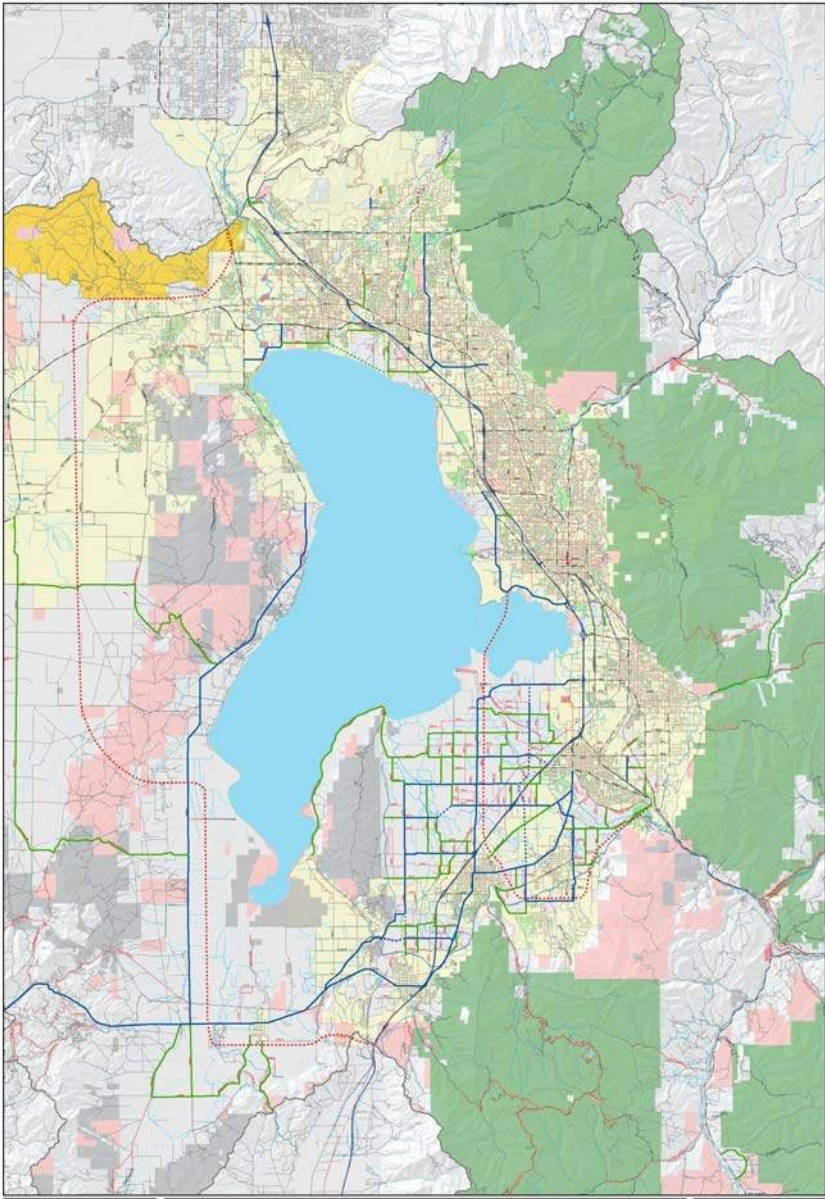


Appendix B
Utah County Land Use

General Plan, Land Use Element Map

The Utah County General Plan, *Land Use Element Map*, illustrates the five areas of the Utah County General Plan, *Land Use Element Plan*. This land use plan and land use map, along with the goals, objectives and policies element; the moderate income housing element; the transportation and traffic circulation element; and the environmental element; make up the advisory guidelines for the comprehensive development and long-range land use planning for the unincorporated lands of Utah County, Utah.



<p>Transportation and Traffic Circulation Element Map</p> <p>Utah County General Plan</p>	<p>Aerial and Collector Roads</p> <ul style="list-style-type: none"> — Arterial ----- Arterial Proposed ----- Collector ----- Collector Proposed ----- Long Range Expressway Proposed 	<p>Scale: 1" = 1 Mile</p> <p>North Arrow</p> <p>Utah County</p>
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Land Use Element Map

Utah County General Plan



1:197,871
1 inch = 3.12 miles

- County Boundary
- Township Lines
- Stream or River

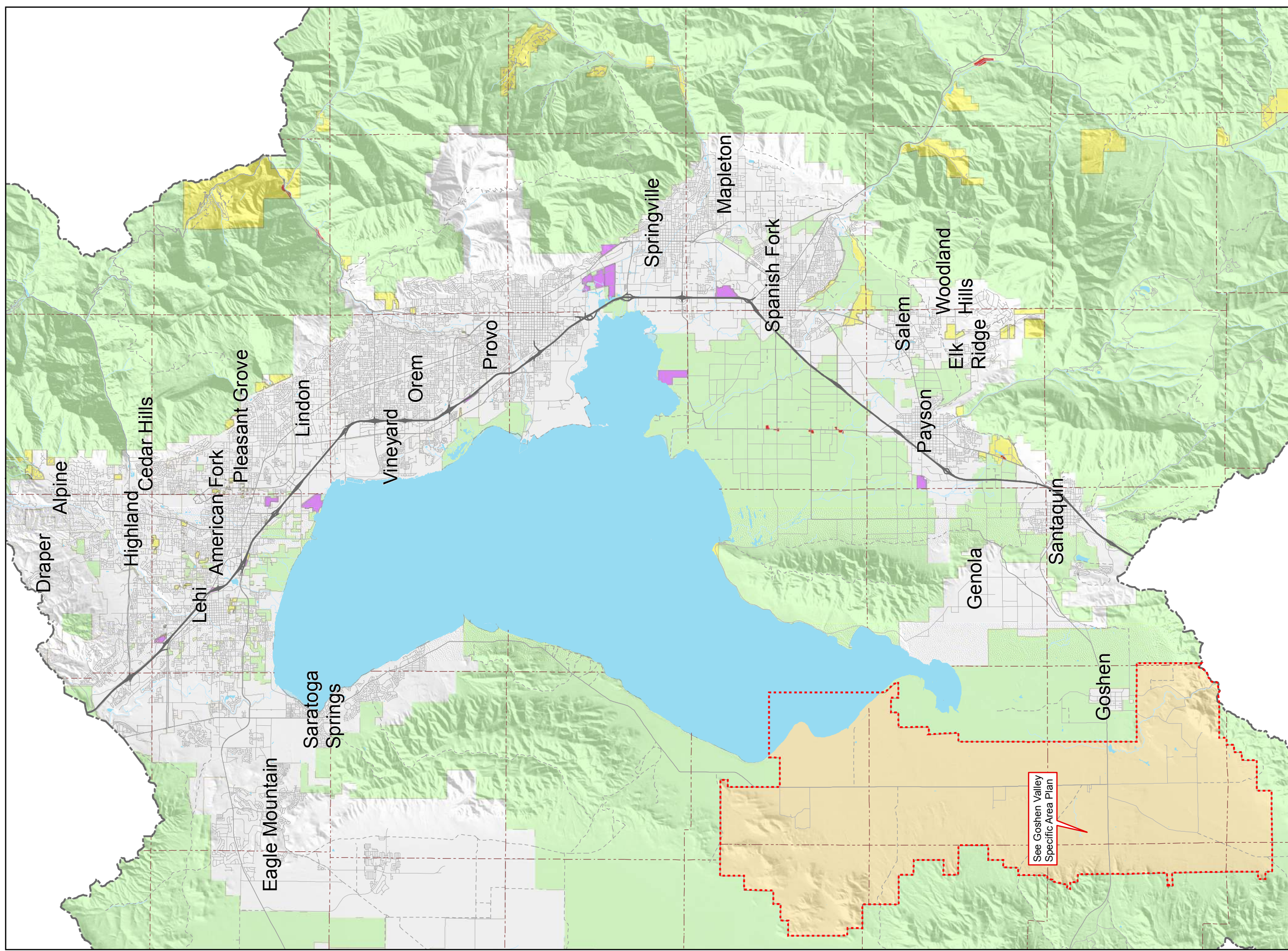
- Roads**
- I-15
 - Highway or State Road
 - Paved Roads
 - Dirt Roads
 - Gravel Roads

- County Land Use**
- Agricultural/Watershed
 - Commercial
 - Incorporated
 - Manufacturing
 - Residential
 - Utah Lake
 - Goshen Valley Area Plan



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Land Use Element Map

Utah County General Plan



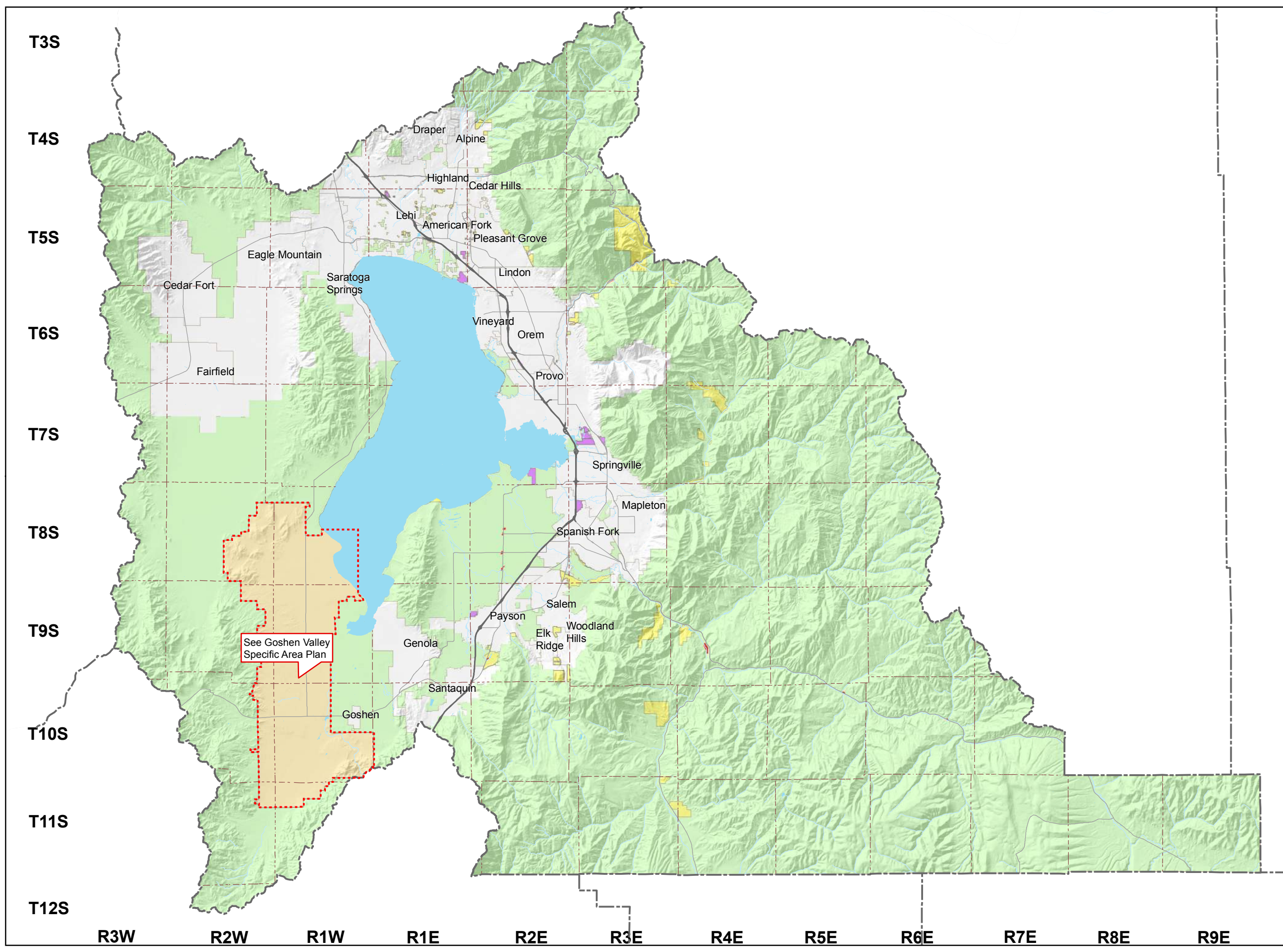
1:356,944
1 inch = 5.63 miles

-  County Boundary
-  Township Lines
-  Stream or River
- Roads**
-  I-15
-  Highway or State Road
- County Land Use**
-  Agricultural/Watershed
-  Commercial
-  Incorporated
-  Manufacturing
-  Residential
-  Utah Lake
-  Goshen Valley Area Plan



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Appendix C
Water Conservation and Management Plan

Water Conservation Plan For Payson City, Utah



November 4, 2015

TABLE OF CONTENTS

1. INTRODUCTION.....	1
2. DESCRIPTION OF PAYSON CITY AND ITS WATER SYSTEM.....	1
2.1. INVENTORY OF WATER RESOURCES.....	2
2.2. WATER BUDGETS.....	3
2.3. PRESENT WATER USE AND FUTURE WATER NEEDS.....	4
3. WATER PROBLEMS, CONSERVATION MEASURES AND GOALS.....	5
3.1. WATER CONSERVATION GOALS.....	6
4. CURRENT CONSERVATION PRACTICES.....	7
4.1. WATER CONSERVATION CONTINGENCY PLAN.....	7
4.1.1. <i>Level 1 – Normal Years</i>	7
4.1.2. <i>Level 2 – 75% of Normal</i>	7
4.1.3. <i>Level 3 – 50% of Normal</i>	7
4.2. WATER EDUCATION PROGRAM.....	7
4.2.1. <i>Outdoor Water Use:</i>	7
4.2.2. <i>Indoor Water Use:</i>	8
5. CURRENT WATER RATES.....	9
6. ADDITIONAL CONSERVATION MEASURES.....	10
7. IMPLEMENTING AND UPDATING THE WATER CONSERVATION PLAN.....	11
APPENDIX A – WORKSHEETS.....	12
8. CURRENT CONSERVATION PRACTICES.....	13
8.1. MEASURE 1.....	13
8.2. MEASURE 2.....	13
8.3. MEASURE 3.....	13
8.4. MEASURE 4.....	13
9. ADDITIONAL CONSERVATION MEASURES.....	14
9.1. BMP 1 – COMPREHENSIVE WATER CONSERVATION PLANS.....	14
9.2. BMP 2 – UNIVERSAL METERING.....	14
9.3. BMP 3 – INCENTIVE WATER CONSERVATION PRICING.....	14
9.4. BMP 4 – WATER CONSERVATION ORDINANCES.....	14
9.5. BMP 5 – WATER CONSERVATION COORDINATOR.....	14
9.6. BMP 6 – PUBLIC INFORMATION PROGRAM.....	14
9.7. BMP 7 – SYSTEM WATER AUDITS, LEAK DETECTION AND REPAIR.....	14
9.8. BMP 8 – LARGE LANDSCAPE CONSERVATION PROGRAMS AND INCENTIVES.....	14
9.9. BMP 9 – WATER SURVEY PROGRAMS FOR RESIDENTIAL CUSTOMERS.....	14
9.10. BMP 10 – PLUMBING STANDARDS.....	15
9.11. BMP 11 – SCHOOL EDUCATION PROGRAMS.....	15
9.12. BMP 12 – CONSERVATION PROGRAMS FOR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL CUSTOMERS.....	15
9.13. BMP 13 – RECLAIMED WATER USE.....	15
10. COST ANALYSIS.....	16
10.1. DESCRIPTION.....	16
10.2. CAPITAL COSTS.....	16
10.3. ANNUAL COSTS.....	16
10.4. AVOIDED COSTS.....	16
10.5. NET COST / BENEFIT.....	16

10.6.	PROGRAM.....	16
11.	IMPLEMENTATION, MONITORING AND EVALUATION.....	17
11.1.	IMPLEMENTATION PROCEDURE.....	17
11.2.	MONITORING & EVALUATION.....	17
11.3.	PLAN UPDATE.....	17
12.	RESOLUTION WATER CONSERVATION PLAN.....	18
	ACKNOWLEDGEMENT.....	18

1. INTRODUCTION

In response to the rapid growth occurring throughout the state of Utah, Payson City citizens and leaders are becoming concerned for the future cost and availability of the water supply. A similar concern has been demonstrated by the state legislature in the Water Conservation Plan Act (House Bill 153) passed and revised in the 1999 legislative session (Section 73-10-32 Utah Code Annotated). This water conservation plan is written to address the concerns of leaders and citizens of both Payson City and the state of Utah.

2. DESCRIPTION OF PAYSON CITY AND ITS WATER SYSTEM

Located in at the southern end of Utah County, and in the second driest state in the nation, Payson City's 2010 population was approximately 18,295. Payson City's current service area is approximately 7,192 acres. Providing water to meet the needs of its citizens has always been a top priority of city leaders and planners. As a result, Payson's well-maintained and operated water system provides the citizens of Payson City with water when and where needed. Currently, the water system provides water to 5,430 residential, 350 combined commercial, industrial, and institutional (public) connections.

Payson City residents and their leaders place a high value on open space. Consequently, 220 acres of land in the city have been set aside as parks and a cemetery. The golf course and landscaped areas around schools, churches and major industries occupy approximately another 230 acres. Payson City still has approximately 1,200 acres of vacant land in agricultural zones, more than 200 vacant acres in industrial zones, and more than 180 acres in undeveloped residential zones.

Payson City is presently receiving a small portion of the county's residential, commercial and industrial growth. This growth is causing small changes in the way the land within the city limits is being utilized, but as of now we are able with our present water supply and delivery system to meet demands. Through careful planning and efficient utilization of available water supplies these increased needs can and will be met.

Payson City's culinary water system is owned and operated by Payson City Corporation. The system serves the residents of Payson City and a small number of the residents in the adjoining unincorporated areas of the county. Water from Peteetneet Creek and/or nearby springs has been used since the settling of the City in the 1850s. It is estimated that the first modern water storage tank was constructed sometime in the 1940s. The distribution system throughout the City has been added to, since the early 1900s. The water sources consist of 9 springs located in Payson Canyon to the south-east of the City and 5 underground wells located within the City limits. Water storage is contained in three storage tanks, (2) 2.5 MG and (1) 0.6 MG, located at the mouth of Payson Canyon.

Significant water conservation was achieved in 1991-2 by installing a pressurized irrigation system throughout the City. The pressurized irrigation system is a completely separate system from the culinary system and is saving close to 4500 acre-feet of culinary water per year over flood irrigation. This system provides pressurized irrigation water to each residence for lawn and garden watering so that culinary water is not needed or used for those purposes. As an addition to the pressurized irrigation a process of implementing a sewer effluent reuse project which has the potential to reuse up to 4,700 acre-feet of culinary water per year has been accomplished. This is done by pumping effluent water into both the Nebo Power Plant and Payson City's pressurized irrigation system. For more information on the reuse plan please refer to Payson City's January 26, 2004 "Sewer Effluent Reuse Project Plan".

2.1. Inventory of Water Resources

Payson City has been withdrawing approximately 1,200 acre-feet of culinary water annually from an underlying aquifer through wells. This has supplied about half of the total water required to meet demands on the culinary system which provides for both indoor water uses. The remaining water need of the city's 18,295 people comes from the 9 springs in Payson Canyon.

Potable water for future city residents will, for the most part come from our current sources and shares turned over to Payson City Corporation by land developers as part of development agreements. For planning purposes the amount withdrawn from the 5 wells will be held below 7,000 acre-feet.

The city owns 266.2 acre feet in South Utah Valley Municipal Water Association (SUVMWA). SUVMWA is an association made up of ten cities in South Utah County for the purpose of helping provide for the member cities' water needs. Water provided under these shares is, and will continue to be, used for irrigation of city owned parks and open spaces.

Under current water rights the city is entitled to withdraw 7,119 acre-feet of culinary water annually from wells as shown below. This amount of water shares should be enough to supply Payson City's culinary needs until the population exceeds 35,000. Furthermore current irrigation water rights entitle Payson City to use 6,322 acre-feet of annually from canyon springs and wells as shown below. This amount of irrigation water shares should be enough to supply Payson City's irrigation needs until the population exceeds 31,000.

Table 1 City-Owned Water Rights

<i>WR #</i>	<i>POINT OF DIVERSION</i>	<i>Quantity Acft</i>	<i>USES OF WATER RIGHT</i>
51-1053	Underground Water Wells	5.4	Irrigation Water
51-1063	Peteetneet Creek, Streams & Springs	11 cfs	Hydro-Electric Power Plant
51-1266	Surface Runoff Water	1400	Spring Lake
51-1313	Underground Water Wells	3608	Culinary Water
51-1711	Dixon Spring	96	Culinary Water
51-1762	Underground Water Wells	0.37	Culinary Water
51-1763	Underground Water Wells	27	Culinary Water
51-2694	Underground Water Wells	122.1	Irrigation Water
51-2868	Underground Water Wells	724	Irrigation Water
51-3781	Underground Water Wells	52	Irrigation Water
51-4766	Underground Water Wells	33.9	Culinary Water
51-5402	Peteetneet Creek, Streams & Springs	50 cfs	Hydro-Electric Power Plant
51-6055	Underground Water Wells	152	Culinary Water
51-6272	Peteetneet Creek, Streams & Springs	3260	Irrigation Water
51-7052	Underground Water Wells	29.6	Culinary Water
51-7113	Underground Water Wells	186.3	Culinary Water
51-7114	Underground Water Wells	101.6	Culinary Water
51-7146	Underground Water Wells	69	Culinary Water
51-7161	Underground Water Wells	31.5	Culinary Water
51-7170	Underground Water Wells	266.2	Irrigation Water
51-7173	Underground Water Wells	327	Culinary Water
51-7191	Utah Lake and Jordan River	41.31	Irrigation Water
51-7192	Underground Water Wells	135.5	Culinary Water

51-7194	Underground Water Wells	9.68	Culinary Water
51-7197	Utah Lake and Jordan River	163.3	Irrigation Water
51-7198	Utah Lake and Jordan River	224.8	Irrigation Water
51-7203	Underground Water Wells	48.4	Culinary Water
51-7224	Underground Water Wells	48.4	Culinary Water
51-7228	Underground Water Wells	28	Culinary Water
51-7241	Underground Water Wells	48.4	Culinary Water
51-7244	Underground Water Wells	4.9	Culinary Water
51-7247	Underground Water Wells	72.6	Culinary Water
51-7250	Underground Water Wells	103.7	Culinary Water
51-7251	Underground Water Wells	51.9	Culinary Water
51-7268	Underground Water Wells	4.8	Culinary Water
51-7277	Underground Water Wells	151	Culinary Water
51-7278	Underground Water Wells	96.8	Culinary Water
51-7294	Underground Water Wells	9.7	Culinary Water
51-7303	Underground Water Wells	9.7	Culinary Water
51-7314	Underground Water Wells	53.2	Culinary Water
51-7315	Underground Water Wells	203.3	Culinary Water
51-7316	Underground Water Wells	4.8	Culinary Water
51-7328	Underground Water Wells	27.5	Culinary Water
51-7336	Underground Water Wells	203.3	Culinary Water
51-7388	Underground Water Wells	0.5	Culinary Water
51-7400	Underground Water Wells	27.5	Culinary Water
51-7403	Underground Water Wells	48.4	Culinary Water
51-7551	Underground Water Wells	212.95	Culinary Water
51-7555	Underground Water Wells	47.2	Culinary Water
51-7572	Underground Water Wells	3.8	Culinary Water
51-7580	Underground Water Wells	4.8	Culinary Water
51-7614	Underground Water Wells	24.2	Culinary Water
51-7615	Underground Water Wells	47.2	Culinary Water
55-9505	Utah Lake and Jordan River	62.9	Irrigation Water
Total Culinary Water		7119	Acre-Feet
Total Irrigation Water		6322	Acre-Feet

2.2. Water Budgets

The following table shows the amount of water delivered into the water system and the metered outflows to end-users for the years 2011 to 2015.

Table 2 City Water Budget - 2011 through 2015

<i>Inflow (AF)</i>				<i>Outflow (AF)</i>				
<i>Year</i>	<i>Springs</i>	<i>Wells</i>	<i>Total</i>	<i>Residential</i>	<i>Commercial</i>	<i>Industrial</i>	<i>Total</i>	<i>Difference</i>
2011	638,266	279,312	2815.94	N/A	N/A	N/A	2139.24	-24%
2012	565,977	412,051	3001.45	N/A	N/A	N/A	2361.03	-21%
2013	445,975	565,071	3102.78	N/A	N/A	N/A	2257.61	-27%
2014	485,683	685,575	3594.45	N/A	N/A	N/A	2695.84	-25%
2015	513,272	578,604	3350.84	N/A	N/A	N/A	2580.15	-23%

Average annual losses from the system are about 24 percent for the five years of record.

2.3. Present Water Use and Future Water Needs

When all uses of culinary grade water are compared with the number of people living in Payson City over the last 5 years, residents use 154.8 gallons of treated water per capita per day (gpcd) compared to the statewide average of 185 gpcd.

The un-metered secondary irrigation system installed in 1991-2 is saving close to an average of 178.0 gpcd of culinary water.

Payson City Culinary Water system consists of nine springs located in Payson Canyon and four deep wells located in the City limits. The total combined water right from these sources is 13,441 acre-ft/year. Since the installation of the PI system in 1991-2, the culinary water usage has increased together with the population of Payson.

The extent of the city's estimated future population growth through the year 2050 is shown in Figure 1. Many factors influence this projection, and the estimates shown may vary substantially from the actual population experienced.

The UAMPS Nebo Power Plant has recently been constructed in the city and is using large volumes of treated city water and effluent in its production process. Payson City also has an active Economic Development Plan that is targeting industrial users to occupy our business park. Furthermore, there is a large cherry processing operation that requires a significant amount of high quality production water.

