facilities from the contractor, a copy of such acceptance must be submitted to the division for record.
2. As-built or record drawings clearly showing the as-built project shall be submitted to the Director within 120 days after the completion of the construction of the approved project or facilities.

1.11. Operation During Construction

A. Construction-related Bypass. Operation of all existing sewers, pump stations, and treatment plants must continue without interruption during the construction of new facilities or modification of existing facilities. Therefore, bypassing will not be allowed except under extenuating circumstances. If this is not possible and construction will result in the discharge of partially treated and untreated sewage into the surface waters of the state, an approval for such a discharge shall be required from the Director before such discharge occurs.

B. Request for a Construction-related Bypass. A formal request for the consideration of a construction-related bypass shall be submitted to the Director by the permittee not less than 90 days prior to the date of proposed bypass initiation. Such request shall contain at least the following information:

1. a detailed description of the construction work to be performed which the owner has deemed warrants a bypass;
2. an analysis of all known alternatives which would eliminate or reduce the need for plant bypassing;
3. cost-benefit and effective analysis of alternatives, including an assessment of resource damages;
4. the minimum and maximum duration of bypassing under each alternative;

5. the applicant's preferred alternative for conducting the bypass;
6. the projected date of initiation of bypass.

C. Approval or Denial of a Construction-related Bypass

1. The request for a construction-related bypass will be approved or denied following a thorough review with due consideration of compliance with the discharge permit(s); water quality standards; and all known available and reasonable methods to abate water pollution.

2. An approval issued to permit bypass will contain all restrictions necessary to minimize the duration of bypassing. A denial determination will state the reasons for the denial and will direct the permittee to initiate a plan of action to implement an alternative to bypassing.

1.12. Innovative Processes Evaluation

A. Basic requirements. The Director will consider the evaluation of innovative approaches to wastewater treatment in the interest of encouraging advances in technology, processes, equipment and material not covered by this rule, provided that:

1. a favorable recommendation has been made by a professional engineer licensed to practice in Utah, following his own evaluation of developmental processes or equipment or material, for a specific project;
2. the applicant has capital and technical resources to replace or modify developmental processes, equipment and material with conventional processes, equipment and material;
3. the risk incurred with the experimentation rests solely with the proponent of processes, equipment and material as evidenced by the written acknowledgement to the Director; and
4. the applicant will replace the failed processes, equipment and material with a proven conventional processes, equipment and material as evidenced by the written acknowledgement to the Director.

B. Approval Limitations

1. The Director may approve developmental processes, equipment and material may be approved in the form of terms and conditions to a construction permit, when reliable operating data from full scale installations are not available. The term and conditions may include such as, but not necessarily limited to, demonstration period for a successful application, requirements to submit reports on the operation of the system during the experimental period.
2. The Director may limit the number of approvals for the same developmental processes, equipment and material until reliable and valid operational experience is gained.

C. Evaluation Criteria. The evaluation of innovative processes will include the following factors:

1. anticipated performance of the system in full scale field conditions,
2. ability to consistently meet required effluent and water quality standards,
3. any evidence of equivalence to conventional technology,
4. the owner's ability to finance, and to operate and maintain the system with the level of expertise necessary, and
5. submission of process descriptions, schematics, reports, monitoring and performance data, costs, specific studies, bench scale test data and pilot plant test data, and any other information appropriate and necessary for the evaluation.

R317-3-2. Sewers.

2.1. General. Construction of a new sewer system project may not begin unless the applicant has submitted an engineering report detailing the design, and construction plans to the Director for review and approval evidenced by a construction permit. The Director will not normally review construction plans for extensions of the existing sewer systems to new areas or replacement of sanitary sewers in the existing sewer systems unless requested or required by state or federal funding programs. Rain water from roofs, streets, and other areas, and ground water from foundation drains must not be allowed to enter the sewer system through planning, design and construction quality assurance and control measures.

2.2. Basis of Design

A. Planning Period. Sewers should be designed for the estimated ultimate tributary population or the 50-year planning period, whichever requires a larger capacity. The Director may approve the design for reduced capacities provided the capacity of the system can be readily increased when required. The maximum anticipated capacity required by institutions, industrial parks, etc. must be considered in the design.

B. Sewer Capacity. The required sewer capacity shall be determined on the basis of maximum hourly domestic sewage flow; additional maximum flow from industrial plants; inflow; ground water infiltration; potential for sulfide generation; topography of area; location of sewage treatment plant; depth of excavation; and pumping requirements.

1. Per Capita Flow. New sewer systems shall be designed on the basis of an annual average daily rate of flow of 100 gallons per capita per day (0.38 cubic meter per capita per day) unless there are data to indicate otherwise. The per capita rate of flow includes an allowance for infiltration/inflow. The per capita rate of flow may be higher than 100 gallons per day (0.38 cubic meter per day) if there is a probability of large amounts of infiltration/inflow entering the system.
2. Design Flow

a. Laterals and collector sewers shall be designed for 400 gallons per capita per day (1.51 cubic meters per capita per day).

b. Interceptors and outfall sewers shall be designed for 250 gallons per capita per day (0.95 cubic meter per capita per day), or rates of flow established from an approved infiltration/inflow study.

c. The Director will consider other rates of flow for the design if such basis is justified on the basis of supporting documentation.

C. Design Calculations. Detailed computations, such as the basis of design and hydraulic calculations showing depth of flow, velocity, water surface profiles, and gradients shall be submitted with plans.

2.3. Design and Construction Details

A. Minimum Size

1. No gravity sewer shall be of less than eight inches (20 centimeters) in diameter.

2. A 6-inch (15 centimeters) diameter pipe may be permitted when the sewer is serving only one connection, or if the applicant justifies the need for such diameter on the basis of supporting documentation.

B. Depth. Sewers should be sufficiently deep to receive sewage from basements and to prevent freezing. Insulation shall be provided for sewers that cannot be placed at a depth sufficient to prevent freezing.

C. Odor and Sulfide Generation. The design shall incorporate features to control and mitigate odor and sulfide generation in sewers. Such features may include steeper slope to achieve higher velocity, reaeration through induced turbulence, etc.

D. Slope

1. The pipe diameter and slope shall be selected to obtain velocities to minimize settling problems.

2. All sewers shall be designed and constructed to give mean velocities of not less than 2 feet per second (0.61 meter per second), when flowing full, based on Manning's formula using an n value of 0.013.

3. Sewers shall be laid with uniform slope between manholes.

4. Table R317-3-2.3(D)(4) shows the minimum slopes which shall be provided; however, slopes greater than these are desirable.

E. Flatter Slopes. Slopes flatter than those required for the 2-feet-per-second (0.61 meter per second)-velocity criterion when flowing full, may be permitted by the Director provided that:

1. there is no other practical alternative;

2. the depth of flow is not less than 30 percent of the diameter at the average design rate of flow;

3. the design engineer has furnished with the report the computations showing velocity and depth of flow corresponding to the minimum, average and peak rates of flow for the present and design conditions in support of the request for variance; and

4. the operating authority of the sewer system submits a written acknowledgement of the ability to provide any additional sewer maintenance required by flatter slopes.

F. Steep Slopes

1. Where velocities greater than 15 feet per second (4.6 meters per second) are attained, special provision shall be made to protect against displacement by erosion and shock.

2. Sewers on 20 percent slopes or greater shall be anchored securely against lateral and axial displacement with suitable thrust blocks, concrete anchors or other equivalent restraints, spaced as follows:

a. Not over 36 feet (11 meters) center to center on grades 20 percent and up to 35 percent;

b. Not over 24 feet (7.3 meters) center to center on grades 35 percent and up to 50 percent;

c. Not over 16 feet (4.9 meters) center to center on grades 50 percent and over.

G. Alignment. Sewers 24 inches (61 centimeters) in diameter or less shall be laid with a straight alignment between manholes. The alignment shall be checked by either using a laser beam or lamping.

H. Changes in Pipe Size. When a smaller sewer joins a large one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.

I. Materials

1. The material of pipe selected should be suitable for local conditions. The material of sewer pipe should be compatible with factors such as industrial wastewater characteristics, putrecibility, physical and chemical properties of adjacent soil, heavy external loading, etc.

2. The material of pipe must withstand superimposed loads without any damage. The design of trench widths and depths should allow for loads. Special bedding, concrete cradle or encasement, or other special construction may be used to withstand extraordinary superimposed loading.

2.4. Curved Sewers. Curved sewers are permitted only under circumstances where conventional sewer construction is not feasible. A conceptual approval must be obtained before beginning the design.

A. Design

1. The minimum radius of curvature shall be greater than 200 feet or one-half of the maximum deflection angle for the material of pipe allowed by the manufacturer.

2. The design n value for the sewer pipe shall be 0.018.

3. Only one horizontal curve in the sewer alignment will be allowed between manholes. No vertical curves shall be permitted.

4. Manhole spacing shall not exceed 400 feet (122 meters).

5. Manholes must be provided at the beginning and the end of a curved alignment (i.e. change in radius of curvature).

6. The design should consider increased erosion potential due to high velocities.

B. Other Requirements

1. Maintenance equipment shall be available at all times for inspection and cleaning.

2. Horizontal and vertical alignment of the sewer after the construction must be verified and certified by a registered professional engineer.

a. Accurate record or as-built drawings must be prepared showing the physical location of the pipe in the ground, and submitted to the division in accordance with the requirements of R317-3-1.

2.5. Installation Requirements

A. Standards

1. The technical specifications shall require that installation be in accordance with the requirements based on the criteria, standards and procedures established by:

a. this rule;

b. recognized industry standards and practices as published in their technical publications;

c. the product manufacturer's recommendations and guidance;

d. Uniform Building Code, Uniform Plumbing Code, Uniform Mechanical Code and National Electrical Code;

e. American Society of Testing Materials;

f. American National Standards Institute; and

g. Occupational Safety and Health Administration (OSHA), US Department of Labor or its succeeding agencies.

2. Requirements shall be set forth in the specifications for the pipe and methods of bedding and backfilling thereof so as not to damage the pipe or its joints, impede cleaning operations and future tapping, nor create excessive side fill pressures or ovalation of the pipe, nor seriously impair flow capacity.

B. Identification of Sewer Lines. A clearly labelled tracer location tape shall be placed two feet above the top of sewer lines less than or equal to 24 inch (61 centimeters) in diameter, along its entire length.

C. Deflection Test

1. Deflection test shall be performed on all flexible pipes. The test shall be conducted after the final backfill has been in place at least 30 days.

2. No pipe shall show a deflection in excess of 5 percent.

3. If the deflection test is run using a rigid ball or mandrel, it shall have a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.

D. Joints and Infiltration

1. Joints. The installation procedures of joints and the materials to be used shall be included in the specifications. Sewer joints shall be designed to minimize infiltration and to prevent the entrance of roots throughout the life of the system.

2. Leakage Tests. Procedures for leakage tests shall be specified. This may include appropriate water or low pressure air testing. The leakage outward or inward (exfiltration or infiltration) shall not exceed 200 gallons per inch of pipe diameter per mile per day (0.19 cubic meter per centimeter of pipe diameter per kilometer per day) for any section of the system. An exfiltration or infiltration test shall be performed with a minimum positive head of 2 feet (0.61 meter). The air test, if used, shall, as a minimum, conform to the test procedure described in the American Society of Testing Materials standards. The testing methods selected should take into consideration the range in ground water elevations projected during the test.

E. Inspection

1. The specifications shall include requirements for inspection of manholes for water-tightness prior to placing in service, including television inspection.

2. Records of television inspection shall be retained for future reference.

2.6. Manholes

A. Location. Manholes shall be installed at:

1. the end of each line exceeding 150 feet (46 meters) in length;

2. all changes in grade, size, or alignment;

3. all intersections; and

4. distances not greater than:

a. 400 feet (120 meters) for sewers 15 inches (38 centimeters) or less; and

b. 500 feet (150 meters) for sewers 18 inches (46 centimeters) to 30 inches (76 centimeters).

5. Distances up to 600 feet (180 meters) may be approved in cases where adequate cleaning equipment for such spacing is provided.

6. Greater spacing may be permitted in larger sewers.

7. Cleanouts shall not be substituted for manholes nor installed at the end of lines greater than 150 feet (46 meters) in length.

B. Drop Type Manholes

1. A drop pipe should be provided for a sewer entering a manhole at an elevation of 24 inches (61 centimeters) or more above the manhole invert. Where the difference in elevation between the incoming sewer and manhole invert is less than 24 inches (61 centimeters), the invert should be filleted to prevent solids deposition.

2. Drop manholes should be constructed with an outside drop connection. If an inside drop connections is necessary, it shall be secured to the interior wall of the manhole and provide access for cleaning.

3. Due to the unequal earth pressures that would result from the backfilling operation in the vicinity of the manhole, the entire outside drop connection shall be encased in concrete.

C. Diameter. The minimum diameter of manholes shall be 48 inches (1.22 meters); larger diameter manholes are preferable for large diameter sewers. A minimum diameter of 22 inches (56 centimeters) shall be provided for safe access.

D. Flow Channel. The flow channel through manholes should be made to conform in shape and slope to that of the sewers. The depth of flow channels should be up to one-half to three-quarters of the diameter of the sewer. Adjacent floor area should drain to the channel with the minimum slope of 1 inch per foot (8.3 centimeters per meter).

E. Watertightness

1. Manholes shall be of the pre-cast concrete or poured-in-place concrete type. Manholes shall be waterproofed on the exterior.

2. Inlet and outlet pipes shall be joined to the manhole with a gasketed flexible watertight connection arrangement that allows differential settlement of the pipe and manhole wall to take place.

3. Watertight manhole covers shall be used wherever the manhole tops may be flooded by street runoff or high water. Locked manhole covers may be desirable in isolated easement locations or where vandalism may be a problem.

F. Electrical. Electrical equipment installed or used in manholes shall conform to appropriate National Electrical Code requirements.

2.7. Inverted Siphons. Inverted siphons shall consist of at least two barrels, with a minimum pipe size of 6 inches (15 centimeters) with an arrangement to exclude debris and solids. The siphon shall be provided with necessary appurtenances for convenient flushing and maintenance. The manholes shall have adequate clearances for rodding; and in general, sufficient head shall be provided and pipe sizes selected to secure velocities of at least 3.0 feet per second (0.92 meter per second) for average flows. The inlet and outlet details shall be so arranged that the normal flow is diverted to 1 barrel, and that either barrel may be cut out of service for cleaning. The vertical alignment should permit cleaning and maintenance.

2.8. Sewers In Relation To Streams

A. Location of Sewers on Streams

1. The top of all sewers entering or crossing streams shall be at a sufficient depth below the natural bottom of the stream bed to protect the sewer line. In general, the following cover requirements must be met:

a. one foot (30 centimeters) of cover is required where the sewer is located in bedrock;

b. three feet (90 centimeters) of cover is required in other material;

c. cover in excess of 3 feet (90 centimeters) may be required in streams having a high erosion potential; and

d. in paved stream channels, the top of the sewer must be placed below the bottom of the channel pavement.

2. If the proposed sewer crossing will not interfere with the future improvements to the stream channel, then reduced cover may be permitted.

B. Horizontal Location. Sewers shall be located along streams outside of the stream bed and sufficiently removed therefrom to provide for future possible stream widening and to prevent pollution by siltation during construction.

C. Structures. The sewer outfalls, headwalls, manholes, gate boxes, or other structures shall be located so they do not interfere with the free discharge of flood flows of the stream.

D. Alignment

1. Sewers crossing streams should be designed to cross the stream as nearly at right angles to the stream flow as possible, and shall be free from change in grade.

2. Sewer systems shall be designed to minimize the number of stream crossings.

E. Construction

1. Materials. Sewers entering or crossing streams shall be constructed of cast or ductile iron pipe with mechanical joints; otherwise they shall be constructed so they will remain watertight and free from changes in alignment or grade. Material used to backfill the trench shall be stone, coarse aggregate, washed gravel, or other materials which will not cause siltation.

2. Siltation and Erosion. Construction methods that will minimize siltation and erosion shall be employed. The design engineer shall include in the project specifications the method(s) to be employed in the construction of sewers in or near streams to provide adequate control of siltation and erosion. Specifications shall require that cleanup, grading, seeding, and planting or restoration of all work areas shall begin immediately. Exposed areas shall not remain unprotected for more than seven days.

F. Aerial Crossings

1. A carrier pipe shall be provided for all aerial sewer crossings. Support shall be provided for all joints in pipes utilized for aerial crossings. The supports shall be designed to prevent frost heave, overturning and settlement.

2. Precautions against freezing, such as insulation and increased slope, shall be provided. Expansion jointing shall be provided between above-ground and below-ground sewers.

3. The design engineer shall consider the impact of flood waters and debris for aerial stream crossings. The bottom of the pipe should be placed below the elevation of twenty-five (25) year flood. Crossings, in no case, shall block the channel.

2.9. Protection of Water Supplies. The applicant must review the requirements stated in R309-112-2 - Distribution System Rules, Drinking Water and Sanitation Rules, to assure compliance with the said rule.

A. Water Supply Interconnections. There shall be no physical connections between a public or private potable water supply system and a sewer, or appurtenance thereto which would permit the passage of any sewage or polluted water into the potable supply. No water pipe shall pass through or come in contact with any part of a sewer manhole.

B. Relation to Water Mains

1. Horizontal Separation

a. Sewers shall be laid at least 10 feet (3.0 meters) horizontally from any existing water main. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, a deviation may be allowed based on

the supportive data from the design engineer. Such deviation may allow installation of the sewer closer to a water main, provided that the sewer is laid:

(1) in a separate trench, or

(2) on an undisturbed earth shelf located on one side of the sewer trench, or

(3) in the sewer trench which has been backfilled and compacted to not less than 95 percent of the optimum density as determined by the ASTM Standard D-690, as amended, and

b. In each of the above cases, the bottom of the water main shall be at least 18 inches (46 centimeters) above the top of the sewer.

2. Crossings. Sewers crossing above water mains shall be laid to provide a minimum vertical distance of 18 inches (46 centimeters) between the outside of the water main and the outside of the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to prevent damage to the water main.

3. Special Conditions. When it is impossible to obtain proper horizontal and vertical separation as stated above, the sewer shall be designed and constructed of cast iron, ductile iron, galvanized steel or protected steel pipe with mechanical joints for the minimum distance of 10 feet on either side of the point of crossing. The design engineer may use other types of joints if equivalent joint integrity is demonstrated. The lines shall be pressure tested to assure watertightness before backfilling.

R317-3-3. Sewage Pumping Stations.

3.1. General. Sewage pumping station structures, and electrical and mechanical equipment shall be protected from physical damage that would be caused by a 100-year flood. Sewage pumping stations must remain fully operational and accessible during a 25-year flood.

3.2. Design

A. Pumping Rates. The pumps and controls of main pumping stations, and especially pumping stations pumping to the treatment works or operated as part of the treatment works, should be selected to operate at varying delivery rates to permit discharging sewage at approximately its rate of delivery to the pump station.

B. System - Head Calculation

1. The design engineer shall submit system-head calculations and curves. System-head curves for C values of 100, 120 and 140 in the Hazen William's equation for calculating head loss corresponding to minimum, median and maximum water levels shall be developed.

2. A system-head curve for C value of 120 corresponding to median (normal operating) water level shall be used to make preliminary selection of motor and pump. The pump and motor must operate satisfactorily over the entire range of system-head curves for C values of 100 and 140 corresponding to minimum and maximum water levels intersected by the head-discharge relationship of a given pump.

3. Pumps and motors shall be sized for the 10-year peak flows; preferably the 20-year sewage flow requirements. These operating points shall be shown on the system-head curves.

C. Accessibility. The pumping station shall be readily accessible by maintenance vehicles during all weather conditions. The facility should be located off the traffic way of streets and alleys.

D. Grit. Where it is necessary to pump sewage before grit removal, the design of the wet well and pump station piping shall be such that operational problems from the accumulation of grit are avoided.

E. Odor and Corrosion Control. The pumping station design should incorporate measures for:

1. mitigating the effects of sulfide corrosion to structure and equipment; and

2. effective odor control when a populated area is within close proximity.

F. Structures

1. Dry wells, including their superstructure, shall be completely separated from the wet well.

2. Provision shall be made to facilitate maintenance and removal of pumps, motors, and other mechanical and electrical equipment.

3. Safe means of access and proper ventilation shall be provided to dry wells and to wet wells containing either bar screens or mechanical equipment requiring inspection or maintenance.

a. For built-in-place pump stations, a stairway with rest landings shall be provided at vertical intervals not to exceed 12 feet (3.7 meters). For factory-built pump stations over 15 feet (4.6 meters) deep, a rigidly fixed landing shall be provided at vertical intervals not to exceed 10 feet (3.0 meters). Where a landing is used, a suitable and rigidly fixed barrier shall be provided to prevent an individual from falling past the intermediate landing to a lower level.

b. Where space requirements are insufficient, the design may provide for a manlift or elevator in lieu of landings in a factory-built station if the design includes an emergency access or exit.

c. Local, state and federal safety requirements, including those in applicable fire code, the Uniform Building Code, etc., must be reviewed and complied with. Those requirements, if more stringent than the ones stated above, shall be incorporated in the design.

4. Construction Materials. The materials selected in construction and installation must be safe and able to withstand adverse operating environmental conditions caused by presence of hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in sewage.

3.3. Pumps and Pneumatic Ejectors

A. Multiple Units

1. At least two pumps or pneumatic ejectors shall be provided. A minimum of three pumps shall be provided for stations handling flows greater than 1 million gallons per day (3,785 cubic meters per day).

2. If only two units are provided, they should have the same capacity. Each shall be capable of handling flows in excess of the expected maximum flow. Where three or more units are provided, they should be designed to fit actual flow conditions and must be of such capacity that with any one of the largest units out of service, the remaining units shall have capacity to handle maximum sewage flows.

B. Protection Against Clogging

1. Pumps handling sewage from 30 inch (76 centimeters) or larger diameter sewers shall be protected by readily accessible bar racks from clogging or damage.

2. Bar racks should have clear openings not exceeding 1-1/2 inches (6.4 centimeters). The design shall provide for a mechanical hoist.

3. The design engineer shall consider installation of mechanically cleaned and duplicate bar racks in the pumping stations handling larger than five million gallons per day (18,900 cubic meters per day) rate of flow.

4. Small pumping stations pumping less than one million gallons per day (3,785 cubic meters per day) shall be equipped with bar racks or inline grinding devices, etc., to prevent clogging.

C. Pump Openings. Except where grinder pumps are used, pumps shall be capable of passing spheres of at least 3 inches (7.6 centimeters) in diameter, and pump suction and discharge piping shall be at least 4 inches (10.2 centimeters) in diameter.

D. Priming. The pump shall be so placed that it will operate under a positive suction head under normal operating conditions, except for submersible pumping stations.

E. Electrical Equipment. Electrical systems and components (e.g., motors, lights, cables, conduits, switchboxes, and control circuits) in raw sewage wet wells, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, shall comply with the National Electrical Code requirements for Class 1 Group D, Division 1 locations. In addition, equipment located in the wet well shall be suitable for use under corrosive conditions. Each flexible cable shall be provided with watertight seal and separate strain relief. A fused disconnect switch located above ground shall be provided for all pumping stations. When such equipment is exposed to weather, it shall as a minimum, meet the requirements of weatherproof equipment (NEMA 3R).

F. Intake. Each pump should have an individual intake. Turbulence should be avoided near the intake in wet wells. Intake piping should be as straight and short as possible.

G. Dry Well Dewatering. A separate sump pump equipped with dual check valves shall be provided in dry wells to remove leakage or drainage. Discharge shall be located as high as possible. A connection to the pump suction is also recommended as an auxiliary feature. Water ejectors connected to a potable water supply will not be approved. All floor and walkway surfaces should have an adequate slope to a point of drainage. Pump seal water shall be piped to the sump.

H. Controls

1. Type. Control systems for liquid level monitoring shall be of the air bubbler type, the capacitance type, the encapsulated float type, or the non-contact type. The selection of type of controls must be based on wastewater characteristics and other site related conditions. The Director may approve the existing float-tube control systems on pumping stations being upgraded. The electrical equipment shall comply with the National Electrical Code requirements for Class I, Group D, Division 1 locations.

2. Location. The level control system shall be located away from the turbulence of incoming flow and pump suction.

3. Alternation. The design engineer must consider automatic alternation of the sequencing of pumps in use.

I. Valves

1. Suction Line. An isolation valve shall be placed on the suction line of each pump except on submersible pumps.

2. Discharge Line

a. Isolation and check valves shall be placed on the discharge line of each pump. The check valve shall be located between the isolation valve and the pump.

b. Check valves shall not be placed in the vertical run of discharge piping unless the valve is designed for that specific application.

c. Ball valves may be permitted in the vertical runs.

d. All valves shall be suitable for the material being handled, and capable of withstanding normal operating pressure and water hammer.

e. Where limited pump backspin will not damage the pump and low discharge head conditions exist, a short individual force main for each pump, may be approved by the Director in lieu of a discharge manifold.

3. Location. Valves shall not be located in wet well. They shall be located in a dry well adjacent to the pumps or in an adjacent isolated pit appropriately protected from physical, weather or freezing damage, with proper access for operation and maintenance.

J. Wet Wells

1. Divided Wells. Wet well should be divided into multiple sections, properly interconnected, to facilitate repairs and cleaning, and non-turbulent hydraulic operating condition to each pump inlet.