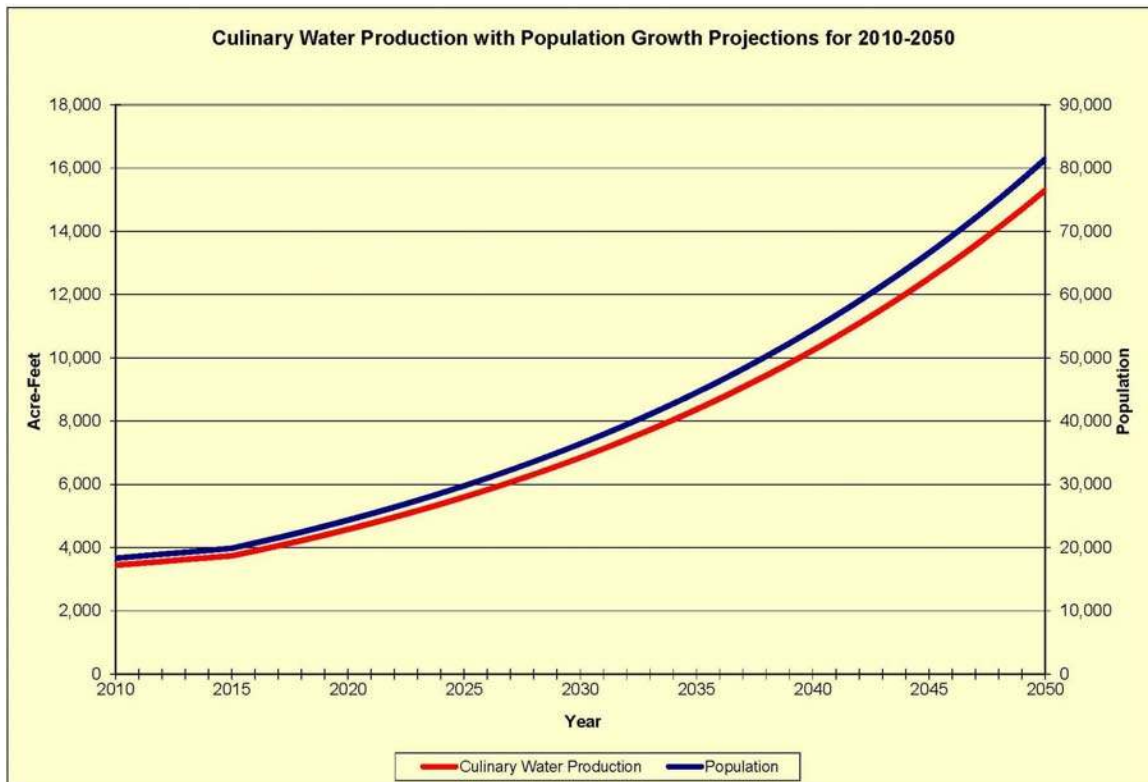


Figure 1 Culinary water production graphed with population growth projected through 2050. Projections are based on maintaining an average Payson City goal of 140 gpcd culinary water usage. Payson city has also made it a goal to reduce the irrigation water usage form 178 gpcd to 169 gpcd as part of the 5% reduction goal.

3. WATER PROBLEMS, CONSERVATION MEASURES AND GOALS

Problems Identified

The Water Conservation Committee, in its recent report, identified and prioritized several problems during the investigative phase of their work. The following are the items identified:

- The current water pricing and billing system, while currently being adjusted to adequately cover expenses in the water enterprise account, lacks incentives and sufficient information for residents and businesses to use water more efficiently.
- Citizens lack information and understanding of landscaping water requirements and efficient water-use habits and practices: Very few residents know how much water is required to maintain healthy landscaped areas and how to consistently use water efficiently indoors. Most citizens' irrigation and indoor practices are based on convenience rather than plant needs and water supply considerations.
- Existing meters are providing inaccurate data due to age and obsolescence. Many meters have been in service for more than 10 years and need to be replaced. Furthermore many of the well meters need to be replaced with automatic read meters.
- Many trees and shrubs on the city's acceptable plants list are high water users. Trees and shrubs on the city's list are preferred because they have non-intrusive root systems.
- Political consequences prevent water rates from keeping up with increasing costs: With the currently available methods for setting water rates, city council action is required for each adjustment. Raising rates often is deferred as long as possible because of political risks to members of the city council.
- Haskellville (an unincorporated area of Utah County east of Payson City) has 25 connections on Salem canal Road which have low flow and pressure.
- Payson City's water system has several outdated lines that have been in service for more than 40 years and are in need of replacement. These lines are most likely the largest source of system water losses. ***We estimate that 20-25% of our loss may be due to inaccurate meters and leaking lines.***
- Some residents are not changed over to the pressurized irrigation system for outdoor watering.

Each problem represents an opportunity. Aside from replacement of meters, replacement of old lines and high water-use landscaping, the opportunity exists to solve the above problems through a well-thought-out water pricing program.

In addition to a new pricing and billing system, the opportunity exists to prepare a new generation of wise-water users. This can be assisted with a strong sustained water education program in the public and private schools.

Additional opportunities can be found in two of the remaining problems. Old meters may provide an opportunity for the city to begin a program to replace old meters with modern remote-read meters that can create substantial savings through reduced labor. High water using plants on an "acceptable plants list" could provide an opportunity for the Urban Forestry Committee to undertake research to find additional water thrifty plants that do not have intrusive root systems, and may improve landscape quality and appearance. Landscaping along existing and future roads in the city could be more easily maintained if low water-use shrubs and mulches were used instead of Kentucky blue grass. All this will help solve the last problem identified by reducing peak demands and the need for expensive water system upgrades.

3.1. Water Conservation Goals

In pursuit of solutions to the problems identified previously, and in light of the variety of conservation measures available to solve these problems, the following goals have been identified:

- GOAL #1
Reduce the city's per capita water use rate by at least 5 percent in five years, 147 gallons of treated water and 169 gallons of untreated water per capita per day (gpcd). The 10 year average water-use rate goal is 140 gallons of treated water and 148 gallons of untreated water per capita per day (gpcd). The ultimate long term goal is to bring these down to a combined 280 gpcd.
- GOAL #2
Maintain a financially viable water system. The water pricing system should encourage customers to reduce use without creating a revenue shortfall.
- GOAL #3
Maintain or improve the appearance of street landscapes, open spaces and yards. Improved irrigation practices and water efficient landscapes can enhance the beauty of the city. Annual surveys of citizen attitudes will measure satisfaction, or lack thereof, with landscapes on city-owned properties and rights-of-way.
- GOAL #4
Installation of Secondary Irrigation Meters. Payson City has actively pursued irrigation meter grant and funding opportunities. With the installation of irrigation meters, it is believed that water conservation will be obtained. As users are held financial responsible for individual water usage, unwanted, disregarded waste and use of water will be avoided.

4. CURRENT CONSERVATION PRACTICES

In order to solve the problems identified above and take advantage of the many associated opportunities, specific water conservation measures must be identified and evaluated. Payson City has already implemented several water conservation measures; these, along with additional measures that will effectively solve Payson City's water problems, are discussed below.

Payson City's current water conservation program is directed primarily at managing water shortages and providing useful material to assist residents to use water more efficiently. Current measures include a water conservation contingency plan, water education program for outdoor and indoor water use, and a conservation oriented water rate structure.

4.1. Water Conservation Contingency Plan

The city has a "Water Conservation Contingency Plan" dated December 2004, which spells out climate and political realities related to water use during drought or other water supply shortages. Also addressed in this report are the conservation measures that may be implemented during times of emergency. They are as follows:

4.1.1. Level 1 – Normal Years

- Eliminate watering on city property from 10 a.m. to 6 p.m.
- Initiate voluntary public conservation measures.
- Issue information to all customers on conservation procedures each can accomplish around their own property and within their own homes.

4.1.2. Level 2 – 75% of Normal

- Minimize watering of city property.
- Educate the public on the water supply decreases.
- Initiate mandatory public conservation measure.
- Enforce outside watering restrictions including watering times and quantities.

4.1.3. Level 3 – 50% of Normal

Strictly enforce all conservation policies with significant fines for non-compliance. Physically restrict water supplies to (in order of priority):

- All outside irrigation systems
- Park properties and other non-essential support facilities
- Commercial businesses, restricting largest users first
- Residential areas
- Any other "non-life support" areas, insuring water supplies to hospitals, hospices, and all other health care facilities, and controlled designated area water facilities.

Additional non-emergency water conservation measures are listed below.

4.2. Water Education Program

The following information on efficient outdoor and indoor water use is available to the citizens of Payson City through the city and county libraries and is occasionally disseminated with the water bill.

4.2.1. Outdoor Water Use:

- Do not irrigate landscaping with culinary water at any time. Take advantage of the pressurized irrigation system. Irrigation of landscaping is not needed before or after the pressurized irrigation system is turned on or shut off.
- Water landscape only as much as required by the type of landscape, and the specific weather patterns of your area, including cutting back on watering times in the spring and fall.
- Do not water on hot, sunny, and/or windy days. You may actually end up doing more harm than good to your landscape, as well as wasting a significant amount of water.
- Sweep sidewalks and driveways instead of using the hose to clean them off.

- Wash your car from a bucket of soapy (biodegradable) water and rinse while parked on or near the grass or landscape so that all the water running off goes to beneficial use instead of running down the gutter to waste.
- Check for and repair leaks in all pipes, hoses, faucets, couplings, valves, etc. Verify there are no leaks by turning everything off and checking your water meter to see if it is still running. Some underground leaks may not be visible due to draining off into storm drains, ditches, or traveling outside your property.
- Use mulch around trees and shrubs, as well as in your garden to retain as much moisture as possible. Areas with drip systems will use much less water, particularly during hot, dry and windy conditions.
- Keep your lawn well trimmed and all other landscaped areas free of weeds to reduce overall water needs of your yard.
- For new development it is mandatory for all landscaped areas to be water by an automated irrigation system.

4.2.2. Indoor Water Use:

About two-thirds of the total water used in a household is used in the bathroom.

Concentrate on reducing your bathroom use. Following are suggestions for this specific area:

- Do not use your toilet as a wastebasket. Put all tissues, wrappers, diapers, cigarette butts, etc. in the trashcan.
- Check the toilet for leaks. Is the water level too high? Put a few drops of food coloring in the tank. If the bowl water becomes colored without flushing, there is a leak.
- If you do not have a low volume flush toilet, put a plastic bottle full of sand and water to reduce the amount of water used per flush. However, be careful not to over conserve to the point of having to flush twice to make the toilet work. Also, be sure the containers used do not interfere with the flushing mechanism.
- Take short showers with the water turned up only as much as necessary. Turn the shower off while soaping up or shampooing. Install low flow showerheads and/or other flow restriction devices.
- Do not let the water run while shaving or brushing your teeth. Fill the sink or a glass instead.
- When doing laundry, make sure you always wash a full load or adjust the water level appropriately if your machine will do that. Most machines use 40 gallons or more for each load, whether it is two socks or a week's worth of clothes.
- Repair any leak within the household. Even a minor slow drip can waste up to 15 to 20 gallons of water a day.
- Know where your main shutoff valve is and make sure that it works. Shutting the water off yourself when a pipe breaks or a leak occurs will not only save water, but also eliminate or minimize damage to your personal property.
- Keep a jar of water in the refrigerator for a cold drink instead of running water from the tap until it gets cold. You are putting several glasses of water down the drain for one cold drink.
- Plug the sink when rinsing vegetables, dishes, or anything else; use only a sink full of water instead of continually running water down the drain.

5. CURRENT WATER RATES

Designing an appropriate rate schedule is a complex task. Rate design is a process of matching the costs of operating the water system to the unique economic, political and social environments in which the city provides its service. The cost of delivering the service must be evaluated and understood. Each water system has unique assets and constraints. Based on the characteristics of the system, and past capital and operating costs, revenue requirements can be estimated.

City staff has estimated the cost of providing water service and proposed a rate schedule designed to cover such costs. Although this rate schedule shown below has recently been adopted by the City Council, it still contains some flaws that could be improved upon with a more conservation oriented rate schedule.

Table 3 Current Water Rates

<i>Type:</i>	<i>Block Rate</i>
Service Charge:	\$16.02/month
Base Allocation:	0 Kgal/month
<u>Amount of Water</u>	<u>Rate</u>
0+ Kgal	\$0.86/Kgal

This rate schedule was raised from \$.83/Kgal in the old rate schedule to \$.86/Kgal in the new.

6. ADDITIONAL CONSERVATION MEASURES

In order to effectively meet Payson City's future water needs and solve all the water problems identified, additional and more specific water conservation measures will be required. These include more stringent water rates, meter replacement and leak repair, improved efficiency of irrigation at city parks and other open spaces, education, and plumbing fixture replacement.

1. More Stringent Water Rate Structure

The Water Conservation Committee, using revenue requirements estimated by the city staff, investigated a different rate schedule designed to meet those requirements, provide additional price incentives for efficient water use, show the customer how much water is needed each month and provide funding for water conservation assistance and education. This rate schedule is called "Target Billing". We feel that a rate structure like the target billing water rate will need the benefit of remote read meters to get accurate monthly readings for each of our customers. Therefore we recommend that the meter replacement program be completed before a target billing water rate could be instituted.

Table 4 Proposed Target Billing Rates

<i>Type:</i>	<i>Target Billing</i>
<i>Base Charge:</i>	\$16.020/month
<i>Base Allocation:</i>	0 Kgal/month
<i>% of Target</i>	<i>Rate</i>
<i>0 – 50%</i>	\$0.71/Kgal
<i>51 – 100%</i>	\$0.95/Kgal
<i>101 – 150%</i>	\$1.50
<i>151 – 200%</i>	\$3.00
<i>201% +</i>	\$6.00/Kgal

This rate schedule is designed to meet revenue requirements while creating funding for the water conservation program from fees paid by those who waste water. The water user who uses water indiscriminately and falls into the most expensive tier experiences a volume charge of \$6.00/Kgal for the last block.

2. Meter Replacement and Leak Detection Program

Over time, all meters become less accurate in recording actual flows. This leads to lost revenue to the city and inaccurate data to citizens. A recent survey of meters revealed that nearly 34 percent of the water delivered to the city is not being registered on the meters.

It is anticipated that a meter replacement program would pay for itself in **two to three** years with enhanced revenues continuing for **five to ten** years after that. Meter replacement does not result directly in lower water use since the rate in this plan is based on total inflow of potable water. Once meters are upgraded however, leak detection programs that do reduce water purchases and the use rate, will be more effective.

3. Improved Efficiency in Irrigating City Parks and Other Open Spaces

A recent water audit of parks and open spaces for a nearby city indicated that most large turf areas were being over irrigated by up to 50 percent. Payson City presently has 230 acres in groomed parks, cemeteries and sports fields.

As part of our water conservation plan Payson City has made it our 5 year goal to have all city parks and open spaces irrigation systems integrated into our computer automated control system. Our automated system will allow us to better control and monitor our city irrigation water system. We estimate that we may see as much as a 10 % reduction in water usage by implementing better management practices alone.

4. Education

Educating residents and businesses that irrigate landscapes to use water more efficiently will enhance the likelihood that Payson water use goals will be met. The Water Conservation Committee is preparing to launch the initial phase of such an education program in September. Benefits and costs of a strong education program are difficult to enumerate but will be tracked and accounted for as it unfolds.

5. Plumbing Fixture Replacement

Incentives to exchange old high water-use toilets and shower heads for new more efficient ones can be provided through city cost sharing using revenues generated by penalty tiers in future rate schedules. While it is difficult to calculate meaningful estimates of the benefits and costs of such programs on the water-use rate, there is ample evidence in the literature that such programs are effective. The Division of Water Resource estimated in 1995 that such programs could reduce residential indoor water use by 33 percent.

7. IMPLEMENTING AND UPDATING THE WATER CONSERVATION PLAN

To insure the goals outlined above are reached, appropriate tasks must be determined, responsibility fixed with the logical person or department, and a time line set for completion of each task. We recommended that Brent Arns be appointed as the water conservation coordinator to supervise and lead the water conservation program. The city council has authorized this position and will have responsibility for providing funding for the measures outlined in this plan. The city manager and their staff will be responsible, under the supervision of the water conservation coordinator, to carry out the necessary task within the appropriate time constraints.

It was also recommended the water conservation coordinator make quarterly reports on progress toward goals to the city council. The water conservation plan will be revised and updated as required to meet changing conditions and needs. This plan will also be updated and resubmitted to the Utah Division of Water Resource in April of 2020, as required by legislative House Bill 153.

APPENDIX A – WORKSHEETS

8. Current Conservation Practices

Please list current water conservation measures and their estimated water savings. Copy this page to add more measures. One completed, use this information to write the Current Conservation Practices section of your Water Conservation Plan (see Sample Plan, pages 7 - 10).

8.1. Measure 1

Description:

The Pressurized irrigation system (PI) supplies irrigation water to each customer in Payson City.

Implemented: 3/15/1991 Still active? Yes/No

Estimated Annual Savings: 4500 Ac Ft

Comments:

Additional savings can be made if we meter the PI system, but we are restricted by the water quality of the irrigation water. New technology is becoming available that appears may provide us with a dirty water meter in the future. Until there is a proven dirty water meter on the market we are not looking into metering the PI system. Furthermore, the PI rates need to be adjusted to compensate for the required system maintenance.

8.2. Measure 2

Description:

The City has implemented a computerized Osmac control system for the City that is tied into a weather station and controls most of the city's irrigation practices.

Implemented: 6/15/2003 Still active? Yes/No

Estimated Annual Savings: 220 Ac Ft

Comments:

8.3. Measure 3

Description: City Ordinance 10.08.11and 10.10.2 Wasting Water, 10.8.13 Use and Regulation of Fire hydrants and Valves, 10.10.7 Prohibitions, 10.10.11Use of culinary Water for Irrigation

Implemented: 8/7/2002 Still active? Yes/No

Estimated Annual Savings: _____ Ac Ft

Comments:

These ordinances are written to limit the use of culinary water and promote the use of irrigation water for all irrigation purposes.

8.4. Measure 4

Description: Public Notice on watering days.

Implemented: 3/15/1991 Still active? Yes/No

Estimated Annual Savings: _____ Ac Ft

Comments:

During drought years Payson City's current policy is to publicly notice watering days and to restrict watering to three times a week and only on certain days based on your address.

9. Additional Conservation Measures

Please list additional conservation measures your entity may consider, enhancing conservation efforts and results. The following is a list of Best Management Practices (BMPs) recommended to water providers by the Division of Water Resource. One completed, use this information to write the Additional Conservation Measures section of your Water Conservation Plan (see Sample Plan, pages 11 - 14).

9.1. BMP 1 – Comprehensive Water Conservation Plans

- Develop a water management and conservation plan as required by law.
- Plans are to be adopted by the water agency authority (city council, board of directors, etc.) and updated no less than every five years.

9.2. BMP 2 – Universal Metering

- Install meters on all residential, commercial, institutional and industrial water connections. Meters should be read on a regular basis.
- Establish a maintenance and replacement program for existing meters.
- Meter secondary water at the most specific level possible, somewhere below Source water metering. Individual secondary connection metering should be done as soon as technology permits.

9.3. BMP 3 – Incentive Water Conservation Pricing

- Implement a water pricing policy that promotes water conservation.
- Charge for secondary water based on individual use levels as soon as technology permits.

9.4. BMP 4 – Water Conservation Ordinances

- Adopt an incentive water rate structure.
- Adopt a time-of-day watering ordinance.
- Adopt an ordinance requiring water-efficient landscaping in all new commercial development. This should include irrigation system efficiency standards and an acceptable plant materials lists.
- Adopt an ordinance prohibiting the general waste of water.

9.5. BMP 5 – Water Conservation Coordinator

- Designate a water conservation coordinator to facilitate water conservation programs.

9.6. BMP 6 – Public Information Program

- Implement a public information program consistent with the recommendations of the Governor’s Water Conservation Team. Such programs can be adapted to meet the specific needs of the local area and may use the “Slow the Flow” logo with approval of the division.

9.7. BMP 7 – System Water Audits, Leak Detection and Repair

- Set specific goals to reduce unaccounted for water to an acceptable level.
- Set standards for annual water system accounting that will quantify system losses and trigger repair and replacement programs, using methods consistent with American Water Works Association’s Water Audit and Leak Detection Guidebook.

9.8. BMP 8 – Large Landscape Conservation Programs and Incentives

- Promote a specialized large landscape water conservation program for all schools, parks and businesses.
- Encourage all large landscape facility managers and workers to attend specialized training in water conservation.
- Provide outdoor water audits to customers with large amenity landscapes.

9.9. BMP 9 – Water Survey Programs for Residential Customers

- Implement residential indoor and outdoor water audits to educate residents on how to save water.

9.10. BMP 10 – Plumbing Standards

- Review existing plumbing codes and revise them as necessary to ensure water-conserving measures in all new construction.
- Identify homes, office building and other structures built prior to 1992 and develop a strategy to distribute or install high-efficiency plumbing fixtures such as ultra low-flow toilets, showerheads, faucet aerators, etc.

9.11. BMP 11 – School Education Programs

- Support state and local water education programs for the elementary school system.

9.12. BMP 12 – Conservation Programs for Commercial, Industrial and Institutional Customers

- Change business license requirements to require water reuse and recycling in new commercial and industrial facilities where feasible.
- Provide comprehensive site water audits to those customers known to be large water users.
- Identify obstacles and benefits of installing separate meters for landscapes.

9.13. BMP 13 – Reclaimed Water Use

- Use reclaimed or recycled water where feasible.

10. Cost Analysis

Please perform a cost analysis on conservation programs you hope to implement in your organization. Once completed, use this information to write the Cost Analysis section of your Water Conservation Plan (see Sample Plan, pages 15 - 17).

10.1. Description

Give a brief description of the proposed program. Example: "Toilet Distribution and Retrofit Program for Customers Targeted for Older Housing Developments".

10.2. Capital Costs

Capital costs are usually one-time purchases, such as equipment or computers, used throughout the life of the program. If you plan to do a showerhead distribution program, the one-time purchase of 5,000 showerheads would be included as a capital cost.

10.3. Annual Costs

Annual costs are those costs that will occur on an on-going basis. These costs include salary for personnel devoted to the program and any rentals that may be necessary.

10.4. Avoided Costs

Avoided costs are costs that will become unnecessary due directly to the efforts of this program. If it is projected that the program will save 2,000 acre-feet of water, then the cost of purchasing 2,000 additional acre-feet of water each year in the future must be considered an avoided cost.

For instance, if the program saves 2,000 acre-feet and water is valued at \$400 per acre-foot, the avoided costs for water purchases is \$800,000.

10.5. Net Cost / Benefit

The Net Benefit of a program can be derived by adding the capital costs to the annual costs (projected over the duration of the program), and then subtracting the program cost from any avoided costs (benefits) this conservation will produce. Example:

Avoided Costs \$178,434

Capital Costs	\$54,757
Annual Costs	<u>\$12,847</u>
TOTAL	\$67,604

Program Duration 5 years

$178,434 - (54,757 + (12,847 * 5)) = \$59,442$ (total benefit of program)

This example has a Net Benefit of **\$59,442** over the life of the program.

10.6. Program

Description _____

_____ minus (_____ plus (_____ times _____) = _____
Avoided Capital Annual Program Total
Costs Costs Costs Duration Benefit

11. Implementation, Monitoring and Evaluation

Please describe the process for plan implementation, the monitoring of the plan, and evaluation of the success of the program(s) selected. One completed, use this information to write the Implementing and Updating section of your Water Conservation Plan (see Sample Plan, page 17).

11.1. Implementation Procedure

Assign Responsibility _____

Budget Projected Costs _____ **Fund** _____

Schedule **Begin Date** _____ **End Date** _____

Public Involvement _____

11.2. Monitoring & Evaluation

Evaluation Schedule Monthly Quarterly Annually Other _____

Data to Be Gathered _____

Evaluation Process _____

11.3. Plan Update

Describe the procedure for updating the water conservation plan:

12. Resolution Water Conservation Plan

Official Resolution

Be it Resolved: This resolution is the adoption of a the Payson City Water Conservation Plan. WHEREAS, the Payson City Council understands the pressing need to use water in a more efficient manner to allow for future sustained growth of the community. The plan will be amended no less than every five years and will continue to play a vital role in the future development of Payson City, Utah

Owner's signature: _____
 (Signature of City Manager)

Acknowledgement

State of _____)
) ss.
 County of _____)

The foregoing instrument was acknowledged before me this _____, _____

 Notary's signature

 Residing at

 My commission expires:

Notary's seal

Appendix D
Current Permits

**Utah Division of Water Quality
Statement of Basis
ADDENDUM
Wasteload Analysis and Antidegradation Level I Review**

Date: April 10, 2017

Facility: Payson City Wastewater Treatment Facility
Payson, UT
UPDES No. UT0020427

Receiving water: Beer Creek (2B, 3C, 4)

This addendum summarizes the wasteload analysis that was performed to determine water quality based effluent limits (WQBEL) for this discharge. Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses (UAC R317-2-8). Projected concentrations are compared to numeric water quality standards to determine acceptability. The numeric criteria in this wasteload analysis may be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

Discharge

Outfall 001: Irrigation Ditch → Beer Creek → Benjamin Slough → Utah Lake

The maximum daily design discharge is 5.0 MGD and the maximum monthly design discharge is 3.0 MGD for the facility.

Receiving Water

The receiving water for Outfall 001 is an unnamed irrigation ditch, which is tributary to Beer Creek, which drains to Benjamin Slough and then to Utah Lake.

Per UAC R317-2-13.5.c, the designated beneficial uses for Beer Creek (Utah County) from 4850 West (in NE1/4NE1/4 sec. 36, T.8 S., R.1 E.) to headwaters are 2B, 3C, and 4.

- *Class 2B - Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.*
- *Class 3C - Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain*
- *Class 4 - Protected for agricultural uses including irrigation of crops and stock watering.*

Typically, the critical flow for the wasteload analysis is considered the lowest stream flow for seven consecutive days with a ten year return frequency (7Q10). Due to a lack of flow records for Beer Creek, the 20th percentile of flow measurements was calculated to estimate seasonal

**Utah Division of Water Quality
Wasteload Analysis
Payson City Wastewater Treatment Plant, Payson, UT
UPDES No. UT0020427**

critical flow in the receiving water (Table 1). No flow records were found for the irrigation ditch and it was assumed the ditch has no flow during critical conditions.

Payson Power (UPDES UT0025518) also discharges to the same irrigation ditch and has the potential to discharge concurrently with the Payson City Wastewater Treatment Plant discharge; however, based on information provided by the permittee, Payson Power would not discharge when the wastewater treatment plant discharge is at the maximum (AQUA Engineering 2017a).

Table 1: Annual critical low flow

Season	Flow (cfs)			
	Payson Power Discharge During Chronic Conditions	Payson Power Discharge During Acute Conditions	Irrigation Ditch above WWTP	Beer Creek above confluence with Irrigation Ditch
Summer	0.0	0.0	0.0	4.0
Fall	0.0	0.0	0.0	10.0
Winter	0.0	0.0	0.0	13.2
Spring	0.0	0.0	0.0	10.0

TMDL

Beer Creek from confluence with Spring Creek to headwaters is listed as impaired for total ammonia and O/E bioassessment according to the 303(d) list in the *Utah’s Final 2016 Integrated Report* (UDWQ 2017). Benjamin Slough from confluence with Utah Lake to Beer Creek confluence is listed as impaired for total ammonia. Utah Lake is listed as impaired for total phosphorus and total dissolved solids.

Mixing Zone

The maximum allowable mixing zone is 15 minutes of travel time for acute conditions, not to exceed 50% of stream width, and 2,500 feet for chronic conditions, per UAC R317-2-5. Water quality standards must be met at the end of the mixing zone.

The actual length of the mixing zone was not determined; however, it was presumed to remain within the maximum allowable mixing zone dimensions. Acute limits were calculated using 50% of the seasonal critical low flow.

Parameters of Concern

The potential parameters of concern identified for the discharge/receiving water were total suspended solids (TSS), dissolved oxygen (DO), BOD₅, total phosphorus (TP), total nitrogen (TN), total ammonia (TAN), E. coli, pH, and total residual chlorine (TRC) as determined in consultation with the UPDES Permit Writer.

**Utah Division of Water Quality
Wasteload Analysis
Payson City Wastewater Treatment Plant, Payson, UT
UPDES No. UT0020427**

Water Quality Modeling

A QUAL2Kw model of the receiving water was built and calibrated to synoptic survey data collected in October of 2013 by DWQ staff using standard operating procedures (UDWQ 2012). The model of Beer Creek extends 4 kilometers downstream from the confluence with the unnamed irrigation ditch to near the crossing with South 4850 West.

Receiving water quality data were obtained from monitoring site 4995420 Beer Creek above Payson WWTP at U-115 Crossing. The average seasonal value was calculated for each constituent with available data in the receiving water. Effluent parameters were characterized using data from monitoring site 4995410 Payson WWTP and 4995480 Payson Power.

The QUAL2Kw model was used for determining the WQBELs. Effluent concentrations were adjusted so that water quality standards were not exceeded in the receiving water. Where WQBELs exceeded secondary standards or categorical limits, the concentration in the model was set at the secondary standard or categorical limit.

The calibration and wasteload models are available for review by request.

WET Limits

The percent of effluent in the receiving water in a fully mixed condition, and acute and chronic dilution in a not fully mixed condition are calculated in the WLA in order to generate WET limits. The LC₅₀ (lethal concentration, 50%) percent effluent for acute toxicity and the IC₂₅ (inhibition concentration, 25%) percent effluent for chronic toxicity, as determined by the WET test, needs to be below the WET limits, as determined by the WLA. The WET limit for LC₅₀ is typically 100% effluent and does not need to be determined by the WLA.

Table 2: WET Limits for IC₂₅

Season	Percent Effluent
Summer	54%
Fall	32%
Winter	26%
Spring	32%

Effluent Limits

The effect of the effluent on the DO in the receiving water was evaluated using the QUAL2Kw model. A DO sag downstream resulting from the plant discharge was predicted by the model in Beer Creek. However, the DO recovered and limits beyond secondary standards are not required for DO and BOD₅ (Table 3). QUAL2Kw rates, input and output for DO and eutrophication related constituents are summarized in Appendix A.

The ammonia limits for both acute and chronic toxicity were determined. The previous permit only had limits for ammonia resulting from acute toxicity (max. daily limit). In 2008, the chronic ammonia criteria were extended to 3C and 3D waters.

**Utah Division of Water Quality
Wasteload Analysis
Payson City Wastewater Treatment Plant, Payson, UT
UPDES No. UT0020427**

The limits for total residual chlorine were determined assuming an average decay rate of 42 /day (at 20 C°) and a travel time in the unnamed irrigation ditch of 107 minutes prior to discharge to Beer Creek (AQUA Engineering 2017b). The analysis for TRC is summarized in Appendix B.

A mass balance mixing analysis was conducted for conservative constituents such as dissolved metals. The WQBELs for conservative constituents are summarized in Appendix C.

Table 3: Water Quality Based Effluent Limits Summary

Effluent Constituent	Acute			Chronic		
	Standard	Limit	Averaging Period	Standard	Limit	Averaging Period
Flow (MGD)		5.0	1 day		3.0	30 days
Ammonia (mg/L) ¹	Varies		1 hour	Varies		30 days
Summer (Jul-Sep)		7.0			4.0	
Fall (Oct-Dec)		9.0			6.0	
Winter (Jan-Mar)		12.0			8.0	
Spring (Apr-Jun)		11.0			8.0	
Min. Dissolved Oxygen (mg/L)	3.0	4.0	Instantaneous	5.0	5.0	30 days
BOD ₅ (mg/L)	None	35	7 days	None	25	30 days
Total Residual Chlorine (mg/L)	0.019		1 hour	0.011		4 days
Summer (Jul-Sep)		0.84			0.72	
Fall (Oct-Dec)		0.49			0.54	
Winter (Jan-Mar)		0.29			0.35	
Spring (Apr-Jun)		0.48			0.53	

1: Ammonia limit due to toxicity requirements.

Models and supporting documentation are available for review upon request.

Antidegradation Level I Review

The objective of the Level I ADR is to ensure the protection of existing uses, defined as the beneficial uses attained in the receiving water on or after November 28, 1975. No evidence is known that the existing uses deviate from the designated beneficial uses for the receiving water. Therefore, the beneficial uses will be protected if the discharge remains below the WQBELs presented in this wasteload.

A Level II Antidegradation Review (ADR) is not required for this discharge since the pollutant concentration and load is not increasing under this permit renewal.

**Prepared by: Nicholas von Stackelberg, P.E.
Standards and Technical Services Section**

Utah Division of Water Quality
Wasteload Analysis
Payson City Wastewater Treatment Plant, Payson, UT
UPDES No. UT0020427

Documents:

WLA Document: *payson_potw_wla_2017-04-10.docx*

QUAL2Kw Calibration Model: *payson_potw_cal_2013.xlsm*

QUAL2Kw Wasteload Model: *payson_wla_2017.xlsm*

References:

AQUA Engineering. 2017a. *Discharge Flows to Beer Creek from Payson City and UAMPS.*

AQUA Engineering. 2017b. *Payson Chlorine Decay Rates.*

Neilson, B.T., A.J. Hobson, N. von Stackelberg, M. Shupryt, and J.D. Ostermiller. 2012. *Using QUAL2K Modeling to Support Nutrient Criteria Development and Wasteload Analyses in Utah.*

Utah Division of Water Quality. 2012a. *Utah Wasteload Analysis Procedures Version 1.0.*

Utah Division of Water Quality. 2012b. *Field Data Collection for QUAL2Kw Model Build and Calibration Standard Operating Procedures Version 1.0.*

Utah Division of Water Quality. 2017. *Utah's Final 2016 Integrated Report.*

Utah Division of Water Quality

WASTELOAD ANALYSIS [WLA]

Date: 4/10/2017

Appendix A: QUAL2Kw Analysis for Eutrophication

Discharging Facility: Payson WWTP
 UPDES No: UT-0020427
 Permit Flow [MGD]: 1.00 Maximum Monthly Flow
 3.00 Maximum Daily Flow

Receiving Water: Beer Creek
 Stream Classification: 2B, 3C, 4
 Stream Flows [cfs]: 4.00 Summer (July-Sept) Critical Low Flow
 10.00 Fall (Oct-Dec)
 13.20 Winter (Jan-Mar)
 10.00 Spring (Apr-June)

Fully Mixed: NO
 Acute River Width: 50%
 Chronic River Width: 100%

Modeling Information

A QUAL2Kw model was used to determine these effluent limits.

Model Inputs

The following is upstream and discharge information that was utilized as inputs for the analysis. Dry washes are considered to have an upstream flow equal to the flow of the discharge.

Headwater/Upstream Information	Summer	Fall	Winter	Spring
Flow (cfs)	4.0	10.0	13.2	10.0
Temperature (deg C)	21.2	12.1	5.0	12.6
Specific Conductance (µmhos)	1125	1125	1125	1125
Inorganic Suspended Solids (mg/L)	28.0	37.3	29.5	27.3
Dissolved Oxygen (mg/L)	6.7	8.2	10.4	8.5
CBOD ₅ (mg/L)	2.6	2.7	5.1	3.6
Organic Nitrogen (mg/L)	1.500	1.500	1.500	1.500
NH ₄ -Nitrogen (mg/L)	0.080	0.185	0.399	0.250
NO ₃ -Nitrogen (mg/L)	1.125	1.327	1.430	1.255
Organic Phosphorus (mg/L)	0.035	0.110	0.119	0.077
Inorganic Ortho-Phosphorus (mg/L)	0.169	0.145	0.186	0.190
Phytoplankton (µg/L)	0.0	0.0	0.0	0.0
Detritus [POM] (mg/L)	3.1	4.1	3.3	3.0
Alkalinity (mg/L)	235	235	235	235
pH	7.8	8.2	8.3	8.0

Utah Division of Water Quality

Discharge Information - Payson POTW

Chronic	Summer	Fall	Winter	Spring
Flow (MGD)	3.0	3.0	3.0	3.0
Temperature (deg C)	22.7	17.1	11.4	16.9
Specific Conductance (µmhos)	1450	1450	1450	1450
Inorganic Suspended Solids (mg/L)	6.0	4.0	5.3	5.0
Organic Nitrogen (mg/L)	5.000	5.000	5.000	5.000
NO3-Nitrogen (mg/L)	21.700	22.875	28.820	28.500
Organic Phosphorus (mg/L)	0.000	0.000	0.000	0.000
Inorganic Ortho-Phosphorus (mg/L)	5.000	5.000	5.000	5.000
Phytoplankton (µg/L)	0.000	0.000	0.000	0.000
Detritus [POM] (mg/L)	0.0	0.0	0.0	0.0
Alkalinity (mg/L)	235	235	235	235
pH	7.6	7.6	7.5	7.5

Acute	Summer	Fall	Winter	Spring
Flow (MGD)	5.0	5.0	5.0	5.0
Temperature (deg C)	22.7	17.1	11.4	16.9
Specific Conductance (µmhos)	1450	1450	1450	1450
Inorganic Suspended Solids (mg/L)	6.0	4.0	5.3	5.0
Organic Nitrogen (mg/L)	10.000	10.000	10.000	10.000
NO3-Nitrogen (mg/L)	21.700	22.875	28.820	28.500
Organic Phosphorus (mg/L)	0.000	0.000	0.000	0.000
Inorganic Ortho-Phosphorus (mg/L)	10.000	10.000	10.000	10.000
Phytoplankton (µg/L)	0.000	0.000	0.000	0.000
Detritus [POM] (mg/L)	0.0	0.0	0.0	0.0
Alkalinity (mg/L)	235	235	235	235
pH	8.0	8.2	7.9	8.1

Discharge Information - Payson Power

Chronic	Summer	Fall	Winter	Spring
Flow (MGD)	0.0	0.0	0.0	0.0

Acute	Summer	Fall	Winter	Spring
Flow (MGD)	0.0	0.0	0.0	0.0

All model numerical inputs, intermediate calculations, outputs and graphs are available for discussion, inspection and copy at the Division of Water Quality.

Effluent Limitations

Current State water quality standards are required to be met under a variety of conditions including in-stream flows targeted to the 7-day, 10-year low flow (R317-2-9).

Other conditions used in the modeling effort reflect the environmental conditions expected at low stream flows.

Effluent Limitations based upon Water Quality Standards for DO, and Ammonia and Total Residual Chlorine Toxicity

In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent limitation as follows:

	Chronic	Standard	Summer	Fall	Winter	Spring
Flow (MGD)		N/A	3.00	3.00	3.00	3.00
NH4-Nitrogen (mg/L)		Varies	6.0	9.0	9.5	12.0
CBOD ₅ (mg/L)		N/A	25.0	25.0	25.0	25.0
Dissolved Oxygen [30-day Ave] (mg/L)		5.0	5.0	5.0	5.0	5.0
	Acute	Standard	Summer	Fall	Winter	Spring
Flow (MGD)		N/A	5.0	5.0	5.0	5.0
NH4-Nitrogen (mg/L)		Varies	10.0	12.0	13.0	12.0
CBOD ₅ (mg/L)		N/A	35.0	35.0	35.0	35.0
Dissolved Oxygen [Minimum] (mg/L)		3.0	4.0	4.0	4.0	4.0

Summary Comments

The mathematical modeling and best professional judgement indicate that violations of receiving water beneficial uses with their associated water quality standards, including important downstream segments, will not occur for the evaluated parameters of concern as discussed above if the effluent limitations indicated above are met.

Utah Division of Water Quality

Coefficients and Other Model Information

<i>Parameter</i>	<i>Value</i>	<i>Units</i>
<i>Stoichiometry:</i>		
Carbon	40	gC
Nitrogen	7.2	gN
Phosphorus	1	gP
Dry weight	100	gD
Chlorophyll	1	gA
<i>Inorganic suspended solids:</i>		
Settling velocity	0.001	m/d
<i>Oxygen:</i>		
Reaeration model	Thackston-Dawson	
Temp correction	1.024	
Reaeration wind effect	None	
O2 for carbon oxidation	2.69	gO2/gC
O2 for NH4 nitrification	4.57	gO2/gN
Oxygen inhib model CBOD oxidation	Exponential	
Oxygen inhib parameter CBOD oxidation	0.60	L/mgO2
Oxygen inhib model nitrification	Exponential	
Oxygen inhib parameter nitrification	0.60	L/mgO2
Oxygen enhance model denitrification	Exponential	
Oxygen enhance parameter denitrification	0.60	L/mgO2
Oxygen inhib model phyto resp	Exponential	
Oxygen inhib parameter phyto resp	0.60	L/mgO2
Oxygen enhance model bot alg resp	Exponential	
Oxygen enhance parameter bot alg resp	0.60	L/mgO2
<i>Slow CBOD:</i>		
Hydrolysis rate	0	/d
Temp correction	1.047	
Oxidation rate	0.103	/d
Temp correction	1.047	
<i>Fast CBOD:</i>		
Oxidation rate	10	/d
Temp correction	1.047	
<i>Organic N:</i>		
Hydrolysis	0.88120891	/d
Temp correction	1.07	
Settling velocity	0.099218	m/d
<i>Ammonium:</i>		
Nitrification	0.2064034	/d
Temp correction	1.07	
<i>Nitrate:</i>		
Denitrification	0.28353818	/d
Temp correction	1.07	
Sed denitrification transfer coeff	0.053355	m/d
Temp correction	1.07	
<i>Organic P:</i>		
Hydrolysis	0.79805215	/d
Temp correction	1.07	
Settling velocity	0.096605	m/d
<i>Inorganic P:</i>		
Settling velocity	0.04793	m/d
Sed P oxygen attenuation half sat constant	0.53889	mgO2/L

Utah Division of Water Quality

Phytoplankton:			
Max Growth rate	2.8944	/d	
Temp correction	1.07		
Respiration rate	0.480803	/d	
Temp correction	1.07		
Death rate	0.86518	/d	
Temp correction	1		
Nitrogen half sat constant	15	ugN/L	
Phosphorus half sat constant	2	ugP/L	
Inorganic carbon half sat constant	1.30E-05	moles/L	
Phytoplankton use HCO3- as substrate	Yes		
Light model	Smith		
Light constant	57.6	langleys/d	
Ammonia preference	25.4151	ugN/L	
Settling velocity	0.468545	m/d	
Bottom Plants:			
Growth model	Zero-order		
Max Growth rate	10.8314	gD/m2/d or /d	
Temp correction	1.07		
First-order model carrying capacity	100	gD/m2	
Basal respiration rate	0.2458802	/d	
Photo-respiration rate parameter	0.01	unitless	
Temp correction	1.07		
Excretion rate	0.046004	/d	
Temp correction	1.07		
Death rate	0.036896	/d	
Temp correction	1.07		
External nitrogen half sat constant	711.113	ugN/L	
External phosphorus half sat constant	123.473	ugP/L	
Inorganic carbon half sat constant	7.44E-05	moles/L	
Bottom algae use HCO3- as substrate	Yes		
Light model	Smith		
Light constant	41.6646	mgO ² /L	
Ammonia preference	28.99375	ugN/L	
Subsistence quota for nitrogen	31.0379	mgN/gD	
Subsistence quota for phosphorus	2.26157	mgP/gD	
Maximum uptake rate for nitrogen	770.252	mgN/gD/d	
Maximum uptake rate for phosphorus	36.4362	mgP/gD/d	
Internal nitrogen half sat ratio	1.468463		
Internal phosphorus half sat ratio	3.2861345		
Nitrogen uptake water column fraction	1		
Phosphorus uptake water column fraction	1		
Detritus (POM):			
Dissolution rate	2.318491	/d	
Temp correction	1.07		
Settling velocity	0.08897	m/d	
pH:			
Partial pressure of carbon dioxide	370	ppm	
TRC:			
Decay rate	0.8	/d	

Atmospheric Inputs:	Summer	Fall	Winter	Spring
Min. Air Temperature, F	57.7	29.5	24.0	45.0
Max. Air Temperature, F	90.5	51.0	44.9	74.2
Dew Point, Temp., F	58.6	35.0	30.3	48.5
Wind, ft./sec. @ 21 ft.	9.8	7.5	7.6	9.2
Cloud Cover, %	10%	10%	10%	10%

Other Inputs:	
Bottom Algae Coverage	75%
Bottom SOD Coverage	100%
Prescribed SOD, gO ₂ /m ² /day	0

Utah Division of Water Quality

WASTELOAD ANALYSIS [WLA]
Appendix B: Total Residual Chlorine

Date: 4/10/2017

Discharging Facility: Payson WWTP
 UPDES No: UT-0020427

CHRONIC

	Season	Receiving Water	Standard	Payson WWTP Effluent	Payson Power Effluent	Total Effluent	Mixing Zone Boundary	Dilution Factor	Effluent Limit Without Decay	Temperature (°C)	Decay Rate @ 20 °C	Decay Rate @ T °C	Travel Time (min)	Decay Coefficient	Effluent Limit
Discharge (cfs)	Summer	4.0		4.6	0.0	4.6	8.6	0.9							
	Fall	10.0		4.6	0.0	4.6	14.6	2.2							
	Winter	13.2		4.6	0.0	4.6	17.8	2.8							
	Spring	10.0		4.6	0.0	4.6	14.6	2.2							
Temperature (°C)	Summer			22.7	30.0	22.7									
	Fall			17.1	25.9	17.1									
	Winter			11.4	27.5	11.4									
	Spring			16.9	23.6	16.9									
TRC (mg/L)	Summer	0.000	0.011						0.020	22.7	42	47.6	107.568	0.03	0.716
	Fall	0.000	0.011						0.035	17.1	42	36.8	107.568	0.06	0.541
	Winter	0.000	0.011						0.042	11.4	42	28.3	107.568	0.12	0.350
	Spring	0.000	0.011						0.035	16.9	42	36.5	107.568	0.07	0.530

ACUTE

	Season	Receiving Water	Standard	Payson WWTP Effluent	Payson Power Effluent	Total Effluent	Mixing Zone Boundary	Dilution Factor	Effluent Limit Without Decay	Temperature (°C)	Decay Rate @ 20 °C	Decay Rate @ T °C	Travel Time (min)	Decay Coefficient	Effluent Limit
Discharge (cfs)	Summer	2.0		7.7	0.0	7.7	9.7	0.3							
	Fall	5.0		7.7	0.0	7.7	12.7	0.6							
	Winter	6.6		7.7	0.0	7.7	14.3	0.9							
	Spring	5.0		7.7	0.0	7.7	12.7	0.6							
Temperature (°C)	Summer			22.7	30.0	22.7									
	Fall			17.1	25.9	17.1									
	Winter			11.4	27.5	11.4									
	Spring			16.9	23.6	16.9									
TRC (mg/L)	Summer	0.000	0.019						0.024	22.7	42	47.6	107.568	0.03	0.836
	Fall	0.000	0.019						0.031	17.1	42	36.8	107.568	0.06	0.487
	Winter	0.000	0.019						0.035	11.4	42	28.3	107.568	0.12	0.291
	Spring	0.000	0.019						0.031	16.9	42	36.5	107.568	0.07	0.478

124.66667

WASTELOAD ANALYSIS [WLA]

Date: 4/10/2017

Appendix C: Mass Balance Mixing Analysis for Conservative Constituents

Discharging Facility:	Payson WWTP
UPDES No:	UT-0020427
Permit Flow [MGD]:	3.00 Maximum Monthly Discharge 5.00 Maximum Daily Discharge
Payson Power:	0.00 Discharge
Receiving Water:	Beer Creek
Stream Classification:	2B, 3C, 4
Stream Flows [cfs]:	4.00 Summer (July-Sept) Critical Low Flow
Fully Mixed:	NO
Acute River Width:	50%
Chronic River Width:	100%
Mixed Flow [cfs]:	8.6 Chronic 9.7 Acute

Modeling Information

A mass balance mixing analysis was used to determine these effluent limits.

All model numerical inputs, intermediate calculations, outputs and graphs are available for discussion, inspection and copy at the Division of Water Quality.

Effluent Limitations

Current State water quality standards are required to be met under a variety of conditions including in-stream flows targeted to the 7-day, 10-year low flow (R317-2-9).

Other conditions used in the modeling effort reflect the environmental conditions expected at low stream flows.

Utah Division of Water Quality

Effluent Limitations for Protection of Recreation (Class 2B Waters)

Physical Parameter		Maximum Concentration
	pH Minimum	6.5
	pH Maximum	9.0

Bacteriological		
	E. coli (30 Day Geometric Mean)	206 (#/100 mL)
	E. coli (Maximum)	668 (#/100 mL)

Effluent Limitations for Protection of Aquatic Wildlife (Class 3C Waters)

Physical Parameter		Maximum Concentration
	Temperature (deg C)	27
	Temperature Change (deg C)	4

Inorganics	Parameter	Chronic Standard (4 Day Average)	Acute Standard (1 Hour Average)
		Standard	Standard
	Phenol (mg/L)		0.010
	Hydrogen Sulfide (Undissociated) [mg/L]		0.002

Total Recoverable Metals	Parameter	Chronic Standard (4 Day Average)¹			Acute Standard (1 Hour Average)¹		
		Standard	Background²	Limit	Standard	Background²	Limit
	Aluminum (µg/L)	N/A ³	5.4	NONE	750	5.4	1,001
	Arsenic (µg/L)	150	7.7	273	340	7.7	452
	Cadmium (µg/L)	0.7	0.5	1.0	8.5	0.5	11.2
	Chromium VI (µg/L)	11.0	2.5	18.3	16.0	2.5	20.7
	Chromium III (µg/L)	263	2.5	487	5,497	2.5	7,344
	Copper (µg/L)	29.8	5.3	51.0	50.5	5.3	66.0
	Cyanide (µg/L)	5.2	3.5	6.7	22.0	3.5	28.4
	Iron (µg/L)				1,000	6.7	1,334
	Lead (µg/L)	18.0	0.3	33.2	462	0.3	617
	Mercury (µg/L)	0.012	0.008	0.015	2.4	0.0	3.2
	Nickel (µg/L)	165	0.5	307	1,484	0.5	1,983
	Selenium (µg/L)	4.6	1.9	6.9	18.4	1.9	24.1
	Silver (µg/L)				39.3	0.1	52.5
	Tributyltin (µg/L)	0.072	0.048	0.092	0.46	0.05	0.60
	Zinc (µg/L)	380	10.0	698	380	10.0	505

1: Based upon a Hardness of 390 mg/l as CaCO₃

2: Background concentration average of monitoring data

3: Where the pH is equal to or greater than 7.0 and the hardness is equal to or greater than 50 ppm as CaCO₃ in the receiving water after mixing, the 87 ug/L chronic criterion (expressed as total recoverable) will not apply, and aluminum will be regulated based on compliance with the 750 ug/L acute aluminum criterion (expressed as total recoverable).