2. Size. The wet well size and level control settings shall be appropriate to avoid heat buildup in the pump motor due to frequent starting (short cycling), and septic conditions due to excessive detention time.

3. Floor Slope. The wet well floor shall have a minimum slope of one to one to the hopper bottom. The horizontal area of the hopper bottom shall be not greater than necessary for proper installation and function of the pump inlet.

K. Ventilation. All pump stations must be ventilated to maintain safe operating environment. Where the pump pit is below the ground surface, mechanical ventilation is required, so arranged as to independently ventilate the dry well and the wet well if screens or mechanical equipment requiring maintenance or inspection are located in the wet well. There shall be no interconnection between the wet well and dry well ventilation systems. In pits over 15 feet (4.6 meters) deep, multiple inlets and outlets are recommended. Dampers should not be used on exhaust or fresh air ducts. Fine screens or other obstructions in air ducts should be avoided to prevent clogging. Switches for operation of ventilation equipment should be marked and located for convenient operation from outside of the enclosed environment. All intermittently operated ventilating equipment shall be interconnected with the respective pit lighting system. Automatic controls are recommended for intermittently ventilated pump stations. Fan parts should be of non-corrosive material. All parts adjacent to moving ones should be of non-sparking materials. Consideration should be given to installation of automatic heating and dehumidification equipment.

1. Wet Wells. Ventilation may be either continuous or intermittent. Ventilation, if continuous, shall provide at least 12 complete air changes per hour; if intermittent, at least 30 complete air changes per hour. Ventilating equipment should force air into wet well rather than exhaust it from wet well.

2. Dry Wells. Ventilation may be either continuous or intermittent. Ventilation, if continuous, shall provide at least 6 complete air changes per hour; if intermittent, at least 30 complete air changes per hour.

L. Flow Measurement. Continuous measuring and recording of sewage flow shall be provided at all pumping stations with a design pumping capacity greater than one million gallons per day (3,785 cubic meters per day).

M. Water Supply. There shall be no physical connection between any potable water supply and a sewage pumping station which under any condition might cause contamination of the potable water supply. The potable water supply to a pumping station shall be protected against cross connection or backflow.

3.4. Self-Priming Pumps. Self-priming pumps shall be capable of rapid priming and repriming at the lead pump on elevation. Such self-priming and repriming shall be accomplished automatically under design operating conditions. Suction piping should not exceed the size of the pump suction and shall not exceed 25 feet (7.6 meters) in total length. Priming lift at the lead pump on elevation shall include a safety factor of at least 4 feet (1.2 meters) from the maximum allowable priming lift for the specific equipment at design operating conditions. The combined total of dynamic suction lift at the pump off elevation and required net positive suction head at design operating conditions shall not exceed 22 feet (6.7 meters).

3.5. Submersible Pump Stations. Submersible pump stations may be used for flows less than 0.25 million gallons per day (946 cubic meters per day). The Director may approve submersible pump stations for flows greater than 0.25 million gallons per day (946 cubic meters per day), based on operational, reliability and maintenance considerations. The submersible pumps stations shall meet the design requirements stated above, except as modified in this section.

A. Construction. Submersible pumps and motors shall be designed specifically for raw sewage use, including totally submerged operation during a portion of each pumping cycle. An effective method to detect shaft seal failure or potential seal failure shall be provided, and the motor shall be of squirrel-cage type design without brushes or other arc-producing mechanisms.

B. Pump Removal. Submersible pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well.

C. Electrical

1. Power Supply and Control. Electrical supply, control and alarm circuits shall be designed to allow for disconnection of the equipment from outside and inside of pumping station. Terminals and connectors shall be protected from corrosion by location outside of wet well or through use of watertight seals. If located outside of the pumping station, weatherproof equipment shall be used.

2. Controls. The motor control center shall be located outside of the wet well and be protected by a conduit seal or other appropriate measures meeting the requirements of the National Electrical Code, to prevent the atmosphere of the wet well from gaining access to the control center. The seal shall be so located that the motor may be removed and electrically disconnected without disturbing the seal.

3. Power Cord. Pump motor power cords shall be designed for flexibility and serviceability under severe service conditions and shall meet the requirements of the Mine Safety and Health Administration for trailing cables. Ground fault interruption protection shall be used to deenergize the circuit in the event of any failure in the electrical integrity of the cable. Power cord terminal fittings shall be corrosion-resistant and constructed in a manner to prevent the entry of moisture into the cable, shall be provided with strain relief appurtenances, and shall be designed to facilitate field connecting.

3.6. Valves. Valves shall be located in a separate valve pit. Accumulated water shall be drained to the wet well or the soil. If the valve pit is drained to the wet well, an effective method shall be provided to prevent sewage gases and liquid from entering the pit during surcharged wet well conditions.

3.7. Alarm Systems.

A. Alarm systems shall be provided for pumping stations. The alarm shall be activated in cases of power failure, high water level in dry or wet well, pump failure, use of the lag pump, air compressor failure, or any other pump malfunction.

B. Pumping station alarms shall be telemetered, including identification of the alarm condition, to the operating agency's facility that is manned 24 hours a day. If such a facility is not available and 24-hour holding capacity is not provided, the alarm shall be telemetered to the operating agency's facility during normal working hours and to the home of the person(s) responsible for the lift station during off-duty hours.

C. The Director may approve audio-visual alarm systems with a self-contained power supply in lieu of the telemetering system outlined above, depending upon location, station holding capacity and inspection frequency.

3.8. Emergency Operation

A. Pumping stations and collection systems shall be designed to prevent bypassing of raw sewage and backup into the sewer system. For use during possible periods of extensive power outages, mandatory power reductions, or uncontrolled storm events, a controlled high-level wet well overflow or emergency power generator shall be provided. Where a high level overflow is utilized, storage or retention tanks, or basins, shall be provided having at least a 2-hour retention capacity at the anticipated overflow rate.

B. The applicant must review the requirements of R317-6 (Ground Water Quality Protection Rule) for compliance with the said rule for earthen retention basins.

C. The operating agency shall provide:

1. an in-place or portable pump, driven by an internal combustion engine or an emergency generator capable of pumping from the wet well to the discharge side of the station for pump stations with a capacity in excess of one million gallons per day (3,785 cubic meters per day), and

2. an engine-driven generating equipment or an independent source of electrical power or emergency generators capable of pumping from the wet well to the discharge side of the station for pump stations with a capacity in excess of five million gallons per day (18,925 cubic meters per day).

3.9. Auxiliary and Emergency Equipment Requirements

A. General. The following general requirements shall apply to all internal combustion engines used to drive auxiliary pumps, service pumps through special drives, or electrical generating equipment.

1. Engine Protection. The engine must be protected from damaging operating conditions. Protective equipment shall shut down the engine and activating an alarm on site unless continuous manual supervision is planned. Protective equipment shall monitor for conditions of low oil pressure and overheating, Oil pressure monitoring is not required for engines with splash lubrication.

2. Size. The engine shall have adequate rated power to start and continuously operate all connected loads.

3. Fuel Type. The type of fuel must be carefully selected for maintaining reliability and ease of starting, especially during cold weather conditions. Unused fuel from the fuel storage tank should be removed annually, and the tank refilled with fresh fuel.

4. Engine Ventilation. The engine shall be located above grade with adequate ventilation of fuel vapors and exhaust gases.

5. Routine Start-up. All emergency equipment shall be provided with instructions indicating the need for regular starting and running of such units at full loads.

6. Protection of Equipment. Emergency equipment shall be protected from damage at the restoration of regular electrical power.

B. Engine-Driven Pumping Equipment. Where permanently installed or portable engine-driven pumps are used, the following requirements in addition to general requirements apply:

1. Pumping Capacity. Engine-driven pump(s) shall be capable of pumping at the design pumping rates unless storage capacity is available for flows in excess of pump capacity. Pumps shall be designed for anticipated operating conditions, including suction lift if applicable.

2. Operation. Provisions shall be made for automatic and manual start-up and load transfer. The pump must be protected against damage from adverse operating conditions. Provisions should be considered to allow the engine to start and stabilize at operating speed before assuming the load. Where manual start-up and transfer is justified, storage capacity and alarm system must meet the requirements stated hereinabove.

3. Portable Generating Equipment. Where portable generating equipment or manual transfer of power to the pumping equipment is provided, sufficient storage capacity shall be provided in the design of pumping station, to allow time for detection of pump station failure and transportation and connection of generating equipment. The use of special electrical connections and double throw switches are recommended for connecting portable generating equipment.

3.10. Instructions and Equipment

A. Sewage pumping stations and their operators must be supplied with a complete set of operational instructions, including emergency procedures, maintenance schedules, special tools, and necessary spare parts.

B. Local, state and federal safety requirements, including those in applicable fire code, the Uniform Building Code etc., must be reviewed and complied with. Those requirements take precedence over the foregoing requirements, if more stringent, and should be incorporated in the design.

3.11. Force Mains

A. Velocity. A velocity of not less than 2 feet per second (0.61 meter per second) shall be maintained at the average design flow, to avoid septic sewage and resulting odors.

B. Air Relief Valve. An automatic air relief valve shall be placed at high points in the force main to prevent air locking.

C. Termination. Force mains should enter the gravity sewer system at a point not more than 2 feet (30 centimeters) above the flow line of the receiving manhole.

D. Design Pressure. The force main and fittings, including reaction blocking, shall be designed to withstand normal pressure and pressure surges (water hammer).

E. Special Construction. Force main construction near streams or used for aerial crossings shall meet the requirements stated in Sewers.

F. Design Friction Losses

1. Friction losses through force mains shall be based on the Hazen and Williams formula or other hydraulic analysis to determine friction losses. When the Hazen and Williams formula is used, the design shall be based on the value of C equal to 120; for unlined iron or steel pipe the value of C equal to 100 shall be used.

2. When initially installed, force mains will have a significantly higher C factor. The higher C factor should be considered only in calculating maximum power requirements.

G. Separation from Water Main. The applicant or the design engineer must review the requirements stated in R309-112.2 - Distribution System rules, Drinking Water and Sanitation Rules, to assure compliance with the said rule.

H. Identification. A clearly labelled tracer location tape shall be placed two feet above the top of force mains less than or equal to 24 inch (61 centimeters) in diameter, along its entire length.

R317-3-4. Treatment Works.

4.1. Plant Location

A. The treatment plant structures and all related equipment shall be protected from physical damage by the 100-year flood. Treatment works must remain fully operational and accessible during the 25-year flood.

B. These conditions shall apply to all new facilities under construction as well as the existing facilities being expanded, upgraded or modified.

4.2. Quality of Effluent. The effluent requirements and water quality standards established in the discharge permit, R317-1 (Definitions and General Requirements), R317-2 (Standards of Quality for Waters of the State) shall be used to determine the required degree of wastewater treatment, and unit processes and operations.

4.3. Design

A. Basis of Design. The plant design shall be based on the higher value of:

1. a moving average of daily rates of flow and wastewater strength as measured by five-day biochemical oxygen demand (BOD_5) and suspended solids determination tests over a period of 30 consecutive days; or

2. an average of values rate of flow and wastewater strength as measured by five-day biochemical oxygen demand (BOD_5) and suspended solids determination tests, over a period of month; or

3. the rate of flow and wastewater strength as measured by five-day biochemical oxygen demand (BOD_5) and suspended solids determination tests, equal to or greater than 92 percent of the daily flow rate and wastewater strength data.

B. Hydraulic Design. The hydraulic capacities of all units and conveyance structures shall be computed and checked for the maximum and average design rates of flow with one largest unit out of service. No overtopping of any structure under any condition shall be permitted.

1. New Systems. The design for sewage treatment plants shall be based upon an average daily per capita flow of 100 gallons (0.38 cubic meter) unless the applicant provides and justifies a better estimate of flow based on water use data. An allowance shall be made in the design for industrial wastewaters and rates of infiltration/inflow.

2. Existing Systems. For an existing system, the applicant may use the data based on both dry-weather and wet-weather conditions. The data over a minimum period of one year shall be taken as the basis for the design.

C. Organic Design

1. New System Design

a. Domestic waste treatment design shall be on the basis of at least 0.17 pounds (0.08 kilogram) or 200 milligrams per liter of BOD_5 per capita per day and 0.20 pounds (0.09 kilogram) or 250 milligrams per liter of suspended solids per capita per day, unless information is submitted to justify alternate designs.

b. When garbage grinders are used in areas tributary to a domestic treatment plant, the design basis may be increased to 0.22 pounds (0.10 kilogram) or 260 milligram per liter of BOD_5 per capita per day and 0.25 pounds (0.11 kilogram) or 300 milligram per liter of suspended solids per capita per day.

c. An allowance shall be made in the design for industrial wastewaters and rates of infiltration/inflow.

d. Other approved methods for measurement of organic strength of wastewater published in Standard Methods for Examination of Water and Wastewater, jointly prepared by American Public Health Association (APHA), American Society of Civil Engineers (ASCE), American Water Works Association (AWWA), and Water Pollution Control Federation (WPCF), will be accepted in lieu of the five-day biochemical oxygen demand (BOD_5) test.

2. Existing Systems

a. For an existing system, the applicant may use the data based on the actual strength of the wastewater as determined by analysis of composite samples for five-day biochemical oxygen demand (BOD_5) and suspended solids. An appropriate increment for growth shall be included in the basis of design.

b. The data over a minimum period of one year shall be taken as the basis for the design.

D. Shock Loadings. The applicant shall consider the shock loadings of high concentrations and diurnal peaks for short periods of time on the treatment process, particularly for small treatment plants.

E. Design by Analogy. The applicant may utilize the data from similar municipalities in the case of new systems, provided that the reliability and applicability of such data is established through thorough investigations and documentation.

F. Flow Conduits. All piping and channels shall be designed to carry the maximum rates of flows. The incoming sewer shall be designed for unrestricted flow. Bottom corners of the channels must be filleted. Conduits shall be designed to

avoid creation of pockets and corners where solids can accumulate. Suitable gates shall be placed in channels to seal off unused sections which might accumulate solids. The use of shear gates or stop planks is permitted where they can be used in place of gate valves or sluice gates. Corrosion resistant materials shall be used for these control gates.

G. Arrangement of Process Units. The design should provide for an arrangement of component parts of the plant, for greatest operating and maintenance convenience, reliability flexibility, economy, continuity of maximum effluent quality, and ease of installation of future units.

H. Flow Division Control. The design shall provide for flow division control facilities to insure organic and hydraulic loading control to various process units. Convenient, easy and safe access, change, observation, and maintenance shall be considered in the design of such facilities. Flow division shall be measured using flow measurement devices to assure uniform loading of all unit processes and operations.

4.4. Plant Design Details

A. Mechanical Equipment. The specifications should provide for:

1. services of a representative of the manufacturer to supervise the installation and initial operation of major items of mechanical equipment; and

2. performance tests of the installed equipment before acceptance by the applicant.

B. Unit Bypasses

1. A minimum of two units in the liquid treatment process train shall be provided for all unit processes and operations in all plants rated at over 1 million gallons per day (3,785 cubic meters per day).

2. The Director will approve any exceptions based on reliability and operability of the components.

3. The design shall provide for properly located and arranged bypass structures and piping so that each unit of the plant can be removed from service independently. The bypass design shall facilitate plant operation during unit maintenance and emergency repair so as to minimize deterioration of effluent quality and insure rapid process recovery upon return to normal operational mode.

C. Unit Bypass During Construction. Any bypass during construction or operation must be approved by the Director before such bypass occurs, as provided in this rule.

D. Drains. The design shall incorporate means to completely drain each unit with a discharge to a point within the process or the plant.

E. Protection of Structures. The design shall incorporate hydrostatic pressure relief devices to prevent flotation of structures.

F. Pipe Cleaning and Maintenance. Fittings, valves, and other appurtenances shall be provided for pipes subject to clogging, to facilitate proper cleaning through mechanical cleaning or flushing. Pipes subject to clogging, such as pipes carrying sludge, shall be lined with a material which creates a smooth and nonadhering surface, thereby reducing clogging and resistance to flow.

G. Construction Materials. The materials of construction and equipment shall be resistant to hydrogen sulfide and other corrosive gases, greases, oils, chemicals, and similar constituents frequently present in sewage. This is particularly important in the selection of metals and paints. Contact between dissimilar metals should be avoided to minimize galvanic action, and consequent corrosion.

H. Painting

1. Piping within the plant shall be color coded to facilitate identification of piping, particularly in the plants rated over 5 million gallons per day (18,925 cubic meters per day). Table R317-3-4.4(H)(1) shows color and identification scheme recommended by the American National Standards Institute (ANSI 253.1 and 13.1) shall be used for the purposes of standardization.

2. The labels shall be stenciled in conformance with the ANSI standard A13.1.

3. The Director may approve painting of piping with one color with a labelling scheme in conformance with the ANSI standard A13.1 provided that:

a. labels are color coded as directed above;

b. piping contents and direction of flow are legibly stenciled on the label; and

c. labels are securely on the piping at interval and all locations required in the above referenced standard.

I. Operating Equipment. A complete outfit of tools, accessories, and spare parts necessary for the plant operator's use should be provided. Readily-accessible storage space and workbench facilities should be provided, and consideration be given to provision of a garage for large equipment storage, maintenance, and repair.

J. Erosion Control During Construction. Effective site erosion control shall be provided during construction.

K. Grading and Landscaping. The site should be graded and landscaped upon completion of the plant. Concrete or gravel walkways should be provided for access to all units. Steep slopes should be avoided to prevent erosion. Surface water shall not be permitted to drain into any unit. Particular care shall be taken to protect all treatment plant components from storm water runoff.

4.5. Plant Outfall Lines

A. Discharge Impact Control. The outfall sewer shall be designed to discharge to the receiving stream in a manner not to impair the beneficial uses of the receiving stream and acceptable to the Director. The outfall design should provide for:

1. Free fall or submerged discharge at the site selected;

2. Cascading of effluent to increase dissolved oxygen concentration in the effluent; and

3. Limited or complete dispersion of discharge across stream to minimize impact on aquatic life movement, and growth in the immediate reaches of the receiving stream; and

B. Protection and Maintenance. The outfall sewer shall be so constructed and protected against the effects of floodwater, ice, or other hazards as to reasonably insure its structural stability and freedom from stoppage.

C. Sampling Provisions. All outfall lines shall be designed with a safe and convenient access, preferably using a manhole, so that a sample of the effluent can be obtained at a point after the final treatment process, and before discharge to or mixing with the receiving waters.

4.6. Essential Facilities

A. Emergency Power Facilities

1. General. All plants shall have an alternate source of electric or mechanical power to allow continuity of operation during power failures. Methods of providing alternate sources include:

a. provision of at least two independent sources of power, such as feeders, grid, etc., to the plant;

b. portable or in-place internal combustion engine equipment which will generate electrical or mechanical energy; or

c. portable pumping equipment when only emergency pumping is required.

2. Power for Aeration. Standby power generating capacity normally is not required for aeration equipment used in the activated sludge type processes or aerated lagoons. In cases where a history of long-term (4 hours or more) power outages have occurred, auxiliary power for minimum aeration of the activated sludge type processes or aerated lagoon will be required. Full power generating capacity may be required when discharge is to critical stream segments to protect downstream uses identified in R317-2 (Standards for Quality for Waters of the State).

3. Power for Disinfection. Standby power generating capacity shall include the capacity needed for continuous disinfection of wastewater during power outages.

B. Plant Water Supply

1. General. An adequate supply of potable water under pressure should be provided for use in the laboratory and for general cleanliness around the plant. No piping or other connections shall exist in any part of the treatment works which, under any conditions, might cause the contamination of a potable water supply. The chemical quality of the water should be checked for suitability for its intended uses such as in heat exchangers, chlorinators, etc.

2. Direct Connections

a. Potable water from a municipal or separate supply may be used directly at points above grade for hot and cold supplies in lavatory, water closet, laboratory sink (with vacuum breaker), shower, drinking fountain, eye wash fountain, and safety shower; unless local authorities require a positive break at the property line.

b. The applicant must review the requirements stated in R309-112.2 - Distribution System Rules, Drinking Water and Sanitation Rules, to assure compliance with the said rule.

c. Hot water for any of the above units shall not be taken directly from a boiler or piping used for supplying hot water to a sludge heat exchanger or digester heating unit.

3. Indirect Connections

a. Where a potable water supply is used for any purpose in a plant, a break tank, pressure pump, and pressure tank shall be provided. Water shall be discharged to the break tank through an air gap at least 6 inches (15.2 centimeters) above the maximum flood line or the spill line of the tank, whichever is higher.

b. A sign shall be permanently posted at every hose bib, faucet, hydrant, or sill cock located on the water system beyond the break tank to indicate that the water is not safe for drinking.

4. Separate Potable Water Supply. Where it is not possible to provide potable water from a public water supply, a separate well may be provided. Location and construction of the well shall be in accordance with the requirements of R309, Drinking Water and Sanitation Rules.

5. Separate Non-Potable Water Supply. Where a separate non-potable water supply or plant effluent is to be provided, a break tank will not be necessary, but all system outlets shall be posted with a permanent sign indicating the water is not safe for drinking.

C. Sanitary Facilities. Toilet, shower, lavatory, and locker facilities shall be provided in convenient locations to serve the expected staffing level at the plant.

D. Floor Slope. All floor surfaces shall be sloped adequately to a collection floor drain system.

E. Stairways

1. Stairways shall be installed wherever possible in lieu of ladders. Spiral or winding stairs are permitted only for secondary access where dual means of egress are provided. Stairways shall have slopes between 50 degrees and 30 degrees (preferably nearer the latter) from the horizontal to facilitate carrying samples, tools, etc. Each tread and riser shall be of uniform dimension in each flight. Minimum tread run shall not be less than 8 inches (20.3 centimeters). The sum of the tread run and riser shall not be less than 17 inches (43 centimeters) nor more than 18 inches (46 centimeters). A flight of stairs shall consist of not more than a 12-foot (3.7 meters) continuous rise without a platform.

2. Local, state and federal safety requirements, including those in applicable fire code, the Uniform Building Code, etc., must be reviewed and complied with. Those requirements take precedence over the foregoing requirements, if more stringent, and should be incorporated in the design.

4.7. Flow Measurement. Flow measurement devices, preferably of the primary type (devices which create a hydrodynamic condition that is sensed by the secondary element), shall be provided at the plant to continuously indicate, totalize and record volume of wastewater entering the plant in a unit time.

A. Flumes. Installation of flumes shall be as follows:

1. Flumes with throat widths of less than 6 inches (15 centimeters) shall not be installed. Throat width shall be selected to measure the entire range of anticipated flow rates at all measurement locations.

2. Locations close to turbulent, surging or unbalanced flow, or a poorly distributed velocity pattern shall be avoided. For super-critical upstream flow, a hydraulic jump should be forced to occur in a section upstream of the flume at a distance of at least 30 times maximum upstream operating depth of flume followed by a straight approach section of a length specified in this rule.

3. For flumes with throat width less than half the width of the approach channel, the length of approach channel - straight upstream section - shall be the greater of 20 times the throat width or ten times maximum upstream operating depth in flume.

4. For flumes with throat width greater than half the width of the approach channel, the length of approach channel - straight upstream section - shall be not less than ten times the maximum upstream operating depth in flume.

5. Parshall flumes shall be permitted only in locations where free discharge conditions exists on the downstream side at the average design flow. Submergence must not exceed 60 percent at the maximum design flow.

6. The stilling well, if used, and secondary measuring elements, such as floats, sensors, or gages, shall be protected against extreme weather conditions.

B. Other Flow Measurement Devices. Effluent discharged to receiving waters should be measured using flow measurement devices, such as weirs, sonic or capacitance type, etc.

C. Flow Recorders

1. Clock-wound mechanisms for recording of flow are not permitted.

2. Battery powered flow measurement devices may be permitted at locations where electrical power is not available, and continuous operability of flow measurement devices is demonstrated.

4.8. Safety and Hazardous Chemical Handling. Adequate provision shall be made to effectively protect the operator and visitors from hazards. Local, state and federal safety requirements must be reviewed and complied with. Typical items for consideration are fence, splash guards, hand and guard rails, labeling of containers and process piping, warning signs, protective clothing, first aid equipment, containments, eye-wash fountains and safety showers, dust collection, portable emergency lighting, etc.

4.9. Laboratory.

A. Treatment plants rated in excess of 1 million gallons per day (3,785 cubic meters per day) shall include a laboratory for making the necessary analytical determinations and operating control tests. Otherwise, the applicant shall show availability of services of state-certified laboratories on a continuous contract basis.

B. The laboratory size, bench space, equipment and supplies shall be such that it can perform analytical work for:

1. All self-monitoring parameters required by discharge permits;

2. The process control necessary for good management of each treatment process included in the design; and

3. Industrial waste control or pretreatment programs.

R317-3-5. Screening and Grit Removal.

5.1. Screening Devices. Coarse bar racks or screens shall be used to protect pumps, comminutors, flow measurement devices and other equipment.

5.2. Bar Racks and Screens

A. Location

1. Indoor. Screening devices, installed in a building where other equipment or offices are located, shall be accessible only through a separate outside entrance to protect the operating personnel and the equipment from damage and nuisance caused by gases, odors and potential flooding.

2. Outdoors. Screening devices not installed in enclosures or buildings shall be protected from freezing or other adverse environmental conditions.