Utah Division of Water Quality

Organics [Pesticides]

Parameter	Chronic Standard (4 Day Average)			Acute Standard (1 Hour Average)		
	Standard	Background ¹	Limit	Standard	Background ¹	Limit
Aldrin (µg/L)				1.5	1.0	1.7
Chlordane (µg/L)	0.0043	0.0029	0.0055	1.2	0.0	1.6
DDT, DDE (µg/L)	0.001	0.001	0.001	0.55	0.00	0.73
Diazinon (µg/L)	0.17	0.11	0.22	0.17	0.11	0.20
Dieldrin (µg/L)	0.0056	0.0038	0.0072	0.24	0.00	0.32
Endosulfan, a & b (µg/L)	0.056	0.038	0.072	0.11	0.04	0.14
Endrin (µg/L)	0.036	0.024	0.046	0.086	0.024	0.108
Heptachlor & H. epoxide (µg/L)	0.0038	0.0025	0.0049	0.26	0.00	0.35
Lindane (µg/L)	0.08	0.05	0.10	1.0	0.1	1.3
Methoxychlor (µg/L)				0.03	0.02	0.03
Mirex (µg/L)				0.001	0.001	0.001
Nonylphenol (µg/L)	6.6	4.4	8.5	28.0	4.4	36.2
Parathion (µg/L)	0.0130	0.0087	0.0167	0.066	0.009	0.086
PCB's (µg/L)	0.014	0.009	0.018			
Pentachlorophenol (µg/L)	15.0	10.1	19.3	19.0	10.1	22.6
Toxephene (µg/L)	0.0002	0.0001	0.0003	0.73	0.00	0.98

1: Background concentration assumed 67% of chronic standard

Radiological

Parameter	Maximum Concentration		
	Standard	Background ¹	Limit
Gross Alpha (pCi/L)	15	10.1	17.3

1: Background concentration assumed 67% of chronic standard; TDS is based on observed ambient data

Effluent Limitation for Protection of Agriculture (Class 4 Waters)

Parameter	Maximum Concentration		
	Standard	Background ¹	Limit
Total Dissolved Solids (mg/L)	1,200	754	1,585
Boron (mg/L)	0.75	0.2	1.2
Arsenic, Dissolved (µg/L)	100	7.7	180
Cadmium, Dissolved (µg/L)	10	0.5	18.2
Chromium, Dissolved (µg/L)	100	2.5	184
Copper, Dissolved (µg/L)	200	5.3	368
Lead, Dissolved (µg/L)	100	0.3	186
Selenium, Dissolved (µg/L)	50	1.9	91.5
Gross Alpha (pCi/L)	15	10.1	19.3

1: Background concentration assumed 67% of chronic standard; TDS is based on observed ambient data

FILE COPY

STATE OF UTAH
DIVISION OF WATER QUALITY
DEPARTMENT OF ENVIRONMENTAL QUALITY
SALT LAKE CITY, UTAH

UTAH POLLUTANT DISCHARGE ELIMINATION SYSTEM (UPDES) PERMITS

Major Municipal Permit No. **UT0020427**
Biosolids Permit No. **UTL0020427**
Storm Water Permit No. **UTR020427**

In compliance with provisions of the *Utah Water Quality Act, Title 19, Chapter 5, Utah Code Annotated ("UCA") 1953, as amended (the "Act")*,

PAYSON CITY WASTEWATER TREATMENT FACILITY

is hereby authorized to discharge from its wastewater treatment facility to receiving waters unnamed irrigation ditch to **BEER CREEK**,

to dispose of biosolids,

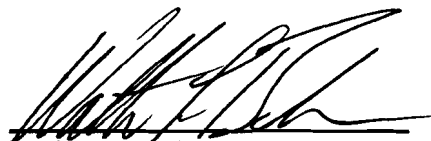
and to discharge storm water,

in accordance with specific limitations, outfalls, and other conditions set forth herein.

This permit shall become effective on April 1, 2008

This permit expires at midnight on March 31, 2013.

Signed this 25th day of March, 2008.



Walter L. Baker
Executive Secretary
Utah Water Quality Board

Table of Contents

<u>Items of interest</u>	<u>Page Number</u>
I. DISCHARGE – LIMITATIONS AND REPORTING REQUIREMENTS.....	1
A. Description of Discharge Point.....	1
B. Narrative Standard.....	1
C. Specific Limitations and Self-Monitoring Requirements.....	1
D. Reporting of Monitoring Results.....	6
II. INDUSTRIAL PRETREATMENT PROGRAM.....	7
III. BIOSOLIDS REQUIREMENTS.....	12
A. Description of Biosolids Treatment and Disposal.....	12
B. Specific Limitations and Monitoring Requirements.....	12
C. Special Conditions on Biosolids Storage.....	13
D. Representative Sampling.....	13
E. Reporting of Monitoring Results.....	13
F. Additional Record Keeping Requirements Specific to Biosolids.....	14
G. Record Keeping.....	14
H. Twenty-four Hour Notice of Noncompliance Reporting.....	15
I. Other Noncompliance Reporting.....	15
IV. STORM WATER REQUIREMENTS.....	16
A. Coverage of This Section.....	16
B. Prohibition of Non-Storm Water Discharges.....	16
C. Storm Water Pollution Prevention Plan Requirements.....	16
D. Monitoring and Reporting Requirements.....	22
V. MONITORING, RECORDING & ADDITIONAL REPORTING REQUIREMENTS.....	24
A. Representative Sampling.....	24
B. Monitoring Procedures.....	24
C. Penalties for Tampering.....	24
D. Compliance Schedules.....	24
E. Additional Monitoring by the Permittee.....	24
F. Records Contents.....	24
G. Retention of Records.....	24
H. Twenty-four Hour Notice of Noncompliance Reporting.....	25
I. Other Noncompliance Reporting.....	26
J. Inspection and Entry.....	26
VI. COMPLIANCE RESPONSIBILITIES.....	27
A. Duty to Comply.....	27
B. Penalties for Violations of Permit Conditions.....	27
C. Need to Halt or Reduce Activity not a Defense.....	27
D. Duty to Mitigate.....	27
E. Proper Operation and Maintenance.....	27
F. Removed Substances.....	27
G. Bypass of Treatment Facilities.....	28
H. Upset Conditions.....	29
VII. GENERAL REQUIREMENTS.....	31
A. Planned Changes.....	31
B. Anticipated Noncompliance.....	31
C. Permit Actions.....	31
D. Duty to Reapply.....	31
E. Duty to Provide Information.....	31
F. Other Information.....	31
G. Signatory Requirements.....	31
H. Penalties for Falsification of Reports.....	32
I. Availability of Reports.....	33
J. Oil and Hazardous Substance Liability.....	33
K. Property Rights.....	33
L. Severability.....	33
M. Transfers.....	33
N. State or Federal Laws.....	33
O. Water Quality – Reopener Provision.....	34
P. Biosolids – Reopener Provision.....	34
Q. Toxicity Limitation – Reopener Provision.....	34
R. Storm Water – Reopener Provision.....	35
S. Total Maximum Daily Load - Reopener Provision.....	35
VIII. DEFINITIONS.....	36

PART I
DISCHARGE PERMIT NO. UT0020427
WASTEWATER

I. DISCHARGE LIMITATIONS AND REPORTING REQUIREMENTS

A. Description of Discharge Point. The authorization to discharge wastewater provided under this part is limited to those outfalls specifically designated below as discharge locations. Discharges at any location not authorized under a UPDES permit are violations of the *Act* and may be subject to penalties under the *Act*. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge may be subject to criminal penalties as provided under the *Act*.

<u>Outfall Number</u>	<u>Location of Discharge Outfall</u>
001	Located at latitude 40°03'41" and longitude 111°43'49". The discharge is through a concrete pipe to an unnamed irrigation return drainage ditch to Beer Creek then Benjamin Slough to Utah Lake.

B. Narrative Standard. It shall be unlawful, and a violation of this permit, for the permittee to discharge or place any waste or other substance in such a way as will be or may become offensive such as unnatural deposits, floating debris, oil, scum, or other nuisances such as color, odor or taste, or cause conditions which produce undesirable aquatic life or which produce objectionable tastes in edible aquatic organisms; or result in concentrations or combinations of substances which produce undesirable physiological responses in desirable resident fish, or other desirable aquatic life, or undesirable human health effects, as determined by a bioassay or other tests performed in accordance with standard procedures.

C. Specific Limitations and Self-Monitoring Requirements.

1. Effective April 1, 2008 and lasting through the life of this permit, there shall be no acute or chronic toxicity in Outfall 001 as defined in *Part VIII*, and determined by test procedures described in *Part I. C. 3.a* of this permit.
2. Effective immediately and lasting the duration of this permit, the permittee is authorized to discharge from Outfall 001. Such discharges shall be limited and monitored by the permittee as specified below:

Parameter	Effluent Limitations			
	Maximum Monthly Average	Maximum Weekly Average	Daily Minimum	Daily Maximum
BOD ₅ , mg/L	25	35	NA	NA
BOD ₅ Min. % Removal	85	NA	NA	NA
TSS, mg/L	25	35	NA	NA
TSS Min. % Removal	85	NA	NA	NA
E. Coli, no./100mL	126	158	NA	NA
Dissolved Oxygen, mg/l	NA	NA	4.0	NA

PART I
DISCHARGE PERMIT NO. UT0020427
WASTEWATER

Ammonia, mg/l				
December – February	NA	NA	NA	14.1
March – May	NA	NA	NA	13.1
June – August	NA	NA	NA	12.5
September – November	NA	NA	NA	13.1
TRC, mg/L				
December – February	NA	NA	NA	2.4
March – May	NA	NA	NA	1.6
June – August	NA	NA	NA	1.1
September – November	NA	NA	NA	1.6
WET, Acute Biomonitoring	NA	NA	NA	Pass/Fail
Oil & Grease, mg/L	NA	NA	NA	10
pH, Standard Units	NA	NA	6.5	9.0

NA – Not Applicable

Self-Monitoring and Reporting Requirements, a*			
Parameter	Frequency	Sample Type	Units
Total Flow, b*, c*	Continuous	Recorder	MGD
BOD ₅ , Influent, d*	2 x Weekly	Composite	mg/L
Effluent	2 x Weekly	Composite	mg/L
TSS, Influent, d*	2 x Weekly	Composite	mg/L
Effluent	2 x Weekly	Composite	mg/L
Dissolved Oxygen	2 x Weekly	Grab	mg/L
Ammonia	2 x Weekly	Grab	No./100mL
E. Coli	2 x Weekly	Grab	No./100mL
TRC	Daily	Grab	mg/L
WET, Acute Biomonitoring	Quarterly		
Ceriodaphnia dubia	1 st & 3 rd Quarters	Composite	Pass/Fail
Pimephales promelas	2 nd & 4 th Quarters	Composite	Pass/Fail
Oil & Grease, e*	Monthly	Grab	mg/L
pH	2 x Weekly	Grab	SU
Metals, Influent	Quarterly	Composite	mg/L
Effluent	Quarterly	Composite	mg/L
Organic Toxics	Yearly	Grab	mg/L

a* See Definitions, *Part VIII*, for definition of terms.

b* Flow measurements of influent/effluent volume shall be made in such a manner that the permittee can affirmatively demonstrate that representative values are being obtained.

c* If the rate of discharge is controlled, the rate and duration of discharge shall be reported.

d* In addition to monitoring the final discharge, influent samples shall be taken and analyzed for this constituent at the same frequency as required for this constituent in the discharge.

e* Sample when Sheen is Visible.

3. Acute/Chronic Whole Effluent Toxicity (WET) Testing.

- a. *Whole Effluent Testing – Acute Toxicity.* Starting on April 1, 2008, the permittee shall conduct quarterly acute static replacement toxicity tests on a composite sample of the final effluent. The sample shall be collected at Outfall 001.

The monitoring frequency for acute tests shall be quarterly unless a sample is found to be acutely toxic during a routine test. If that occurs, the monitoring frequency shall become weekly (See *Part I.C. 3.b, Accelerated Testing*). Samples shall be collected on a two day progression; i.e., if the first sample is on a Monday, during the next sampling period, the sampling shall begin on a Wednesday, etc.

The replacement static acute toxicity tests shall be conducted in general accordance with the procedures set out in the latest revision of *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. Fourth Edition. August 1993, EPA/600/4-90/027F* as per 40 CFR 136.3(a) TABLE 1A-LIST OF APPROVED BIOLOGICAL METHODS, and the *Region VIII EPA NPDES Acute Test Conditions – Static Renewal Whole Effluent Toxicity Test (August, 1997)*. In the case of conflicts, the Region VIII procedures will prevail. The permittee shall conduct the 48-hour static replacement toxicity test using Ceriodaphnia dubia (water flea) and the acute 96-hour static replacement toxicity test using Pimephales promelas (fathead minnow). Tests will be conducted quarterly alternating between the Ceriodaphnia dubia and Pimephales promelas species replacement toxicity tests as appropriate. A CO₂ atmosphere may be used (in conjunction with an unmodified test) in order to account for pH drift.

Acute toxicity occurs when 50 percent or more mortality is observed for either species at any effluent concentration. Mortality in the control must simultaneously be 10 percent or less for the results to be considered valid. If more than 10 percent control mortality occurs, the test shall be repeated until satisfactory control mortality is achieved. A variance to this requirement may be granted by the Executive Secretary if a mortality of less than 10 percent was observed in higher effluent dilutions.

If the permit contains a total residual chlorine limitation greater than 0.20 mg/L, the permittee may request from the Executive Secretary approval to de-chlorinate the sample, or collect the sample prior to chlorination.

Quarterly test results shall be reported along with the Discharge Monitoring Report (DMR) submitted for the end of the reporting calendar quarter e.g., biomonitoring results for the calendar quarter ending March 31 shall be reported with the DMR due April 28, with the remaining biomonitoring reports submitted with DMRs due each July 28, October 28, and January 28). All test results shall be reported along with the DMR submitted for that

PART I
DISCHARGE PERMIT NO. UT0020427
WASTEWATER

reporting period. The format for the report shall be consistent with the latest revision of the *Region VIII Guidance for Acute Whole Effluent Reporting (August, 1997)* and shall include all chemical and physical data as specified.

If the results for one year of testing indicate no acute toxicity, the permittee may request a reduction in testing frequency and/or reduction to one species. The Executive Secretary may approve, partially approve, or deny the request based on results and other available information. If approval is given, the modification will take place without a public notice.

- b. *Accelerated Testing.* When acute toxicity is indicated during routine biomonitoring as specified in this permit, the permittee shall notify the Executive Secretary in writing within five (5) days after becoming aware of the test result. The permittee shall perform an accelerated schedule of biomonitoring to establish whether a pattern of toxicity exists. Accelerated testing will begin within seven (7) days after the permittee becomes aware of the test result. Accelerated testing shall be conducted as specified under *Part I.C.3.c, Pattern of Toxicity*. If the accelerated testing demonstrates no pattern of toxicity, routine monitoring shall be resumed.
- c. *Pattern of Toxicity.* A pattern of toxicity is defined by the results of a series of up to five (5) biomonitoring tests pursuant to the accelerated testing requirements using 100 percent effluent on the single species found to be more sensitive, once every week for up to five (5) consecutive weeks.

If two (2) consecutive tests (not including the scheduled quarterly or monthly test which triggered the search for a pattern of toxicity) do not result in acute toxicity, no further accelerated testing will be required and no pattern of toxicity will be found to exist. The permittee will provide written verification to the Executive Secretary within five (5) days, and resume routine monitoring.

A pattern of toxicity is established if one of the following occurs:

- (1) If two (2) consecutive test results (not including the scheduled quarterly or monthly test, which triggered the search for a pattern of toxicity) indicate acute toxicity, this constitutes an established pattern of toxicity.
 - (2) If consecutive tests continue to yield differing results each time, the permittee will be required to conduct up to a maximum of five (5) acute tests (not including the scheduled quarterly or monthly test which triggered the search for a pattern of toxicity). If three out of five test results indicate acute toxicity, this will constitute an established pattern of toxicity.
- d. *Preliminary Toxicity Investigation.*
 - (1) When a pattern of toxicity is detected the permittee will notify the Executive Secretary in writing within five (5) days and begin an

PART I
DISCHARGE PERMIT NO. UT0020427
WASTEWATER

evaluation of the possible causes of the toxicity. The permittee will have fifteen (15) working days from demonstration of the pattern to complete a Preliminary Toxicity Investigation (PTI) and submit a written report of the results to the Executive Secretary. The PTI may include, but is not limited to, additional chemical and biological monitoring, examination of pretreatment program records, examination of discharge monitoring reports, a thorough review of the testing protocol, evaluation of treatment processes and chemical use, inspection of material storage and transfer areas to determine if a spill may have occurred, and similar procedures.

- (2) If the PTI identifies a probable toxicant and/or a probable source of toxicity the permittee shall submit, as part of its final results written notification of that effect to the Executive Secretary. Within thirty (30) days of completing the PTI the permittee shall submit for approval a control program to control effluent toxicity and shall proceed to implement such a plan within seven (7) days following approval. The control program, as submitted to or revised by the Executive Secretary, may be incorporated into the permit.
 - (3) If no probable explanation for toxicity is identified in the PTI, the permittee shall notify the Executive Secretary as part of its final report, along with a schedule for conducting a Phase I Toxicity Reduction Evaluation (TRE) (See *Part I.C.3.f, Toxicity Reduction Evaluation*).
 - (4) If toxicity spontaneously disappears during the PTI, the permittee shall submit written notification to that effect to the Executive Secretary as part of the reporting requirements of paragraph a. of this section.
- e. *Toxicity Reduction Evaluation (TRE)*. If toxicity is detected during the life of this permit and it is determined by the Executive Secretary that a TRE is necessary, the permittee shall be so notified and shall initiate a TRE immediately thereafter. The purpose of the TRE will be to establish the cause of toxicity, locate the source(s) of the toxicity, and control or provide treatment for the toxicity.

A TRE may include but is not limited to one, all, or a combination of the following:

- (1) Phase I – Toxicity Characterization
- (2) Phase II – Toxicity Identification Procedures
- (3) Phase III – Toxicity Control Procedures
- (4) Any other appropriate procedures for toxicity source elimination and control.

If the TRE establishes that the toxicity cannot be immediately eliminated, the permittee shall submit a proposed compliance plan to the Executive

PART I
DISCHARGE PERMIT NO. UT0020427
WASTEWATER

Secretary. The plan shall include the proposed approach to control toxicity and a proposed compliance schedule for achieving control. If the approach and schedule are acceptable to the Executive Secretary, this permit may be reopened and modified.

If the TRE shows that the toxicity is caused by a toxicant(s) that may be controlled with specific numerical limitations, the permittee may:

- (a) Submit an alternative control program for compliance with the numerical requirements.
- (b) If necessary, provide a modified biomonitoring protocol, which compensates for the pollutant(s) being controlled numerically.

If acceptable to the Executive Secretary, this permit may be reopened and modified to incorporate any additional numerical limitations, a modified compliance schedule if judged necessary by the Executive Secretary, and/or a modified biomonitoring protocol.

Failure to conduct an adequate TRE, or failure to submit a plan or program as described above, or the submittal of a plan or program judged inadequate by the Executive Secretary, shall be considered a violation of this permit.

- D. Reporting of Wastewater Monitoring Results. Monitoring results obtained during the previous month shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), post-marked no later than the 28th day of the month following the completed reporting period. The first report is due on May 28, 2008. If no discharge occurs during the reporting period, "no discharge" shall be reported. Legible copies of these, and all other reports including whole effluent toxicity (WET) test reports required herein, shall be signed and certified in accordance with the requirements of *Signatory Requirements (see Part VII.G)*, and submitted to the Director, Division of Water Quality at the following address:

original to: Department of Environmental Quality
Division of Water Quality
288 North 1460 West
PO Box 144870
Salt Lake City, Utah 84114-4870

II. INDUSTRIAL PRETREATMENT PROGRAM

A. Pretreatment Program Delegation. The permittee has been delegated primary responsibility for enforcing against discharges prohibited by *40 CFR 403.5* and applying and enforcing any national Pretreatment Standards established by the United States Environmental Protection Agency in accordance with Section 307 (b) and (c) of *The Clean Water Act (CWA)*, as amended by *The Water Quality Act (WQA)*, of 1987.

The permittee shall implement the Industrial Pretreatment Program in accordance with the legal authorities, policies, and procedures described in the permittee's approved Pretreatment Program submission. Such program commits the permittee to do the following:

1. Carry out inspection, surveillance, and monitoring procedures, which will determine, independent of information supplied by the industrial user, whether the industrial user is in compliance with the pretreatment standards. At a minimum, all significant industrial users shall be inspected and sampled by the permittee at least once per year;
2. Control through permit, order, or similar means, the contribution to the POTW by each industrial user to ensure compliance with applicable pretreatment standards and requirements;
3. Require development, as necessary, of compliance schedules by each industrial user for the installation of control technologies to meet applicable pretreatment standards;
4. Maintain and update industrial user information as necessary, to ensure that all IUs are properly permitted and/or controlled at all times;
5. Enforce all applicable pretreatment standards and requirements and obtain appropriate remedies for noncompliance by any industrial user;
6. Annually publish a list of industrial users that were determined to be in significant noncompliance during the previous year. The notice must be published before March 28 of the following year;
7. Maintain an adequate revenue structure and staffing level for continued implementation of the Pretreatment Program.
8. Evaluate all significant industrial users at least once every two years to determine if they need to develop a slug prevention plan. If a slug prevention plan is required, the permittee shall insure that the plan contains at least the minimum elements required in *40 CFR 403.8(f)(2)(v)*;
9. Notify all significant industrial users of their obligation to comply with applicable requirements under *Subtitles C and D* of the *Resource Conservation and Recovery Act (RCRA)*; and

PART II
DISCHARGE PERMIT NO. UT0020427
PRETREATMENT

10. Develop, implement, and maintain an enforcement response plan as required by *40 CFR 403.8(f)(5)* which shall, at a minimum,
 - a. Describe how the POTW will investigate instances of noncompliance;
 - b. Describe the types of escalating enforcement responses the POTW will take in response to all anticipated type of industrial user violations; and
 - c. Describe the time periods within which such responses will be taken and identify the POTW staff position(s) responsible for pursuing these actions.
 11. Establish and enforce specific local limits as necessary to implement the provisions of the *40 CFR Parts 403.5(a)* and *(b)*, and as required by *40 CFR Part 403.5(c)*.
- B. Program Updates. The permittee is required to modify its pretreatment program, as necessary, to reflect changes in the regulations of *40 CFR 403*. Such modifications shall be completed within the time frame set forth by the applicable regulations. Modification of the approved pretreatment program must be done in accordance with the requirements of *40 CFR 403.18*. Modifications of the approved program which result in less stringent industrial user requirements shall not be effective until after approval has been granted by the Executive Secretary.
- C. Annual Report. The permittee shall provide the Division of Water Quality and EPA with an annual report briefly describing the permittee's pretreatment program activities over the previous calendar year. Reports shall be submitted no later than March 28 of each year. These annual reports shall, at a minimum, include:
1. An updated listing of the permittee's industrial users.
 2. A descriptive summary of the compliance activities including numbers of any major enforcement actions, i.e., administrative orders, penalties, civil actions, etc.
 3. An assessment of the compliance status of the permittee's industrial users and the effectiveness of the permittee's Pretreatment Program in meeting its needs and objectives.
 4. A summary of all sampling data taken of the influent and effluent for those pollutants listed in *Part II.H*.
 5. A description of all substantive changes made to the permittee's pretreatment program referenced in *Section B* of this section. Substantive changes include, but are not limited to, any change in any ordinance, major modification in the program's administrative structure or operating agreement(s), a significant reduction in monitoring, or a change in the method of funding the program.
 6. Other information as may be determined necessary by the Executive Secretary.

PART II
DISCHARGE PERMIT NO. UT0020427
PRETREATMENT

- D. General and Specific Prohibitions. Pretreatment standards (*40 CFR 403.5*) specifically prohibit the introduction of the following pollutants into the waste treatment system from any source of non-domestic discharge:
1. Pollutants which create a fire or explosion hazard in the publicly owned treatment works (POTW), including, but not limited to, wastestreams with a closed cup flashpoint of less than 140oF (60oC);
 2. Pollutants, which will cause corrosive structural damage to the POTW, but in no case, discharges with a pH lower than 5.0;
 3. Solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW resulting in interference;
 4. Any pollutant, including oxygen demanding pollutants (BOD, etc.), released in a discharge at such volume or strength as to cause interference in the POTW;
 5. Heat in amounts, which will inhibit biological activity in the POTW, resulting in interference, but in no case, heat in such quantities that the influent to the sewage treatment works exceeds 104°F (40°C);
 6. Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through;
 7. Pollutants, which result in the presence of toxic gases, vapor, or fumes within the POTW in a quantity that may cause worker health or safety problems;
 8. Any trucked or hauled pollutants, except at discharge points designated by the POTW; or
 9. Any pollutant that causes pass through or interference at the POTW.
 10. Any specific pollutant which exceeds any local limitation established by the POTW in accordance with the requirement of *40 CFR 403.5(c)* and *40 CFR 403.5(d)*.
- E. Categorical Standards. In addition to the general and specific limitations expressed in *Part A and D* of this section, applicable National Categorical Pretreatment Standards must be met by all industrial users of the POTW. These standards are published in the federal regulations at *40 CFR 405* et. seq.
- F. Enforcement Notice. *UCA 19-5-104* provides that the State may issue a notice to the POTW stating that a determination has been made that appropriate enforcement action must be taken against an industrial user for noncompliance with any pretreatment requirements within 30 days. The issuance of such notice shall not be construed to limit the authority of the Executive Secretary.
- G. Formal Action. The Executive Secretary retains the right to take legal action against any industrial user and/or POTW for those cases where a permit violation has

PART II
DISCHARGE PERMIT NO. UT0020427
PRETREATMENT

occurred because of the failure of an industrial user to meet an applicable pretreatment standard.

H. Self-Monitoring and Reporting Requirements.

1. Influent and Effluent Monitoring and Reporting Requirements. The permittee shall sample and analyze both the influent and effluent quarterly, for the following parameters.