B. Access. Screening areas shall be provided with proper work and safe access and egress, proper and emergency lighting, ventilation, and a convenient and safe means for removing the screenings.

C. Design and Installation

1. Bar Spacing. Clear openings between bars should be:

a. not more than 1 inch (2.54 centimeters) for manually cleaned screens; and

b. less than 5/8 of an inch (1.59 centimeters) for mechanically cleaned screens.

2. Bar Slope. Manually cleaned screens, except those for emergency use, should be placed on a slope of 30 to 45 degrees from the horizontal.

3. Approach Velocities. At average design flow conditions, approach velocities should be no less than 1.25 feet per second (38 centimeters per second), to prevent settling; and no greater than three (3) feet per second (91 centimeters per second) to prevent forcing material through the openings.

4. Channels. Dual channels shall be provided and equipped with the necessary gates to isolate flow from any screening unit. Provisions shall also be made to facilitate dewatering each unit. The channel preceding and following the screen shall be shaped to eliminate stranding and settling of solids. Entrance channels should be designed to provide equal and uniform distribution of flow to the screens.

5. Reliability. A minimum of two screens shall be provided. Each screen shall be designed to handle the peak design rate of flow. Where more than two screens are provided, the peak design rate of flow shall be handled with one of the largest units out of service. Where a single mechanical screen handles the peak design rate of flow, then other unit can be a manually cleaned screen.

6. Flow Measurement. The types and locations of flow measurement devices should be selected for reliability and accuracy. The effect of changes in backwater elevations, due to intermittent blinding and cleaning of screens, should be considered in the selection of the locations for flow measurement equipment.

7. Invert. The screen channel invert should be 3.0 to 6.0 inches (7.6-15.2 centimeters) below the invert of the incoming sewer.

D. Safety

1. Railings and Gratings.

a. All screening installations shall be equipped with guard rails and deck grating to insure operator safety.

b. The manually cleaned bar rack shall be accessible for cleaning insuring operator safety.

c. Proper guard rails and enclosures shall be used to protect the operator from moving parts of mechanically operated and cleaned screens. These guard rails and enclosures shall be removable for safe access to maintain and repair mechanically operated and cleaned screens. Catchments shall be provided to prevent dripping of liquids in multi-level installations.

2. Equipment Deactivation and Lockout. Each piece of electrical power mechanical equipment shall be equipped with a positive means of deactivating or locking out or isolating from its power source. Such device shall be located in close proximity to the equipment.

3. Removal of Screenings. The design shall provide for mechanical conveying or lifting systems for safe transport of screenings from a subgrade installation to a collection point on grade.

E. Power Control Systems

1. Timing Devices. All mechanical units which are operated by timing devices shall be provided with auxiliary override controls which will set the cleaning mechanism in operation at a preset high water elevation or water differential across the screen.

2. Electrical Fixtures and Controls. Electrical fixtures and controls in screening areas where hazardous gases may accumulate shall meet the requirements of the National Electrical Code for Class I, Group D, Division 1 locations.

3. Manual Override. Automatic controls shall be supplemented with a manual override.

F. Disposal of Screenings

1. Facilities shall be provided for removal, handling, storage, and disposal of screenings in a sanitary manner. Separate grinding of screenings and return to the sewage flow is unacceptable. Manually cleaned screening facilities should include an accessible platform from which the operator may rake screenings easily and safely. Suitable drainage facilities shall be provided for both the platform and the storage areas.

2. Screenings may be landfilled. The ultimate disposal of screenings shall conform to and comply with the requirements for the ultimate disposal of residues or sludge management plan.

5.3. Comminutors

A. General. Comminutors may be used in plants, excepting aerated or facultative or total containment lagoons, where mechanically cleaned bar screens are not used.

B. Design Considerations

1. Location. Comminutors should be located downstream of bar screen and any grit removal equipment.

2. Size. Comminutor capacity shall be adequate to handle the peak design rate of flow.

3. Installation.

a. A comminutor bypass channel, with manually cleaned bar screen, shall be provided. The use of the bypass channel should be automatic at depths of flow exceeding the design capacity of the comminutor. The bypass channel should be able to pass the peak design rate of flow when the comminutor channel is out of service.

b. Each comminutor that is not preceded by grit removal equipment should be protected by a 6-inch (15.2 centimeters) deep easily cleaned gravel trap.

PC Maintenance. Gates shall be provided for isolation of comminutor, comminutor channel including bypass channel for draining, repairs and maintenance. Provisions shall be made to facilitate servicing of units in place and removing units from their location for servicing.

5. Electrical Power Controls and Motors. Electrical equipment in comminutor chambers where hazardous gases may accumulate shall meet the requirements of the National Electrical Code for Class 1, Group D, Division 1 locations. Motors in areas not governed by this requirement may need protection against accidental submergence.

5.4. Grit Removal Facilities

A. General. Grit removal facilities shall be provided for all mechanical treatment plants. Pumps, comminutors, and other mechanical equipment preceding grit removal, shall be protected from the damaging effects of grit. Storage capacity shall be provided in treatment units where grit is likely to accumulate.

B. Location. Grit removal facilities should be located ahead of pumps and comminuting devices. Coarse bar racks should be placed ahead of grit removal facilities.

C. Enclosed Facilities

1. Ventilation. Uncontaminated air shall be introduced continuously at a minimum rate of 12 air changes per hour, or intermittently at a minimum rate of 30 air changes per hour. Odor control facilities are recommended.

2. Access. Grit removal facilities shall be provided with proper and safe access, and egress from equipment and facilities.

3. Electrical Work. All electrical work in enclosed grit removal areas where hazardous gases may accumulate shall meet the requirements of the National Electrical Code for Class 1, Group D, Division 1 locations.

D. Outdoor Facilities. Grit removal facilities located outside the buildings shall be protected from freezing, and other adverse environmental conditions.

E. Type and Number of Units

1. Number of Units. For plants treating:

a. more than 1 million gallons per day rate of flow (3,785 cubic meters per day), two mechanically cleaned grit removal units shall be installed in a parallel configuration. Each grit channel shall be designed to handle the peak design rate of flow.

b. less than 1 million gallons per day rate of flow (3,785 cubic meters per day), a single manually cleaned or mechanically cleaned grit chamber with a bypass channel shall be provided.

2. Other types. When arrangements other than channel-type of grit removal is considered, equipment for agitation, air supply, grit collection, grit removal, and grit washing shall be provided with controls for handling variations in rates of flow, and providing operating flexibility.

F. Design Factors

1. General. The designed effectiveness of a grit removal system shall be commensurate with the requirements of the subsequent process units.

2. Inlet Configuration. Inlet turbulence shall be minimized. The inlet flow direction must be parallel to the induced roll direction within aerated grit chambers.

3. Velocity and Detention Time.

a. Horizontal Channel-type Grit Chambers.

(1) Velocity of flow through a channel-type chamber shall be controlled such that it is not less than one foot per second (30 centimeters per second) during normal variations in flow.

(2) The detention time shall be based on the size of particle to be removed but not less than 20 seconds at the maximum design flow. Velocity and detention time in the channel shall be regulated by installation of control devices such as proportional flow, Sutro weirs, etc.

b. Aerated grit chambers.

(1) The velocity of flow through an aerated grit chamber shall not be less than 1 foot per second (30 centimeters per second) during normal variations in flow, in the direction of induced roll.

(2) A minimum detention time of two to five minutes at the maximum design flow shall be provided. Rate of aeration shall not be less than 4 cubic feet per minute per lineal foot (1.5 liters per second per meter). Outlet weir shall be provided parallel to the direction of induced roll.

c. Square grit chambers. Detention time and overflow rate for square grit chambers shall be based on the size of particles intended to be removed. Overflow rate should not exceed 40,000 gallons per day per square foot of the chamber area (1,600 cubic meters per day per square meter).

4. Grit Washing. Grit should be washed before the disposal.

5. Drains. Provision shall be made for to adequately bypass, isolate and dewater each grit removal unit for maintenance.

6. Water. An adequate supply of service or non-potable plant water under pressure shall be provided for cleanup.

G. Grit Handling.

1. Mechanical equipment for hoisting or transporting grit to ground level shall be provided in grit removal facilities located in deep pits. Impervious, non-slip, working surfaces with adequate drainage shall be provided for grit handling areas. Grit transporting facilities shall be provided with protection against freezing and loss of material.

2. Grit may be landfilled. The ultimate disposal of grit shall conform to and comply with the requirements for the ultimate disposal of residues or sludge management plan.

R317-3-6. Settling.

6.1. General Considerations

A. Number of Units. Multiple units capable of independent operation shall be provided in all plants where the design rate of flow exceed 1 million gallons per day (3,785 cubic meters per day). Plants where the design rate of flow is less than one (1) million gallons per day (3,785 cubic meters per day), shall include other provisions to assure continuity of treatment.

B. Arrangement. Settling tanks shall be arranged for optimum site utilization, and shall be consistent with the hydraulic head requirements for other ancillary units.

C. Flow Distribution. Effective flow measurement devices and control appurtenances (e.g. valves, gates, splitter, boxes, etc.) should be provided to permit proper proportioning of flow to each unit.

D. Tank Configuration. The selection of tank size and shape, and inlet and outlet type and location shall be based on the site and flow patterns.

6.2. Design Considerations

A. Dimensions.

1. The minimum length of flow from inlet to outlet should not be less than be 10 feet (3 meters) unless special provisions are made to prevent short circuiting. The sidewater depth for primary clarifiers shall be not less than 8 feet (2.4 meters).

2. Clarifiers following an activated sludge process shall have sidewater depths of at least 12 feet (3.7 meters) to provide adequate separation zone between the sludge blanket and the overflow weirs.

3. Clarifiers following fixed film reactors shall have sidewater depth of at least 8 feet (2.4 meters).

B. Surface Loading (Overflow) Rates

1. Primary Settling Tanks

a. Surface loading or overflow rates at the average design rate of flow for primary tanks shall not exceed:

(1) 600 gallons per day per square foot (24 cubic meters per square meter per day) for plants treating at the rate of flow less than 1 million gallons per day (3,785 cubic meter per day), or

(2) 1,000 gallons per day per square foot (41 cubic meters per square meter per day) for plants treating at the rate of flow more than 1 million gallons per day (3,785 cubic meter per day).

b. For primary settling, expected influent BOD_5 removal and surface loading is as shown by the relationship: E = (41.5 - (0.01 x Surface loading at average design Q)) where, E = efficiency, percent, and surface loading less than or equal to 2,000 gallons per day per square foot (82 cubic meters per square meter per day). However, anticipated higher BOD_5 removal than the one predicted using above relationship for sewage or sewage containing appreciable quantities of industrial wastes (or chemical additions to be used), shall be validated by plant performance data.

2. Intermediate Settling Tanks. Surface loading or overflow rates for intermediate settling tanks following fixed film reactor processes shall not exceed 1,000 gallons per day per square foot (41 cubic meters per square meter per day) at the average design rate of flow.

3. Final Settling Tanks

a. Settling tests should be conducted wherever a pilot study of biological treatment is warranted by unusual waste characteristics or treatment requirements.

b. The applicant will conduct pilot testing where proposed loadings go beyond the limits set forth in this section.

c. Surface loading or overflow rates for settling tanks following fixed film processes shall not exceed 800 gallons per day per square foot (33 cubic meters per square meter per day) at the average design rate of flow.

d. Settling tanks following activated sludge processes must be designed to meet thickening as well as solids separation requirements. Surface loading or overflow, and weir overflow rates must be adjusted for the various processes to minimize the problems with sludge loadings, density currents, inlet hydraulic turbulence, and occasional poor sludge settleability. The high rate of recirculation of return sludge from the final settling tanks to the aeration or reaeration tanks requires careful consideration of above factors. The hydraulic design of intermediate and final settling tanks following the activated sludge process shall be based upon the average design rate of flow excluding activated sludge return flow as shown in Table R317-3-6.2(B)(3)(d).

C. Inlet Structures. Inlets should be designed to dissipate the inlet velocity and to distribute the flow equally both horizontally and vertically and to prevent short circuiting. Channels should be designed to maintain a velocity of at least one foot per second (0.3 meter per second) at the minimum design flow. Corner pockets and dead ends should be eliminated and corner fillets or channeling used where necessary. Provisions shall be made for elimination or removal of floating materials in inlet structures.

D. Effluent Overflow Weirs

1. General. Effluent overflow weirs shall be adjustable for leveling.

2. Location. Effluent overflow weirs shall be located to optimize actual hydraulic detention time, and minimize short circuiting.

3. Design Rates. Weir loadings shall not exceed 10,000 gallons per day per lineal foot (124 cubic meters per meter per day) for plants treating the average design rate of flow of one (1) million gallons per day (3,785 cubic meters per day) or less. Higher weir loadings may be used for plants designed for larger average flows, but shall not exceed 15,000 gallons per day per lineal foot (186 cubic meters per meter per day). If pumping is required, weir loadings must be related to pump delivery rates to avoid short circuiting.

4. Weir Troughs. Weir troughs shall be designed to prevent submergence at the maximum design rate of flow (peak daily flow), and to maintain a velocity of at least one foot per second (0.3 meter per second) at one-half of the average design rate of flow. Submergence may be permitted at the maximum design rate of flow (peak daily flow) with one unit out of service.

E. Submerged Surfaces. The tops of troughs, beams, and similar submerged construction elements shall have a minimum slope of 1.4 vertical to 1 horizontal; the underside of such elements should have a slope of 1 to 1 to prevent the accumulation of scum and solids.

F. Unit Dewatering. The bypass design shall provide for redistribution of the plant flow to the remaining units in operation.

G. Freeboard. Walls of settling tanks shall extend at least 6 inches (15 centimeters) above the surrounding ground surface and shall provide not less than 12 inches (30 centimeters) freeboard. Additional freeboard or the use of wind screens should be provided where larger settling tanks are subject to high velocity wind currents that would cause tank surface waves and inhibit effective scum removal.

6.3. Sludge and Scum Removal

A. Scum Removal. Effective scum collection and removal facilities, including baffling, shall be provided for primary, intermediate and secondary settling tanks. The unusual characteristics of scum which may adversely affect pumping, piping, sludge handling and disposal, should be recognized in design. Provisions may be made for the discharge of scum with the sludge; however, other special provisions for disposal may be necessary.

B. Sludge Removal. Sludge collection and withdrawal facilities shall be designed to assure rapid removal of the sludge. Suction withdrawal of sludge from the tank floor should be provided for activated sludge plants designed for reduction of the nitrogenous oxygen demand.

1. Sludge Hopper. When scrapers are used to move sludge into a discharge hopper, the minimum slope of the side walls shall be 1.7 vertical to 1 horizontal. Hopper wall surfaces should be made smooth with rounded corners to aid in sludge removal. Hopper bottoms shall have a maximum dimension of two feet (0.6 meter). Deep sludge hoppers for sludge thickening are not acceptable.

2. Sludge Removal Piping. Each hopper shall have an individually valved sludge withdrawal line at least six inches (15 centimeters) in diameter. The static head available for withdrawal of sludge shall be 30 inches (76 centimeters) or greater, as necessary to maintain a three foot per second (0.91 meter per second) velocity in the withdrawal pipe. Clearance between the end of the withdrawal line and the hopper walls shall be sufficient to prevent bridging of the sludge. Adequate provisions shall be made for rodding or back-flushing individual pipe runs for activated sludge secondary clarifiers except for oxidation ditch clarifiers. Piping shall also be provided to return waste sludge to primary clarifiers.

3. Sludge Removal Control. Sludge wells shall be provided with telescoping valves or other equipment for viewing, sampling and controlling the rate of sludge withdrawal. The use of sight glass and sampling valves may be appropriate. A means of measuring the sludge removal rate shall be provided. Air lift type of sludge removal must not be used for removal of primary sludges. Sludge pump motor control systems shall include time clocks and valve controls for regulating the duration and sequencing of sludge removal.

6.4. Protective and Service Facilities

A. Operator Protection. All settling tanks shall be equipped to provide safe working conditions for operators. Such features shall include machinery covers, life lines, stairways, walkways, handrails and slip resistant surfaces.

B. Mechanical Maintenance Access. The design shall provide for convenient and safe access to routine maintenance items such as gear boxes, scum removal mechanisms, baffles, weirs, inlet stilling baffle area, sludge and scum pumps, and effluent channels.

C. Electrical Fixtures and Controls. Electrical fixtures and controls in enclosed settling basins shall meet the requirements of the National Electrical Code for Class 1, Group D, Division 1 locations. The fixtures and controls shall be located so as to provide convenient and safe access for operation and maintenance. Walkways, bridge area and area around settling tanks shall be illuminated with area lighting for operating personnel safety.

R317-3-7. Biological Treatment.

7.1. Trickling Filters

A. General. Trickling filters shall be preceded by effective settling tanks equipped with scum and grease collecting devices, or other suitable pretreatment facilities.

B. Hydraulics

1. Distribution. The sewage may be distributed over the filter by rotary distributors or other suitable devices which will ensure uniform wastewater distribution to the surface area. Uniform hydraulic distribution of sewage on the filters is required.

2. For reaction type distributors, a minimum head of 24 inches (61 centimeters) between low water level in the siphon chamber and center of the arms is required. Similar allowance in design shall be provided for added pumping head requirements where pumping to the reaction type distributor is used. The applicant should evaluate other types of drivers and drives.

3. A minimum clearance of 6 inches (15 centimeters) between media and distributor arms shall be provided. Larger clearance than 6 inches (15 centimeters) must be provided where ice buildup may occur.

C. Wastewater Application. Application of the sewage shall be continuous. The piping system shall be designed for recirculation. The design must provide for routine flushing of filters by heavy dosing at intermittent intervals.

D. Piping System. The piping system, including dosing equipment and distributor, shall be designed to provide capacity for the peak design rate of flow, including recirculation.

E. Media

1. Quality

a. The media may be crushed rock, slag, or specially manufactured material. The media shall be durable, resistant to spalling or flaking and insoluble in sewage. The top 18 inches (46 centimeters) shall have a loss by the 20-cycle, sodium sulfate soundness test of not more than 10 percent. The balance is to pass a ten-cycle test using the same criteria. Slag media shall be free from iron.

b. Manufactured media shall be resistant to ultraviolet degradation, disintegration, erosion, aging, all common acids and alkalies, organic compounds, and fungus and biological attack. Such media shall be structurally capable of supporting a man's weight or a suitable access walkway shall be provided to allow for distributor maintenance.

2. Depth. The filter design shall provide for a depth of:

a. not less than 5 feet (1.5 meters) above the underdrains, but not more than 10 feet (3 meters) when rock or slag media is used in the filters.

b. not less than 10 feet (3 meters) above the underdrains to provide adequate contact time with the wastewater, but not more than 30 feet (9 meters) unless additional structural construction and aeration are provided, when manufactured media is used in the filters.

3. Size and Grading of Media

a. Rock, Slag and Similar Media

(1) Rock, slag, and similar media shall not contain more than 5 percent by weight of pieces whose longest dimension is three times the least dimension.

(2) Media shall be free from thin, elongated and flat pieces, dust, clay, sand or fine material and shall conform to the size and grading when mechanically graded over vibrating screens with square openings, as shown in Table R317-3-7.1(E)(3(a)(2).

b. Manufactured Media. The applicant must evaluate suitability of manufactured media on the basis of experience with installations handling similar wastes and loadings.

c. Handling and Placing of Media. Material delivered to the filter site shall be stored on wood-planked or other approved clean, hard-surfaced areas. All material shall be rehandled at the filter site and no material shall be dumped directly into the filter. Crushed rock, slag and similar media shall be washed and rescreened or forked at the filter site to remove all fines. Such material shall be placed by hand to a depth of 12 inches (30 centimeters) above the tile underdrains. The remainder of material may be placed by means of belt conveyors or equally effective methods approved by the design engineer. All material shall be carefully placed so as not to damage the underdrains. Manufactured media shall be handled and placed as approved by the engineer. Trucks, tractors, and other heavy equipment shall not be driven over the filter during or after construction.

F. Underdrain System

1. Arrangement. Underdrains with semicircular inverts or equivalent should be provided and the underdrainage system shall cover the entire floor of the filter. Inlet openings into the underdrains shall have an unsubmerged gross combined area equal to at least 15 percent of the surface area of the filter.

2. Hydraulic Capacity and Ventilation.

a. The underdrains shall have a minimum slope of 1 percent. Effluent channels shall be designed to produce a minimum velocity of two (2) feet per second (0.61 meters per second) at average daily rates of application to the filter.

b. The underdrainage system, effluent channels, and effluent pipe shall be designed to permit a free passage of air preventing septicity within the filter. The size of drains, channels, and pipe should be such that not more than 50 percent of their cross-sectional area will be submerged under the design peak hydraulic loading, including proposed or possible future recirculated flows. Forced air ventilation must be provided for deep or covered filters using manufactured media. The design of filters should be compatible for the installation of odor control equipment such as covers, forced air ventilation, scrubber, etc., as a retrofit.

3. Flushing. The design should include means for flushing of the underdrains. In small filters, use of a peripheral head channel with vertical vents is acceptable for flushing purposes. Means or facilities of inspection of underdrainage should be provided.

G. Special Features

1. Flooding. Appropriate valves, sluice gates, or other structures shall be provided to enable flooding of filters comprised of rock or slag media.

2. Freeboard. A freeboard of not less than 4 feet (1.2 meters) should be provided for tall filters using manufactured media, to maximize the containment of windblown spray.

3. Maintenance. All distribution devices, underdrains, channels, and pipes shall be installed so that they may be properly maintained, flushed or drained.

4. Freeze Protection. When climatic conditions are expected to result in operational problems due to cold temperatures, the filters may be covered for protection against freezing; maintaining operation and treatment efficiencies.

5. Recirculation. The piping and pumping systems shall be designed for recirculation rates as required to achieve sufficient wetting of biofilm and the design efficiency.

6. Recirculation Measurement. Recirculation rate to the filters shall be measured using flow measurement and recording devices. Time lapse meters and pump head recording devices are acceptable for facilities treating less than 1 million gallons per day (3,785 cubic meters per day).

H. Rotary Distributor Seals. Mercury seals are not permitted. The design of the distributor support septum shall provide for convenient and easy seal replacement to assure continuity of operation.

I. Multi-Stage Filters. The foregoing standards in this rule also apply to all multi-stage filters.

J. Unit Sizing

1. Required volumes of rock or slag media filters shall be based upon the following equations: For Single or First stage of Trickling Filter: $E = 100 - ((100 / (3 + 2 (R/I))) + (0.4 x (W / V) - 10))$. For Second stage of Trickling Filter: $E = 100 x ((1 + (R_2 / I)) / (2 + (R_2 / I)))$ where, E = Efficiency, percent R = recirculated flow through trickling filter, mgd I = raw sewage flow, mgd W = pounds of BOD_5 per day in raw sewage V = volume of filter media in 1000 cubic feet R_2 = recirculated flow through second-stage trickling filter, mgd.

2. The required volume of media may be determined by pilot testing or use of any of the various empirical design equations that have been verified through actual full scale experience. Such calculations must be submitted if pilot testing is not utilized. Pilot testing is recommended to verify performance predictions based upon the various design equations, particularly when significant amounts of industrial wastes are present.

3. Expected performance of filters packed with manufactured media shall be determined from documented full scale experience on similar installations or through actual use of a pilot plant on site.

K. Nitrification

1. Trickling filters may be used for nitrification. The design should be based as shown in Table R317-3-7.1(K)(1).

2. Nitrification is affected by variations in flow, loadings and temperature, and other factors. Therefore, the applicant must conduct pilot studies before developing the design criteria.

L. Design Safety Factors. Trickling filters are affected by diurnal load conditions. The volume of media determined from either pilot plant studies or use of acceptable design equations shall be based upon organic loading at the maximum design rate of flow rather than the average design rate of flow.

7.2. Activated Sludge

A. General. The activated sludge process and its several modifications may be used to accomplish varied degrees of removal of suspended solids, and reduction of carbonaceous and nitrogenous oxygen demand. The degree and consistency of treatment required, type of waste to be treated, proposed plant size, anticipated degree of operation and maintenance, and operating and capital costs determine the choice of the process to be used. The design shall provide for flexibility in operation. Plants over 1 million gallons per day (3,785 cubic meters per day) shall be designed to facilitate easy conversion to various operational modes. In severe climates, protection against freezing shall be provided to ensure continuity of operation and performance.

B. Aeration

1. Capacities and Permissible Loadings

a. The design of the aeration tank for any particular adaptation of the process shall be based on full scale experience at the plants receiving wastewater of similar characteristics under similar climatic conditions, pilot plant studies, or calculations based on process kinetics parameters reported in technical literature. The size of treatment plant, diurnal load variations, degree of treatment required, temperature, pH, and reactor dissolved oxygen when designing for nitrification, influence the design. Calculations using values differing substantially from those in the table shown below must reference actual operational data.

b. The applicant must substantiate capability of the aeration and clarification systems in the processes using mixed liquor suspended solids levels greater than 5,000 milligrams per liter.

c. The applicant shall use the values shown in Table R317-3-7.2(B)(1)(c) to determine the aeration tank capacities and permissible loadings for the several adaptations of the processes, when process design calculations are not submitted. These values are based on the average design rate of flow, and apply to plants receiving peak to average diurnal load ratios ranging from about 2:1 to 4:1.