Metals Monitoring for Pretreatment Program				
Parameter	Sample Type	Frequency	Units	Test Limit a.*
Total Arsenic	Composite	Quarterly	ug/L	100.2
Total Cadmium				0.6
Total Chromium				11.0
Total Copper				23.9
Total Cyanide	Grab			5.2
Total Lead	Composite			12.9
Total Mercury	Composite/Grab			0.012
Total Molybdenum	Composite			n/a
Total Nickel				132
Total Selenium				4.6
Total Silver				25.1
Total Zinc				304.7

a.* The MDL of the test method used for analysis must be below this limit, if a test method is not available the permittee must submit documentation to the Executive Secretary regarding the method that will be used.

In addition, the permittee shall analyze the treatment facility influent and effluent for the presence of the toxic pollutants listed in *40 CFR 122 Appendix D Table II (Organic Toxic Pollutants)* yearly. The pesticides fraction of *Appendix D, Table II* is suspended unless pesticides are expected to be present.

The results of the analyses of metals, cyanide and toxic organics shall be submitted along with the Discharge Monitoring Report (DMR) at the end of the earliest possible reporting period.

2. In accordance with the requirements of *40 CFR Part 403.5(c)*, the permittee shall determine if there is a need to develop or revise its local limits in order to implement the general and specific prohibitions of *40 CFR Part 403.5 (a)* and *Part 403.5 (b)*. A technical evaluation of the need to develop or revise local limits shall be submitted to the Division within **12 months** of the effective date of this permit. This evaluation should be conducted in accordance with the latest revision of the *Utah Model industrial Pretreatment Program, Section 4, Local Limits*. If a technical evaluation, which may be based on the *Utah Model Industrial Pretreatment Program, Section 4, Local Limits*, reveals that development or revision of local limits is necessary, the permittee shall submit the

PART II
DISCHARGE PERMIT NO. UT0020427
PRETREATMENT

proposed local limits revision to the Division of Water Quality for approval, and after approval implement the new local limits, within **12 months** of the Division's determination that a revision is necessary.

III. BIOSOLIDS REQUIREMENTS

A. Description of Biosolids Treatment and Disposal.

The authorization to dispose of biosolids provided under this permit is limited to those biosolids produced from the treatment works owned and operated by the permittee. The treatment methods and disposal practices are specifically designated below.

1. Treatment.

Biosolids produced at the PCWWTP **are stabilized in anaerobic digesters with a hydraulic retention time of approximately 40 days at an estimated average temperature of 95° F (29.4°C). The biosolids are de-watered with drying beds.**

2. Description of Biosolids Disposal Method.

The biosolids are disposed in a landfill

3. Changes in Treatment Systems and Disposal Practices.

Should the PCWWTP change their disposal methods or the biosolids generation and handling processes of the plant, the PCWWTP must notify the Executive Secretary at least 180 days in advance. This includes, but is not limited to, the addition or removal of any biosolids treatment units (e.g., digesters, drying beds, etc.) and/or any other change that would require a major modification of the permit.

All biosolids land filled must meet the requirements of *40 CFR 258, Utah Administrative Code R315-301-5* and *Section 2.12* of the latest version of the *EPA Region VIII Biosolids Management Handbook*.

B. Specific Limitations and Monitoring Requirements.

All biosolids generated by this facility that are disposed shall meet the requirements of *Part III.B.1* and *2* listed below.

1. Vector Attraction Reduction Requirements.

The vector attraction reduction must be met with a 38% volatile solids reduction prior to disposal in the landfill.

- a. There are additional vector attraction reduction alternatives available in *40 CFR 503.33*. If the permittee intends to use one of these alternatives, the Executive Secretary and the EPA must be informed at least thirty (30) days prior to its use. This change may be made without additional public notice.

2. Self-Monitoring Requirements.

At a minimum, upon the effective date of this permit, vector attraction reduction and paint filter tests requirements shall be monitored according to *40 CFR 503.16*.

- Minimum Frequency of Monitoring

Amount of Biosolids Disposed Per Year	Monitoring Frequency
> 0 to < 290 DMT	One Time Per Year
> 290 to < 1500 DMT	Four times Per Year

Sample collection, preservation and analysis shall be performed in a manner consistent with the requirements of *40 CFR Part 503* and/or other criteria specified in this permit.

C. Special Conditions on Biosolids Storage.

For biosolids or material derived from biosolids that are stored in piles for one year or longer, measures shall be taken to ensure that erosion (whether by wind or water) does not occur. However, best management practices should also be used for piles used for biosolids treatment. If a treatment pile is considered to have caused a problem, best management practices could be added as a requirement in the next permit renewal.

Permanent storage of biosolids is prohibited. Biosolids shall not be temporarily stored for more than two years. Written permission to store biosolids for more than two years must be obtained from the Executive Secretary. Storage of biosolids for more than two years will be allowed only if it is determined that significant treatment is occurring.

D. Representative Sampling.

Biosolids samples used to measure compliance with Part II of this Permit shall be collected at locations representative of the quality of biosolids generated at the treatment works and immediately prior to land application.

E. Reporting of Monitoring Results.

1. The PCWWTP shall provide the results of all monitoring performed in accordance with *Part III.B.* of the permit and information on management practices, and certifications shall be provided no later than February 19 of each year. Each report is for the previous calendar year. If no biosolids were applied to the land during the reporting period, "no biosolids were applied" shall be reported. Legible copies of these, and all other reports required herein, shall be signed and certified in accordance with Record Keeping (see *Part III.G.*) and

submitted to the Utah Division of Water Quality and the EPA at the following addresses:

Original to: Biosolids Coordinator
Utah Division of Water Quality
P. O. Box 144870
Salt Lake City Utah, 84114-4870

Copy to: Biosolids Coordinator, 8P-W-P
U. S. Environmental Protection Agency
Region VIII
999 18th Street, Suite 500
Denver, Colorado 80202-2466

F. Additional Monitoring by the Permittee. If the PCWWTP monitors any pollutant more frequently than required by this permit, using test procedures approved under *40 CFR 503* or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted on the Biosolids Report form. Such increased frequency shall also be indicated

G. Record Keeping

1. If so notified by the Executive Secretary the PCWWTP may be required to add additional record keeping if information provided indicates that this is necessary to protect public health and the environment.
2. The PCWWTP is required to keep the following information for at least 5 years:

"I certify under the penalty of law, that the vector attraction requirements in *Part III.B.1.*, have been met. This determination has been made under my direction and supervision in accordance with the system designed to assure that qualified personnel properly gathered and evaluated the information used to determine that the vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including the possibility of imprisonment."

3. Records of monitoring information shall include:
 - a. The date, exact place, and time of sampling or measurements;
 - b. The initials or name(s) of the individual(s) who performed the sampling or measurements;
 - c. The date(s) analyses were performed;
 - d. The time(s) analyses were initiated;
 - e. The initials or name(s) of individual(s) who performed the analyses;

- f. References and written procedures, when available, for the analytical techniques or methods used; and,
 - g. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine these results.
4. The PCWWTP shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit and records of all data used to complete the application for this permit for the life of the permit. Data collected on site, copies of Biosolids Report forms, and a copy of this UPDES biosolids-only permit must be maintained on site during the duration of activity at the permitted location.

H. Twenty-four Hour Notice of Noncompliance Reporting.

- 1. The shall report any noncompliance including transportation accidents and spills from the transfer of biosolids which may seriously endanger health or the environment as soon as possible, but no later than 24 hours from the time the PCWWTP first became aware of the circumstances. The report shall be made to the Division of Water Quality at (801) 538-6146 or (801) 536-4123 (24-hour answering machine).
 - 2. A written submission shall also be provided within five days of the time that the PCWWTP becomes aware of the circumstances. The written submission shall contain:
 - a. A description of the noncompliance and its cause;
 - b. The period of noncompliance, including exact dates and times;
 - c. The estimated time noncompliance is expected to continue if it has not been corrected; and,
 - d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
 - 3. The Executive Secretary may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Division of Water Quality, by phone, at (801) 538-6146.
 - 4. Reports shall be submitted to the addresses in Part III.E.1., Reporting of Monitoring Results.
- I. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for *Part III.B.* are submitted. The reports shall contain the information listed in *Part III.F.*

IV. STORM WATER REQUIREMENTS.

- A. Coverage of This Section. The requirements listed under this section shall apply to storm water discharges. Storm water discharges from the following portions of the facility may be eligible for coverage under this permit: biosolids drying beds, haul or access roads on which transportation of biosolids may occur, grit screen cleaning areas, chemical loading, unloading and storage areas, salt or sand storage areas, vehicle or equipment storage and maintenance areas, or any other wastewater treatment device or system, used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including lands dedicated to the disposal of sewage sludge that are located within the confines of the facility that may have a reasonable expectation to contribute to pollutants in a storm water discharge.
- B. Prohibition of Non-Storm Water Discharges. Except for discharges identified in *Part I.*, and discharges described below in this paragraph, non-storm water discharges are prohibited. The following non-storm water discharges may be authorized under this permit provided the non-storm water component of the discharge is in compliance with this section; discharges from fire fighting activities; fire hydrant flushing; potable water sources including waterline flushing; drinking fountain water; irrigation drainage and lawn watering; routine external building wash down water where detergents or other compounds have not been used in the process; pavement wash waters where spills or leaks of toxic or hazardous materials (including oils and fuels) have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; uncontaminated compressor condensate; uncontaminated springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials such as solvents.
- C. Storm Water Pollution Prevention Plan Requirements. The permittee must have (on site) or develop and implement a storm water pollution prevention plan as a condition of this permit.
1. Contents of the Plan. The plan shall include, at a minimum, the following items:
 - a. *Pollution Prevention Team.* Each plan shall identify a specific individual or individuals within the facility organization as members of a storm water Pollution Prevention Team who are responsible for developing the storm water pollution prevention plan and assisting the facility or plant manager in its implementation, maintenance, and revision. The plan shall clearly identify the responsibilities of each team member. The activities and responsibilities of the team shall address all aspects of the facility's storm water pollution prevention plan.
 - b. *Description of Potential Pollutant Sources.* Each plan shall provide a description of potential sources which may reasonably be expected to add significant amounts of pollutants to storm water discharges or which may result in the discharge of pollutants during dry weather from separate storm sewers draining the facility. Each plan shall identify all activities and significant materials, which may be reasonably expected to have the potential as a significant pollutant source. Each plan shall include, at a minimum:

PART IV
STORM WATER PERMIT NO. UT020427

- (1) *Drainage*. A site map indicating drainage areas and storm water outfalls. For each area of the facility that generates storm water discharges associated with the waste water treatment related activity with a reasonable potential for containing significant amounts of pollutants, a prediction of the direction of flow and an identification of the types of pollutants that are likely to be present in storm water discharges associated with the activity. Factors to consider include the toxicity of the pollutant; quantity of chemicals used, produced or discharged; the likelihood of contact with storm water; and history of significant leaks or spills of toxic or hazardous pollutants. Flows with a significant potential for causing erosion shall be identified. The site map shall include but not be limited to:
- (a) Drainage direction and discharge points from all wastewater associated activities including but not limited to grit screen cleaning, bio-solids drying beds and transport, chemical/material loading, unloading and storage areas, vehicle maintenance areas, salt or sand storage areas.
 - (b) Location of any erosion and sediment control structure or other control measures utilized for reducing pollutants in storm water runoff.
 - (c) Location of bio-solids drying beds where exposed to precipitation or where the transportation of bio-solids may be spilled onto internal roadways or tracked off site.
 - (d) Location where grit screen cleaning or other routinely performed industrial activities are located and are exposed to precipitation.
 - (e) Location of any handling, loading, unloading or storage of chemicals or potential pollutants such as caustics, hydraulic fluids, lubricants, solvents or other petroleum products, or hazardous wastes and where these may be exposed to precipitation.
 - (f) Locations where any major spills or leaks of toxic or hazardous materials have occurred.
 - (g) Location of any sand or salt piles.
 - (h) Location of fueling stations or vehicle and equipment maintenance and cleaning areas that are exposed to precipitation.
 - (i) Location of receiving streams or other surface water bodies.
 - (j) Locations of outfalls and the types of discharges contained in the drainage areas of the outfalls.

PART IV
STORM WATER PERMIT NO. UT020427

- (2) *Inventory of Exposed Materials.* An inventory of the types of materials handled at the site that potentially may be exposed to precipitation. Such inventory shall include a narrative description of significant materials that have been handled, treated, stored or disposed in a manner to allow exposure to storm water between the time of 3 years prior to the effective date of this permit and the present; method and location of onsite storage or disposal; materials management practices employed to minimize contact of materials with storm water runoff between the time of 3 years prior to the effective date of this permit and the present; the location and a description of existing structural and nonstructural control measures to reduce pollutants in storm water runoff; and a description of any treatment the storm water receives.
- (3) *Spills and Leaks.* A list of significant spills and significant leaks of toxic or hazardous pollutants that occurred at areas that are exposed to precipitation or that otherwise drain to a storm water conveyance at the facility after the date of 3 years prior to the effective date of this permit. Such list shall be updated as appropriate during the term of the permit.
- (4) *Sampling Data.* A summary of existing discharge sampling data describing pollutants in storm water discharges from the facility, including a summary of sampling data collected during the term of this permit.
- (5) *Summary of Potential Pollutant Sources and Risk Assessment.* A narrative description of the potential pollutant sources from the following activities associated with treatment works: access roads/rail lines; loading and unloading operations; outdoor storage activities; material handling sites; outdoor vehicle storage or maintenance sites; significant dust or particulate generating processes; and onsite waste disposal practices. Specific potential pollutants shall be identified where known.
- (6) *Measures and Controls.* The permittee shall develop a description of storm water management controls appropriate for the facility, and implement such controls. The appropriateness and priorities of controls in a plan shall reflect identified potential sources of pollutants at the facility. The description of storm water management controls shall address the following minimum components, including a schedule for implementing such controls:
 - (7) *Good Housekeeping.* All areas that may contribute pollutants to storm waters discharges shall be maintained in a clean, orderly manner. These are practices that would minimize the generation of pollutants at the source or before it would be necessary to employ sediment ponds or other control measures at the discharge outlets. Where applicable, such measures or other equivalent measures would include the following: sweepers and covered storage to minimize dust generation and storm runoff; conservation of vegetation where possible to minimize erosion;

PART IV
STORM WATER PERMIT NO. UT020427

- sweeping of haul roads, bio-solids access points, and exits to reduce or eliminate off site tracking; sweeping of sand or salt storage areas to minimize entrainment in storm water runoff; collection, removal, and proper disposal of waste oils and other fluids resulting from vehicle and equipment maintenance; other equivalent measures to address identified potential sources of pollution.
- (8) *Preventive Maintenance.* A preventive maintenance program shall involve timely inspection and maintenance of storm water management devices (e.g., cleaning oil/water separators, catch basins) as well as inspecting and testing facility equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters, and ensuring appropriate maintenance of such equipment and systems.
- (9) *Spill Prevention and Response Procedures.* Areas where potential spills that can contribute pollutants to storm water discharges can occur, and their accompanying drainage points, shall be identified clearly in the storm water pollution prevention plan. Where appropriate, specifying material handling procedures, storage requirements, and use of equipment such as diversion valves in the plan should be considered. Procedures and equipment for cleaning up spills shall be identified in the plan and made available to the appropriate personnel.
- (10) *Inspections.* In addition to the comprehensive site evaluation required under paragraph (*Part IV.C.1.b.(16)*) of this section, qualified facility personnel shall be identified to inspect designated equipment and areas of the facility on a periodic basis. The following areas shall be included in all inspections: access roads/rail lines, equipment storage and maintenance areas (both indoor and outdoor areas); fueling; material handling areas, residual treatment, storage, and disposal areas; and wastewater treatment areas. A set of tracking or follow-up procedures shall be used to ensure that appropriate actions are taken in response to the inspections. Records of inspections shall be maintained. The use of a checklist developed by the facility is encouraged.
- (11) *Employee Training.* Employee training programs shall inform personnel responsible for implementing activities identified in the storm water pollution prevention plan or otherwise responsible for storm water management at all levels of responsibility of the components and goals of the storm water pollution prevention plan. Training should address topics such as spill response, good housekeeping and material management practices. The pollution prevention plan shall identify how often training will take place, but training should be held at least annually (once per calendar year). Employee training must, at a minimum, address the following areas when applicable to a facility: petroleum product management; process chemical management; spill prevention and control; fueling procedures; general good housekeeping

PART IV
STORM WATER PERMIT NO. UT020427

practices; proper procedures for using fertilizers, herbicides and pesticides.

- (12) *Record keeping and Internal Reporting Procedures.* A description of incidents (such as spills, or other discharges), along with other information describing the quality and quantity of storm water discharges shall be included in the plan required under this part. Inspections and maintenance activities shall be documented and records of such activities shall be incorporated into the plan.
- (13) *Non-storm Water Discharges.*
- (a) *Certification.* The plan shall include a certification that the discharge has been tested or evaluated for the presence of non-storm water discharges. The certification shall include the identification of potential significant sources of non-storm water at the site, a description of the results of any test and/or evaluation for the presence of non-storm water discharges, the evaluation criteria or testing method used, the date of any testing and/or evaluation, and the onsite drainage points that were directly observed during the test. Certifications shall be signed in accordance with *Part VII.G* of this permit.
 - (b) *Exceptions.* Except for flows from fire fighting activities, sources of non-storm water listed in *Part IV.B. (Prohibition of Non-storm Water Discharges)* of this permit that are combined with storm water discharges associated with industrial activity must be identified in the plan. The plan shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.
 - (c) *Failure to Certify.* Any facility that is unable to provide the certification required (testing for non-storm water discharges), must notify the *Executive Secretary* within 180 days after the effective date of this permit. If the failure to certify is caused by the inability to perform adequate tests or evaluations, such notification shall describe: the procedure of any test conducted for the presence of non-storm water discharges; the results of such test or other relevant observations; potential sources of non-storm water discharges to the storm sewer; and why adequate tests for such storm sewers were not feasible. Non-storm water discharges to waters of the State, which are not, authorized by a *UPDES* permit are unlawful, and must be terminated.
- (14) *Sediment and Erosion Control.* The plan shall identify areas, which, due to topography, activities, or other factors, have a high potential for significant soil erosion, and identify structural, vegetative, and/or stabilization measures to be used to limit erosion.

PART IV
STORM WATER PERMIT NO. UT020427

- (15) *Management of Runoff.* The plan shall contain a narrative consideration of the appropriateness of traditional storm water management practices (practices other than those which control the generation or source(s) of pollutants) used to divert, infiltrate, reuse, or otherwise manage storm water runoff in a manner that reduces pollutants in storm water discharges from the site. The plan shall provide that measures that the permittee determines to be reasonable and appropriate shall be implemented and maintained. The potential of various sources at the facility to contribute pollutants to storm water discharges associated with industrial activity *Part IV.C.1.b* (Description of Potential Pollutant Sources) of this permit] shall be considered when determining reasonable and appropriate measures. Appropriate measures or other equivalent measures may include: vegetative swales and practices, reuse of collected storm water (such as for a process or as an irrigation source), inlet controls (such as oil/water separators), snow management activities, infiltration devices, wet detention/retention devices and discharging storm water through the waste water facility for treatment.
- (16) *Comprehensive Site Compliance Evaluation.* Qualified personnel shall conduct site compliance evaluations at appropriate intervals specified in the plan, but in no case less than once a year. Such evaluations shall provide:
- (a) Areas contributing to a storm water discharge associated with industrial activity shall be visually inspected for evidence of, or the potential for, pollutants entering the drainage system. Measures to reduce pollutant loadings shall be evaluated to determine whether they are adequate and properly implemented in accordance with the terms of the permit or whether additional control measures are needed. Structural storm water management measures, sediment and erosion control measures, and other structural pollution prevention measures identified in the plan shall be observed to ensure that they are operating correctly. A visual inspection of equipment needed to implement the plan, such as spill response equipment, shall be made.
 - (b) Based on the results of the evaluation, the description of potential pollutant sources identified in the plan in accordance with *Part IV.C.1.b* (Description of Potential Pollutant Sources) of this section and pollution prevention measures and controls identified in the plan in accordance with *Part IV.C.1.b.(6)* (Measures and Controls) of this section shall be revised as appropriate within 2 weeks of such evaluation and shall provide for implementation of any changes to the plan in a timely manner, but in no case more than 12 weeks after the evaluation.
 - (c) A report summarizing the scope of the evaluation, personnel making the evaluation, the date(s) of the evaluation, major observations relating to the implementation of the storm water pollution

PART IV
STORM WATER PERMIT NO. UT020427

prevention plan, and actions taken in accordance with paragraph *i.* (above) shall be made and retained as part of the storm water pollution prevention plan for at least 3 years after the date of the evaluation. The report shall identify any incidents of noncompliance. Where a report does not identify any incidents of noncompliance, the report shall contain a certification that the facility is in compliance with the storm water pollution prevention plan and this permit. The report shall be signed in accordance with *Part VII.G* (Signatory Requirements) of this permit.

- (17) *Deadlines for Plan Preparation and Compliance.* The permittee shall prepare and implement a plan in compliance with the provisions of this section within 270 days of the effective date of this permit. If the permittee already has a plan, it shall be revised according to *Part IV.C.1.b.(16)*, Comprehensive Site Evaluation.
- (18) *Keeping Plans Current.* The permittee shall amend the plan whenever there is a change in design, construction, operation, or maintenance, that has a significant effect on the potential for the discharge of pollutants to the waters of the state or if the storm water pollution prevention plan proves to be ineffective in eliminating or significantly minimizing pollutants from sources identified by the plan, or in otherwise achieving the general objective of controlling pollutants in storm water discharges associated with the activities at the facility.

D. Monitoring and Reporting Requirements.

1. Quarterly Visual Examination of Storm Water Quality. Facilities shall perform and document a visual examination of a storm water discharge associated with industrial activity from each outfall, except discharges exempted below. The examination must be made at least once in each of the following designated periods during daylight hours unless there is insufficient rainfall or snow melt to produce a runoff event: January through March; April through June; July through September; and October through December.
 - a. *Sample and Data Collection.* Examinations shall be made of samples collected within the first 30 minutes (or as soon thereafter as practical, but not to exceed 1 hour) of when the runoff or snowmelt begins discharging. The examinations shall document observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of storm water pollution. The examination must be conducted in a well lit area. No analytical tests are required to be performed on the samples. All such samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. Where practicable, the same individual should carry out the collection and examination of discharges for entire permit term.

PART IV
STORM WATER PERMIT NO. UT020427

- b. *Visual Storm Water Discharge Examination Reports.* Visual examination reports must be maintained onsite in the pollution prevention plan. The report shall include the examination date and time, examination personnel, the nature of the discharge (i.e., runoff or snow melt), visual quality of the storm water discharge (including observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of storm water pollution), and probable sources of any observed storm water contamination.

- c. *Representative Discharge.* When the permittee has two or more outfalls that, based on a consideration of industrial activity, significant materials, and management practices and activities within the area drained by the outfall, the permittee reasonably believes discharge substantially identical effluents, the permittee may collect a sample of effluent of one of such outfalls and report that the observation data also applies to the substantially identical outfall(s) provided that the permittee includes in the storm water pollution prevention plan a description of the location of the outfalls and explains in detail why the outfalls are expected to discharge substantially identical effluents. In addition, for each outfall that the permittee believes is representative, an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area [e.g., low (under 40 percent), medium (40 to 65 percent), or high (above 65 percent)] shall be provided in the plan.

- d. *Adverse Conditions.* When a discharger is unable to collect samples over the course of the visual examination period as a result of adverse climatic conditions, the discharger must document the reason for not performing the visual examination and retain this documentation onsite with the results of the visual examination. Adverse weather conditions, which may prohibit the collection of samples, include weather conditions that create dangerous conditions for personnel (such as local flooding, high winds, hurricane, tornadoes, electrical storms, etc.) or otherwise make the collection of a sample impracticable (drought, extended frozen conditions, etc.).

- e. *Inactive and Unstaffed Site.* When a discharger is unable to conduct visual storm water examinations at an inactive and unstaffed site, the operator of the facility may exercise a waiver of the monitoring requirement as long as the facility remains inactive and unstaffed. The facility must maintain a certification with the pollution prevention plan stating that the site is inactive and unstaffed so that performing visual examinations during a qualifying event is not feasible.

V. MONITORING, RECORDING & GENERAL REPORTING REQUIREMENTS

- A. Representative Sampling. Samples taken in compliance with the monitoring requirements established under *Part I* shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge. Samples of biosolids shall be collected at a location representative of the quality of biosolids immediately prior to the use-disposal practice.
- B. Monitoring Procedures. Monitoring must be conducted according to test procedures approved under *Utah Administrative Code ("UAC") R317-2-10 and 40CFR Part 503*, unless other test procedures have been specified in this permit.
- C. Penalties for Tampering. The *Act* provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than six months per violation, or by both.
- D. Compliance Schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.
- E. Additional Monitoring by the Permittee. If the permittee monitors any parameter more frequently than required by this permit, using test procedures approved under *UAC R317-2-10 and 40 CFR 503* or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or the Biosolids Report Form. Such increased frequency shall also be indicated. Only those parameters required by the permit need to be reported.
- F. Records Contents. Records of monitoring information shall include:
1. The date, exact place, and time of sampling or measurements;
 2. The individual(s) who performed the sampling or measurements;
 3. The date(s) and time(s) analyses were performed;
 4. The individual(s) who performed the analyses;
 5. The analytical techniques or methods used; and,
 6. The results of such analyses.
- G. Retention of Records. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least five years from the date of the sample, measurement, report or application. This period may be extended by request of the Executive Secretary at any time. A copy of this UPDES permit must be maintained on site during the duration of activity at the permitted location

H. Twenty-four Hour Notice of Noncompliance Reporting.

1. The permittee shall (orally) report any noncompliance including transportation accidents, spills, and uncontrolled runoff from biosolids transfer or land application sites which may seriously endanger health or environment, as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of circumstances. The report shall be made to the Division of Water Quality, (801) 538-6146, or 24-hour answering service (801) 536-4123.
2. The following occurrences of noncompliance shall be reported by telephone (801) 536-4123 as soon as possible but no later than 24 hours from the time the permittee becomes aware of the circumstances:
 - a. Any noncompliance which may endanger health or the environment;
 - b. Any unanticipated bypass, which exceeds any effluent limitation in the permit (See *Part VI.G, Bypass of Treatment Facilities.*);
 - c. Any upset which exceeds any effluent limitation in the permit (See *Part VI.H, Upset Conditions.*);
 - d. Violation of a maximum daily discharge limitation for any of the pollutants listed in the permit; or,
 - e. Violation of any of the Table 3 metals limits, the pathogen limits, the vector attraction reduction limits or the management practices for biosolids that have been sold or given away.
3. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:
 - a. A description of the noncompliance and its cause;
 - b. The period of noncompliance, including exact dates and times;
 - c. The estimated time noncompliance is expected to continue if it has not been corrected;
 - d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and,
 - e. Steps taken, if any, to mitigate the adverse impacts on the environment and human health during the noncompliance period.

PART V
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UT020427

4. The Executive Secretary may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Division of Water Quality, (801) 538-6146.
5. Reports shall be submitted to the addresses in *Part I.D, Reporting of Monitoring Results*.
- I. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for *Part I.D* are submitted. The reports shall contain the information listed in *Part V.H.3*
- J. Inspection and Entry. The permittee shall allow the Executive Secretary, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:
 1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;
 2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
 3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, including but not limited to, biosolids treatment, collection, storage facilities or area, transport vehicles and containers, and land application sites;
 4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the *Act*, any substances or parameters at any location, including, but not limited to, digested biosolids before dewatering, dewatered biosolids, biosolids transfer or staging areas, any ground or surface waters at the land application sites or biosolids, soils, or vegetation on the land application sites; and,
 5. The permittee shall make the necessary arrangements with the landowner or leaseholder to obtain permission or clearance, the Executive Secretary, or authorized representative, upon the presentation of credentials and other documents as may be required by law, will be permitted to enter without delay for the purposes of performing their responsibilities.

VI. COMPLIANCE RESPONSIBILITIES

- A. Duty to Comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give advance notice to the Executive Secretary of any planned changes in the permitted facility or activity, which may result in noncompliance with permit requirements.
- B. Penalties for Violations of Permit Conditions. The *Act* provides that any person who violates a permit condition implementing provisions of the *Act* is subject to a civil penalty not to exceed \$10,000 per day of such violation. Any person who willfully or negligently violates permit conditions or the Act is subject to a fine not exceeding \$25,000 per day of violation. Any person convicted under *UCA 19-5-115(2)* a second time shall be punished by a fine not exceeding \$50,000 per day. Except as provided at *Part VI.G, Bypass of Treatment Facilities* and *Part VI.H, Upset Conditions*, nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.
- C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
- D. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit, which has a reasonable likelihood of adversely affecting human health or the environment. The permittee shall also take all reasonable steps to minimize or prevent any land application in violation of this permit.
- E. Proper Operation and Maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.
- F. Removed Substances. Collected screening, grit, solids, sludge, or other pollutants removed in the course of treatment shall be disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Sludge/digester supernatant and filter backwash

PART VI
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

shall not directly enter either the final effluent or waters of the state by any other direct route.

G. Bypass of Treatment Facilities.

1. Bypass Not Exceeding Limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to paragraph 2 and 3 of this section.
2. Prohibition of Bypass.
 - a. Bypass is prohibited, and the Executive Secretary may take enforcement action against a permittee for bypass, unless:
 - (1) Bypass was unavoidable to prevent loss of human life, personal injury, or severe property damage;
 - (2) There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance, and
 - (3) The permittee submitted notices as required under *section VI.G.3.*
 - b. The executive Secretary may approve an anticipated bypass, after considering its adverse effects, if the Executive Secretary determines that it will meet the three conditions listed in *sections VI.G.2.a (1), (2) and (3).*
3. Notice.
 - a. *Anticipated bypass.* Except as provided above in *section VI.G.2* and below in *section VI.G.3.b*, if the permittee knows in advance of the need for a bypass, it shall submit prior notice, at least ninety days before the date of bypass. The prior notice shall include the following unless otherwise waived by the Executive Secretary:
 - (1) Evaluation of alternative to bypass, including cost-benefit analysis containing an assessment of anticipated resource damages:

PART VI
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

- (2) A specific bypass plan describing the work to be performed including scheduled dates and times. The permittee must notify the Executive Secretary in advance of any changes to the bypass schedule;
 - (3) Description of specific measures to be taken to minimize environmental and public health impacts;
 - (4) A notification plan sufficient to alert all downstream users, the public and others reasonably expected to be impacted by the bypass;
 - (5) A water quality assessment plan to include sufficient monitoring of the receiving water before, during and following the bypass to enable evaluation of public health risks and environmental impacts; and,
 - (6) Any additional information requested by the Executive Secretary.
- b. *Emergency Bypass.* Where ninety days advance notice is not possible, the permittee must notify the Executive Secretary, and the Director of the Department of Natural Resources, as soon as it becomes aware of the need to bypass and provide to the Executive Secretary the information in *section VI.G.3.a.(1) through (6)* to the extent practicable.
- c. *Unanticipated bypass.* The permittee shall submit notice of an unanticipated bypass to the Executive Secretary as required under *Part IV.H, Twenty Four Hour Reporting.* The permittee shall also immediately notify the Director of the Department of Natural Resources, the public and downstream users and shall implement measures to minimize impacts to public health and environment to the extent practicable.

H. Upset Conditions.

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of paragraph 2 of this section are met. Executive Secretary's administrative determination regarding a claim of upset cannot be judiciously challenged by the permittee until such time as an action is initiated for noncompliance.
2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate,

PART VI
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

through properly signed, contemporaneous operating logs, or other relevant evidence that:

- a. An upset occurred and that the permittee can identify the cause(s) of the upset;
 - b. The permitted facility was at the time being properly operated;
 - c. The permittee submitted notice of the upset as required under *Part V.H, Twenty-four Hour Notice of Noncompliance Reporting*; and,
 - d. The permittee complied with any remedial measures required under *Part VI.D, Duty to Mitigate*.
3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

PART VII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

VII. GENERAL REQUIREMENTS

- A. Planned Changes. The permittee shall give notice to the Executive Secretary as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when the alteration or addition could significantly change the nature or increase the quantity of parameters discharged or pollutant sold or given away. This notification applies to pollutants, which are not subject to effluent limitations in the permit. In addition, if there are any planned substantial changes to the permittee's existing sludge facilities or their manner of operation or to current sludge management practices of storage and disposal, the permittee shall give notice to the Executive Secretary of any planned changes at least 30 days prior to their implementation.
- B. Anticipated Noncompliance. The permittee shall give advance notice to the Executive Secretary of any planned changes in the permitted facility or activity, which may result in noncompliance with permit requirements.
- C. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.
- D. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee shall apply for and obtain a new permit. The application shall be submitted at least 180 days before the expiration date of this permit.
- E. Duty to Provide Information. The permittee shall furnish to the Executive Secretary, within a reasonable time, any information which the Executive Secretary may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Executive Secretary, upon request, copies of records required to be kept by this permit.
- F. Other Information. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Executive Secretary, it shall promptly submit such facts or information.
- G. Signatory Requirements. All applications, reports or information submitted to the Executive Secretary shall be signed and certified.

PART VII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

1. All permit applications shall be signed by either a principal executive officer or ranking elected official.
2. All reports required by the permit and other information requested by the Executive Secretary shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
 - a. The authorization is made in writing by a person described above and submitted to the Executive Secretary, and,
 - b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. A duly authorized representative may thus be either a named individual or any individual occupying a named position.
3. Changes to authorization. If an authorization under *paragraph VII.G.2* is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of *paragraph VII.G.2.* must be submitted to the Executive Secretary prior to or together with any reports, information, or applications to be signed by an authorized representative.
4. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

- H. Penalties for Falsification of Reports. The *Act* provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than

PART VII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

\$10,000.00 per violation, or by imprisonment for not more than six months per violation, or by both.

- I. Availability of Reports. Except for data determined to be confidential under *UAC R317-8-3.2*, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the office of Executive Secretary. As required by the *Act*, permit applications, permits and effluent data shall not be considered confidential.
- J. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the permittee of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under the *Act*.
- K. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.
- L. Severability. The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.
- M. Transfers. This permit may be automatically transferred to a new permittee if:
 - 1. The current permittee notifies the Executive Secretary at least 20 days in advance of the proposed transfer date;
 - 2. The notice includes a written agreement between the existing and new permittee's containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,
 - 3. The Executive Secretary does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.
- N. State or Federal Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by *UCA 19-5-117* and *Section 510* of the *Act* or any applicable Federal or State transportation regulations, such as but not limited to the Department of Transportation regulations.

PART VII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

- O. Water Quality - Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations and compliance schedule, if necessary, if one or more of the following events occurs:
1. Water Quality Standards for the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.
 2. A final wasteload allocation is developed and approved by the State and/or EPA for incorporation in this permit.
 3. A revision to the current Water Quality Management Plan is approved and adopted which calls for different effluent limitations than contained in this permit.
- P. Biosolids – Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate biosolids limitations (and compliance schedule, if necessary), management practices, other appropriate requirements to protect public health and the environment, or if there have been substantial changes (or such changes are planned) in biosolids use or disposal practices; applicable management practices or numerical limitations for pollutants in biosolids have been promulgated which are more stringent than the requirements in this permit; and/or it has been determined that the permittees biosolids use or land application practices do not comply with existing applicable state or federal regulations.
- Q. Toxicity Limitation - Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include, whole effluent toxicity (WET) limitations, a compliance date, a compliance schedule, a change in the whole effluent toxicity (biomonitoring) protocol, additional or modified numerical limitations, or any other conditions related to the control of toxicants if one or more of the following events occur;
1. Toxicity is detected, as per *Part I.C.4.a* of this permit, during the duration of this permit.
 2. The TRE results indicate that compliance with the toxic limits will require an implementation schedule past the date for compliance and the Executive Secretary agrees with the conclusion.
 3. The TRE results indicate that the toxicant(s) represent pollutant(s) that may be controlled with specific numerical limits, and the Executive

PART VII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

Secretary agrees that numerical controls are the most appropriate course of action.

4. Following the implementation of numerical control(s) of toxicant(s), the Executive Secretary agrees that a modified biomonitoring protocol is necessary to compensate for those toxicant that are controlled numerically.
 5. The TRE reveals other unique conditions or characteristics, which in the opinion of the permit issuing authority justify the incorporation of unanticipated special conditions in the permit.
- R. Storm Water-Reopener Provision. At any time during the duration (life) of this permit, this permit may be reopened and modified (following proper administrative procedures) as per *UAC R317.8*, to include, any applicable storm water provisions and requirements, a storm water pollution prevention plan, a compliance schedule, a compliance date, monitoring and/or reporting requirements, or any other conditions related to the control of storm water discharges to "waters-of-State".
- S. Total Maximum Daily Load-Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include Total Maximum Daily Load (TMDL) monitoring, related effluent limits, a compliance schedule, a compliance date, additional or modified numerical limitations, or any other conditions related to the TMDL Process and activity in effected impaired water body

VIII. DEFINITIONS

A. Wastewater.

1. The "7-day (and weekly) average", other than for e-coli bacteria, fecal coliform bacteria, and total coliform bacteria, is the arithmetic average of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. Geometric means shall be calculated for e-coli bacteria, fecal coliform bacteria, and total coliform bacteria. The 7-day and weekly averages are applicable only to those effluent characteristics for which there are 7-day average effluent limitations. The calendar week, which begins on Sunday and ends on Saturday, shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms. Weekly averages shall be calculated for all calendar weeks with Saturdays in the month. If a calendar week overlaps two months (i.e., the Sunday is in one month and the Saturday in the following month), the weekly average calculated for that calendar week shall be included in the data for the month that contains Saturday.
2. The "30-day (and monthly) average," other than for e-coli bacteria, fecal coliform bacteria and total coliform bacteria, is the arithmetic average of all samples collected during a consecutive 30-day period or calendar month, whichever is applicable. Geometric means shall be calculated for e-coli bacteria, fecal coliform bacteria and total coliform bacteria. The calendar month shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms.
3. "Act," means the *Utah Water Quality Act*.
4. "Acute toxicity" occurs when 50 percent or more mortality is observed for either test species at any effluent concentration.
5. "Bypass," means the diversion of waste streams from any portion of a treatment facility.
6. "Chronic toxicity" occurs when the survival, growth, or reproduction for either test species exposed to a dilution of 25 percent effluent (or lower) is significantly less (at the 95 percent confidence level) than the survival, growth, or reproduction of the control specimens.
7. "Composite Samples" shall be flow proportioned. The composite sample shall, as a minimum, contain at least four (4) samples collected over the compositing period. Unless otherwise specified, the time between the collection of the first sample and the last sample shall not be less than six

PART VIII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

(6) hours nor more than 24 hours. Acceptable methods for preparation of composite samples are as follows:

- a. Constant time interval between samples, sample volume proportional to flow rate at time of sampling;
 - b. Constant time interval between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at the time the sample was collected may be used;
 - c. Constant sample volume, time interval between samples proportional to flow (i.e., sample taken every "X" gallons of flow); and,
 - d. Continuous sample volume, with sample collection rate proportional to flow rate.
8. "CWA," means *The Federal Water Pollution Control Act*, as amended, by *The Clean Water Act of 1987*.
 9. "Daily Maximum" (Daily Max.) is the maximum value allowable in any single sample or instantaneous measurement.
 10. "EPA," means the United States Environmental Protection Agency.
 11. "Executive Secretary," means Executive Secretary of the Utah Water Quality Board.
 12. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.
 13. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.
 14. "Severe Property Damage," means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
 15. "Upset," means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused

PART VIII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

B. Biosolids.

1. "Biosolids," means any material or material derived from sewage solids that have been biologically treated.
2. "Dry Weight-Basis," means 100 percent solids (i.e. zero percent moisture).
3. "Land Application" is the spraying or spreading of biosolids onto the land surface; the injection of biosolids below the land surface; or the incorporation of biosolids into the land so that the biosolids can either condition the soil or fertilize crops or vegetation grown in the soil. Land application includes distribution and marketing (i.e. the selling or giving away of the biosolids).
4. "Pathogen," means an organism that is capable of producing an infection or disease in a susceptible host.
5. "Pollutant" for the purposes of this permit is an organic substance, an inorganic substance, a combination of organic and inorganic substances, or pathogenic organisms that after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food-chain, could on the basis of information available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction), or physical deformations in either organisms or offspring of the organisms.
6. "Runoff" is rainwater, leachate, or other liquid that drains over any part of a land surface and runs off the land surface.
7. "Similar Container" is either an open or closed receptacle. This includes, but is not limited to, a bucket, a box, a carton, and a vehicle or trailer with a load capacity of one metric ton or less.
8. "Total Solids" are the materials in the biosolids that remain as a residue if the biosolids are dried at 103° or 105° Celsius.
9. "Treatment Works" are either Federally owned, publicly owned, or privately owned devices or systems used to treat (including recycling and

PART VIII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

reclamation) either domestic sewage or a combination of domestic sewage and industrial waste or liquid manure.

10. "Vector Attraction" is the characteristic of biosolids that attracts rodents, flies mosquito's or other organisms capable of transporting infectious agents.
11. "Animals" for the purpose of this permit are domestic livestock.
12. "Annual Whole Sludge Application Rate" is the amount of sewage sludge (dry-weight basis) that can be applied to a unit area of land during a cropping cycle.
13. "Agronomic Rate is the whole sludge application rate (dry-weight basis) designed to: (1) provide the amount of nitrogen needed by the crop or vegetation grown on the land; and (2) minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.
14. "Annual Pollutant Loading Rate" is the maximum amount of a pollutant (dry-weight basis) that can be applied to a unit area of land during a 365-day period.
15. "Application Site or Land Application Site" means all contiguous areas of a users' property intended for sludge application.
16. "Cumulative Pollutant Loading Rate" is the maximum amount of an inorganic pollutant (dry-weight basis) that can be applied to a unit area of land.
17. "Grit and Screenings" are sand, gravel, cinders, other materials with a high specific gravity and relatively large materials such as rags generated during preliminary treatment of domestic sewage at a treatment works and shall be disposed of according to *40 CFR 258*.
18. "High Potential for Public Contact Site" is land with a high potential for contact by the public. The includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses.
19. "Low Potential for Public Contact Site" is the land with a low potential for contact by the public. This includes, but is not limited to, farms, ranches, reclamation areas, and other lands which are private lands, restricted public lands, or lands which are not generally accessible to or used by the public.

PART VIII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

20. "Monthly Average" is the arithmetic mean of all measurements taken during the month.
21. "Volatile Solids" is the amount of the total solids in sewage sludge lost when the sludge is combusted at 550 degrees Celsius for 15-20 minutes in the presence of excess air.

C. Storm Water

1. "Best Management Practices" ("BMPs") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control facility site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.
2. "Coal pile runoff" means the rainfall runoff from or through any coal storage pile.
3. "Co-located industrial activity" means when a facility has industrial activities being conducted onsite that are described under more than one of the coverage sections of *Appendix II* in the General Multi-Sector Permit for Storm Water Discharges Associated with Industrial Activity. Facilities with co-located industrial activities shall comply with all applicable monitoring and pollution prevention plan requirements of each section in which a co-located industrial activity is described.
4. "Commercial Treatment and Disposal Facilities" means facilities that receive, on a commercial basis, any produced hazardous waste (not their own) and treat or dispose of those wastes as a service to the generators. Such facilities treating and/or disposing exclusively residential hazardous wastes are not included in this definition.
5. "Landfill" means an area of land or an excavation in which wastes are placed for permanent disposal, and that is not a land application unit, surface impoundment, injection well, or waste pile.
6. "Land application unit" means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for treatment or disposal.
7. "Municipal separate storm sewer system" (large and/or medium) means all municipal separate storm sewers that are either:

PART VIII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

- a. Located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (at the issuance date of this permit, Salt Lake City is the only city in Utah that falls in this category); or
 - b. Located in the counties with unincorporated urbanized populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships or towns within such counties (at the issuance date of this permit Salt Lake County is the only county that falls in this category); or
 - c. Owned or operated by a municipality other than those described in paragraph *a.* or *b.* (above) and that are designated by the *Executive Secretary* as part of the large or medium municipal separate storm sewer system.
8. “NOI” means “notice of intent”, it is an application form that is used to obtain coverage under the General Multi-Sector Permit for Storm Water Discharges Associated with Industrial Activity.
 9. “NOT” means “notice of termination”, it is a form used to terminate coverage under the General Multi-Sector Permit for Storm Water Discharges Associated with Industrial Activity.
 10. “Point source” means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.
 11. “Section 313 water priority chemical” means a chemical or chemical categories that:
 - a. Are listed at *40 CFR 372.65* pursuant to *Section 313* of the *Emergency Planning and Community Right-to-Know Act (EPCRA)* (also known as *Title III of the Superfund Amendments and Reauthorization Act (SARA)* of 1986);
 - b. Are present at or above threshold levels at a facility subject to *EPCRA Section 313* reporting requirements; and
 - c. Meet at least one of the following criteria:

PART VIII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

- (1) Are listed in *Appendix D* of *40 CFR Part 122* on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols) or Table V (certain toxic pollutants and hazardous substances);
 - (2) Are listed as a hazardous substance pursuant to *Section 311(b)(2)(A)* of the *CWA* at *40 CFR 116.4*; or
 - (3) Are pollutants for which EPA has published acute or chronic water quality criteria. See *Appendix III* of this permit. This appendix was revised based on final rulemaking EPA published in the *Federal Register* November 30, 1994.
12. "Significant materials" includes, but is not limited to: raw materials; fuels; materials such as solvents, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under *Section 101(14)* of *CERCLA*; any chemical the facility is required to report pursuant to *EPCRA Section 313*; fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with storm water discharges.
 13. "Significant spills" includes, but is not limited to: releases of oil or hazardous substances in excess of reportable quantities under *Section 311* of the *Clean Water Act* (see *40 CFR 110.10* and *CFR 117.21*) or *Section 102* of *CERCLA* (see *40 CFR 302.4*).
 14. "Storm water" means storm water runoff, snowmelt runoff, and surface runoff and drainage.
 15. "SWDMR" means "storm water discharge monitoring report", a report of the results of storm water monitoring required by the permit. The Division of Water Quality provides the storm water discharge monitoring report form.
 16. "Storm water associated with industrial activity" (*UAC R317-8-3.8(6)(c) & (d)*) means the discharge from any conveyance that is used for collecting and conveying storm water and that is directly related to manufacturing, processing or raw materials storage areas at an industrial plant. The term does not include discharges from facilities or activities excluded from the *UPDES* program. For the categories of industries identified in paragraphs (*a*) through (*j*) of this definition, the term includes, but is not limited to, storm water discharges from industrial plant yards; immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used

**PART VIII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427**

or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste waters (as defined in *40 CFR Part 401*); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and finished products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to storm water. For the categories of industries identified in paragraph *(k)* of this definition, the term includes only storm water discharges from all areas (except access roads and rail lines) listed in the previous sentence where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to storm water. For the purposes of this paragraph, material handling activities include the storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, finished product, by-product or waste product. The term excludes areas located on plant lands separate from the plant's industrial activities, such as office buildings and accompanying parking lots as long as the drainage from the excluded areas is not mixed with storm water drained from the above described areas. Industrial facilities (including industrial facilities that are Federally, State, or municipally owned or operated that meet the description of the facilities listed in paragraphs *(a)* to *(k)* of this definition) include those facilities designated under *UAC R317-8-3.8(1)(a)5*. The following categories of facilities are considered to be engaging in "industrial activity" for purposes of this subsection:

- a. Facilities subject to storm water effluent limitations guidelines, new source performance standards, or toxic pollutant effluent standards under *40 CFR Subchapter N* (except facilities with toxic pollutant effluent standards that are exempted under category *(k)* of this definition);
- b. Facilities classified as Standard Industrial Classifications 24 (except 2434), 26 (except 265 and 267), 28 (except 283 and 285), 29, 311, 32 (except 323), 33, 3441, 373;
- c. Facilities classified as Standard Industrial Classifications 10 through 14 (mineral industry) including active or inactive mining operations (except for areas of coal mining operations no longer meeting the definition of a reclamation area under *40 CFR 434.11(l)* because the performance bond issued to the facility by the appropriate SMCRA authority has been released, or except for areas of non-coal mining operations that have been released from applicable State or Federal reclamation requirements after December 17, 1990) and oil and gas

PART VIII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

exploration, production, processing, or treatment operations, or transmission facilities that discharge storm water contaminated by contact with or that has come into contact with, any overburden, raw material, intermediate products, finished products, byproducts or waste products located on the site of such operations; inactive mining operations are mining sites that are not being actively mined, but that have an identifiable owner/operator;

- d. Hazardous waste treatment, storage, or disposal facilities, including those that are operating under interim status or a permit under Subtitle C of RCRA;
- e. Landfills, land application sites, and open dumps that have received any industrial wastes (waste that is received from any of the facilities described under this subsection) including those that are subject to regulation under *Subtitle D of RCRA*;
- f. Facilities involved in the recycling of materials, including metal scrapyards, battery reclaimers, salvage yards, and automobile junkyards, including but limited to those classified as Standard Industrial Classification 5015 and 5093;
- g. Steam electric power generating facilities, including coal handling sites;
- h. Transportation facilities classified as Standard Industrial Classifications 40, 41, 42 (except 4221-25), 43, 44, 45 and 5171 that have vehicle maintenance shops, equipment cleaning operations, or airport deicing operations. Only those portions of the facility that are either involved in vehicle maintenance (including vehicle rehabilitation, mechanical repairs, painting, fueling, and lubrication), equipment cleaning operations, airport deicing operations, or that are otherwise identified under paragraphs (a) to (g) or (I) to (k) of this subsection are associated with industrial activity;
- i. Treatment works treating domestic sewage or any other sewage sludge or wastewater treatment device or system, used in the storage treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated to the disposal of sewage sludge that are located within the confines of the facility, with a design flow of 1.0 mgd or more, or required to have an approved pretreatment program under *40 CFR Part 403*. Not included are farm lands, domestic gardens or lands used for sludge management where sludge is beneficially reused and that are not physically located in the confines of the facility, or areas that are in compliance with *40 CFR Part 503*;

PART VIII
DISCHARGE PERMIT NO. UT0020427
BIOSOLIDS PERMIT NO. UTL-020427
STORM WATER PERMIT NO. UTR020427

- j. Construction activity including clearing, grading and excavation activities except: operations that result in the disturbance of less than 5 acres of total land area that are not part of a larger common plan of development or sale;
 - k. Facilities under Standard Industrial Classifications 20, 21, 22, 23, 2434, 25, 265, 267, 27, 283, 285, 30, 31 (except 311), 323, 34 (except 3441), 35, 36, 37 (except 373), 38, 39, 4221-25, (and that are not otherwise included within categories (a) to (j))
17. "Waste pile" means any non-containerized accumulation of solid, non-flowing waste that is used for treatment or storage.