2. Arrangement of Aeration Tanks

a. Dimensions. Effective mixing and utilization of air must be the basis of dimensions of each independent mixed liquor aeration tank or return sludge reaeration tank. Liquid depths should not be less than 10 feet (3 meters) or more than 30 feet (9 meters) unless the applicant justifies the need for shallower or deeper tanks.

b. Short-circuiting. The shape of the tank and the installation of aeration equipment should provide for positive control of short-circuiting through the aeration tank.

c. Number of Units. Total aeration tank volume shall be divided among two or more units, capable of independent operation, to meet applicable effluent limitations and reliability guidelines.

d. Inlets and Outlets. Inlets and outlets for each aeration tank unit shall be suitably equipped with valves, gates, stop plates, weirs, or other devices to permit controlling the flow to any unit and to maintain reasonable constant liquid level. The hydraulic properties of the system shall permit the maximum instantaneous hydraulic load to be carried with any single aeration tank unit out of service.

e. Conduits. Channels and pipes carrying liquids with solids in suspension shall be designed to maintain self-cleaning velocities or shall be agitated to keep such solids in suspension at all rates of flow within the design limits. Drains shall be installed in the aeration tank to drain segments or channels which are not being used due to alternate flow patterns.

f. Freeboard. All aeration tanks should have a freeboard of not less than 18 inches (46 centimeters). Additional freeboard or windbreak may be necessary to protect against freezing or windblown spray.

3. Aeration Requirements

a. Oxygen requirements must be calculated based on factors such as, maximum organic loading, degree of treatment, level of suspended solids concentration (mixed liquor) to be maintained, and uniformly maintaining a minimum dissolved oxygen concentration in the aeration tank, at all times, of two milligrams per liter.

b. When pilot plant or experimental data on oxygenation requirements are not available, the design oxygen requirements shall be calculated on the basis of:

(1) 1.2 pounds 0_2 per pound of maximum BOD_5 applied to the aeration tanks (1.2 kilograms 0_2 per kilogram of maximum BOD_5), for carbonaceous BOD_5 removal in all activated sludge processes with the exception of the extended aeration process,

(2) 2 pounds 0_2 per pound of maximum BOD_5 applied to the aeration tanks (two kilograms 0_2 per kilogram of maximum BOD_5) for carbonaceous BOD_5 removal in the extended aeration process,

(3) 4.6 pounds 0_2 per pound of maximum total kjeldahl nitrogen (TKN) applied to the aeration tanks (1.2 kilograms 0_2 per kilogram of maximum TKN), for oxidizing ammonia in the case of nitrification, and

(4) oxygen demand due to the high concentrations of BOD_5 and TKN associated with recycle flows such as, digester supernatant, heat treatment supernatant, belt filter pressate, vacuum filtrate, elutriates, etc.

c. Oxygen utilization should be maximized per unit power input. The aeration system should be designed to match the diurnal organic load variation while economizing on power input.

4. Diffused Air Systems

a. The design of the diffused air system to provide the oxygen requirements shall be done using data derived from pilot testing or an empirical approach.

b. Air requirements for a diffused air system may be determined by use of any of the recognized equations incorporating such factors as:

(1) tank depth;
(2) alpha factor of waste;
(3) beta factor of waste;
(4) certified aeration device transfer efficiency;
(5) minimum aeration tank dissolved oxygen concentrations;
(6) critical wastewater temperature; and
(7) altitude of plant.

c. In the absence of experimentally determined alpha and beta factors by an independent laboratory for the manufacturer or at the site, wastewater transfer efficiency shall be assumed to be 50 percent of clean water efficiency for plants treating primarily (90 percent or greater) domestic sewage. Treatment plants where the waste contains higher percentages of industrial wastes shall use a correspondingly lower percentage of clean water efficiency and shall submit calculations to justify such a percentage.

d. The design air requirements shall be calculated on the basis of:

(1) 1,500 cubic feet per pound of maximum BOD_5 applied to the aeration tanks (94 cubic meters per kilogram of maximum BOD_5), for carbonaceous BOD_5 removal in all activated sludge processes with the exception of the extended aeration process,

(2) 2,000 cubic feet per pound of maximum BOD_5 applied to the aeration tanks (125 cubic meters per kilogram of maximum BOD_5) for carbonaceous BOD_5 removal in the extended aeration process,

(3) 5800 cubic feet per pound of maximum total kjeldahl nitrogen (TKN) applied to the aeration tanks (360 cubic meters per kilogram of maximum TKN), for oxidizing ammonia in the case of nitrification,

(4) corresponding air quantities for satisfaction of oxygen demand due to the high concentrations of BOD_5 and TKN associated with recycle flows such as, digester supernatant, heat treatment supernatant, belt filter pressate, vacuum filtrate, elutriates, etc., and

(5) air required for channels, pumps, aerobic digesters, or other uses.

e. The capacity of blowers or air compressors, particularly centrifugal blowers, must be calculated on the basis of air intake temperature of 40 degrees Centigrade (104 degrees Fahrenheit) or higher and the less than normal operating pressure. The capacity of drive motor must be calculated on the basis of air intake temperature of -30 degrees Centigrade (-22 degrees Fahrenheit) or less. The design must include means of controlling the rate of air delivery to prevent overheating or damage to the motor.

f. The blowers shall be provided in multiple units, so arranged and in such capacities as to meet the maximum air demand with the single largest unit out of service. The design shall also provide for varying the volume of air delivered in proportion to the load demand of the plant. Aeration equipment shall be easily adjustable in increments and shall maintain solids suspension within these limits.

g. Diffuser systems shall be capable of providing for the maximum design oxygen demand or 200 percent of the average design oxygen demand, whichever is larger. The air diffusion piping and diffuser system shall be capable of delivering normal air requirements with minimal friction losses.

h. Air piping systems should be designed such that total head loss from blower outlet (or silencer outlet where used) to the diffuser inlet does not exceed 0.5 pounds per square inch (0.04 kilogram per square centimeter) at average operating conditions.

i. The spacing of diffusers should be in accordance with the oxygen requirements through the length of the channel or tank, and should be designed to facilitate adjustment of their spacing without major revision to air header piping. Removable diffuser assemblies are recommended to minimize downtime of aeration tanks.

j. Individual assembly units of diffusers shall be equipped with control valves, preferably with indicator markings for throttling, or for complete shutoff. Diffusers in any single assembly shall have substantially uniform pressure loss.

k. Air filters shall be provided in numbers, arrangements, and capacities to furnish, at all times, an air supply sufficiently free from dust to prevent damage to blowers and clogging of the diffuser system used.

5. Mechanical Aeration Systems

a. Oxygen Transfer Performance. The mechanism and drive unit shall be designed for the expected conditions in the aeration tank in terms of the power performance. The mechanical aerator performance shall be verified by certified testing.

b. Design Requirements. The design requirements of a mechanical aeration system shall accomplish the following:

(1) Maintain a minimum of 2.0 milligrams per liter of dissolved oxygen in the mixed liquor at all times throughout the tank or basin;

(2) Maintain all biological solids in suspension;

(3) Meet maximum oxygen demand and maintain process performance with the largest unit out of service; and

(4) Provide for varying the amount of oxygen transferred in proportion to the load demand on the plant.

c. Winter Protection. Due to high heat loss and the nature of spray-induced agitation, the mechanism, as well as subsequent treatment units, shall be protected from freezing where extended cold weather conditions occur.

6. Return Sludge Equipment

a. Return Sludge Rate

(1) The minimum permissible return sludge rate of withdrawal from the final settling tank is a function of the concentration of suspended solids in the mixed liquor entering it, the sludge volume index of these solids, and the length of time these solids are retained in the settling tank. Since undue retention of solids in the final settling tanks may be deleterious to both the aeration and sedimentation phases of the activated sludge process, the rate of sludge return expressed as a percentage of the average design flow of sewage should be between the limits set forth in Table R317-3-7.2(B)(6)(a)(1).

(2) The rate of sludge return shall be varied by means of variable speed motors, drives, or timers (in plants designed for less than one million gallons per day - 3,785 cubic meters per day) to pump sludge at the above rates.

b. Return Sludge Pumps

(1) If motor driven return sludge pumps are used, the maximum return sludge capacity shall be with the largest pump out of service. A positive head should be provided on pump suctions. Pumps should have at least 3 inch (7.6 centimeters) suction and discharge openings.

(2) If air lifts are used for returning sludge from each settling tank hopper, no standby unit is required provided the design of the air lifts are such to facilitate their rapid and easy cleaning and provided standby air lifts are provided. Air lifts should be at least 3 inches (7.6 centimeters) in diameter.

c. Return Sludge Piping. Discharge piping shall not be less than 4 inches (10 centimeters) in diameter, and should be designed to maintain a velocity of not less than two (2) feet per second (0.61 meters per second) when return sludge facilities are operating at normal return sludge rates. Sight glasses, sampling ports and rate of flow controllers for return activated sludge flow from each settling tank hopper shall be provided.

7. Waste Sludge Facilities

a. The design of waste sludge control facilities should be based on a logically developed solids mass balance at the maximum design flow. Otherwise, a maximum capacity of not less than 25 percent of the average design flow shall be provided, and function satisfactorily at rates of 0.5 percent of average sewage flow or a minimum of 10 gallons per minute (0.63 liters per second), whichever is larger.

b. Sight glasses, sampling ports and rate of flow controllers for waste activated sludge flow shall be provided.

c. Waste sludge may be discharged to the concentration or thickening tank, primary settling tank, sludge digestion tank, vacuum filters, other thickening equipment, or any practical combination of these units.

7.3. Flow Measurement. Instrumentation should be provided in all plants for indicating flow rates of raw sewage or primary effluent, return sludge, and air to each tank unit. For plants designed for the average design rate of flow of 1 million gallons per day (3,785 cubic meters per day) or more, these devices should total, record, and indicate the rate of flow. Where the design provides for all return sludge to be mixed with the raw sewage (or primary effluent) at one location, then the mixed liquor flow rate to each aeration unit should be measured.

7.4. Other Biological Systems. The Director may consider and approve new biological treatment processes with promising applicability in wastewater treatment. The approval will be based on the required engineering data for new process evaluation as provided in this rule.

7.5. Packaged Plants. The Director may consider and approve packaged biological treatment plants only when there are no other and appropriate alternatives for waste treatment. These type of plants shall be designed for handling large flow variations and to meet all requirements contained in this rule. The applicant must consider the need for close attention and competent operating supervision, including routine laboratory control, when proposing a packaged plant.

R317-3-8. Disinfection.

8.1. General

A. All wastewaters containing pathogens or coliform bacteria must be disinfected before discharge to a water course. The disinfection procedures must consider any effect on the natural aquatic habitat and biota of the receiving water course. Effectiveness of disinfection also varies with BOD_5 and suspended solids in the effluent. If chlorination is utilized, it may be necessary to dechlorinate if the residual chlorine level would otherwise impair the receiving water course. The applicant must submit justification to the Director for the determination of the acceptability of any disinfection system other than chlorination or ultraviolet irradiation.

B. If effluent to be discharged meets applicable bacteriologic standards before disinfection, the Director may waive the disinfection process. However, all plants must have an ability to introduce a disinfectant in the effluent with proper reaction time before discharge. An example could be multi-celled (more than three cells) lagoon discharge following extended storage in excess of 150 days.

C. The disinfection method should be selected after due consideration of wastewater flow rates, application rates, demand rates and effects, pH of the wastewater, cost of equipment, availability, maintenance, reliability and safety problems.

D. Chlorine is the most commonly used chemical for wastewater disinfection. The forms most often used are liquid-gaseous chlorine and sodium and calcium hypochlorite. The Director may review and accept other disinfection methods based on the information submitted.

8.2. Design

A. Capacity of System

1. Required disinfection capacity will vary, depending on the uses and points of application of the disinfectant, e.g., prechlorination, post chlorination, odor and process control uses, etc.

2. For disinfection of the wastewater before its discharge to a water course, the disinfection system capacity shall be sufficient to produce an effluent that will meet the coliform bacteria limits specified for that installation at all times. This condition must be attainable when maximum flow rates occur and during emergency conditions. For non-chemical disinfecting systems, an equivalent installed capacity shall be provided. Normal dosage requirements for disinfection will vary with the quality of effluent to be treated.

3. Duplicate disinfection systems shall be provided. Where only two units are installed, each shall be capable of feeding the expected maximum dosage rate.

4. Disinfection system equipment should be provided with necessary changeable parts to permit operation of system at initial anticipated flows at mid-scale on flow meters and other devices. Spare parts shall be provided for all disinfection equipment to replace parts which are subject to wear and breakage. Operation and maintenance data for all equipment shall be furnished.

5. Dosage control based on effluent flow rate should be provided because of the diurnal variations in the disinfectant demand of the wastewater. A residual disinfectant concentration must be maintained to insure the pathogen destruction, and subsequent reactivation, if any.

B. Contact Period

1. For a chlorination system, a minimum contact period is required after a thorough mixing of disinfectant with the effluent. The minimum contact period shall be greater of:

a. 30 minutes at the maximum design rate of flow (peak daily rate of flow) or the maximum pumping rate, or

b. 60 minutes at the average design rate of flow.

2. This contact period shall normally be provided in the contact tank. Contact period in pipeline or outfalls before discharge into a water course, may be credited towards the contact time if the effluent discharge point can be sampled.

C. Contact Chambers

1. The contact chambers must be designed such that:

a. effectiveness of disinfection is maximized;

b. accumulation of solids is minimized;

c. maintenance and cleaning is facilitated; and

d. short circuiting of flow is reduced to a practical minimum by installation of baffles.

2. Two tanks are required for all plants treating more than 1 million gallons per day (3,785 cubic meters per day). Means of removal of solids from the tank bottom shall be provided. Solids and drainage water must be returned to the head end of the plant. Skimming devices should be provided in all contact tanks. Covered tanks must have means of access for maintenance and cleaning.

3. Pipelines and outfall sewers may be acceptable as effective plug-flow contact chambers.

4. The applicant must incorporate all of the above process and design features in devices using other disinfecting methods.

D. Point of Application

1. The design shall provide for application of chlorine or other disinfectants to all fully treated, partially treated, or untreated wastewater discharged from the treatment plant. Other points of application shall be incorporated in the design for process considerations such as prechlorination, odor control, control of sludge bulking, etc. All application points shall be submerged below the wastewater surface.

2. Chlorine shall be positively mixed as rapidly as possible, with a complete mix being effected in three seconds. This may be accomplished by either the use of turbulent flow regime or a mechanical flash mixer.

8.3. Disinfection Methods

A. Chlorination (Liquid or Gaseous Chlorine)

1. Equipment

a. The installed capacity of a chlorine feed system shall be sufficient to provide a dosage of 25 milligrams per liter at the maximum design rate of flow. Procedures recommended by the Chlorine Institute and the Occupational Safety and Health Administration, the US Department of Labor, and succeeding organizations should be carefully followed in handling, installation, operation and maintenance of chlorination equipment. The requirements, procedures and recommendations from these organizations take precedence over the requirements stated herein, if more stringent.

b. Liquid chlorine lines from tank cars to evaporators shall be buried and installed in a conduit and shall not be exposed in below grade spaces. Systems shall be designed for the shortest possible pipe transportation of liquid chlorine. When chlorine cylinders are used, two scales, indicating and recording type, should be used for weighing the cylinders in use. Each scale should be sized to accommodate the maximum number of cylinders required to deliver chlorine at the maximum chlorine feeding rate. Adequate means for supporting cylinders on the scales should be provided. Scales shall be of corrosion-resistant material.

c. Separate manifolds shall be provided for the bank of cylinders on each scale. The manifolds shall be properly valved so that one bank of cylinders may be replaced while chlorine is being withdrawn from the other bank of cylinders. Provision should be made for automatically changing the withdrawal of chlorine from one bank of cylinders to the second when the chlorine in the first bank of cylinders has been exhausted.

d. Gas chlorinators shall be of the solution feed type. The design capacity of evaporators must correspond to gaseous chlorine demand, where several cylinders or ton containers are manifolded to evaporate sufficient chlorine. Chlorine gas systems and piping should be of vacuum type.

2. Housing and Storage

a. Local, state and federal safety requirements, including fire code, shall be carefully followed in storing and handling of chlorine containers, cylinders or tank cars.

b. Gaseous chlorine and chlorination equipment rooms shall be isolated from other sections of the building by gas-tight partitions. Separation of the chlorine storage room and the chlorination equipment room is required for safety. All doors and rooms containing gas chlorination equipment and rooms used for chlorine gas storage should open only to the outside of the building, and all doors should be equipped with panic hardware and a viewing window. Multiple exits to the outside should be provided for each room in which chlorine gas is stored or used. Rooms housing chlorination equipment should be heated to 70 degrees Fahrenheit (21 degrees Centigrade), but never in excess of normal summer temperatures. Rooms containing chlorine cylinders from which chlorine is being withdrawn should be heated to above 60 degrees Fahrenheit (16 degrees Centigrade), but never above the temperature of the equipment room. Where chlorine containers are stored out of doors, the storage area shall be provided with a canopy. Similar precautions should be taken for tank cars. Also, if containers are stored out of doors, cylinders and containers must be allowed to reach room temperature before being placed in use. Floor drains from chlorine rooms must not be connected to floor drains from other rooms.

c. Chlorine rooms shall be at ground level, and should permit easy access to all equipment. The storage area should be separated from the feed area. Chlorination equipment should be situated as close to the application point as reasonably possible.

3. Ventilation and Heating

a. With chlorination systems, forced, mechanical ventilation shall be installed which will provide one complete air change per minute when the room is occupied.

b. When unoccupied, facilities in the ventilation system may be provided with means to reduce the number of air changes to twenty per hour to conserve energy. Whenever such a two-speed ventilation system is used, adequate provisions shall be made to insure that one complete air change per minute is provided when the room is occupied.

c. The entrance to the air exhaust duct from the room shall be near the floor and the point of discharge shall be so located as not to contaminate the air inlet to any buildings or inhabited areas.

d. Air inlets shall be so located as to provide cross ventilation with air and at such temperature that will not adversely affect the chlorination equipment. The vent hose from the chlorinator shall discharge to the outside atmosphere above grade or to the scrubbing system.

e. Switches for exhaust fans and cylinders shall be kept at essentially room temperature.

f. Chlorine scrubbing systems should be incorporated in the design of handling and storage areas where required by the state or local codes.

4. Ancillary Services

a. Water Supply. An ample supply of water meeting a minimum of secondary effluent quality, R317-1, Definitions and General Requirements, shall be available for operating the chlorinator. All in-plant use of effluent shall be taken from downstream of the sampling point for effluent quality monitoring and permit compliance. Where a booster pump is required, a standby booster pump shall be provided, and standby power shall be available.

b. Other Equipment. All electrical fixtures and drainage conduits in chlorination equipment rooms and chlorine storage rooms shall be gas-tight to prevent the spread of chlorine gas in the event of a leak.

5. Piping and Material. Piping systems should be as simple as possible, specifically selected and manufactured to be suitable for chlorine service, with a minimum number of joints. Piping should be well supported and protected against temperature extremes. Low pressure lines made of hard rubber, saran-lined, rubber-lined, polyethylene, polyvinyl chloride (PVC), or Uscolite materials are satisfactory for wet chlorine or aqueous solutions of chlorine.

6. Reliability. The design of the system must include the necessary provisions that will either prevent failures or allow immediate corrective action to be taken. Standby power, duplicate equipment and water storage shall be incorporated in the design to prevent interruption of feed, water supply and backup to power and equipment failures.

7. Residual Monitoring

a. An indicating and recording type residual chlorine analyzer using accepted test procedures shall be installed to monitor residual chlorine as required in the discharge permit.

b. Where dechlorination is used, residual chlorine analyzers shall be equipped with audible and visual alarms to indicate discharge of chlorine in the effluent.

8. Safety

a. At least two complete sets of respiratory air-pac protection equipment, meeting the requirements of the Occupational Safety and Health Administration (OSHA), shall be available where chlorine gas is handled, and shall be stored at a convenient location, but not inside any room where chlorine is used or stored. Instructions for using the equipment shall be

posted near the equipment. The equipment shall, using compressed air, have at least 30-minute capacity, and be compatible with the equipment used by the fire department responsible for the plant.

b. Where ton containers or tank cars are used, a leak repair kit approved by the Chlorine Institute shall be provided. Caustic soda solution reaction tanks for absorbing the contents of leaking ton containers must be provided where such containers are in use. The installation of automatic gas detection and related alarm equipment must be provided.

B. Ultraviolet Irradiation

1. The Director will consider and approve the use of ultraviolet irradiation for disinfection of wastewater treatment plant effluent based on the information submitted. Effectiveness of this system depends upon shallowness of depth or contact volume at the point of application and relative absence of suspended solids.

a. The applicant must submit supporting data describing the proposed system and including such items as contact geometry between the ultraviolet light source and water, reliability, and suitability of the effluent for this process. Designs should be investigated for sound application of the fundamentals of UV disinfection theory.

b. The design shall be based on factors such as, plug-flow hydraulics, intimate contact with the UV light for a sufficient period, short-circuiting, illumination. Tracer test results are helpful in assessment of hydraulic characteristics.

c. Materials of construction should be consistent with the wastewater and environment.

2. The design of ultraviolet disinfection systems shall be based on on-site testing and the following considerations:

a. Wastewater characteristics. Concentration of total suspended solids (TSS), calcium, magnesium, iron, etc., should be such that UV disinfection is effective. The wastewater should contain low levels of total suspended solids, preferably 20 milligrams per liter or below, and must transmit at least 50 percent of UV light through a wastewater depth of one (1) centimeter.

b. Layout

(1) Adequate space around the UV units to accommodate maintenance activities is required.

(2) Easy removal and replacement of lamps without the use of special tools by one man should be a feature of the equipment design.

(3) The ballasts should be arranged for ready and unhindered access for removal or replacement of any ballast without having a need to remove others.

(4) The layout design must provide adequate floor space for any separate components of the UV system in addition to the UV reactor itself, including requirements for power supply cabinets or cleaning equipment.

(5) Modular design with multiple units to allow uninterrupted service when performing maintenance must be specified.

3. Electrical Requirements

a. power consumption of this process alone should be separately metered.

b. UV lamps and ballasts must be properly matched. The proper matching of lamp and ballast will improve the lamps output and extend its useful life.

c. arrangements for shutting off banks of lamps within a single unit must be provided for lamp replacement or maintenance.

d. power controls should be provided for matching output of lamps with the rate of flow, and system maintenance by the plant staff.

e. minimum electrical standards of construction shall conform to the National Electrical Code, and other applicable codes and standards, consistent with the location or environment surrounding the UV unit and associated equipment.

4. Ventilation. Adequate ventilation to the structure housing the electrical components of the system must be provided to prevent failures from overheating.

5. Cleaning

a. The various means of chemical cleaning available must be evaluated. The evaluation must cover methods required for the unit to be drained; volume of cleansing agent required per cleaning; disposition of spent cleaning solution; manpower requirements to accomplish a cleaning cycle; capital costs of the cleaning and equipment; cleaner cost availability; and special storage and handling needs.

b. The system design must provide for complete draining and easy cleaning.

c. Ultrasonic cleaning must be considered for prevention of biofilm growth on non-illuminated quartz sleeves.

6. Monitoring and Instrumentation

i. Adequate staffing and resources to conduct the data collection and monitoring required for assessing performance must be provided.

ii. Each individual lamp output shall be measured and recorded.

8.4. Dechlorination

A. Sulfur Dioxide (SO_2)

1. Sulfur dioxide is most readily available in liquid (gaseous) form in ton containers similar to chlorine. Approximately, 1 milligram per liter of sulfur dioxide is required to dechlorinate 1 milligram per liter of chlorine residual (free or combined).

2. The dechlorination reaction between sulfur dioxide and both free and combined chlorine is a rapid reaction and requires only a few seconds of contact. The design of sulfur dioxide system must be based on the following considerations:

a. Equipment. Generally sulfur dioxide shall be fed as a gas similar to chlorine gas, as described in R317-3-8. The sulfur dioxide header should be heated to prevent re-liquefaction.

b. Housing and Storage. These requirements are same as to those for chlorine, as described in R317-3-8.

c. Ventilation. These requirements are same as to those for chlorine, as described in R317-3-8.

d. Ancillary Services. These requirements are same as to those for chlorine, as described in R317-3-8.

e. Piping and Material. Pipe material (plastics) inside the sulfonator must be compatible with continuous exposure to sulfur dioxide gas.

f. Reliability. These requirements are same as to those for chlorine, as described in R317-3-8.

g. Residual Monitoring. Control is critical when sulfur dioxide is used as the dechlorinating agent because excess sulfur dioxide consumes excess dissolved oxygen in the wastewater or receiving waters. The dechlorination reaction between sulfur dioxide and both free and combined chlorine is rapid, a few seconds at the most, so sampling can be performed immediately downstream of good mixing. The system should be monitored with a residual chlorine analyzer.

h. The design shall incorporate reaeration of the effluent to be in compliance with the dissolved oxygen requirement, if any, of the discharge permit.

i. Safety

(1) Adequate precautions must be taken for storing sulfur dioxide as it is a potentially hazardous chemical to store.

(2) Provide the same amount of air changes per hour as would be required for chlorine, together with a sulfur dioxide sensing and alarm detector.

B. Other Dechlorinating Agents. The Director may review and approve other methods and chemicals for dechlorination based on the information submitted.

R317-3-9. Sludge Processing and Disposal.