**STATEMENT OF BASIS
PAYSON CITY WASTEWATER TREATMENT PLANT
RENEWAL PERMIT: DISCHARGE, BIOSOLIDS & STORM WATER
UPDES PERMIT NUMBER: UT0020427
UPDES BIOSOLIDS PERMIT NUMBER: UTL-020427
UPDES MULTI-SECTOR STORM WATER GENERAL PERMIT NUMBER: UTR000000
MAJOR MUNICIPAL**

FACILITY CONTACTS

Person Name:	Jeff Hiatt
Position:	Plant Superintendent
Facility Name:	Payson City Wastewater Treatment Plant
Mailing Address:	439 West Utah Ave Payson City, Utah 84651
Telephone:	(801) 465-5277
Actual Address:	1062 North Main

DESCRIPTION OF FACILITY

The Payson City Wastewater Treatment Plant (PCWWTP) is located at 1062 North Main, Payson City, Utah and serves the City of Payson. The State of Utah Data Base Storet number is 499541. The population of the City is approximately 20,000. The design flow of the facility is 3.0 MGD average daily flow with a peak flow of 4.5 MGD.

The influent enters the plant through a 30" Parmer Bowlus flume. The headworks contain two (2) 30" step screens followed by rag washers for each screen. The headworks also contain an 8 ft diameter vortex grit removal system with an air lift pump to a grit washer. The process water is then pumped to the 70 ft diameter Primary Clarifier followed by the 102 ft diameter Primary Trickling Filter (Rock Media Volume = 57,200 ft³). The primary pump station has a capacity of 0.5-7.0 MGD with one standby pump.

The flow then enters the secondary pump station where the wastewater is pumped to one of two 45 ft diameter Intermediate Clarifiers. The secondary pump station has a capacity of 0.5-6.5 MGD with one standby pump. After leaving the Intermediate Clarifiers, the flow enters the STM Aerotors. In July 2002, a rectangular tank (92.5 ft x 49.5 ft x 16 ft) fitted with eight (8) STM Aerotors were brought on line, replacing the Secondary Trickling Filters which were taken off line to be converted to Aeration Basins. The Aeration Basins were only to be used during the cherry processing season, July through September. The flow would leave the Intermediate Clarifiers, enter the Aeration Basins, and then flow back to the Aerotor tank. Throughout the remainder of the year, the Aeration Basins would be off line, and the flow leaving the Intermediate Clarifiers will directly enter the Aerotor tank. Currently the Aeration Basins are incomplete and off line, and the cherry processing is no longer done in Payson.

After leaving the Aerotor Tank, the process water will enter one of two Final Clarifiers with diameters of 45 ft and 60 ft. Following the Final Clarifiers, the flow is directed through 2-Shallow

bed, Traveling Bridge Rapid Sand Filters followed by a Chlorine Contact Basin having a sixty (60) minute detention time in the Chlorine Contact Basin and then discharged through Outfall 001.

PCWWTP has three (3) anaerobic digesters. Each Digester is 40 ft in diameter with a total digester volume of 91,471 ft³. Payson City has nine (9) drying beds. The first five drying beds have an area of 5000 ft² each. The remaining four drying beds have a combined area of 16,150 ft². The bio-solids are removed from the drying beds and sent to land fill. Approximately 250 metric tons of dry bio-solids are produced each year by the facility.

SUMMARY OF CHANGES FROM PREVIOUS PERMIT

In an effort to increase efficiency, the DWQ has recently begun consolidating permits. Therefore, in addition to the Discharge provisions, the renewal permit for PCWWTP will include provisions for storm water, biosolids, and pretreatment.

The Utah Water Quality Board had revised the bacteriological criteria in the Standards of Quality for Waters of the State effective June 1, 2005. Based, in part, on a long-standing recommendation from the Environmental Protection Agency, numeric criteria for E. coli bacteria were added to the standards. The new E. coli criteria is 126 (no.)/100 mL (30-day geometric mean) and 158 (no.)/100 mL (7-day geometric mean), which is considered equivalent to 200 (no.)/100 mL and 250 (no.)/100 mL fecal coliforms (*UAC R317-1-3.2*), respectively.

In March 2003, the Board agreed to adopt new standards that will have a significant effect on ammonia limits. The new ammonia standards were public noticed and approved in January 2004. The parameters affected were dissolved oxygen (DO), ammonia and total residual chlorine (TRC).

DISCHARGE

DESCRIPTION OF DISCHARGE

The PCWWTF discharges into an irrigation ditch which runs approximately one to two miles before entering Beer Creek. Beer Creek runs through Benjamin Slough and hence to Utah Lake. The PCWWTF has been reporting self-monitoring results on Discharge Monitoring Reports on a monthly basis. A summary of the last 3 years of data is attached and there were no significant violations.

<u>Outfall</u>	<u>Description of Discharge Point</u>
001	Located at latitude 40°03'41" and longitude 111°43'49". The discharge is through a concrete pipe to an unnamed irrigation return drainage ditch to Beer Creek then Benjamin Slough to Utah Lake.

RECEIVING WATERS AND STREAM CLASSIFICATION

The final discharge has been classified as 3C (Beer Creek) and 4 (unnamed ditch and Beer Creek) according to *Utah Administrative Code (UAC) R317-2-13*.

Class 3C	-Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain.
Class 4	-Protected for agricultural uses including irrigation of crops and stock watering.

BASIS FOR EFFLUENT LIMITATIONS

Limitations on total suspended solids (TSS), biochemical oxygen demand (BOD₅), E-coli coliforms, pH and percent removal for BOD₅ and TSS are based on current Utah Secondary Treatment Standards, *UAC R317-1-3.2*. The Dissolved Oxygen, Ammonia and Total Residual Chlorine limits are based on the Waste Load Analysis attached. The oil and grease is based on best professional judgment (BPJ). The permit limitations are:

Parameter	Effluent Limitations			
	Maximum Monthly Average	Maximum Weekly Average	Daily Minimum	Daily Maximum
BOD ₅ , mg/L	25	35	NA	NA
BOD ₅ Min. % Removal	85	NA	NA	NA
TSS, mg/L	25	35	NA	NA
TSS Min. % Removal	85	NA	NA	NA
E. Coli, no./100mL	126	158	NA	NA
Dissolved Oxygen, mg/l	NA	NA	4	NA
Ammonia, mg/l				
December – February	NA	NA	NA	14.1
March – May	NA	NA	NA	13.1
June – August	NA	NA	NA	12.5
September – November	NA	NA	NA	13.1
TRC, mg/L				
December – February	NA	NA	NA	2.4
March – May	NA	NA	NA	1.6
June – August	NA	NA	NA	1.1
September – November	NA	NA	NA	1.6
WET, Acute Biomonitoring	NA	NA	NA	Pass/Fail
Oil & Grease, mg/L	NA	NA	NA	10
pH, Standard Units	NA	NA	6.5	9.0

NA – Not Applicable.

SELF-MONITORING AND REPORTING REQUIREMENTS

The following self-monitoring requirements are the same as in the previous permit. The permit will require reports to be submitted monthly and quarterly, as applicable, on Discharge Monitoring Report (DMR) forms due 28 days after the end of the monitoring period. Lab sheets for biomonitoring must be attached to the biomonitoring DMR.

Self-Monitoring and Reporting Requirements			
Parameter	Frequency	Sample Type	Units
Total Flow	Continuous	Recorder	MGD
BOD ₅ , Influent	2 x Weekly	Composite	mg/L
BOD ₅ , Effluent	2 x Weekly	Composite	mg/L
TSS, Influent	2 x Weekly	Composite	mg/L
TSS, Effluent	2 x Weekly	Composite	mg/L
Dissolved Oxygen	2 x Weekly	Grab	mg/L

Ammonia	2 x Weekly	Grab	No./100mL
E. Coli	2 x Weekly	Grab	No./100mL
TRC	Daily	Grab	mg/L
WET, Acute Biomonitoring Ceriodaphnia dubia Pimephales promelas	Quarterly 1 st & 3 rd Quarters 2 nd & 4 th Quarters	Composite Composite	Pass/Fail Pass/Fail
Oil & Grease	Monthly	Grab	mg/L
pH	2 x Weekly	Grab	SU
Metals, Influent	Quarterly	Composite	mg/L
Effluent	Quarterly	Composite	mg/L
Organic Toxics	Yearly	Grab	mg/L

BIOSOLIDS

The biosolids (sewage sludge) are stabilized in anaerobic digesters with a hydraulic retention time of 40 days at an average temperature of 95° F (35° C). Once a week the biosolids are drawn off the bottom of the primary digester and sent to the secondary digester that serves as a holding tank. The biosolids from the secondary digester are wasted to the drying beds. The typical drying time is 3 to 4 months depending on the weather. In 2006 the PWRF produced 477 dry metric tons (DMT) of biosolids, all of which was disposed in the Payson City landfill.

BIOSOLIDS MONITORING REQUIREMENTS

Under *40 CFR 503* biosolids are not required to be monitored for heavy metals content or pathogens if the biosolids are disposed in a landfill.

LANDFILL MONITORING

Paint Filter Test¹

Under *40 CFR 258*, landfill monitoring requirements, the biosolids will need to pass a paint filter test before the biosolids are disposed of in a landfill. If the biosolids do not pass a paint filter test, the biosolids cannot be disposed in a landfill.

Vector Attraction Reduction Monitoring

The PWRF needs to meet a method of vector attraction reduction (VAR) if the biosolids are hauled to the landfill. The PWRF meets the VAR requirement by a 38% reduction in volatile solids through the anaerobic digesters and drying beds (*40 CFR 503.33(b)(1)*).

Minimum Frequency of Monitoring for the Paint Filter Test

Amount of Biosolids Disposed Per Year	Monitoring Frequency
> 0 to < 290 DMT	One Time Per Year
> 290 to < 1500 DMT	Four times Per Year

MONITORING DATA

The PWRF is not required to monitor for heavy metals or pathogens if the biosolids are disposed of in a landfill. Therefore, there is not any monitoring data for heavy metals or pathogens, however, the PWRF did sample for total solids content, for the paint filter test.

Paint Filter Tests, 2006		Total Solids, 2006
Dates Sampled	Results	Results
Sept. 28, 2006 - Sludge Pile West End	Pass	66.2 %
Sept. 28, 2006 - Sludge Pile East End	Pass	69.6 %

¹(Under *40 CFR 258*-Criteria for Municipal Solid Waste Landfills, the permittee must sample the biosolids to ensure the biosolids pass the paint filter test. When the biosolids are in “batches” each batch must be sampled to ensure compliance with *40 CFR, Part 258*).

RECORD KEEPING

The record keeping requirements from *40 CFR 503.17* are included under *Part III.G.* of the permit. Since the biosolids are disposed in a landfill the disposal records need to be retained for a minimum of five years.

REPORTING

The PWRF needs to report annually as required in *40 CFR 503.18*. This report is to include the results of all monitoring performed in accordance with *Part III.B.* of the permit, information on management practices, biosolids treatment, and certifications. This report is due no later than February 19 of each year. Each report is for the previous calendar year.

During the last permit cycle, the PWRF submitted all reports before the deadline of February 19. All reports were complete and accurate with the laboratory analysis attached.

STORM WATER

STORMWATER REQUIREMENTS

Storm water provisions are included in this combined UPDES permit.

The storm water requirements are based on the UPDES Multi-Sector General Permit for Storm Water Discharges for Industrial Activity, General Permit No. UTR000000 (MSGP). All sections of the MSGP that pertain to discharges from wastewater treatment plants have been included and sections which are redundant or do not pertain have been deleted.

The permit requires the preparation and implementation of a storm water pollution prevention plan for all areas within the confines of the plant. Elements of this plan are required to include: 1. The development of a pollution prevention team: 2. Development of drainage maps and materials stockpiles: 3. An inventory of exposed materials: 4. Spill reporting and response procedures: 5. A preventative maintenance program: 6. Employee training: 7. Certification that storm water discharges are not mixed with non-storm water discharges: 8. Compliance site evaluations and potential pollutant source identification, and: 9. Visual examinations of storm water discharges.

PCWWTP is currently covered under the UPDES Multi Sector General Permit for Industrial Activities.

PRETREATMENT REQUIREMENTS

The pretreatment requirements remain the same as in the current permit with the permittee administering an approved pretreatment program. Any substantial changes to the program must be

submitted for approval to the Division of Water Quality. Authority to require a pretreatment program is provided for in *19-5-108 UCA, 1953 ann.* and *UAC R317-8-8.*

The permittee will be required to perform an annual evaluation of the need to revise or develop technically based local limits to implement the general and specific prohibitions of *40 CFR, Part 403.5(a)* and *Part 403.5(b)*. This evaluation may indicate that present local limits are sufficiently protective, or that they must be revised.

As part of this evaluation, the permit requires quarterly influent and effluent monitoring for metals and yearly organic toxics listed in *R317-8-7.5* and sludge monitoring for potential pollutants listed in *40 CFR 503.*

BIOMONITORING REQUIREMENTS

A nationwide effort to control toxic discharges where effluent toxicity is an existing or potential concern is regulated in accordance with the *State of Utah Permitting and Enforcement Guidance Document for Whole Effluent Toxicity Control (biomonitoring)*. Authority to require effluent biomonitoring is provided in *Permit Conditions, UAC R317-8-4.2, Permit Provisions, UAC R317-8-5.3* and *Water Quality Standards, UAC R317-2-5* and *R317-2-7.2.*

Since the permittee is a major municipal discharger, the renewal permit will require whole effluent toxicity (WET) testing. Acute toxicity testing will be conducted using both species, *Ceriodaphnia dubia* quarterly and *Pimephales promelas* (fathead minnow) quarterly. The permit will contain the standard requirements for accelerated testing upon failure of a WET test and a PTI (Preliminary Toxicity Investigation) and TRE (Toxicity Reduction Evaluation) as necessary. (Description of monitoring frequency, species being monitored and Numerical Toxicity Limit if necessary)

The permit will contain the standard requirements for accelerated testing upon failure of a WET test and a PTI (Preliminary Toxicity Investigation) and TRE (Toxicity Reduction Evaluation) as necessary.

TOTAL MAXIMUM DAILY LOAD REQUIREMENTS

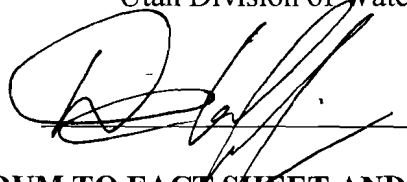
PCWWTP discharges wastewater into Utah Lake, which has been identified as impaired for total dissolved solids (TDS) and total phosphorus (TP) based on the 1998, 303(d) assessment process as defined in the Clean Water Act. As required under federal regulation a total maximum daily load (TMDL) will be developed for all impaired waters. The TMDL will focus on developing limitations for those parameters of concern (POC) that were identified during the 305(b) and 303(d) assessment process. POC's are parameters that are in violation of water quality standards or that contribute to impairment of a beneficial use (a major component of the water quality standards).

Currently, a TMDL evaluation is underway for the Utah Lake. If the results of the TMDL process establish effluent limits for any of the POC's, then it would be required by (40 CFR Part 130) to include these effluent limits in the UPDES permit. Therefore, it is strongly recommended that the facility staff participate in the TMDL development process. The staff at the Division of Water Quality will be responsible for scheduling and notifying appropriate facility personnel regarding TMDL meetings. Please contact your UPDES permit writer for information on scheduled TMDL meetings.

PERMIT DURATION

It is recommended that this permit be effective for a duration of five (5) years.

Drafted by
Daniel Griffin, Discharge
Mark Schmitz, Biosolids
Mike George, Storm Water
Utah Division of Water Quality

 3/19/08

ADDENDUM TO FACT SHEET AND STATEMENT OF BASIS

The public notice e comment period started on February 15, 2008, and was advertised in The Daily Herald. Comments were accepted through March 18, 2008. The Public Notice, Draft FSSOB, and Draft Permit were all posted on the Division of water quality web page. No comments were received. No changes have been made to the Permit or FSSOB.

REVISED MARCH 19, 2008

Utah Division of Water Quality
Salt Lake City, Utah

WASTELOAD ANALYSIS [WLA]
Addendum: Statement of Basis
SUMMARY

Discharging Facility: Payson WWTP

UPDES No: UT-0020427
Current Flow: 1.40 MGD
Projected Flow: 3.00 MGD

Receiving Water: Irrigation Ditch -> Beer Creek -> Utah Lake

Stream Classification: 3C, 4
Stream Flows [cfs]:
0.0 Summer (July-Sept) 20th Percentile
0.0 Fall (Oct-Dec) 20th Percentile
0.0 Winter (Jan-Mar) 20th Percentile
0.0 Spring (Apr-June) 20th Percentile
0.0 Average
Stream TDS Values:
350.0 Summer (July-Sept) 80th Percentile
350.0 Fall (Oct-Dec) 80th Percentile
350.0 Winter (Jan-Mar) 80th Percentile
350.0 Spring (Apr-June) 80th Percentile

Effluent Limits:

Flow, MGD:	3.00 MGD	Design Flow
BOD, mg/l:	25.0 Summer	5.0 Indicator
Dissolved Oxygen, mg/l	5.0 Summer	5.0 30 Day Average
TNH3, Chronic, mg/l:	12.5 Summer	Varies Function of pH and Temperature
TDS, mg/l:	1201.8 Summer	1200.0

WQ Standard:

Modeling Parameters:

Acute River Width: 50.0%
Chronic River Width: 100.0%

Antidegradation Review Completed for: TDS

Antidegradation Level II Review is NOT Required

Special Considerations: Values are from combined Payson/Salem WLAs June 15-16, 2004.

Date: 1/14/2008

**Utah Division of Water Quality
Salt Lake City, Utah**

**WASTELOAD ANALYSIS [WLA]
Addendum: Statement of Basis**

14-Jan-08
10:00 AM

Facilities: Payson WWTP
Discharging to: Irrigation Ditch -> Beer Creek -> Utah Lake

UPDES No: UT-0020427

I. Introduction

Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses [R317-2-8, UAC]. Projected concentrations are compared to numeric water quality standards to determine acceptability. The anti-degradation policy and procedures are also considered. The primary in-stream parameters of concern may include metals (as a function of hardness), total dissolved solids (TDS), total residual chlorine (TRC), un-ionized ammonia (as a function of pH and temperature, measured and evaluated in terms of total ammonia), and dissolved oxygen.

Mathematical water quality modeling is employed to determine stream quality response to point source discharges. Models aid in the effort of anticipating stream quality at future effluent flows at critical environmental conditions (e.g., low stream flow, high temperature, high pH, etc).

The numeric criteria in this wasteload analysis may always be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

II. Receiving Water and Stream Classification

Irrigation Ditch -> Beer Creek -> Utah 3C, 4
Antidegradation Review: Antidegradation Level II Review is NOT Required

III. Numeric Stream Standards for Protection of Aquatic Wildlife

Total Ammonia (TNH3)	Varies as a function of Temperature and pH Rebound. See Water Quality Standards
Chronic Total Residual Chlorine (TRC)	0.011 mg/l (4 Day Average) 0.019 mg/l (1 Hour Average)
Chronic Dissolved Oxygen (DO)	5.00 mg/l (30 Day Average) N/A mg/l (7Day Average) 3.00 mg/l (1 Day Average)
Maximum Total Dissolved Solids	1200.0 mg/l

Acute and Chronic Heavy Metals (Dissolved)

**Utah Division of Water Quality
Salt Lake City, Utah**

Parameter	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard		
	Concentration	Load*	Concentration		Load*
Aluminum	87.00 ug/l**	2.176 lbs/day	750.00	ug/l	18.761 lbs/day
Arsenic	190.00 ug/l	4.753 lbs/day	340.00	ug/l	8.505 lbs/day
Cadmium	0.61 ug/l	0.015 lbs/day	6.52	ug/l	0.163 lbs/day
Chromium III	211.98 ug/l	5.303 lbs/day	4435.01	ug/l	110.942 lbs/day
ChromiumVI	11.00 ug/l	0.275 lbs/day	16.00	ug/l	0.400 lbs/day
Copper	23.86 ug/l	0.597 lbs/day	39.43	ug/l	0.986 lbs/day
Iron			1000.00	ug/l	25.015 lbs/day
Lead	12.89 ug/l	0.322 lbs/day	330.75	ug/l	8.274 lbs/day
Mercury	0.0120 ug/l	0.000 lbs/day	2.40	ug/l	0.060 lbs/day
Nickel	132.17 ug/l	3.306 lbs/day	1188.80	ug/l	29.738 lbs/day
Selenium	4.60 ug/l	0.115 lbs/day	20.00	ug/l	0.500 lbs/day
Silver	N/A ug/l	N/A lbs/day	25.06	ug/l	0.627 lbs/day
Zinc	304.03 ug/l	7.605 lbs/day	304.03	ug/l	7.605 lbs/day

* Allowed below discharge

**Chronic Aluminum standard applies only to waters with a pH < 7.0 and a Hardness < 50 mg/l as CaCO

Metals Standards Based upon a Hardness of 300.11 mg/l as CaCO₃

Organics [Pesticides]

Parameter	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard		
	Concentration	Load*	Concentration		Load*
Aldrin			1.500	ug/l	0.038 lbs/day
Chlordane	0.004 ug/l	0.108 lbs/day	1.200	ug/l	0.030 lbs/day
DDT, DDE	0.001 ug/l	0.025 lbs/day	0.550	ug/l	0.014 lbs/day
Dieldrin	0.002 ug/l	0.048 lbs/day	1.250	ug/l	0.031 lbs/day
Endosulfan	0.056 ug/l	1.404 lbs/day	0.110	ug/l	0.003 lbs/day
Endrin	0.002 ug/l	0.058 lbs/day	0.090	ug/l	0.002 lbs/day
Guthion			0.010	ug/l	0.000 lbs/day
Heptachlor	0.004 ug/l	0.095 lbs/day	0.260	ug/l	0.007 lbs/day
Lindane	0.080 ug/l	2.006 lbs/day	1.000	ug/l	0.025 lbs/day
Methoxychlor			0.030	ug/l	0.001 lbs/day
Mirex			0.010	ug/l	0.000 lbs/day
Parathion			0.040	ug/l	0.001 lbs/day
PCB's	0.014 ug/l	0.351 lbs/day	2.000	ug/l	0.050 lbs/day
Pentachlorophenol	13.00 ug/l	325.896 lbs/day	20.000	ug/l	0.500 lbs/day
Toxephene	0.0002 ug/l	0.005 lbs/day	0.7300	ug/l	0.018 lbs/day

IV. Numeric Stream Standards for Protection of Agriculture

	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard	
	Concentration	Load*	Concentration	Load*
Arsenic			100.0 ug/l	lbs/day
Boron			750.0 ug/l	lbs/day
Cadmium			10.0 ug/l	0.13 lbs/day
Chromium			100.0 ug/l	lbs/day
Copper			200.0 ug/l	lbs/day

**Utah Division of Water Quality
Salt Lake City, Utah**

Lead	100.0 ug/l	lbs/day
Selenium	50.0 ug/l	lbs/day
TDS, Summer	1200.0 mg/l	15.01 tons/day

V. Numeric Stream Standards for Protection of Human Health (Class 1C Waters)

Metals	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard	
	Concentration	Load*	Concentration	Load*
Arsenic			ug/l	lbs/day
Barium			ug/l	lbs/day
Cadmium			ug/l	lbs/day
Chromium			ug/l	lbs/day
Lead			ug/l	lbs/day
Mercury			ug/l	lbs/day
Selenium			ug/l	lbs/day
Silver			ug/l	lbs/day
Fluoride (3)			ug/l	lbs/day
to			ug/l	lbs/day
Nitrates as N			ug/l	lbs/day

Chlorophenoxy Herbicides

2,4-D	ug/l	lbs/day
2,4,5-TP	ug/l	lbs/day
Endrin	ug/l	lbs/day
gamma-cyhalothrin (Lindane)	ug/l	lbs/day
Methoxychlor	ug/l	lbs/day
Toxaphene	ug/l	lbs/day

VI. Numeric Stream Standards the Protection of Human Health from Water & Fish Consumption [Toxics]

Maximum Conc., ug/l - Acute Standards

Toxic Organics	Class 1C		Class 3A, 3B	
	[2 Liters/Day for 70 Kg Person over 70 Yr.]		[6.5 g for 70 Kg Person over 70 Yr.]	
Acenaphthene	ug/l	lbs/day	2700.0 ug/l	67.69 lbs/day
Acrolein	ug/l	lbs/day	780.0 ug/l	19.55 lbs/day
Acrylonitrile	ug/l	lbs/day	0.7 ug/l	0.02 lbs/day
Benzene	ug/l	lbs/day	71.0 ug/l	1.78 lbs/day
Benzidine	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Carbon tetrachloride	ug/l	lbs/day	4.4 ug/l	0.11 lbs/day
Chlorobenzene	ug/l	lbs/day	21000.0 ug/l	526.45 lbs/day
1,2,4-Trichlorobenzene				
Hexachlorobenzene	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
1,2-Dichloroethane	ug/l	lbs/day	99.0 ug/l	2.48 lbs/day
1,1,1-Trichloroethane				
Hexachloroethane	ug/l	lbs/day	8.9 ug/l	0.22 lbs/day
1,1-Dichloroethane				
1,1,2-Trichloroethane	ug/l	lbs/day	42.0 ug/l	1.05 lbs/day
1,1,2,2-Tetrachloroethane	ug/l	lbs/day	11.0 ug/l	0.28 lbs/day
Chloroethane			0.0 ug/l	0.00 lbs/day
Bis(2-chloroethyl) ether	ug/l	lbs/day	1.4 ug/l	0.04 lbs/day
2-Chloroethyl vinyl ether	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day