9.1. Design Considerations

A. Process Selection

1. The selection of sludge handling and disposal methods must be based on the following considerations:

a. Energy requirements;

b. Efficiency of equipment for sludge thickening;

c. Complexity and costs of equipment and operations;

d. Staffing requirements;

e. Toxic effects of heavy metals and other substances on sludge stabilization and disposal alternatives;

f. Treatment and disposal of side-stream flows, such as digester and thickener supernatant;

g. Process considerations and good house keeping procedures for minimum waste stream generation;

h. A back-up method of sludge handling and disposal; and

i. The long term effects and regulatory requirements on methods of ultimate sludge disposal.

2. The selected process shall be designed to result in stabilized sludge prior to disposal. Significant reduction of odors, volatile solids and reduction or deactivation of pathogenic organisms can be achieved by chemical, physical, thermal or biological treatment processes; thereby reducing public health hazards and nuisance conditions.

B. Sludge Quantities

1. The sludge treatment system shall be designed to accommodate the quantities of sludge generated through the design period. Individual process sizing shall consider the sludge generation peaking factors appropriate for the size and type of facility, with allowance for: seasonal variations, industrial loads, and type of collection system. Reserve capacity in the form of off-line storage, standby units or use of extended hours of operation should be considered to handle peak sludge loads.

2. In plants treating less than one million gallons per day (3,785 cubic meters per day), sludge dewatering equipment may operate for less than 35 hours per week. Sludge processing equipment must be designed to operate efficiently over the range of sludge characteristics expected from the preceding unit process. The design engineer shall submit to the Director, copies of design sizing calculations and relevant information to include:

a. average and maximum sludge quantities;

b. number and size of units;

c. equipment characteristics, conditioning chemical requirements and basic sizing parameters;

d. hours of operation;

e. expected capture efficiency;

f. expected percent solids yield.

C. Recycle loads. The sludge system as well as the liquid handling system shall be designed to take into consideration the recycle BOD5, suspended solids, nitrogen and phosphorus from the solids processing units. The magnitude of such recycle loads and resulting additional sludge will normally range from 5 to 30 percent of the influent loads. Solids balances to account for the additional solids must be calculated.

D. Sludge Storage

1. Design Considerations

a. When the plant design, except for the lagoons, does not include aerobic or anaerobic digesters, or gravity thickeners, etc., a minimum sludge storage for the entire sludge production over a two week period must be provided.

b. In-line storage by increasing mixed liquor solids concentration in aeration tanks or increasing retention in settling tanks is not permitted.

c. Aerated off-line sludge storage of not less than seven days shall be provided for oxidation ditch type activated sludge plants without a sludge digestion process.

2. Equipment Design. The sludge storage system should be equipped with mixing devices to prevent separation of solids and provide a more uniform feed to dewatering devices. Provision for adding lime, chlorine or air to prevent septicity and resulting odors is desirable. Decanting systems to provide thicker solids and flushing water to clean out tankage are necessary. Covering and odor control devices should be provided to minimize nuisance conditions.

9.2. Sludge Pumps and Piping

A. Design Basis

1. Pump Capacity. Capacity shall be adequate to cover the full range of solid concentrations and sludge production. Variable speed or other rate control systems should be provided for all sludge pumps. Maximum operating pressure should be calculated to account for the high friction factor when pumping thixotropic sludges in low velocity laminar ranges.

2. Duplicate Units. Duplicate units shall be provided where failure of one unit would seriously hamper plant operation. Pump suction and discharge manifolds should be interconnected so that one pump discharge can be used to backflush other suction piping.

3. Minimum Head. A minimum positive static head of 24 inches (61 cm) shall be provided at the suction side of centrifugal type pumps and is desirable for all types of sludge pumps. Maximum suction lift should not exceed 10 feet (3 meters) for plunger or diaphragm pumps.

4. Piping

a. Size. Sludge withdrawal piping shall have a minimum diameter of 8 inches (20 cm) for gravity withdrawal and 6 inches (15 cm) for pump suction and discharge lines. Where withdrawal is by gravity, available head shall be adequate to provide sufficient velocity in pipe; thereby preventing solids deposition in pipe.

b. Slope. Gravity flow piping should be laid on a uniform grade and alignment. The slope of gravity discharge lines should not be less than 3 percent.

c. Lining. Scum and primary sludge conveying piping should be lined with a low roughness material such as, glass lining, to reduce friction and to aid in cleaning and maintenance.

B. Equipment Features

1. Plunger type, screw feed type, rotary lobe type, recessed-impeller centrifugal type, progressive cavity type or other types of pumps with demonstrated solids handling capability shall be provided for handling raw sludge. Plunger pump backup for centrifugal pumps is recommended. The abrasive nature of sludges, especially those containing grit, must be considered in the selection of pump type and materials of construction.

2. Sludge grinders should be used where downstream process equipment, such as frame and plate presses, centrifuges, heat exchangers, sludge mixing devices or progressive cavity pumps, is susceptible to rag or trash build-up.

3. Valves. The piping system shall be equipped with isolation valves to allow for repairs and replacement of equipment or metering devices.

4. Piping Layout. Provisions should be made for cleaning, draining and flushing sludge piping. Flanges tees and crosses and cleanouts to allow rodding of suction line are desirable. Provision for back flushing with positive displacement pump discharge is desirable. Provision for cleaning by hot water, steam injection, in-line pigging or chemical degreasing should be considered in long lines containing raw sludge or scum.

C. Control Devices

1. Flow meters should be provided on all process and ancillary lines such as feed, withdrawal, gas, transfer, recirculation, hot water etc. Provision should be made for equipment isolation, cleaning and calibrating.

2. Sludge pumps used on intermittent withdrawal service should be equipped with variable timer equipment.

3. Quick-closing sampling valves shall be installed at the sludge pump, unless sludge sampling is provided separately elsewhere. The size of the valve and piping shall be at least 1 1/2 inches in diameter (3.8 centimeters).

9.3. Sludge Thickeners

1. The design of thickeners (gravity, dissolved-air flotation, centrifuge, and others) should consider the type and concentration of sludge, the sludge stabilization processes, the method of ultimate sludge disposal, chemical needs, and the cost of operation. The pumping rate and piping of the concentrated sludge should be selected such that anaerobic conditions are prevented.

2. No credit towards sludge storage or digestion, if any, in thickeners shall be permitted.

A. Gravity Thickening

1. Design Basis

a. Typical loading rates and resulting solids concentration for gravity thickening are as shown in Table R317-3-9.3(A)(1)(a).

b. Equipment and piping must be designed to deliver sufficient dilution water to gravity thickeners. Flow rate of dilution water shall be measured and recorded. Hydraulic loading to produce overflow rates of 400 to 800 gallons per day per square foot (16-33 cubic meter per day per square meter) shall be maintained to prevent septicity.

2. Equipment Features

a. Heavy duty scrapers capable of withstanding extra heavy torque loads should be provided.

b. Sidewater depths of 10-14 feet (3-4.2 meters) are recommended.

c. Ability to add chlorine solution should be provided to prevent septicity.

d. Tank covers and odor control systems should be considered depending on adjacent land use.

B. Co-Settling. Trickling filter or activated sludge may be returned to primary clarifiers for co-settling. If this method is utilized:

1. Peak design overflow rates for the primary clarifier shall not exceed 1,500 gallons per day per square foot (61 cubic meters per day per square meter), including recirculated sludge flow, and

2. Minimum sidewater depth in the primary clarifier must not be less than 12 feet (3.7 meters).

9.4. Anaerobic Digestion

A. Design Basis

1. The anaerobic digestion system shall provide for active digestion, supernatant separation, sludge concentration and storage. Heating and gas collection systems are required. Mixing systems for primary digesters shall be provided, and are recommended for secondary digesters.

2. Multiple digestion units shall be provided in all plants designed for more than 1 million gallons per day (3,7854 cubic meter per day) rate of flow. For plants designed for less than one million gallons per day (3,785 cubic meters per day), alternative methods of sludge stabilization and emergency storage must be available if only one unit is available.

3. The total digestion tank capacity should be determined by rational calculations based upon the following factors:

a. sludge characteristics - volume and percent solids,

b. the temperature to be maintained in the digesters,

c. the degree and extent of mixing in the digesters, and

d. the degree of volatile solids reduction desired.

4. Calculations shall be submitted to justify the basis of design. Otherwise, the following assumptions shall be used:

a. sludge characteristics - domestic wastewater sludge volume generated as shown in Table R317-3-9.4(A)(4)(a).

b. the temperature to be maintained in the digesters: 90 to 100 degrees Fahrenheit (32-38 degrees Centigrade).

c. the degree and extent of mixing in the digesters: 40 horsepower per million gallons (8 watts per cubic meter).

d. volatile solids in digested sludge: 50 percent.

5. Completely-mixed systems, mixed at an intensity such that digester contents are completely turned over every 30 minutes, may be loaded at a rate up to 120 pounds of volatile solids per 1,000 cubic feet of volume per day (1.92 kilograms per cubic meter per day) in the active digestion units. When grit removal facilities are not provided, the digester volume must be increased to accommodate grit accumulation.

6. Moderately mixed digestion systems, mixed by circulating sludge through an external heat exchanger, may be loaded at a rate up to 40 pounds of volatile solids per 1,000 cubic feet of volume per day (0.64 kilograms per cubic meter per day) in the active digestion units. This loading may be modified upward or downward depending upon the degree of mixing provided.

7. For those units intended to serve as supernatant separation tanks, the depth should be sufficient to allow for the formation of a reasonable depth of supernatant liquor. A minimum sidewater depth of 20 feet (6.1 meters) is recommended.

B. Tank Covers

1. All anaerobic digestion tanks shall be covered. Primary tanks may be equipped with gas-tight, fixed steel or concrete covers or floating steel covers made gas-tight by extended rims. Secondary tank covers may be of the fixed type or floating steel type, including gas storage type units.

2. Floating covers shall be equipped with a guide rail system to prevent tipping and lower-landing ridges, and cover restraints.

C. Sludge Inlets and Outlets

1. Multiple recirculation, withdrawal and return points, should be provided, to enhance flexible operation and effective mixing, unless mixing facilities are incorporated within the digester. The returns, in order to assist in scum breakup, should discharge above the liquid level and be located near the center of the tank.

2. Raw sludge feed to the digester should be through the sludge heater and recirculation return piping, or directly to the tank if internal mixing facilities are provided.

3. Sludge withdrawal to disposal should be from the bottom of the tank. This pipe should be interconnected with the recirculation piping, if such piping is provided, to increase versatility in mixing the tank contents. Additional alternative withdrawal lines should be provided.

D. Supernatant Withdrawal

1. Supernatant piping should not be less than 6 inches (15 centimeters) in diameter. Piping should be arranged so that withdrawal can be made from three or more levels in the digester. A positive, unvalved, vented overflow shall be provided with a drop leg for a liquid seal and downstream vent.

2. If a supernatant selector is provided, provisions shall be made for at least one other draw-off level, located in the supernatant zone of the tank, in addition to the unvalved emergency supernatant draw-off pipe. High pressure back-wash facilities shall be provided.

3. Multiple supernatant draw-offs should be provided for sampling at different levels. Sampling pipes must be at least 1 1/2 inches (3.8 centimeters) in diameter, and should terminate at a suitably-sized sampling sink or basin.

E. Sampling. Sampling hatches shall be provided in all tank covers with water seal tubes extending to beneath the liquid surface.

F. Gas Collection, Piping and Appurtenances

1. General. All portions of the gas system, including the space above the tank liquor, storage facilities and piping, shall be so designed that under normal operating conditions, including sludge withdrawal, the gas will be maintained under positive pressure. All enclosed areas where any gas leakage might occur shall be adequately ventilated.

2. Safety Equipment. All safety equipment shall be provided where gas is produced. Pressure and vacuum relief valves, flame traps, gas detectors, and automatic safety shut off valves, shall be provided.

3. Gas Piping and Condensate. Gas piping shall be of adequate diameter for gas flow rate and shall slope to condensate traps at low points. The use of float-controlled condensate traps is not permitted.

4. Gas Utilization Equipment.

a. Gas-fired boilers for heating digesters shall be located in a separate room not directly connected to the digester gallery. Gas lines to these units shall be provided with flame traps.

b. Dual fuel engines on major pumps or blowers, should be installed with possible recovery of exhaust and jacket cooling heat for use in heating digester or building spaces. An alternate system would consist of direct electric power generation. Gas cleaning and storage may be desirable.

5. Electrical Fixtures. Electrical fixtures and controls in enclosed places where hazardous gases may accumulate shall comply with the National Electrical Code for Class I, Division I Group D locations. Digester galleries must be isolated from normal operating areas to avoid an extension of the hazardous location.

6. Waste Gas.

a. Waste gas burners shall be readily accessible and should be located at least 25 feet (7.6 meters) away from any plant structure if placed at ground level, or they may be located on the roof of the control building at a height of not less than three feet (0.9 meter) from the top of the roof.

b. All waste gas burners shall be equipped with automatic ignition, such as a pilot light or a device using a photoelectric cell sensor. Consideration should be given to the use of natural or propane gas to insure reliability of the pilot light.

c. Necessary approvals from the Director, shall be obtained for burning any waste gas and any other emissions from the treatment plant.

7. Ventilation. Any underground enclosures connecting with digesters or containing sludge or gas piping or equipment shall be forced ventilated. The piping gallery for digesters should not be connected to other passages.

8. Metering. Gas meters, with by-pass, shall be provided to meter total and waste gas production.

G. Digester Heating

1. Insulation. Wherever possible, digesters should be constructed above ground water level and should be suitably insulated to minimize heat loss.

2. Heating Facilities

a. External Heating. Sludge may be heated by circulating the sludge through external heaters. Piping should be designed to provide for the preheating of feed sludge before introduction to the digesters, especially if sludge thickeners are not used, or if feed is a batch feed resulting in high intermittent feed rates. Provisions shall be made in the lay-out of the piping and valving to facilitate cleaning of these lines. Heat exchanger sludge piping should be sized for heat transfer requirements.

b. Other Heating Methods. The Director may approve review other types of heating facilities based on the information submitted by the applicant.

3. Heating Capacity. Heating capacity sufficient to consistently maintain the design sludge temperature shall be provided. Where digester tank gas is used for sludge heating, an auxiliary fuel supply is required.

4. Hot Water Internal Heating Controls

a. A suitable automatic mixing valve shall be provided to temper the boiler water with return water so that the inlet water to the heat jacket can be held below a temperature at which caking will be accentuated. Manual control should also be provided by suitable by-pass valves.

b. The boiler should be provided with suitable automatic controls to maintain the boiler temperature at approximately 180 degrees Fahrenheit (82.2 degrees Centigrade), to minimize corrosion, and to shut off the main gas supply in the event of pilot burner or electrical failure, low boiler water level, or excessive temperatures.

c. Thermometers shall be provided to show temperatures of the sludge, hot water feed, hot water return, and boiler water.

H. Mixing Systems. Sludge mixing systems shall be gas recirculation, draft tube mixing, mechanical mixer or pump recirculation types. The mixing system should be designed such that routine maintenance can be performed without taking the digester out of service.

I. Operational Considerations

1. Piping Flexibility. Where two stage digestion is practiced, provision shall be made to feed and heat the secondary digester. Mixing systems should be installed in secondary digestion units.

2. Provision to pump secondary sludge to primary units for reseeding and extending sludge detention time is recommended.

3. When digested sludge is pumped to the dewatering unit, piping shall be laid out so as to prevent uncontrolled gravity flow.

4. Provisions to adjust pH and alkalinity by addition of chemicals shall be made.

J. Maintenance Features for draining, cleaning, and maintenance must be considered in the design of the digesters.

1. Slope. The tank bottom should slope to drain toward the withdrawal pipe. For tanks equipped with a suction mechanism for withdrawal of sludge, a bottom slope of 1:12 or greater is recommended. Where the sludge is to be removed by gravity alone, 1:4 slope is recommended.

2. Access Manholes. At least two 36 inch (91 centimeters) diameter access manholes should be provided in the top of the tank in addition to the gas dome. There should be stairways to reach the access manholes. A separate sidewall manhole shall be provided. The opening should be large enough to permit the use of mechanical equipment to remove grit and sand.

3. Safety. Local, state and federal safety requirements, including those in applicable fire code, the Uniform Building Code etc., must be reviewed and complied with. Those requirements take precedence over the requirements stated herein, if more stringent, and should be incorporated in the design. Nonsparking tools, safety lights, rubber-soled shoes, safety harness, gas detectors for inflammable and toxic gases, and at least two self-contained breathing units shall be provided for emergency use.

9.5. Aerobic Digestion

A. General. Aerobic digestion may be used for stabilization of primary sludge, and activated or trickling filter sludge. Digestion may take place in single or multiple tanks designed to provide effective air mixing, reduction of the organic matter, supernatant separation, and sludge concentration under controlled conditions.

B. Tank Capacity. The digestion tank capacity shall be based on such factors as, quantity of sludge produced, sludge concentration and related characteristics, time of aeration, sludge temperature, etc.

1. Volatile Solids Loading. Volatile suspended solids loading shall not exceed 100 pounds per 1,000 cubic feet of volume per day (1.60 kilograms per cubic meter per day) in the digestion units.

2. Detention Time. The minimum detention time of 15 days shall be provided for aerobic digestion. The detention time may vary with sludge characteristics. Where sludge temperature is lower than 50 degrees Fahrenheit (10 degrees Centigrade) additional detention time should be considered. Covering of the aerobic digesters may be considered to prevent heat losses to atmosphere.

3. Multiple Units. Multiple tanks are required for plants designed to treat more than 1 million gallons per day (3,785 cubic meters per day). Adequate provision must be made for sludge handling and storage for the plants treating less than 1 million gallons per day (3,785 cubic meters per day). When multiple units are provided, ability to utilize them in serial operation is recommended.

4. Mixing and Air Requirements

a. Aerobic sludge digestion tanks shall be designed for effective mixing. Sufficient air shall be provided to keep the solids in suspension and maintain dissolved oxygen between 1 to 2 milligrams per liter.

b. A minimum air volume of 30 cubic feet per minute per 1,000 cubic feet of tank volume (0.51 liters per cubic meter per second) shall be provided with the largest blower out of service for the mixing and aeration requirements. For the diffused aeration systems, the nonclog type air diffusers are recommended, and shall be designed to permit continuity of service.

c. A minimum of 75 horsepower per million gallon of tank volume (15 watts per cubic meter) shall be provided for mechanical aeration systems. Mechanical aerators must be protected where freezing temperatures are expected. Submerged turbine units or floating surface aerators may be considered to allow for liquid level variation.

5. Supernatant Separation. Facilities shall be provided for effective separation and withdrawal of supernatant and for effective collection and removal of scum and grease. Multiple level decant withdrawal lines should be provided.

6. Foam Spray. Foam suppression spray water piping and nozzles should be provided.

9.6. Sludge Dewatering

A. Belt Filter Press

1. Design Basis

a. Hydraulic and solids loading rates, conditioning requirements, and performance shall be based on pilot unit performance or operational results on similar sludges.

b. Multiple units are required unless storage capacity or alternate dewatering methods are available to handle sludge during prolonged power outage.

c. In plants designed for 1 million gallons per day (3,785 cubic meters per day), the operational period should not usually exceed 35 hours per week which allows one shift operation with time for chemical makeup, cleanup and delays. In plants designed for over 1 million gallons per day (3,785 cubic meters per day), the operational period may approach 20 hours per day.

2. Equipment Features

a. The facility should provide for chemical storage, feed equipment, belt wash water, and filtrate return and for conveying and loading sludge cake onto transport vehicles.

b. Belt alignment and tensioning should be regulated automatically.

c. If a single unit is provided, standby equipment should be provided for the sludge feed pump, belt wash, and chemical feed.

d. Facilities or piping for filtrate and wash water sampling should be provided.

3. Operational Considerations. Good house keeping and maintenance features should include press housing, ventilation, safe and convenient access for cleanup and maintenance, floor drains, minimum splashing of filtrate or wash water, etc.

9.7. Sludge Drying Beds

A. Design Basis

1. The area of sludge drying beds is determined by factors such as, climatic conditions, the character and volume of the sludge to be dewatered, the method and schedule of sludge removal, and other methods of sludge disposal.

2. The applicant or the design engineer must submit the basis of design including calculations for review. When the basis of design is not submitted, the drying bed area shall be determined on the basis of 4 square feet per population equivalent

(0.38 square meter per population equivalent) when the drying bed is the primary method of dewatering, and 2.0 square feet per population equivalent (0.19 square meter per population equivalent) if it is to be used as a backup dewatering unit. An increase of bed area by 25 percent is required for paved beds. Sludge storage or alternate dewatering methods should be considered for winter weather.

3. A ground water discharge permit may be required for beds without an impervious base. Hydraulic conductivity shall not be greater than 1 x 10-6 centimeters per second or as required for compliance with the provisions of R317-6 (Ground Water Quality Protection Regulations).

B. Design Features

1. Gravel. The lower course of gravel around the underdrains should be properly graded and not less than 12 inches (30.5 centimeters) in depth, extending at least 6 inches (15.2 centimeters) above the top of the underdrains. It is desirable to place this in two or more layers. The top layer of at least 3 inches (7.6 centimeters) must consist of gravel 1/8 inch to 1/4 inch (3.18 to 6.35 millimeters) in size. The remaining layer of gravel below the top 3-inch (7.6 centimeters) layer may be 3/4 to 1 inch (1.9 to 2.5 centimeters) in size.

2. Sand. The top course placed above the gravel should consist of at least 6 to 9 inches (15.2 to 22.9 centimeters) of clean coarse sand. The finished sand surface should be level.

3. Underdrains. Underdrains should be clay pipe or concrete drain tile at least 4 inches (10.2 centimeters) in diameter laid with open joints. Underdrains should be spaced not more than 20 feet (6.1 meters) apart. Underdrainage should be returned to the process with raw or settled sewage.

4. Partially Paved Type. The partially paved drying bed should be designed with consideration for the space requirement to operate mechanical equipment for removing the dried sludge. Paving must positively slope to the underdrains.

5. Containment Walls. Walls should be water-tight and extend 15 to 18 inches (38 to 46 centimeters) above and at least 6 inches (15 centimeters) below the surface of the drying bed. Outer walls should be curbed to prevent soil from washing onto the beds.

6. Sludge Removal. Not less than two beds should be provided and they should be arranged to facilitate sludge removal. Paved truck tracks should be provided for all percolation-type sludge beds.

7. Sludge Feed Line. The sludge pipe to the drying beds should terminate at least 12 inches (30.5 centimeters) above the floor surface and be so arranged that it will drain into the bed. Concrete splash blocks should be provided at sludge discharge points.

9.8. Other Sludge Treatment Methods. Other methods for sludge dewatering, treatment, and stabilization will be considered by the Director based on such factors as the need, suitability of application and process, reliability and flexibility, etc.

R317-3-10. Lagoons.

10.1. Lagoon Siting

A. Distance from Habitation. A lagoon should be sited as far as practicable, with a minimum of 1/4 mile (0.4 kilometer), from areas developed for residential or commercial or institutional purposes or may be developed for such purposes within a foreseeable future. Site characteristics such as topography, prevailing wind direction, forests, etc., must be considered in siting the lagoon.

B. Prevailing Winds. The lagoon should be sited where the direction of local prevailing winds is towards uninhabited areas.

C. Surface Runoff. The lagoon should not be sited in watersheds receiving significant amounts of storm-water runoff. Storm-water runoff should be diverted around the lagoon and protect lagoon embankments from erosion.

D. Hydrology and hydrogeology. Close proximity to water supplies and other facilities subject to wastewater contamination should be avoided in siting the lagoon. A minimum separation of four (4) feet (1.2 meters) between the bottom of the lagoon and the maximum ground water elevation should be maintained.

E. Geology

1. The lagoon shall not be located in areas which may be subjected to karstification, i.e., sink holes or underground streams generally occurring in area underlain by porous limestone or dolomite or volcanic soil.

2. A minimum separation of 10 feet (3.0 meters) between the lagoon bottom and any bedrock formation is recommended.

10.2. Small Facilities. The Director will review and approve the construction of a lagoon for a design rate of flow less than 25,000 gallons per day (95 cubic meters per day) only if:

A. there are no other alternatives for wastewater treatment and disposal available to the applicant;

B. there is no other appropriate technology for wastewater treatment and disposal except lagoon; and

C. the applicant has resources to satisfactorily operate and maintain the lagoon.

10.3. Basis of Design. Design variables such as lagoon depth, number of units, detention time, and additional treatment units must be based on effluent standards for BOD_5, total suspended solids (TSS), E. coli, dissolved oxygen (DO), and pH.

A. Design for Discharging and Total Containment Lagoons

1. The design shall be based on BOD_5 loading ranging from 15 to 35 pounds per acre per day (16.8-39.2 kilograms per hectare per day).

2. The design for total containment lagoons shall be based on conservative estimates of precipitation, evaporation, seepage or percolation and inflow relevant to the site. A mass diagram showing each of the foregoing factors on a month-by-month basis, shall be prepared and submitted with the design and plans for review.

B. Design Depth. The minimum operating depth should be such that growth of aquatic plants is suppressed to prevent damage to the dikes, bottom, control structures, aeration equipment and other appurtenances.

1. Discharging or Total Containment Lagoons. The maximum water depth shall be 6 feet (1.8 meters) in primary cells. Greater depth in subsequent cells may be deeper than 6 feet provided that supplemental aeration or mixing is incorporated in the design. Minimum operating depth shall be three feet.

2. Aerated Lagoons. The design water depth should range from 10 to 15 feet (three to 4.5 meters). The type of the aeration equipment, waste strength and climatic conditions affect the selection of the design water depth.

3. Sludge Accumulation. The minimum depth of 18 inches (45 centimeters) for sludge accumulation shall be provided in primary cells of facultative lagoons.

C. Freeboard. The minimum freeboard shall be three (3) feet (1.0 meter). For small systems - less than 50,000 gallons per day (190 cubic meters per day), the minimum freeboard can be reduced to two (2) feet (0.6 meter).

D. Slope

1. Maximum Dike Slope. The inner and outer dike slopes shall not be steeper than 3 horizontal to 1 vertical (3:1).

2. Minimum Dike Slope. Inner dike slope shall not be flatter than 4 horizontal to 1 vertical (4:1). A flatter slope can be specified for larger installations because of wave action, but have the disadvantages of added shallow areas, that are conducive to emergent vegetation.

E. Seepage

1. The bottom of lagoons treating domestic sewage shall be no less than 12-inch (30 centimeters) in thickness, constructed in two six-inch (15 centimeters) lifts. The selection of the type of seals using soils, bentonite, or synthetic liners for the lagoon bottom shall be based on the design hydraulic conductivity, durability, and integrity of the proposed material.

2. Hydraulic conductivity of the lagoon bottom as constructed or installed, shall be such that it meets the requirements of ground water discharge permit issued under R317-6, (Ground Water Quality Protection rules). It shall not exceed 1.0×10^{-6} centimeters per second.

3. The seepage loss may vary with the thickness of the bottom seal and hydraulic head thereon. Detailed calculations on the determination of seepage loss shall be submitted with the design. It shall not exceed 6,500 gallons per acre per day (60.8 cubic meters per hectare per day).

4. Results of field and laboratory hydraulic conductivity tests, including a correlation between them, shall meet the design and ground water discharge permitting requirements, before the use of lagoon can be authorized.

5. Hydraulic conductivity for the lagoon where industrial waste is a significant component of sewage, shall be based on ground water protection criteria contained in R317-6 (Ground Water Quality Protection rules).

F. Detention time

1. Discharging Lagoons. Detention time in the lagoon shall be the greater, and exclusive of the capacity provided for sludge build-up, of:

a. 120 days based on winter flow and the maximum operating depth of the entire system; or

b. 60 days based on summer flow and peak monthly infiltration/inflow.

c. The detention time shall not be less than 150 days at the mean operating depth for effluent discharge without chlorination. In order to meet bacteriologic standards in such a case, at least 5 cells shall be provided. The detention time and organic loading rate shall depend on climatic or stream conditions.

2. Aerated Lagoons

a. The detention time shall be the greater of:

(1) 30 days minimum; or

(2) the value determined using the following formula: $E = (1/(1 + (2.3 \times K_1 \times t)))$ where: t = detention time, days; E = fraction of BOD_5 remaining in an aerated lagoon; K_1 = reaction coefficient, aerated lagoon, base 10. For normal domestic sewage, the K_1 value may be assumed to be 0.12 day^{-1} at 20 degrees Centigrade, and 0.06 day^{-1} at one degree Centigrade.

b. The reaction rate coefficient for domestic sewage which includes some industrial wastes must be determined experimentally for various conditions which might be encountered in the aerated lagoons. The reaction rate coefficient based on temperature used in the experimental data, shall be adjusted for the minimum sewage temperature.

G. Aeration Requirements for Aerated Lagoons

1. The design parameters for the aerated lagoon should be based on pilot testing or validated experimental data.

2. When pilot testing is not conducted, the design should be based on two pounds of oxygen input per pound of BOD_5 applied (two kilograms of oxygen input per kilogram of BOD_5 applied). However, it may vary with the degree of treatment, and the concentration of suspended solids to be maintained. A tapered mode of aeration is permitted based on applied BOD_5 to each cell.

3. Aeration equipment shall be capable of maintaining a minimum dissolved oxygen level of 2 milligrams per liter in the lagoon at all times such that their circles of influence meet.

a. Circle of Influence. It is that area in which return velocity is greater than 0.15 feet per second as indicated by the manufacturer's certified data. Table R317-3-10.3(G)(3)(a) may be used when the manufacturer's certified data is not available.

b. Freezing. Suitable protection from weather shall be provided for aerators and electrical controls.

H. Industrial Wastes. For industrial waste treatment using lagoon, the design parameters shall be based on the type and treatability of industrial wastes using biological processes. In some cases it may be necessary to pretreat industrial waste or combine with domestic sewage.

10.4. Lagoon Construction Details

A. Cell Shape. The shape of all cells should be such that there are no narrow or elongated portions. Round, square or rectangular lagoons with a length not exceeding three times the width are most desirable. No islands, peninsulas or coves are permitted. Dikes should be rounded at corners to minimize accumulations of floating materials. Common-wall dike construction, wherever possible, is strongly encouraged.

B. Multiple Units

1. At a minimum, the lagoon system shall consist of three cells of approximately equal capacity designed to facilitate both series and parallel operations.

2. The Director may approve less than three cells on the basis of review of factors such as, the rate of flow, the need, treatment reliability, etc.

3. All systems shall be designed with piping:

a. to permit isolation of any cell without affecting the transfer and discharge capabilities of the total system, and

b. to split the influent waste load to a minimum of two cells or all primary cells in the system.

C. Embankments and Dikes

1. Material. Dikes shall be constructed of relatively impervious material and compacted to no less than 90 percent Standard Proctor Density at 3 percent above the optimum moisture density to form a stable structure. The area where the embankment is to be placed shall be from vegetation and unstable organic material.

2. Top Width. The minimum dike width shall be 8 feet (2.4 meters) and shall permit access by maintenance vehicles.

D. Lagoon Bottom

1. Soil. Soil used in constructing the lagoon bottom (not including seal) and dike cores shall be incompressible and tight and compacted at a moisture content of 3 percent above the optimum water content to at least 90 percent Standard Proctor Density.

2. Uniformity. The lagoon bottom should be as level as possible at all points. Finished elevations shall not be more than three (3) inches (7.5 centimeters) from the average elevation of the bottom.

3. Prefilling. The lagoon should be prefilled to a level which protects the liner, prevents weed growth, reduces odor, and maintains moisture content of the seal. However, the dikes must be completely prepared before the introduction of any water.

E. Construction Quality Control and Assurance. A construction quality control and assurance plan showing frequency and type of testing for materials used in construction shall be submitted with the design for review and approval. Results of such testing, gradation, compaction, field permeability, etc., shall be submitted to the Director.

F. Erosion Control

1. The site shall be protected from erosion. The design of control measures shall be based on factors, such as lagoon location and size, seal material, topography, prevailing winds, cost breakdown, application procedures, etc.

2. For aerated lagoons, the slopes and bottom shall be protected from erosion resulting from turbulence.

3. Exterior face of the dike slope shall be protected from erosion due to severe flooding of a water course.

4. Seeding. The outside surface of dikes shall have a cover layer of at least 4 inches (10 centimeters), of fertile topsoil to promote establishment of an adequate vegetative cover wherever riprap is not utilized. Prior to prefilling, adequate vegetation shall be established on dikes from the outside toe to 2 feet (0.6 meter) above the lagoon bottom on the interior as measured on the slope. Perennial-type, low-growing, native, spreading grasses that minimize erosion and can be mowed are most satisfactory for seeding on dikes. Alfalfa and other deep-rooted crops must not be used for seeding since the roots of this type are apt to impair the water holding efficiency of the dikes.

5. Riprap or equivalent material shall be placed from 1 foot (0.3 meter) above the high water mark to two feet (0.6 meter) below the low water mark (measured on the vertical) for protection from severe wave action.

a. Riprap. The interior face of dikes must be protected from erosion by riprap or other equivalent methods of erosion control.

(1) Riprap layer shall be of durable, angular, sound and hard, field or quarry stones, and shall be free from seams, cracks and structural defects.

(2) The thickness of riprap layer shall be at least 8 inches (20 centimeters).

(3) Stones to be used in the riprap layer shall meet the following requirements:

(a) A minimum of 50 percent of stones by weight, shall be of sizes between two-thirds and one and one-half of the layer thickness;

(b) No more than ten percent of stones by weight, shall be of a size less than one-tenth of the layer thickness;

(c) The specific weight of stones must range between 2.5 and 2.82;

(d) Durability shall be tested in accordance with ASTM Standard C-535, as amended, and stones wearing in excess of 40 percent shall not be used.

(e) Stones shall be graded and manipulated in size so as to produce a regular surface of dense and stable mass. A stable foundation for the placed riprap shall be provided at the toe of the dike.

10.5. Influent Piping

A. Influent and Effluent Structures

1. All influent and effluent structures shall be located to minimize short-circuiting within lagoons, and to avoid blocking of lagoon circulation. Such structures must have protection against freezing or ice damage under winter conditions.

2. Inlets to the primary cells shall meet the following criteria:

a. Surcharging of upstream sewer from the inlet manhole is not permitted.

b. Multiple influent discharge points for primary cells of 20 acres (8 hectares) or larger should be provided to enhance the distribution of waste load in the cell.

c. Discharge shall be in the center of a round or a square cell, or at the third point farthest from the outlet structure in a rectangular cell, or at least 100 feet (30 meters) from the toe of the dike.

d. All aerated cells shall have an influent line which distributes the load within the mixing zone of the aeration equipment. Multiple inlets may be considered for a diffused aeration system.

e. Force mains shall be valved at the lagoon, and may terminate in a vertically or horizontally discharging section. The discharge end of the vertical pipe must be located no more than one foot above the lagoon bottom. Flow velocities in the discharge section entering the lagoon must not be in excess of two feet per second.

B. Influent Discharge Apron

1. The influent line shall discharge horizontally into a shallow, saucer-shaped, depression extending below the lagoon bottom not more than the diameter of the influent pipe plus 1 foot.

2. The end of the discharge line shall rest on a suitable concrete apron large enough to prevent the terminal influent velocity at the end of the apron from causing soil erosion. A 2-foot (0.6 meter) square apron shall be provided at the minimum.

C. Flow Measurement. Influent flow to the lagoon shall be continuously indicated and recorded. Flow measurement and recording equipment shall be weatherproof.

D. Level Gauges. Level gauges with clear markings shall be provided in:

1. each cell to measure and manually record the depth; and

2. the primary flow measurement device structure to indicate the depth or the rate of flow.

E. Manhole

1. A manhole or vented cleanout wye shall be installed prior to entrance of the influent line into the primary cell and shall be located close to the dike as topography permits. Its invert shall be at least 6 inches (15 centimeters) above the maximum operating level of the lagoon and provide sufficient hydraulic head without surcharging the manhole.

2. A manhole is required for small systems to house flow measurement device. For larger systems, flow measurement device and related instrumentation must be housed in a headworks type structure.

F. Flow Distribution. Flow distribution structures shall be designed to effectively split hydraulic and organic loads equally to primary cells.

G. Material. The material for influent line to the lagoon should meet the requirements of material for underground sewer construction described in this rule. Unlined corrugated metal pipe is not permitted due to corrosion problems. The material selection shall be based on factors such as, wastewater characteristics, heavy external loadings, abrasion, soft foundations, etc.

10.6. Control Structures and Interconnecting Piping

A. Structure

1. As a minimum, control structures shall:

a. be accessible for maintenance and adjustment of controls;

b. be adequately ventilated for safety and to minimize corrosion;

c. be locked to discourage vandalism;

d. contain controls to permit water level and flow rate control, and complete shutoff;

e. be constructed of non-corrodible materials (metal-on-metal); and

f. be located to minimize short-circuiting within the cell and avoid freezing and ice damage.

2. Recommended devices to regulate water level are valves, slide tubes or dual slide gates. Regulators should be designed so that they can be preset to stop flows at any lagoon elevation.

B. Piping. All piping shall be of cast iron or other material for installation of underground piping. The piping shall be located along the bottom of the lagoon with the top of the pipe just below average elevation of the lagoon bottom. Pipes should be anchored and protected from erosion.

10.7. Effluent Discharge Piping

A. Submerged Takeoffs. For lagoons designed for shallow or variable depth operations, submerged takeoffs are required. Intakes shall be located a minimum of 10 feet (3.0 meters) from the toe of the dike and 2 feet (0.6 meter) from the seal, and shall employ vertical withdrawal.

B. Multi-level Takeoffs. For lagoons that are designed deeper than 10 feet (3 meters), enough to permit stratification of lagoon content, multiple takeoffs are required. There shall be a minimum of three withdrawal pipes at different elevations. Adequate structural support for takeoffs shall be provided.

C. Emergency Overflow. An emergency overflow should be provided to prevent overtopping of dikes. The hydraulic capacity for continuous discharge structures and piping shall allow for a minimum of 250 percent of the design flow of the system. The hydraulic capacity for controlled-discharge systems shall permit transfer of water at a minimum rate of six (6) inches (15 centimeters) of lagoon water depth per day at the available head.

10.8. Miscellaneous

A. Fencing. The lagoon area shall be enclosed with not less than 6 feet high chain link fence to prevent entering of livestock and to discourage trespassing. Fencing must not obstruct vehicle traffic on top of the dikes. A vehicle access gate of sufficient width to accommodate all maintenance equipment shall be provided. All access gates shall be provided with locks.

B. Access. An all-weather access road shall be provided to the lagoon site to allow year-round maintenance of the facility.

C. Warning Signs. Permanent signs shall be provided along the fence around the lagoon to designate the nature of the facility and advise against trespassing. At least one sign shall be provided on each side of the site and one for every 500 feet (150 meters) of its perimeter.

D. Service Building A service building for laboratory and maintenance equipment should be considered.

10.9. Industrial Waste Lagoons. The Director will review the design of lagoons for treatment of industrial wastes on the basis of such factors as treatability, operability, reliability, ground water protection levels, water quality objectives, etc.

R317-3-11. Use, Land Application and Alternate Methods for Disposal of Treated Wastewater Effluents.

11.1. General. Design requirements for effluent disposal or water reuse of municipal wastewater treatment plant effluents shall comply with the requirements of this section. Administrative and approval requirements for these land application systems are found in R317-13 and R317-14 for water reuse and effluent disposal, respectively. Land application of effluent from industrial wastewater treatment plants shall comply with the requirements of R317-1-5.

11.2 Effluent Criteria. Land application of treated effluents is permitted following treatment if standards are met as defined in this section.

11.3 Submittal of Project Plan. If a person intends to use or provide for the use of treated domestic wastewater directly for any purpose, except on the treatment plant site as described in R317-1-4.2, a Project Plan must be submitted to and approved by the Director. A copy of the plan must also be submitted to the local health department. Any needed construction of wastewater treatment and delivery systems would also be covered by a construction permit as required in section R317-1-2.2. The plan must contain the following information. At least items A, B, D and E should be provided before construction begins. All items must be provided before any water deliveries are made.

A. A description of the quantity, quality, and use of the treated wastewater to be delivered, the location of the site, an assessment of the direct hydrologic effects of the action, and how the requirements of this rule would be met. A nutrient management and agronomic uptake analysis may be required to document the proposed management of all nutrients.

B. A description of public notification and participation in the development of the Project Plan may be required.

C. An operation and management plan to include:

1. A copy of the contract with the user, if other than the treatment entity.

2. A labeling and separation plan for the prevention of cross connections between treated effluent distribution lines and potable water lines. Guidance for distribution systems is available from the Division of Water Quality.

3. Schedules for routine maintenance.

4. A contingency plan for system failure or upsets.

D. If the water will be delivered to other entities for transmission, distribution and/or use, a copy of the contract covering how the requirements of this rule will be met.

E. Requirements for ground water discharge permits, underground injection control (U.I.C.) permits, surface water discharge permits, total maximum daily load (TMDL) or nutrient loading considerations, if required, shall be determined in accordance with R317-1, R317-2, R317-6, R317-7, R317-8.

11.4 Use of Treated Domestic Wastewater Effluent Where Human Exposure is Likely (Type I)

A. Uses Allowed

1. Residential irrigation, including landscape irrigation at individual houses.

2. Urban uses, which includes non-residential landscape irrigation, golf course irrigation, toilet flushing, fire protection, and other uses with similar potential for human exposure. Internal building uses of treated effluent will not be allowed in individual, wholly-owned residences; and are only permitted in situations where maintenance access to the building's utilities is strictly controlled and limited only to the services of a professional plumbing entity. Projects involving effluent reuse within a building must be approved by the local building code official.

3. Irrigation of food crops where the applied reuse water is likely to have direct contact with the edible part. Type I water is required for all spray irrigation of food crops.

4. Irrigation of pasture for milking animals.

5. Impoundments of wastewater where direct human contact is likely to occur.

6. All Type II uses listed in 11.5.A below.

B. Required Treatment Processes

1.a. Treatment processes that are expected to produce effluent in which both the BOD and total suspended solids concentrations do not exceed secondary quality effluent limits as defined in R317-1-3.2.

b. Filtration, which includes passing the wastewater through filter media such as sand and/or anthracite, approved membrane processes or other approved filtration processes.

c. Disinfection to destroy, inactivate, or remove pathogenic microorganisms by chemical, physical, or biological means. Disinfection may be accomplished by chlorination, ozonation, or other chemical disinfectants, UV radiation, or other approved processes.

2. Other approved treatment processes in which any of the unit process functions of secondary treatment, filtration and disinfection may be combined, but still achieve the same secondary quality effluent limits as required above.

C. Water Quality Limits. The quality of treated effluent before use must meet the following standards. Testing methods and procedures shall be performed according to test procedures approved under R317-2-10, or as otherwise approved by the Director. Water quality sampling requirements specified in this section shall apply to the point of compliance at all times during use of treated effluent.

1. The monthly arithmetic mean of BOD shall not exceed 10 mg/l as determined by composite sampling conducted once per week. Composite samples shall be comprised of at least six flow proportionate samples taken over a 24-hour period.

2. The daily arithmetic mean turbidity shall not exceed 2 NTU, and turbidity shall not exceed 5 NTU at any time. Turbidity shall be measured continuously. The turbidity standard shall be met prior to disinfection. If the turbidity standard cannot be met, but it can be demonstrated to the satisfaction of the Director that there exists a consistent correlation between turbidity and the total suspended solids, then an alternate turbidity standard may be established. This will allow continuous turbidity monitoring for quality control while maintaining the intent of the turbidity standard, which is to have 5 mg/l total suspended solids or less to assure adequate disinfection.

3. The weekly median E. coli concentration shall be none detected, as determined from daily grab samples, and no sample shall exceed 9 organisms/100 ml.

4. The total residual chlorine shall be measured continuously and shall at no time be less than 1.0 mg/l after 30 minutes contact time at peak flow. If an alternative disinfection process is used, it must be demonstrated to the satisfaction of the Director that the alternative process is comparable to that achieved by chlorination with a 1 mg/l residual after 30 minutes contact time. If the effectiveness cannot be related to chlorination, then the effectiveness of the alternative disinfection process must be demonstrated by testing for pathogen destruction as determined by the Director. A 1 mg/l total chlorine residual is recommended after disinfection and before the treated effluent goes into the distribution system.

5. The pH as determined by daily grab samples or continuous monitoring shall be between 6 and 9.

D. Other Requirements

1. An alternative disposal option or diversion to storage must be automatically activated if turbidity exceeds the maximum instantaneous limit for more than 5 minutes, or chlorine residual drops below the instantaneous required value for more than 5 minutes, where chlorine disinfection is used.

2. Any irrigation must be at least 50 feet from any potable water well. Impoundments of treated effluent, if not sealed, must be at least 500 feet from any potable water well. The use should not result in a surface runoff and must not result in the creation of an unhealthy or nuisance condition, as determined by the local health department.

3. For residential landscape irrigation at individual homes, additional quality control restrictions may be required by the Director. Proposals for such uses should also be submitted to the local health authority to determine any conditions they may require. When secondary residential irrigation systems are planned utilizing treated effluent in new subdivisions, it is recommended that a notification of the type of irrigation system and possible sources of irrigation waters be made on the deed for the property. Such notification could be made during the plat approval process.

11.5 Use of Treated Domestic Wastewater Effluent Where Human Exposure is Unlikely (Type II)

A. Uses Allowed

1. Irrigation of sod farms, silviculture, limited access highway rights of way, and other areas where human access is restricted or unlikely to occur.

2. Irrigation of food crops where the applied treated effluent is not likely to have direct contact with the edible part, whether the food will be processed or not (spray irrigation not allowed).

3. Irrigation of animal feed crops other than pasture used for milking animals.

4. Impoundments of wastewater where direct human contact is not allowed or is unlikely to occur.

5. Cooling water. Use for cooling towers which produce aerosols in populated areas may have special restrictions imposed.

6. Soil compaction or dust control in construction areas.

B. Required Treatment Processes

1. Treatment processes that are expected to produce effluent in which both the BOD and total suspended solids concentrations do not exceed secondary quality effluent limits as defined in R317-1-3.2.

2. Disinfection to destroy, inactivate, or remove pathogenic microorganisms by chemical, physical, or biological means. Disinfection may be accomplished by chlorination, ozonation, or other chemical disinfectants, UV radiation, or other approved processes.

C. Water Quality Limits. The quality of effluent before use must meet the following standards. Testing methods and procedures shall be performed according to test procedures approved under R317-2-10, or as otherwise approved by the Director. Water quality sampling requirements specified in this section shall apply to the point of compliance at all times during use of treated effluent.

1. The monthly arithmetic mean of BOD shall not exceed 25 mg/l as determined by composite sampling conducted once per week. Composite samples shall be comprised of at least six flow proportionate samples taken over a 24-hour period.

2. The monthly arithmetic mean total suspended solids concentration shall not exceed 25 mg/l as determined by daily composite sampling. The weekly mean total suspended solids concentration shall not exceed 35 mg/l. Properly calibrated, continuous monitoring of turbidity may be substituted for the suspended solids testing.

3. The weekly median E. coli concentration shall not exceed 126 organisms/100 ml, as determined from daily grab samples, and no sample shall exceed 500 organisms/100 ml.

4. The pH as determined by daily grab samples or continuous monitoring shall be between 6 and 9.

5. At the discretion of the Director, the sampling frequency to determine compliance with water quality limits for effluent from lagoon systems used to irrigate agricultural crops, may be reduced to monthly grab sampling for BOD, and weekly grab sampling for E. coli, TSS and pH. The Director may also allow a relaxation of lagoon effluent BOD and suspended solids concentrations, in accordance with R317-1-3.2.

D. Other Requirements

1. An alternative disposal option or diversion to storage must be available in case quality requirements are not met.

2. Any irrigation must be at least 300 feet from any potable water well. Spray irrigation must be at least 100 feet from areas intended for public access. This distance may be reduced or increased by the Director, based on the type of spray irrigation equipment used and other factors. Impoundments of treated effluent, if not sealed, must be at least 500 feet from any potable water well. The use should not result in a surface runoff and must not result in the creation of an unhealthy or nuisance condition, as determined by the local health department.

3. Public access to effluent storage and irrigation or disposal sites shall be restricted by a stock-tight fence or other comparable means which shall be posted and controlled to exclude the public.

11.6 Records. Records of volume and quality of treated wastewater used shall be maintained and submitted monthly in accordance with R317-1-2.7. If monthly operating reports are already being submitted to the Division of Water Quality, the data on treated effluent delivered may be submitted on the same form.

11.7 Other Uses of Effluents. Proposed uses of effluents not identified above, including industrial uses, shall be considered for approval by the Director based on a case-specific analysis of human health and environmental concerns.

11.8 Treated Effluent Water Distribution Systems. Where treated effluent is to be provided by pressure pipeline, unless contained in surface pipes wholly on private property and for agricultural purposes, the following requirements will apply. The requirements will apply to all new systems and it is recommended that the accessible portions of existing reuse water distribution systems be retrofitted to comply with these rules. Requirements for irrigation systems proposed for conversion from use of secondary water to use with treated effluent will be considered on an individual basis considering protection of public health and the environment. Any person or agency that is constructing all or part of the distribution system must obtain a construction permit from the Director prior to beginning construction.

A. Distribution Lines

1. Minimum Separation.

a. Horizontal Separation. Treated effluent main distribution lines parallel to potable (culinary) water lines should be installed in separate trenches. Treated effluent main distribution lines parallel to sanitary sewer lines shall be installed at least ten feet horizontally from the sanitary sewer line if the sanitary sewer line is located above the treated effluent main and three feet horizontally from the sanitary sewer line if the sanitary sewer line is located below the reuse water main.

b. Vertical Separation. At crossings of treated effluent main distribution lines with potable water lines and sanitary sewer lines the order of the lines from lowest in elevation to highest should be; sanitary sewer line, treated effluent line, and potable water line. A minimum 18 inches vertical separation between the treated effluent line and sewer line shall be provided as measured from outside of pipe to outside of pipe. The crossings shall be arranged so that the reuse water line joints will be equidistant and as far as possible from the water line joints and the sewer line joints. If the treated effluent line must cross above the potable water line, the vertical separation should be a minimum 18 inches. If the treated effluent line must cross below the sanitary sewer line, the vertical separation shall be a minimum 18 inches and the treated effluent line shall be encased in a continuous pipe sleeve to a distance on each side of the crossing equal to the depth of the treated effluent line from the ground surface.

c. Special Provisions. Where the horizontal and/or vertical separation as required above cannot be maintained, special construction requirements shall be provided in accordance with requirements in this Rule for protection of potable water lines and treated effluent lines. Existing pressure lines carrying treated effluent shall not be required to meet these requirements.

2. Depth of Installation. To provide protection of the installed pipeline, treated effluent lines should be installed with a minimum depth of bury of three feet.

3. Treated Effluent Pipe Identification.

a. General. All new buried pipe within the public domain, including service lines, valves, and other appurtenances, shall be colored purple, Pantone 522 or equivalent. If fading or discoloration of the purple pipe is experienced during construction, identification tape is recommended. A clearly labeled tracer location tape or wire shall be placed two feet above the top of treated effluent lines less than or equal to 24 inch (61 centimeters) in diameter, along its entire buried length.

b. Identification Tape. If identification tape is installed along with the purple pipe, it shall be prepared with white or black printing on a purple field, color Pantone 512 or equivalent, having the words, "Caution: Treated Wastewater-Do Not Drink". The overall width of the tape shall be at least three inches. Identification tape shall be installed 12 inches above the transmission pipe longitudinally and shall be centered.

4. Conversion of existing water lines. Existing water lines that are being converted to use with treated effluent shall first be accurately located and comply with leak test standards in accordance with AWWA Standard C-600 and in coordination with regulatory agencies. The pipeline must be physically disconnected from any potable water lines and brought into compliance with current State cross connection rules and requirements (R309-102-5), and must meet minimum separation requirements in section 4.8.A.1 of this rule above. If the existing lines meet approval of the water supplier and the Division, the

lines shall be approved for treated effluent distribution. If regulatory compliance of the system (accurate location and verification of no cross connections) cannot be verified with record drawings, televising, or otherwise, the lines shall be uncovered, inspected, and identified prior to use. All accessible portions of the system must be retrofitted to meet the requirements of this rule.

5. Valve Boxes and Other Surface Identification. All valve covers shall be of non-interchangeable shape with potable water covers, and shall have an inscription cast on the top surface stating "Reclaimed Water" or "Treated Wastewater". Valve boxes shall meet AWWA standards. All above ground facilities shall be consistently color coded (purple, Pantone 512 or equivalent color) and marked to differentiate treated effluent facilities from potable water facilities.

6. Blow-off Assemblies. If either an in-line type or end-of-line type blow-off or drain assembly is installed in the system, the Division of Water Quality shall be consulted on acceptable discharge or runoff locations.

7. Line Drains. All distribution pipes and sprinklers must have the capability to be completely drained.

8. Flow Measurement. Main distribution headers must have flow measurement devices and pressure gages. All land applied flow must be totalized.

B. Storage. If storage or impoundment of treated effluent is provided, the following requirements apply:

1. Fencing. For Type I effluent, no fencing is required by this rule, but may be required by local laws or ordinances. For Type II effluent, see R317-3-11.5.D.2 above.

2. Identification. All storage facilities shall be identified by signs prepared according to the requirements of Section 11.8.D.6 below. Signs shall be posted on the surrounding fence at minimum 500 foot intervals and at the entrance of each facility. If there is no fence, signs shall be located as a minimum on each side of the facility or at minimum 250 foot intervals or at all accessible points.

C. Pumping Facilities.

1. Marking. All exposed and above ground piping, fittings, pumps, valves, etc., shall be painted purple, Pantone 512 or equivalent color. In addition, all piping shall be identified using an accepted means of labeling reading "Caution: Treated Wastewater - Do Not Drink." In a fenced pump station area, signs shall be posted on the fence on all sides.

2. Sealing Water. Any potable water used as seal water for reuse water pumps seals shall be protected from backflow with a reduced pressure principle device.

D. Other Requirements.

1. Backflow Protection. In no case shall a connection be made between the potable and treated effluent system. If it is necessary to put potable water into the treated effluent distribution system, an approved air gap must be provided to protect the potable water system. A reduced pressure principle device may be used only when approved by the Director, the local health department, and the potable water supplier.

2. Drinking Fountains. Drinking fountains and other public facilities shall be placed out of any spray irrigation area in which reuse water is used, or shall be otherwise protected from contact with the treated effluent. Exterior drinking fountains and other public facilities shall be shown and called out on the construction plans. If no exterior drinking fountains, picnic tables, food establishments, or other public facilities are present in the design area, then it shall be specifically stated on the plans that none are to exist.

3. Hose Bibs. Hose bibs on treated effluent systems in public areas and at individual residences are permitted for Type I water, with the following restrictions:

a. All exposed hose bib piping must be painted purple, Pantone 512 or equivalent color and,

b. Hose bibs shall be fitted with a valve having a non-permanently attachable operating handle. To discourage inappropriate casual use, it is recommended that each hose bib be posted with a warning label or sign, as detailed in R317 - 3.11.8.D.5, and/or placed in a lockable subsurface valve box in accordance with R317-3-11.8.A.5.

In public, non-residential areas, replacement of hose bibs with quick couplers is recommended.

4. Equipment and Facilities. To ensure the protection of public health, any equipment or facilities such as tanks, temporary piping or valves, and portable pumps which have been used for conveying treated effluent may not be reused for conveying potable water.

5. Warning Labels. Warning labels shall be installed on designated facilities such as, but not limited to, controller panels and washdown or blow-off hydrants on water trucks, and temporary construction services. The labels shall indicate the system contains treated wastewater that is unsafe to drink.

6. Warning signs. Where treated effluent is stored or impounded, or used for irrigation in public areas, warning signs shall be installed and contain, as a minimum, 1/2 inch purple letters (Pantone 512 or equivalent color) on a white or other high contrast background notifying the public that the water is unsafe to drink. Signs may also have a purple background with white or other high contrast lettering. Warning signs and labels shall read, "Warning: Treated Wastewater - Do Not Drink". The signs shall include the international symbol for Do Not Drink.

7. Public Education Program. Where treated effluent is used in individual residential landscape or public landscape area irrigation systems, a public education program must be implemented prior to initial operation of the program and, as necessary, during operation of the system.

R317-3-12. Effluent Filtration.

12.1. Granular Media Filters. Granular media filters may be used as a tertiary treatment device for the removal of residual suspended solids from secondary effluents. A pretreatment process such as chemical coagulation and sedimentation or other acceptable process must precede the filter units, where effluent suspended solids requirements are less than 10 milligrams

per liter, or where secondary effluent quality can be expected to fluctuate significantly, or where filters follow a treatment process and where significant amounts of algae will be present.

12.2. Design Considerations. The plant design should incorporate flow-equalization facilities to moderate filter influent quality and quantity. The selection of pumping equipment ahead of filter units should be designed to minimize shearing of floc particles.

A. Filter Types. Filters may be of the gravity or pressure type. Pressure filters shall be provided with ready and convenient access to the media for treatment or cleaning. Where greases or similar solids which result in filter plugging are expected, filters should be of the gravity type.

B. Filtration Rates. Filtration rates shall not exceed 5 gallons per minute per square foot. (3.4 liters per square meter per second) based on the maximum hydraulic flow rate applied to the filter units.

C. Number of Units. Total filter area shall be provided in two or more units, and the filtration rate shall be calculated on the total available filter area with one unit out of service.

D. Filter Backwash

1. Backwash Rate. The backwash rate shall be adequate to fluidize and expand each media layer a minimum of 20 percent based on the media selected. The backwash system shall be capable of providing a variable backwash rate having a maximum of at least 20 gallons per minute per square foot, (13.6 liters per square meter per second) and a minimum backwash period of 10 minutes.

2. Backwash Pumps. Pumps for backwashing filter units shall be sized and interconnected to provide the required rate to any filter with the largest pump out of service. Filtered water should be used as the source of backwash water. Waste filter backwash shall be returned to the treatment process or otherwise adequately treated.

E. Filter Media

1. Selection. Selection of proper media size will depend on the rate of filtration rate, the type of pretreatment, filter configuration, and effluent quality objectives. In dual or multi-media filters, media size selection must consider compatibility among media.

2. Media Specifications. Table R317-3-12.2(E)(2) provides minimum media depths and the normally acceptable range of media sizes. The applicant has the responsibility for selection of media to meet specific conditions and treatment requirements relative to the project under consideration.

12.3. Filter Appurtenances. The filters shall be equipped with wash water troughs, surface wash or air scouring equipment, means of measurement and positive control of the backwash rate, equipment for measuring filter head loss, positive means of shutting off flow to a filter being backwashed, and filter influent and effluent sampling points. If automatic controls are provided, there shall be a manual override for operating equipment, including each individual valve essential to the filter operation. The underdrain system shall be designed for uniform distribution of backwash water (and air if provided) without danger of clogging from solids in the backwash water. Provision shall be made to allow periodic chlorination of the filter influent or backwash water to control slime growths.

12.4. Reliability. Each filter unit shall be designed and installed so that there is ready and convenient access to all components and the media surface for inspection and maintenance without taking other units out of service. The need for enclosing filter units shall depend on expected extreme climatic conditions at the treatment plant site. As a minimum, all controls shall be protected from adverse process and climatic conditions. The structure housing filter controls and equipment shall be provided with adequate heating and ventilation equipment to minimize problems with excess humidity.

12.5. Backwash Surge Control. The rate of waste filter backwash water return to treatment units shall be controlled such that the rate does not exceed 15 percent of the design average daily flow rate to the treatment units. The hydraulic and organic loads from waste backwash water shall be considered in the overall design of the treatment plant. Where waste backwash water is returned for treatment by pumping, adequate pumping capacity shall be provided with the largest unit out of service.

12.6. Backwash Water Storage. Total backwash water storage capacity provided in an effluent clearwell or surge tank or other unit shall equal or exceed the volume required for two complete backwash cycles. Additional storage capacity should be considered for operational flexibility.

12.7. Proprietary Equipment. Where proprietary filtration equipment, not conforming to the preceding requirements is proposed, data which supports the capacity of the equipment to meet effluent requirements under design conditions shall be submitted for review and approval by the Director.

TABLE R317-3-2.3(D)(4).
Minimum Slopes

Sewer Size, inch (centimeter)	Minimum Slope, feet per feet or meter per meter
8 (20)	0.00334
9 (23)	0.00285
10 (25)	0.00248
12 (30)	0.00194
14 (36)	0.00158
15 (38)	0.00144
16 (41)	0.00132

18 (46)	0.00113
21 (53)	0.00092
24 (61)	0.00077
27 (69)	0.00066
30 (76)	0.00057
36 (91)	0.00045

TABLE R317-3-4.4(H)(1).
Painting

Service	Color
Sludge	Brown
Gas	Orange
Potable Water	Blue
Non-Potable Water	Blue with a 6-inch (15 centimeters) red band spaced 30 inches (76 centimeters) apart
Chlorine	Yellow
Compressed Air	Green
Sewage	Gray

TABLE R317-3-6.2(B)(3)(d).
Loadings for Final Settling Tanks Following Activated Sludge Process

Process	Average Design Rate of Flow, million gallons per day (cubic meters per day)	Surface Loading, gallons per day per square foot (cubic meters per day per square meter)	Surface Loading, pounds per day per square foot (kilograms per day per square meter)
Contact Stabilization	0.5 (1,893) to 1.5 (5,678)	400 (16.3) to 600 (24.5)	
	Greater than or equal to 1.5 (5,678)	500 (20.4) to 700 (28.5)	
Extended Aeration	Less than or equal to 0.5 (1,893)	200 (8.2) to 400 (16.3)	
	0.5 (1,893) to 1.5 (5,678)	300 (12.3) to 500 (20.4)	25 (122.1)
	Greater than or equal to 1.5 (5,678)	400 (16.3) to 600 (24.5)	
Other than Contact Stabilization and Extended Aeration	Less than or equal to 0.5 (1,893)	400 (16.3) to 600 (24.5)	
	0.5 (1,893) to 1.5 (5,678)	500 (20.4) to 700 (28.5)	25 (122.1)
	Greater than or equal to 1.5 (5,678)	600 (24.5) to 800 (32.6)	

TABLE R317-3-7.1(E)(3)(a)(2).

Media Grading

	Percent by Weight
Passing 4-1/2 inch (11.4 centimeters) screen	100
Retained on 3 inch (7.6 centimeters) screen	95 - 100
Retained on 2 inch (5.1 centimeters) screen	98

TABLE R317-3-7.1(K)(1).
Hydraulic and Organic Loadings
for Nitrification in Trickling Filters

Trickling Filter Configuration	Loadings
Rock or Slag Media Filters	
Hydraulic Loading	Less than or equal to 4 million gallons per acre per day, or less than or equal to 4 cubic meters per square meter per day
Organic Loading	Less than or equal to 25 pounds BOD_5 per day per 1000 cubic feet, or less than or equal to 0.4 kilograms BOD_5 per day per cubic meter
Deep Manufactured Media Filters	
Hydraulic Loading	Less than or equal to 25 million gallons per acre per day, or less than or equal to 25 cubic meters per square meter per day
Organic Loading	Less than or equal to 100 pounds BOD_5 per day per 1000 cubic feet, or less than or equal to 1.6 kilograms BOD_5 per day per cubic meter

TABLE R317-3-7.2(B)(1)(c)
Permissible Aeration Tank Capacities and Loadings

Process	Hydraulic Retention Time (HRT), hours	Solids Retention Time (SRT), days	Aeration Tank Loading, pounds of BOD_5 per day per 1000 cubic feet	Food:Mass Ratio, (F:M) pounds of BOD_5 per pound of MLVSS (2)	Mixed Liquor Suspended Solids (1) (MLSS) milligrams per liter
Conventional	4-8	4-8	20-40	0.2-0.4	1,500-4,000
Step Aeration					
Complete Mix					
Contact Stabilization	1-3 (4) 3-6 (5)	3-10	50 (3)	0.2-0.6	2,000-4,000

zation

Extended Aeration, or Oxidation Ditch	24	30	10-12	0.05-0.1	2,000-4,000

Notes:
(1) Mixed Liquor Suspended Solids (MLSS) values are dependent upon the surface area provided for sedimentation and the rate of sludge return as well as the aeration process.
(2) Mixed Liquor Volatile Suspended Solids (MLVSS)
(3) Total Aeration capacity, includes both contact and reaeration capacities. Normally, the contact zone equals 30 to 35 percent of the total aeration capacity.
(4) Contact zone
(5) Reaeration zone

TABLE R317-3-7.2(B)(6)(a)(1).
Return Sludge Rate

Process	Q_R / Q, Percent
Standard Rate	15-75
Carbonaceous stage of separate stage nitrification	15-75
Step Aeration	15-75
Contact stabilization	50-150
Extended aeration	50-150
Nitrification stage of separate stage nitrification	50-200

TABLE R317-3-9.3(A)(1)(a).
Gravity Thickening

Type	Solids Loading Rate, pounds per day per square foot (kilograms per square meter per day)	Percent solids in thickened sludge
Primary sludge	20-30 (98-146)	8-10
Trickling filter sludge	8-10 (39-49)	7-9
Activated sludge	4-8 (20-49)	2.5-3
Combined primary and trickling filter sludges	10-12 (49-59)	7-9
Combined primary and activated sludges	6-10 (29-49)	3-6

TABLE R317-3-9.4(A)(4)(a).
Sludge Volume Generated

Type of Plant	cubic feet per Population Equivalent (P.E.) or cubic meters per Population Equivalent (P.E.)
Trickling Filter	5 (0.14)
Activated Sludge	6 (0.17)

TABLE R317-3-10.3(G)(3)(a).
Circle of Influence

Nameplate Horsepower	Radius, Feet
5	35
10-25	50
40-60	50-100
75	60-100
100	100

TABLE R317-3-12.2(E)(2).
Media Depths and Size

Media Material	Single Media	Multi-Media	
		Two	Three
Anthracite:			
Minimum Depth, inches		20	20
Effective Size, millimeters		1-2	1-2
Sand:			
Minimum Depth, inches	48	12	10
Effective Size, millimeters	1-4	0.5-1	0.6-0.8
Garnet or Similar Material:			
Minimum Depth, inches			2
Effective Size, millimeters			0.3-0.6

Uniformity Coefficient shall be less than or equal to 1.7

KEY: wastewater, water quality, water pollution
Date of Last Change: September 24, 2013
Notice of Continuation: April 26, 2022
Authorizing, and Implemented or Interpreted Law: 19-5; 19-5-104; 40 CFR 503

Appendix D Unit Flow Calculation

Supporting summary to the second paragraph of Section 4.2 • Calendar Year 2025 data • Unrounded ERU basis

Purpose of the Calculation

- Establish a single "unit flow" – the average wastewater loading of one Equivalent Residential Unit (ERU) – so that residential, commercial, and industrial loadings can all be expressed in the same unit.
- Express the entire 2025 system demand in ERUs, providing the denominator for the level of service, flow projection, and impact fee analyses in Chapters 5 and 9.

Data Used

- All values are calendar year 2025 records provided by Hyrum City.
- Total wastewater volume is taken from the metered influent at the Water Reclamation Facility (WRF); commercial volumes are taken from City water billing records and reported dairy effluent.
- Because the numerator originates at the WRF meter, the resulting unit flow is inclusive of infiltration and inflow (I&I).

Table 1. Input Data – Calendar Year 2025

Input	Value	Units	Source
Total metered influent at WRF	534,146,201	gal/yr	WRF meter records
Metered commercial accounts (60+ accounts)	30,762,857	gal/yr	City water billing
West Point Dairy (WPD) effluent	80,060,586	gal/yr	City records
Western Dairy Transport (WDT) water use	1,549,000	gal/yr	City records
Total commercial water use	112,372,443	gal/yr	Sum of the three above
Residential connections	3,846	connections	City connection records
Days in calendar year 2025	365	days	–

ERU Calculation

- **Step 1 – Establish total system volume.** The total metered influent at the WRF for CY 2025 is 534,146,201 gallons per year. This captures every source discharging to the City system, including I&I.
- **Step 2 – Aggregate commercial volume.** The metered commercial accounts (30,762,857 gal/yr), West Point Dairy effluent (80,060,586 gal/yr), and Western Dairy Transport water use (1,549,000 gal/yr) are summed to a total commercial contribution of 112,372,443 gal/yr.
- **Step 3 – Isolate the residential contribution.** Commercial volume is subtracted from total influent: 534,146,201 − 112,372,443 = 421,773,758 gal/yr attributable to residential users.
- **Step 4 – Convert to a daily basis.** 421,773,758 gal/yr ÷ 365 days = 1,155,545 gallons per day of residential contribution.
- **Step 5 – Divide by residential connections.** 1,155,545 gpd ÷ 3,846 residential connections = 300.5 gpd per connection, adopted as 300 gpd/ERU.
- **Step 6 – Convert commercial flows to ERUs.** Each commercial volume is converted to an average daily flow and divided by the 300 gpd/ERU unit flow, so that commercial demand is expressed in the same unit as residential demand.

- **Step 7 – Sum the total system demand.** Residential ERUs plus commercial ERUs give the total 2025 system demand in ERUs.

Table 2. Unit Flow Calculation

Step	Operation	Result	Units
1	Total metered influent at WRF	534,146,201	gal/yr
2	Less total commercial water use	(112,372,443)	gal/yr
3	Residential contribution	421,773,758	gal/yr
4	÷ 365 days	1,155,545	gpd
5	÷ 3,846 residential connections	300.5	gpd/ERU
6	**Adopted unit flow**	**300**	**gpd/ERU**

Table 3. 2025 System Demand in ERUs – Unrounded Basis

User Category	Volume (gal/yr)	Avg. Daily (gpd)	ERUs (calc.)	ERUs (reported)
Residential (3,846 connections)	421,773,758	1,155,545	3,846.0	3,846
Metered commercial accounts	30,762,857	84,282	280.9	281
West Point Dairy (WPD)	80,060,586	219,344	731.1	731
Western Dairy Transport (WDT)	1,549,000	4,244	14.1	14
Commercial subtotal	112,372,443	307,870	1,026.2	1,026
Total – 2025 system demand	**534,146,201**	**1,463,414**	**4,872.2**	**4,872**

ERU values are carried unrounded so that the aggregate reconciles to the metered influent at the WRF. The reported column is shown to the nearest whole ERU for presentation only. See Note 3.

Verification and Qualifying Notes

1. State cross-check. The 300 gpd/ERU result is consistent with the State recommendation of 100 gallons per capita per day, which at the Hyrum household density of 3.01 persons per household (Section 1.4.1) yields 301 gpd/ERU.

2. I&I is included. Because the unit flow is derived from total metered influent at the WRF, the 300 gpd/ERU value is inclusive of infiltration and inflow. The decomposition into base sanitary flow and the I&I component is presented in Section 9.4. The system-wide I&I allowance of 0.300 MGD is a component of the 300 gpd/ERU value and is not additive to it.

3. Unrounded basis. The ERU values in Table 3 are carried unrounded – 280.9, 731.1, and 14.1 commercial ERUs, for a commercial subtotal of 1,026.2 and a system total of 4,872.2 – so that the aggregate reconciles exactly to the 534,146,201 gallons of metered influent. These are the values reported in the Section 4.2 narrative as 281, 731, 14, 1,026, and 4,872. Fractional values must be retained wherever ERU counts are checked against metered flow or used to derive unit flows.

4. Assessment basis differs. For individual commercial accounts assessed for impact fees or user rates, commercial ERUs are rounded up to whole units. On that basis, and as calculated in the ERU evaluation of 17 August 2026, the metered commercial accounts total 318 ERUs, West Point Dairy is assessed at 732 ERUs, and Western Dairy Transport at 15 ERUs, for a commercial total of 1,065 ERUs and a system total of 4,911 ERUs. Rounding each commercial account up in this manner necessarily produces a higher commercial total than the 1,026.2 ERUs shown in Table 3, and the assessment figures must not be substituted back into any flow reconciliation or used to derive

a unit flow. The 280.9 ERU value for metered commercial accounts is an aggregate of 60-plus accounts; rounding each of those accounts up individually sums to 318 ERUs, not to 281.

5. Flow basis. The 534,146,201 gallon annual influent equates to an average annual daily flow of 1.46 MGD. This is an average annual day flow, not an average day / maximum month flow; the WRF experiences its highest monthly flows between February and May, as described in Section 4.3.3.

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City Council Agenda Information

To: Mayor Steve Miller and City Council

From: Robert Stroud, Recreation Manager

Date: November 5, 2026

Subject: Review and approval of the annual Recreation Department fee schedule, administrative pricing parameters, and officiating/ contractor pay scales.

Summary: **The Recreation Department presents its annual program and administrative pricing guide update for City Council review and adoption. Because community recreation demand, facility operations, equipment costs, and staffing requirements evolve over time, this annual update establishes a comprehensive, transparent operational framework for municipal youth athletic leagues, adult sports, instructional classes, community wellness programs, and special events.**

ATTACHMENT NOTICE: All specific fee schedules, individual program pricing tiers, team rates, official pay scales, and field staff wage structures are detailed in the accompanying Excel spreadsheet (Attachment A: 2025–2028 Recreation Fee Schedule & Staff Wage Matrix). This memorandum highlights the programmatic scope, structural adjustments, and policy frameworks governed by the document.

The primary objectives of this annual update are to:

- **Cost Recovery Alignment:** Align program user fees with municipal cost-recovery targets while preserving broad community accessibility.
- **Growth Management:** Support rapid program growth and facility utilization through standardized fee structures.
- **Non-Resident Policy:** Standardize non-resident fee parameters across high-demand youth and adult programs.
- **Contractor & Officiating:** Establish competitive, structured pay rates for sports officials, scorekeepers, site supervisors, and program contractors.
- **Administrative Agility:** Provide administrative flexibility to respond to market conditions and cost fluctuations without requiring frequent code revisions.

Overview of Document Structure and Program Scope

The updated guide is organized into six functional operational sections, outlined below:

1. Youth Sports Leagues & Program Expansion

- **Core Youth Leagues:** Covers active youth divisions in basketball, baseball, softball, flag football, volleyball, track & field, cheer, and pickleball. Modest rate updates accommodate rising facility maintenance and equipment expenses (see attached Excel sheet for specific league rates).

- **Standardized Non-Resident Surcharge:** Applies a uniform non-resident surcharge across primary youth athletic leagues to ensure resident priority and equitable facility funding.

2. Adult Leagues & Community Tournaments

- **Adult Athletic Leagues:** Establishes team registration rates for Men's and Co-ed Adult Softball leagues as well as indoor and outdoor Pickleball leagues.
- **Specialty Tournaments:** Includes team entry pricing for community tournaments such as late-season Softball, the Pickleball Open, and 3v3 Streetball competitions.

3. Instructional Lessons & Partner Models

- **Instructional Offerings:** Defines fee structures for youth, adult, and senior pickleball instruction, youth fishing classes (partnered with Hyrum Dam), skateboard lessons, square dancing, and community STEAM workshops.
- **Public-Private & Institutional Partnerships:** Highlights cooperative agreements with local specialized partners (e.g., The Paddle, Directive, local schools, and other businesses) to broaden community offerings at low net cost to the municipality.

4. Community Fitness & Special Events

- **Free Community Wellness Initiatives:** Reaffirms that core community group fitness classes, including REV + FLOW, REFIT, and the annual Fitness Bash, remain 100% free to the public as part of community health and wellness initiatives.
- **Special Events & Traditions:** Details entry rates and vendor fees for signature civic traditions, including Movies in the Park (Free), Parent & Daughter Dance, July 4th Craft & Food Vendor spaces, and parade entries.
- **Future Program Pipeline (2027–2028):** Previews multi-year program rollouts for 2027–2028, including Adaptive Sports programs, Children's Theater, Itty Bitty Sports clinics, a Disc Golf event series, and Noon Year's Eve family events.

5. Officiating, Contractor, & Volunteer Incentives

- **Game Officials' Pay Scale:** Defines per-game compensation schedules for youth and adult sports referees and umpires based on sport, age division, and certification levels.
- **Facility & Event Support:** Sets hourly wage rates for facility supervisors, hall monitors, practice site supervisors, scorekeepers, and administrative interns.
- **Volunteer Leadership Recognition:** Outlines volunteer coach fee refund parameters and free registration incentives for head program leads to encourage community volunteer leadership.

Key Presentation Points for City Council Review

- **Addressing Capacity & Demand:** Several core youth sports reached 100% registration capacity in 2026. The structured non-resident surcharges and minor rate adjustments reflect direct operational costs and generate essential revenue to support facility expansion.
- **Preserving Accessibility & Public Health:** The pricing schedule maintains a strong commitment to public health by keeping group fitness classes and major community gatherings free or low-cost, ensuring equitable access for all families.

RESOLUTION 26-29

A RESOLUTION SETTING THE 2027 HYRUM CITY RECREATION FEE SCHEDULE.

WHEREAS, Hyrum City provides a variety of recreational programs, athletic leagues, instructional classes, community fitness opportunities, special events, and facility activities for residents and surrounding communities; and

WHEREAS, the costs associated with providing recreational services, including facility maintenance, equipment, supplies, staffing, officiating, and program operations, continue to increase; and

WHEREAS, the Hyrum City Recreation Department has reviewed its existing program fees and recommends adjustments to certain registration fees, team fees, instructional fees, and non-resident surcharges to better reflect operational costs while maintaining accessible recreational opportunities; and

WHEREAS, several youth athletic programs reached 100% registration capacity in 2026, demonstrating increased community demand and the need to provide adequate funding for program operations, facility maintenance, and potential facility expansion; and

WHEREAS, the proposed 2027 Recreation Fee Schedule establishes consistent fee structures for youth athletic leagues, adult athletic leagues, community tournaments, instructional programs, special events, and other recreational activities; and

WHEREAS, the proposed schedule establishes a standardized non-resident surcharge for designated youth athletic leagues to prioritize Hyrum City residents and provide equitable funding for the use and maintenance of City recreational facilities; and

WHEREAS, the Recreation Department continues to support community health and accessibility by maintaining free community fitness programs, including REV + FLOW, REFIT, and the annual Fitness Bash, as well as free community events such as Movies in the Park; and

WHEREAS, Hyrum City recognizes the value of partnerships with local businesses, organizations, schools, and specialized instructors to expand recreational opportunities while minimizing the financial impact on the City; and

WHEREAS, the proposed fee schedule also establishes compensation for game officials, facility supervisors, scorekeepers, and other program support personnel, as well as volunteer coach incentives and registration benefits to encourage community involvement and leadership; and

WHEREAS, the Hyrum City Council has reviewed the proposed 2027 Recreation Fee Schedule and finds that the recommended fees and program structures are reasonable and in the best interest of Hyrum City and its residents.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF HYRUM CITY, UTAH, AS FOLLOWS:

The Hyrum City Council hereby adopts the 2027 Recreation Fee Schedule, attached hereto as Exhibit "A". The adopted schedule establishes the fees, registration rates, surcharges, compensation schedules, and volunteer incentives applicable to the City's recreation programs and activities for 2027.

2. EFFECTIVE DATE. This ordinance shall become effective upon posting three (3) copies in three (3) public places within Hyrum City.

3. ADOPTION. This ordinance is hereby adopted and passed by the Hyrum City Council this of 5th day of November, 2026.

HYRUM CITY

BY: _____
Steve J. Miller
Mayor

ATTEST:

_____
Stephanie Fricke
City Recorder

Roll Call Vote -	**Aye**	**Nay**	**Absent**
Councilmember Rebecca Foulger	☐	☐	☐
Councilmember Michael Nelson	☐	☐	☐
Councilmember Nalyn Nelson	☐	☐	☐
Councilmember Craig Rasmussen	☐	☐	☐
Councilmember James L. Wright	☐	☐	☐

Recreation Department and the Programs It Supports							
First Year	Program / Division	Current Pricing	Updated Pricing	Add-Ons	2025 Participants/ Teams	2026 Participants/ Teams	Program Notes & Needs
	YOUTH SPORTS LEAGUES						
	Youth Girls Basketball (Winter League)					**140**	
2026	1st and 2nd Grade Girls	$40.00	$45.00	$10 NR	N/A	44	FULL in 2026; Expanding Program in 2027: Update will go into effect in 2027 for this program
2026	3rd and 4th Grade Girls	$45.00	$45.00	$10 NR	N/A	60	FULL in 2026; Expanding Program in 2027
2026	5th and 6th Grade Girls	$50.00	$50.00	$10 NR	N/A	24	FULL in 2026; Expanding Program in 2027
2026	7th and 8th Grade Girls	$50.00	$50.00	$10 NR	N/A	12	FULL in 2026; Expanding Program in 2027
	Youth Boys Basketball (Winter League)					**309**	
2026	1st and 2nd Grade Boys	$40.00	$45.00	$10 NR	N/A	98	FULL in 2026; Expanding Program in 2027
2026	3rd and 4th Grade Boys	$45.00	$45.00	$10 NR	N/A	99	FULL in 2026; Expanding Program in 2027
2026	5th and 6th Grade Boys	$50.00	$50.00	$10 NR	N/A	56	FULL in 2026; Expanding Program in 2027
2026	7th and 8th Grade Boys	$50.00	$50.00	$10 NR	N/A	56	FULL in 2026; Expanding Program in 2027
	Youth Tee Ball					**94**	
	6 years old or younger on August 31	$25.00	$30.00		87	94	100 is FULL; Had to use more than just Tee Ball Field to meet demand
	Youth Baseball				**137**	**180**	
	Rookie 7 - 8 years (1st & 2nd Grade)	$40.00	$40.00		55	74	Pitching Machine will likely need to be replaced with in 2 years
	Minor 9 - 10 years (3rd - 4th Grade)	$70.00	$70.00		44	62	Participants play with teams from Providence, Nibley, Paradise, & Wellsville
	Major 11 - 12 years (5th & 6th Grade)	$75.00	$75.00		25	31	Participants play with teams from Providence, Nibley, Paradise, & Wellsville
	Pony 13 - 14 years (7th & 8th Grade)	$75.00	$75.00		13	13	Participants play with teams from Preston to Wellsville
	Comp Youth Baseball						
2026	Youth Comp Baseball (Team Pricing)	$700.00	$725.00		N/A	9	Ran by Recreation department with volunteers and teams helping. 9 Teams
	Youth Softball				**101**	**110**	
	Ponytail 8 & under (1st & 2nd Grade)	$40.00	$40.00		34	28	Participants play with teams from Providence, Nibley, Paradise, & Wellsville
	Fastpitch 10 & under (3rd & 4th Grade)	$45.00	$45.00		38	37	Participants play with teams from Providence, Nibley, Paradise, & Wellsville
	Fastpitch 12 & under (5th & 6th Grade)	$45.00	$45.00		16	23	Participants play with teams from Smithfield to Wellsville
	Fastpitch 14 & under (7th & 8th Grade)	$55.00	$55.00		13	22	Participants play with teams from Smithfield to Wellsville
	Youth Flag Football				**46**	**71**	
2025	Co-ed 1st & 2nd Grade	$35.00	$35.00		24	33	Currently playing with other cities for participation needs
2025	Co-ed 3rd & 4th Grade	$35.00	$35.00		18	29	Currently playing with other cities for participation needs
2025	Co-ed 5th & 6th Grade	$45.00	$45.00		4	9	Currently playing with other cities for participation needs
	Youth Volleyball						
2027	Co-ed 3rd & 4th Grade		$40.00	$10 NR	N/A	N/A	This will be a stand alone program ran at MCHS like Jr Jazz; Coaches and AD are onboard for the program. Will have NR fee as this will be the only Rec City Program on the South End of the Valley. **Will need an additional Recreational Staff for this program.**
2027	Co-ed 5th & 6th Grade		$40.00	$10 NR	N/A	N/A	
2027	Co-ed 7th & 8th Grade		$40.00	$10 NR	N/A	N/A	
	Youth Pickleball						
2026	**Youth Pickleball League (8-15yrs old)**		$40.00				Price will reflect how long the program will go. In Fall of 2026 we are $40 for 4 day program from 4:30PM -6PM. Mondays and Wednesdays — Sept. 29, Oct. 13, Oct. 20, and Oct. 27
	Other Youth Leagues						
2026	Youth Track & Field	$40.00	$40.00		N/A	49	Volunteered ran Program; Practice at SCMS
	ADULT LEAGUES						
	Adult Softball				**15**	**22**	
2025	2-Pitch (Team Pricing)	$315.00	$315.00		4	3	Demand isn't where I'd like it to be and likely to be discontinued.
2025	Standard Pitch (Team Pricing)	$415.00	$415.00		11	19	Men's and Coed Leagues. Slowly growing and getting the word out. Based on Fall & Spring Numbers
	Adult Pickleball				**52**		
2025	Outdoor Pickleball Leagues	$30.00	$40.00		52	N/A	Moved away from program due to lack of volunteers & staffing to run. Will look to bring it back when able to.
2025	Indoor Pickleball Leagues	$30.00	$40.00		N/A	12	In partnership with The Paddle Pickleball LLC
	TOURNAMENTS						
TBA	Softball Tournaments (Team Pricing)		TBA		N/A	TBA	Looking at a Tournament late September
TBA	Pickleball Open Tournament (Team Pricing)		$50.00		N/A	N/A	Will need staff, volunteers or contractors for this program.
TBA	3V3 Streetball Classic (Team Pricing)		$100.00		N/A	N/A	Will need staff, volunteers or contractors for this program.
	LESSONS & CLASSES						
	Pickleball Lessons						
2026	Adult & Senior Lessons	$40–$50	$40.00		N/A	21	Adult Lessons Slowed & Senior Lessons are being handled by the Paddle
2026	Youth Lessons (4yrs+)	$40–$50	$40.00		N/A	68	Still doing more sessions in 2026; Partnered with Paddle; Price
	Other Lessons & Classes						
2026	Fishing Lessons (8yrs+)	$25.00	$25.00		N/A	31	Both sessions sold out. Looking to add a third session in 2027. Partnered with Hyrum Dam.
2026	Skateboard Lessons (7yrs+)	$65.00	$65.00		N/A	42	Partnered with Directive who ran program; Bringing back in 2027; Looking at partnered Event.
2025	Square Dance Lessons (15yrs+)	$40.00	$40.00		16	44	Partnered with Lace & Levi who does the program for a free Elite Hall Rentals.
2025	STEAM Classes (4yrs - 14yrs)	FREE or up to $5	FREE or up to $5		217	180+	Volunteered Program ran out of the Civic Center; 2026 Slowed & two cancelled sessions; reworking
2026	Date Night Art Class		$25.00		N/A	N/A	Classes will be brought on once we have contractors to teach them. 2026 is a shared program with USU students
	FITNESS CLASSES						
	REV + FLOW	FREE	FREE		25	68	Volunteer certified fitness instructors teach this class; Brought under Rec umbrella in 2025 but has been going on for years!
	REFIT	FREE	FREE		10	48	
	Fitness Bash	FREE	FREE		10	40	New Years Event
	SPECIAL EVENTS & PROGRAMS						
2027/ 2028	Camps (e.g. Lego Camp, DND Camp, Board Game Camp)		TBA				Pricing of camps will be based on what is included.

2027/ 2028	Adaptive Program & Sports		Free to $30	N/A			Looking to add in 2027/2028 with a contractors or volunteers running the program
2027	Program: Children's Theater		$85.00	NR $15	N/A	N/A	Looking to add in winter of 2027 with a contractor running the program
2027/ 2028	Program: Itty Bitty Sports		$30.00		N/A	N/A	Looking to add in 2027 with a contractor running the program; 4 per year, roughly one each quarter
2025	Movie in the Park	FREE	FREE		?	?	Estimated 70 to 200+ participants per showing. Rec has asked Youth Council to assist with concessions. 3 movies a year, with plans to expand into a bigger event with activities in 2027/2028, depending on volunteer and staff availability.
2025	Parent & Daughter Dance	ter Couple: $20Additional Child: $5Additiona	l/Daughter Couple: $15Additional Child: $5Additional Adult: $7		48		Reducing price in a effort to create a higher demand based on value & cost. Rec has asked Youth Council to assist. Will try this program again in a year or two.
	Main Street Mile	FREE	FREE		?		Councilmember Rebecca Foulger Program, Rec Assists when asked
	Parade	$25 NR	TBA		109	134	Councilmember Mont Wright to set prices
2026	July 4th Craft Vendors	$20.00	$30.00	$10 Elec	N/A	28	Councilmember Rebecca Foulger Program, Rec Assists when asked
2026	July 4th Food Vendors	$20.00	$50.00	$10 Elec	N/A	9	Councilmember Rebecca Foulger Program, Rec Assists when asked
2027/ 2028	Food Trucks & Market	N/A	Following July 4th Pricing	$10 Elec	N/A	N/A	Would need a volunteer/ Staff/ Or Contractor to Supervise site during program nights.
	Hyrum Patriotic Children's Choir		FREE		127	123	Councilmember Nalyn Nelson Program, Rec Assists when asked
2026	Healthy Utah Community						Community Services Program
2025	Community Yard Sale						2025 program not bringing right now. No one seems to be calling for this program, but could come back in the future.
	National Night Out Against Crime						Councilmember Mont Wright Program, Rec Assists when asked
	National Day of Service						Councilmember Nalyn Nelson Program, Rec Assists when asked
	New Program Pay	**Staff has the degression to create the new pay for new programs for cost recovery goals.**					
NR	**Non-Resident (Used when there is a facility rental or extra details to program)**						
Elec	**Electricity**						
	Contractors Pay, Coach Refunds, & Financials						
	Program	**Role/ League**	**Pay Range**				
2025	**Coach Refunds**	**Cost of program up to $45, whichever is less.**					**Must be a head coach**
	Program Lead/ Running the Program	**Their children are free to participant for free.**					
	Youth Flag Football Pay	**Referee (3rd grade & up)**	**Solo: $25**				
		Referee (1st & 2nd)	**Call their own**				
	Youth Basketball Jr Jazz Pay	**Referee (1st & 2nd)**	**$10 with Partner; x1.5 if Solo**				
		Referee (3rd & 4th)	**$12 with Partner; x1.5 if Solo**				
		Referee 1 (5th Grade & Up)	**$15 with Partner if in HS; Adult is $25; x1.5 if Solo**				
		Scorekeeper	**$12.00**				
		Hall Supervisor	**$10.00**				
		Practice Site Supervisor	**$12.00**				
	Baseball & Softball Umpire Pay	**BB: Pony**	**$50.00**				
		BB: Majors & Minors; SB: U12 & U14	**$35.00**				
		SB: U10	**$20.00**				
		U8 and Rookies call their own	**Call their own**				
	Comp Youth Baseball	**Plate Umpire**	**$45.00**				
		Field Umpire	**$40.00**				
	Adult Softball	**2 Pitch Umpire**	**$20.00**				
		2 Pitch Scorekeeper/ Site Sup	**$13.00**				
		Regular Pitch Softball Umpire	**$25.00**				
		Regular Pitch Softball	**$15.00**				
	College Interns for Administrative & Program Assistance		**$12.00**	**$12hr for admin & program assistance but will assume rates above when officiating programs**			
	Revenue Streams						
	Program & League Fees						
2026	**Grant Funding**						
2027/ 2028	**Sponsorship Funds**						
	*** Recreation Department Staff has permission set pricing for new programs under $50 for residents and $100 for non residents**						
	Anything with a future date or TBA may or may not happen dependant on time, staffing/ volunteers and resources.						
	The Recreation Department may brand events and programs beyond the program name.						

ORDINANCE 26-23

WHEREAS, on June 18, 2026, the Hyrum City Council adopted Ordinance 26-13 establishing the Compensation Schedule for all Hyrum City employees; and

WHEREAS, the compensation range established for the Fire Fighter AEMT Full Time, Paramedic Part Time, and Fire Fighter AEMT Part Time positions were set higher than requested by the Hyrum Fire Department; and

WHEREAS, the Hyrum Fire Chief has requested an adjustment to the hourly wage range for the Fire Fighter AEMT Full Time, Paramedic Part Time, and Fire Fighter AEMT Part Time positions to more accurately reflect the positions' job description, responsibilities, and compensation requirements; and

WHEREAS, the requested adjustment is to reduce the hourly wage range from the previously adopted range of $22.00 minimum, $30.00 mid-range, and $38.00 maximum to $17.00 Minimum, $23.50 Mid Range, and $30.00 Maximum per hour.

NOW, THEREFORE, the Hyrum City Council hereby adopts, passes, and publishes the following:

AN ORDINANCE AMENDING THE 2026-2027 HYRUM CITY COMPENSATION SCHEDULE FOR FIRE FIGHTER AEMT FULL TIME, PARAMEDIC PART TIME, AND FIRE FIGHTER AEMT PART TIME.

BE IT ORDAINED by the City Council of Hyrum City, Cache County, State of Utah, that as follows:

1. The 2026-2027 Hyrum City Compensation Schedule for Fire Fighter AEMT Full Time, Paramedic Part Time, and Fire Fighter AEMT Part Time be amended as follows:

Position	Type	Minimum	Mid	Maximum	Phone Allowance	Safety Incentive	Appreciation Bonus
Fire Fighter AEMT Full Time	Hourly	$17.00	$23.50	$30.00	$35.00 month	$10.00 month	$324.85 annually
Fire Fighter AEMT Part Time	Hourly	$17.00	$23.50	$30.00			
Paramedic Part Time	Hourly	$17.00	$23.50	$30.00			

2. EFFECTIVE DATE. This ordinance shall become effective upon posting three (3) copies in three (3) public places within Hyrum City.

3. ADOPTION. This ordinance is hereby adopted and passed by the Hyrum City Council this of 5th day of November, 2026.

HYRUM CITY

BY:_____
Steve J. Miller
Mayor

ATTEST:

_____
Stephanie Fricke
City Recorder

Posted:_____

Roll Call Vote -	**Aye**	**Nay**	**Absent**
Councilmember Rebecca Foulger	☐	☐	☐
Councilmember Michael Nelson	☐	☐	☐
Councilmember Nalyn Nelson	☐	☐	☐
Councilmember Craig Rasmussen	☐	☐	☐
Councilmember James L. Wright	☐	☐	☐

HYRUM CITY
Established 1860
60 West Main Street
Hyrum, Utah 84319
Ph. (435) 245-6033
www.hyrumcity.gov

City Council Agenda Information

To: Mayor Miller and City Council

From: Dan Ferris, City Administrator

Date: November 2, 2026

Subject: Recommendation to Adjust Paramedic and Firefighter/AEMT Salary Ranges

Summary: At the City Council Meeting on June 18th, 2026, the City Council approved an ordinance amending Chapter 2.12. Section 2.12.010 of the Hyrum City Municipal Code to provide for adjustments in the salaries of officers and employees of Hyrum City. In the Position Wage Scale, there were some errors that need to be corrected.

Recommendation:
Staff recommends changing the pay range for Firefighter AEMT and Paramedic/AEMT Part Time positions as follows:

Previous:

POSITION	TYPE	MINIMUM	MID	MAXIMUM
Firefighter AEMT	Hourly	$22.00	$30.00	$38.00
Paramedic/AEMT Part Time	Hourly	$22.00	$30.00	$38.00

New:

POSITION	TYPE	MINIMUM	MID	MAXIMUM
Firefighter AEMT	Hourly	$17.00	$23.50	$30.00
Paramedic/AEMT Part Time	Hourly	$17.00	$23.50	$30.00

City Council Meeting Details:
• Meeting Date: November 5, 2026
• Council Role: Approval

Attachments:

None

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City Council Agenda Information

To: Mayor Miller and City Council

From: Larry Coleman, Power Superintendent

Date: October 29, 2026

Subject: Acceptance of Switchgear Protection & Controls Design Bid

Summary: As part of the Substation 3 Switchgear installation, there will be outside engineering that needs to take place on site to coordinate the building with our system. Historically we have had WSP do much of our relay protection and controls to coordinate between any electrical equipment, substations, and SCADA. Because of their familiarity of our system and have had a vital role in the substation 3 switchgear building RFP, they have all the necessary data for this project. We would like to use them as the electrical engineering firm to assist in the switchgear protection and control design. The breakdown of the scope of work and costs are attached in this packet.

Recommendation:
Larry Coleman, Power Superintendent, is recommending approval of bid from WSP to perform the Protection and Controls design and commissioning of the Substation 3 switchgear building.

City Council Meeting Details:
• Meeting Date: Nov.5 2026
• Council Role: Approval

Attachments:
1

October 13th 2026

Substation 3 - Switchgear P&C Design
Hyrum City Power
Attn: Larry Coleman
60 W Main St.
Hyrum, UT 84319

Subject: Substation 3 Switchgear P&C Design

Dear Larry:

Thank you for the opportunity to submit WSP's proposal for Hyrum City's installation of a new switchgear at the Substation 3 site. The following proposal package includes our proposed work plan, schedule, and cost.

The primary contact person for this proposal is Lucas Becker P.E, who is also the project manager. The Primary Engineer will be Gabrielle Panday, E.I.T.

Attached with this cover letter is our project approach for this project where we identify key tasks that we will perform.

We appreciate your consideration and look forward to discussing our proposal with Hyrum. Please reach out with any questions or comments.

Thank you once again for this opportunity to serve Hyrum City Power!

Sincerely,



Lucas Becker, PE

Primary Contact:	**Secondary Contact:**
Lucas Becker, PE	Gabrielle Panday, E.I.T.
Senior Technical Manager	Experienced Professional
T: (303)716-8913	T: (352) 657-4375
Lucas.Becker@wsp.com	Gabrielle.panday@wsp.com

Project Scope of Work

The City of Hyrum is planning an expansion of Substation 3 that includes installing new metal-clad switchgear with four distribution bays and new relay panels housing protection and control devices for the site's three existing line breakers and one transformer breaker.

WSP's scope of services will include:

- Detailed design for the installation of the metal-clad switchgear.
- Protective relay coordination and documentation, relay settings, and test sheets
    - Includes coordination, settings, protection philosophy, and test sheets for local relays.
- SCADA Points List updates and RTAC programming
- Updates to existing cable schedules
- Project Reporting (incl. Remote Testing and Commissioning Support)
- Updating associated drawings as required

Deliverables

Once the City's approval is received WSP will move forward with a 60% / 90% / 100% Design Package schedule.

WSP Engineers will include the following documents and reports for each stage of design transmittals.

Design Deliverables		
Design Stage	**Drawings**	**Reports/Calcs**
60% Submittal	Updated Switchgear Bid package with comments from ICC addressed.	
	Three line Diagrams	
	AC and DC Panel Drawings	
	DC Control Schematics	
90% Submittal	60% Package with Comments Incorporated from Hyrum	
	Equipment Wiring Diagrams	
	Panel Wiring Diagrams	
	Circuit List/Cable Schedule	
		Testing and Commissioning Specification
		Protection Philosophy
IFC Submittal	90% Package with Comments Incorporated from Hyrum	
		Protective Relay/SCADA Settings
		Relay Test sheets
		SCADA Points list
		Equipment Test Sheets
For Record	For Record Drawing Set with Field Red-Lines Incorporated	
		Reviewed and Approved Testing Results and Reports

Schedule

Design Deliverables	
Deliverable	**Date**
60%	04/01/2026
90% (IFC)	06/01/2026
100% (RECORD)	TBD

Cost Estimates

WSP proposes the following rates for the engineering classifications proposed. Estimated hours are based on the above preliminary schedule. This cost proposal is submitted on a Time and Material Not to Exceed basis, any hours or expenses not actually charged to the project will not be invoiced.

PROJECT DESIGN		
Subtask	**Hours**	**Total Cost**
Project Management	48.00	8,200.00
Electrical Design	444.00	73,252.00
Relay Settings	104.00	20,984.00
Commissioning Support	40.00	8,344.00
Total	**636.00**	**110,780.00**

Notable Exclusions

WSP proposes the list of exceptions below:

- Hyrum will provide WSP with available fault currents for necessary relay coordination studies and settings development.
- This proposal covers the P&C design inside of the switchgear and the control wiring from the switchgear to the yard equipment. Hyrum will be responsible for all physical, conduit and grounding modifications necessary at the Substation 3 site.
- Hyrum will provide any available CAD versions (dwg preferred) of equipment vendor drawings for WSP to edit.
    - Should CAD files of drawings not be available, Hyrum will provide any necessary drawings as scanned version of hard copies for WSP to edit.
- Hyrum will provide existing settings for all remote and local line relays.
- WSP typical calculation and detailing procedures will be used for engineering design.
- Offsite support includes 40 hours of remote technical support for any questions concerning the above scope of work.
- This proposal does not include a pre-design site walkdown. Information not readily available on existing drawings will be verified by Hyrum onsite personnel as directed by WSP.
- This proposal is based off the switchgear bid package issued on 05/08/2026. Any major deviations from the initial bid package will require a change order.