**Utah Division of Water Quality
Salt Lake City, Utah**

2-Chloronaphthalene	ug/l	lbs/day	4300.0 ug/l	107.80 lbs/day
2,4,6-Trichlorophenol	ug/l	lbs/day	6.5 ug/l	0.16 lbs/day
p-Chloro-m-cresol			0.0 ug/l	0.00 lbs/day
Chloroform (HM)	ug/l	lbs/day	470.0 ug/l	11.78 lbs/day
2-Chlorophenol	ug/l	lbs/day	400.0 ug/l	10.03 lbs/day
1,2-Dichlorobenzene	ug/l	lbs/day	17000.0 ug/l	426.17 lbs/day
1,3-Dichlorobenzene	ug/l	lbs/day	2600.0 ug/l	65.18 lbs/day
1,4-Dichlorobenzene	ug/l	lbs/day	2600.0 ug/l	65.18 lbs/day
3,3'-Dichlorobenzidine	ug/l	lbs/day	0.1 ug/l	0.00 lbs/day
1,1-Dichloroethylene	ug/l	lbs/day	3.2 ug/l	0.08 lbs/day
1,2-trans-Dichloroethyle	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
2,4-Dichlorophenol	ug/l	lbs/day	790.0 ug/l	19.80 lbs/day
1,2-Dichloropropane	ug/l	lbs/day	39.0 ug/l	0.98 lbs/day
1,3-Dichloropropylene	ug/l	lbs/day	1700.0 ug/l	42.62 lbs/day
2,4-Dimethylphenol	ug/l	lbs/day	2300.0 ug/l	57.66 lbs/day
2,4-Dinitrotoluene	ug/l	lbs/day	9.1 ug/l	0.23 lbs/day
2,6-Dinitrotoluene	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
1,2-Diphenylhydrazine	ug/l	lbs/day	0.5 ug/l	0.01 lbs/day
Ethylbenzene	ug/l	lbs/day	29000.0 ug/l	727.00 lbs/day
Fluoranthene	ug/l	lbs/day	370.0 ug/l	9.28 lbs/day
4-Chlorophenyl phenyl ether				
4-Bromophenyl phenyl ether				
Bis(2-chloroisopropyl) e	ug/l	lbs/day	170000.0 ug/l	4261.71 lbs/day
Bis(2-chloroethoxy) met	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Methylene chloride (HM)	ug/l	lbs/day	1600.0 ug/l	40.11 lbs/day
Methyl chloride (HM)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Methyl bromide (HM)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Bromoform (HM)	ug/l	lbs/day	360.0 ug/l	9.02 lbs/day
Dichlorobromomethane	ug/l	lbs/day	22.0 ug/l	0.55 lbs/day
Chlorodibromomethane	ug/l	lbs/day	34.0 ug/l	0.85 lbs/day
Hexachlorobutadiene(c)	ug/l	lbs/day	50.0 ug/l	1.25 lbs/day
Hexachlorocyclopentadi	ug/l	lbs/day	17000.0 ug/l	426.17 lbs/day
Isophorone	ug/l	lbs/day	600.0 ug/l	15.04 lbs/day
Naphthalene				
Nitrobenzene	ug/l	lbs/day	1900.0 ug/l	47.63 lbs/day
2-Nitrophenol	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4-Nitrophenol	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
2,4-Dinitrophenol	ug/l	lbs/day	14000.0 ug/l	350.96 lbs/day
4,6-Dinitro-o-cresol	ug/l	lbs/day	765.0 ug/l	19.18 lbs/day
N-Nitrosodimethylamine	ug/l	lbs/day	8.1 ug/l	0.20 lbs/day
N-Nitrosodiphenylamine	ug/l	lbs/day	16.0 ug/l	0.40 lbs/day
N-Nitrosodi-n-propylami	ug/l	lbs/day	1.4 ug/l	0.04 lbs/day
Pentachlorophenol	ug/l	lbs/day	8.2 ug/l	0.21 lbs/day
Phenol	ug/l	lbs/day	4.6E+06 ug/l	1.15E+05 lbs/day
Bis(2-ethylhexyl)phthala	ug/l	lbs/day	5.9 ug/l	0.15 lbs/day
Butyl benzyl phthalate	ug/l	lbs/day	5200.0 ug/l	130.36 lbs/day
Di-n-butyl phthalate	ug/l	lbs/day	12000.0 ug/l	300.83 lbs/day
Di-n-octyl phthlate				
Diethyl phthalate	ug/l	lbs/day	120000.0 ug/l	3008.27 lbs/day
Dimethyl phthlate	ug/l	lbs/day	2.9E+06 ug/l	7.27E+04 lbs/day
Benzo(a)anthracene (P)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day

**Utah Division of Water Quality
Salt Lake City, Utah**

Benzo(a)pyrene (PAH)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Benzo(b)fluoranthene (F)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Benzo(k)fluoranthene (F)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Chrysene (PAH)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Acenaphthylene (PAH)				
Anthracene (PAH)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Dibenzo(a,h)anthracene	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Indeno(1,2,3-cd)pyrene	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Pyrene (PAH)	ug/l	lbs/day	11000.0 ug/l	275.76 lbs/day
Tetrachloroethylene	ug/l	lbs/day	8.9 ug/l	0.22 lbs/day
Toluene	ug/l	lbs/day	200000.0 ug/l	5013.78 lbs/day
Trichloroethylene	ug/l	lbs/day	81.0 ug/l	2.03 lbs/day
Vinyl chloride	ug/l	lbs/day	525.0 ug/l	13.16 lbs/day
				lbs/day
Pesticides				lbs/day
Aldrin	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Dieldrin	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Chlordane	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDT	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDE	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDD	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
alpha-Endosulfan	ug/l	lbs/day	2.0 ug/l	0.05 lbs/day
beta-Endosulfan	ug/l	lbs/day	2.0 ug/l	0.05 lbs/day
Endosulfan sulfate	ug/l	lbs/day	2.0 ug/l	0.05 lbs/day
Endrin	ug/l	lbs/day	0.8 ug/l	0.02 lbs/day
Endrin aldehyde	ug/l	lbs/day	0.8 ug/l	0.02 lbs/day
Heptachlor	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Heptachlor epoxide				
PCB's				
PCB 1242 (Arochlor 1242)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1254 (Arochlor 1254)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1221 (Arochlor 1221)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1232 (Arochlor 1232)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1248 (Arochlor 1248)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1260 (Arochlor 1260)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1016 (Arochlor 1016)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Pesticide				
Toxaphene	ug/l		0.0 ug/l	0.00 lbs/day
Dioxin				
Dioxin (2,3,7,8-TCDD)	ug/l	lbs/day		
Metals				
Antimony	ug/l	lbs/day		
Arsenic	ug/l	lbs/day	4300.00 ug/l	107.80 lbs/day
Asbestos	ug/l	lbs/day		
Beryllium				
Cadmium				

**Utah Division of Water Quality
Salt Lake City, Utah**

Chromium (III)				
Chromium (VI)				
Copper				
Cyanide	ug/l	lbs/day	2.2E+05 ug/l	5515.16 lbs/day
Lead	ug/l	lbs/day		
Mercury			0.15 ug/l	0.00 lbs/day
Nickel			4600.00 ug/l	115.32 lbs/day
Selenium	ug/l	lbs/day		
Silver	ug/l	lbs/day		
Thallium			6.30 ug/l	0.16 lbs/day
Zinc				

There are additional standards that apply to this receiving water, but were not considered in this modeling/waste load allocation analysis.

VII. Mathematical Modeling of Stream Quality

Model configuration was accomplished utilizing standard modeling procedures. Data points were plotted and coefficients adjusted as required to match observed data as closely as possible.

The modeling approach used in this analysis included one or a combination of the following models.

(1) The Utah River Model, Utah Division of Water Quality, 1992. Based upon STREAMDO IV (Region VIII) and Supplemental Ammonia Toxicity Models; EPA Region VIII, Sept. 1990 and QUAL2E (EPA, Athens, GA).

(2) Utah Ammonia/Chlorine Model, Utah Division of Water Quality, 1992.

(3) AMMTOX Model, University of Colorado, Center of Limnology, and EPA Region 8

(4) Principles of Surface Water Quality Modeling and Control. Robert V. Thomann, et.al. Harper Collins Publisher, Inc. 1987, pp. 644.

Coefficients used in the model were based, in part, upon the following references:

(1) Rates, Constants, and Kinetics Formulations in Surface Water Quality Modeling. Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Athens Georgia. EPA/600/3-85/040 June 1985.

(2) Principles of Surface Water Quality Modeling and Control. Robert V. Thomann, et.al. Harper Collins Publisher, Inc. 1987, pp. 644.

VIII. Modeling Information

The required information for the model may include the following information for both the upstream conditions at low flow and the effluent conditions:

**Utah Division of Water Quality
Salt Lake City, Utah**

Flow, Q, (cfs or MGD)	D.O. mg/l
Temperature, Deg. C.	Total Residual Chlorine (TRC), mg/l
pH	Total NH3-N, mg/l
BOD5, mg/l	Total Dissolved Solids (TDS), mg/l
Metals, ug/l	Toxic Organics of Concern, ug/l

Other Conditions

In addition to the upstream and effluent conditions, the models require a variety of physical and biological coefficients and other technical information. In the process of actually establishing the permit limits for an effluent, values are used based upon the available data, model calibration, literature values, site visits and best professional judgement.

Model Inputs

The following is upstream and discharge information that was utilized as inputs for the analysis. Dry washes are considered to have an upstream flow equal to the flow of the discharge.

Current Upstream Information

	Stream								
	Critical								
	Low Flow		Temp.	pH	T-NH3	BOD5	DO	TRC	TDS
	cfs		Deg. C		mg/l as N	mg/l	mg/l	mg/l	mg/l
Summer (Irrig. Season)	0.0		20.0	8.2	0.05	0.10	---	0.00	350.0
Fall	0.0		12.0	8.1	0.05	0.10	---	0.00	350.0
Winter	0.0		4.0	8.0	0.05	0.10	---	0.00	350.0
Spring	0.0		12.0	8.1	0.05	0.10	10.86	0.00	350.0
Dissolved Metals	Al		As	Cd	CrIII	CrVI	Copper	Fe	Pb
	ug/l		ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
All Seasons	1.59*		0.53*	0.053*	0.53*	2.65*	0.53*	0.83*	0.53*
Dissolved Metals	Hg		Ni	Se	Ag	Zn	Boron		
	ug/l		ug/l	ug/l	ug/l	ug/l	ug/l		
All Seasons	0.0000		0.53*	1.06*	0.1*	0.053*	10.0		* 1/2 MDL

Projected Discharge Information

Season	Flow, MGD	Temp.	TDS mg/l	TDS tons/day
Summer	3.00000	22.5	350.00	4.37762
Fall	3.00000	10.0		
Winter	3.00000	4.0		
Spring	3.00000	10.0		

All model numerical inputs, intermediate calculations, outputs and graphs are available for discussion, inspection and copy at the Division of Water Quality.

**Utah Division of Water Quality
Salt Lake City, Utah**

IX. Effluent Limitations

Current State water quality standards are required to be met under a variety of conditions including in-stream flows targeted to the 7-day, 10-year low flow (R317-2-9).

Other conditions used in the modeling effort coincide with the environmental conditions expected at low stream flows.

Effluent Limitation for Flow based upon Water Quality Standards

In-stream criteria of downstream segments will be met with an effluent flow maximum value as follows:

Season	Daily Average	
Summer	3.000 MGD	4.641 cfs
Fall	3.000 MGD	4.641 cfs
Winter	3.000 MGD	4.641 cfs
Spring	3.000 MGD	4.641 cfs

Flow Requirement or Loading Requirement

The calculations in this wasteload analysis utilize the maximum effluent discharge flow of 3 MGD. If the discharger is allowed to have a flow greater than 3 MGD during 7Q10 conditions, and effluent limit concentrations as indicated, then water quality standards will be violated. In order to prevent this from occurring, the permit writers must include the discharge flow limitation as indicated above; or, include loading effluent limits in the permit.

Effluent Limitation for Whole Effluent Toxicity (WET) based upon WET Policy

Effluent Toxicity will not occur in downstream segments if the values below are met.

WET Requirements	LC50 >	EOP Effluent	[Acute]
	IC25 >	99.8% Effluent	[Chronic]

Effluent Limitation for Biological Oxygen Demand (BOD) based upon Water Quality Standards or Regulations

In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent BOD limitation as follows:

Season	Concentration	
Summer	25.0 mg/l as BOD5	625.4 lbs/day
Fall	25.0 mg/l as BOD5	625.4 lbs/day
Winter	25.0 mg/l as BOD5	625.4 lbs/day
Spring	25.0 mg/l as BOD5	625.4 lbs/day

Effluent Limitation for Dissolved Oxygen (DO) based upon Water Quality Standards

**Utah Division of Water Quality
Salt Lake City, Utah**

In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent D.O. limitation as follows:

Season	Concentration
Summer	4.00
Fall	4.00
Winter	4.00
Spring	4.00

Effluent Limitation for Total Ammonia based upon Water Quality Standards

In-stream criteria of downstream segments for Total Ammonia will be met with an effluent limitation (expressed as Total Ammonia as N) as follows:

Season		Concentration		Load	
Summer	4 Day Avg. - Chronic	12.5	mg/l as N	312.2	lbs/day
	1 Hour Avg. - Acute	55.9	mg/l as N	1,397.3	lbs/day
Fall	4 Day Avg. - Chronic	13.1	mg/l as N	327.7	lbs/day
	1 Hour Avg. - Acute	57.9	mg/l as N	1,447.4	lbs/day
Winter	4 Day Avg. - Chronic	14.1	mg/l as N	352.0	lbs/day
	1 Hour Avg. - Acute	62.1	mg/l as N	1,553.4	lbs/day
Spring	4 Day Avg. - Chronic	13.1	mg/l as N	0.0	lbs/day
	1 Hour Avg. - Acute	57.9	mg/l as N	0.0	lbs/day

Acute limit calculated with an Acute Zone of Initial Dilution (ZID) to be equal to 100.%.
Note: Values are from combined Payson/Salem WLAs June 15-16, 2004.

Effluent Limitation for Total Residual Chlorine based upon Water Quality Standards

In-stream criteria of downstream segments for Total Residual Chlorine will be met with an effluent limitation as follows:

Season		Concentration		Load	
Summer	4 Day Avg. - Chronic	1.1	mg/l	26.29	lbs/day
	1 Hour Avg. - Acute	1.9	mg/l	47.90	lbs/day
Fall	4 Day Avg. - Chronic	1.6	mg/l	39.45	lbs/day
	1 Hour Avg. - Acute	2.7	mg/l	68.22	lbs/day
Winter	4 Day Avg. - Chronic	2.4	mg/l	59.29	lbs/day
	1 Hour Avg. - Acute	4.1	mg/l	101.36	lbs/day
Spring	4 Day Avg. - Chronic	1.6	mg/l	0.00	lbs/day
	1 Hour Avg. - Acute	2.7	mg/l	0.00	lbs/day

Note: Values are from combined Payson/Salem WLAs June 15-16, 2004.

Effluent Limitations for Total Dissolved Solids based upon Water Quality Standards

**Utah Division of Water Quality
Salt Lake City, Utah**

Season		Concentration		Load	
Summer	Maximum, Acute	1201.8	mg/l	15.03	tons/day
Fall	Maximum, Acute	1201.8	mg/l	15.03	tons/day
Winter	Maximum, Acute	1201.8	mg/l	15.03	tons/day
Spring	4 Day Avg. - Chronic	1201.8	mg/l	15.03	tons/day
Colorado Salinity Form Limits			Determined by Permitting Section		

**Effluent Limitations for Total Recoverable Metals based upon
Water Quality Standards**

In-stream criteria of downstream segments for Dissolved Metals will be met with an effluent limitation as follows (based upon a hardness of 300.11 mg/l):

	4 Day Average		Load	1 Hour Average		Load
	Concentration			Concentration		
Aluminum	N/A		N/A	751.6	ug/l	18.8 lbs/day
Arsenic	190.41	ug/l	3.1 lbs/day	340.7	ug/l	8.5 lbs/day
Cadmium	0.61	ug/l	0.0 lbs/day	6.5	ug/l	0.2 lbs/day
Chromium III	212.43	ug/l	3.4 lbs/day	4,444.6	ug/l	111.2 lbs/day
Chromium VI	11.02	ug/l	0.2 lbs/day	16.0	ug/l	0.4 lbs/day
Copper	23.91	ug/l	0.4 lbs/day	39.5	ug/l	1.0 lbs/day
Iron	N/A		N/A	1,002.2	ug/l	25.1 lbs/day
Lead	12.91	ug/l	0.2 lbs/day	331.5	ug/l	8.3 lbs/day
Mercury	0.01	ug/l	0.0 lbs/day	2.4	ug/l	0.1 lbs/day
Nickel	132.45	ug/l	2.1 lbs/day	1,191.4	ug/l	29.8 lbs/day
Selenium	4.61	ug/l	0.1 lbs/day	20.0	ug/l	0.5 lbs/day
Silver	N/A	ug/l	N/A lbs/day	25.1	ug/l	0.6 lbs/day
Zinc	304.68	ug/l	4.9 lbs/day	304.7	ug/l	7.6 lbs/day
Cyanide	5.21	ug/l	0.1 lbs/day	22.0	ug/l	0.6 lbs/day

**Effluent Limitations for Heat/Temperature based upon
Water Quality Standards**

Summer	24.0 Deg. C.	75.2 Deg. F
Fall	16.0 Deg. C.	60.8 Deg. F
Winter	8.0 Deg. C.	46.4 Deg. F
Spring	14.0 Deg. C.	57.2 Deg. F

**Effluent Limitations for Organics [Pesticides]
Based upon Water Quality Standards**

In-stream criteria of downstream segments for Organics [Pesticides] will be met with an effluent limit as follows:

**Utah Division of Water Quality
Salt Lake City, Utah**

	4 Day Average		1 Hour Average	
	Concentration	Load	Concentration	Load
Aldrin			1.5E+00	ug/l 5.80E-02 lbs/day
Chlordane	4.30E-03 ug/l	1.08E-01 lbs/day	1.2E+00	ug/l 4.64E-02 lbs/day
DDT, DDE	1.00E-03 ug/l	2.50E-02 lbs/day	5.5E-01	ug/l 2.13E-02 lbs/day
Dieldrin	1.90E-03 ug/l	4.75E-02 lbs/day	1.3E+00	ug/l 4.84E-02 lbs/day
Endosulfan	5.60E-02 ug/l	1.40E+00 lbs/day	1.1E-01	ug/l 4.26E-03 lbs/day
Endrin	2.30E-03 ug/l	5.75E-02 lbs/day	9.0E-02	ug/l 3.48E-03 lbs/day
Guthion	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l 3.87E-04 lbs/day
Heptachlor	3.80E-03 ug/l	9.51E-02 lbs/day	2.6E-01	ug/l 1.01E-02 lbs/day
Lindane	8.00E-02 ug/l	2.00E+00 lbs/day	1.0E+00	ug/l 3.87E-02 lbs/day
Methoxychlor	0.00E+00 ug/l	0.00E+00 lbs/day	3.0E-02	ug/l 1.16E-03 lbs/day
Mirex	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l 3.87E-04 lbs/day
Parathion	0.00E+00 ug/l	0.00E+00 lbs/day	4.0E-02	ug/l 1.55E-03 lbs/day
PCB's	1.40E-02 ug/l	3.50E-01 lbs/day	2.0E+00	ug/l 7.74E-02 lbs/day
Pentachlorophenol	1.30E+01 ug/l	3.25E+02 lbs/day	2.0E+01	ug/l 7.74E-01 lbs/day
Toxephene	2.00E-04 ug/l	5.00E-03 lbs/day	7.3E-01	ug/l 2.82E-02 lbs/day

**Effluent Targets for Pollution Indicators
Based upon Water Quality Standards**

In-stream criteria of downstream segments for Pollution Indicators will be met with an effluent limit as follows:

	1 Hour Average	
	Concentration	Loading
Gross Beta (pCi/l)	50.0 pCi/L	
BOD (mg/l)	5.0 mg/l	125.1 lbs/day
Nitrates as N	4.0 mg/l	100.1 lbs/day
Total Phosphorus as P	0.05 mg/l	1.3 lbs/day
Total Suspended Solids	90.0 mg/l	2251.3 lbs/day

Note: Pollution indicator targets are for information purposes only.

**Effluent Limitations for Protection of Human Health [Toxics Rule]
Based upon Water Quality Standards (Most stringent of 1C or 3A & 3B as appropriate.)**

In-stream criteria of downstream segments for Protection of Human Health [Toxics] will be met with an effluent limit as follows:

	Maximum Concentration	
	Concentration	Load
Toxic Organics		
Acenaphthene	2.71E+03 ug/l	6.77E+01 lbs/day
Acrolein	7.82E+02 ug/l	1.96E+01 lbs/day
Acrylonitrile	6.61E-01 ug/l	1.65E-02 lbs/day
Benzene	7.12E+01 ug/l	1.78E+00 lbs/day
Benzidine	ug/l	lbs/day

**Utah Division of Water Quality
Salt Lake City, Utah**

Carbon tetrachloride	4.41E+00 ug/l	1.10E-01 lbs/day
Chlorobenzene	2.10E+04 ug/l	5.26E+02 lbs/day
1,2,4-Trichlorobenzene		
Hexachlorobenzene	7.72E-04 ug/l	1.93E-05 lbs/day
1,2-Dichloroethane	9.92E+01 ug/l	2.48E+00 lbs/day
1,1,1-Trichloroethane		
Hexachloroethane	8.92E+00 ug/l	2.23E-01 lbs/day
1,1-Dichloroethane		
1,1,2-Trichloroethane	4.21E+01 ug/l	1.05E+00 lbs/day
1,1,2,2-Tetrachloroethane	1.10E+01 ug/l	2.76E-01 lbs/day
Chloroethane		
Bis(2-chloroethyl) ether	1.40E+00 ug/l	3.51E-02 lbs/day
2-Chloroethyl vinyl ether		
2-Chloronaphthalene	4.31E+03 ug/l	1.08E+02 lbs/day
2,4,6-Trichlorophenol	6.51E+00 ug/l	1.63E-01 lbs/day
p-Chloro-m-cresol		
Chloroform (HM)	4.71E+02 ug/l	1.18E+01 lbs/day
2-Chlorophenol	4.01E+02 ug/l	1.00E+01 lbs/day
1,2-Dichlorobenzene	1.70E+04 ug/l	4.26E+02 lbs/day
1,3-Dichlorobenzene	2.61E+03 ug/l	6.52E+01 lbs/day
1,4-Dichlorobenzene	2.61E+03 ug/l	6.52E+01 lbs/day
3,3'-Dichlorobenzidine	7.72E-02 ug/l	1.93E-03 lbs/day
1,1-Dichloroethylene	3.21E+00 ug/l	8.02E-02 lbs/day
1,2-trans-Dichloroethylene1		
2,4-Dichlorophenol	7.92E+02 ug/l	1.98E+01 lbs/day
1,2-Dichloropropane	3.91E+01 ug/l	9.78E-01 lbs/day
1,3-Dichloropropylene	1.70E+03 ug/l	4.26E+01 lbs/day
2,4-Dimethylphenol	2.30E+03 ug/l	5.77E+01 lbs/day
2,4-Dinitrotoluene	9.12E+00 ug/l	2.28E-01 lbs/day
2,6-Dinitrotoluene		
1,2-Diphenylhydrazine	5.41E-01 ug/l	1.35E-02 lbs/day
Ethylbenzene	2.91E+04 ug/l	7.27E+02 lbs/day
Fluoranthene	3.71E+02 ug/l	9.28E+00 lbs/day
4-Chlorophenyl phenyl ether		
4-Bromophenyl phenyl ether		
Bis(2-chloroisopropyl) ether	1.70E+05 ug/l	4.26E+03 lbs/day
Bis(2-chloroethoxy) methane		
Methylene chloride (HM)	1.60E+03 ug/l	4.01E+01 lbs/day
Methyl chloride (HM)		
Methyl bromide (HM)		
Bromoform (HM)	3.61E+02 ug/l	9.02E+00 lbs/day
Dichlorobromomethane(HM)	2.20E+01 ug/l	5.52E-01 lbs/day
Chlorodibromomethane (HM)	3.41E+01 ug/l	8.52E-01 lbs/day
Hexachlorocyclopentadiene	1.70E+04 ug/l	4.26E+02 lbs/day
Isophorone	6.01E+02 ug/l	1.50E+01 lbs/day
Naphthalene		
Nitrobenzene	1.90E+03 ug/l	4.76E+01 lbs/day
2-Nitrophenol		
4-Nitrophenol		
2,4-Dinitrophenol	1.40E+04 ug/l	3.51E+02 lbs/day
4,6-Dinitro-o-cresol	7.67E+02 ug/l	1.92E+01 lbs/day

**Utah Division of Water Quality
Salt Lake City, Utah**

N-Nitrosodimethylamine	8.12E+00 ug/l	2.03E-01 lbs/day
N-Nitrosodiphenylamine	1.60E+01 ug/l	4.01E-01 lbs/day
N-Nitrosodi-n-propylamine	1.40E+00 ug/l	3.51E-02 lbs/day
Pentachlorophenol	8.22E+00 ug/l	2.06E-01 lbs/day
Phenol	4.61E+06 ug/l	1.15E+05 lbs/day
Bis(2-ethylhexyl)phthalate	5.91E+00 ug/l	1.48E-01 lbs/day
Butyl benzyl phthalate	5.21E+03 ug/l	1.30E+02 lbs/day
Di-n-butyl phthalate	1.20E+04 ug/l	3.01E+02 lbs/day
Di-n-octyl phthlate		
Diethyl phthalate	1.20E+05 ug/l	3.01E+03 lbs/day
Dimethyl phthlate	2.91E+06 ug/l	7.27E+04 lbs/day
Benzo(a)anthracene (PAH)	3.11E-02 ug/l	7.77E-04 lbs/day
Benzo(a)pyrene (PAH)	3.11E-02 ug/l	7.77E-04 lbs/day
Benzo(b)fluoranthene (PAH)	3.11E-02 ug/l	7.77E-04 lbs/day
Benzo(k)fluoranthene (PAH)	3.11E-02 ug/l	7.77E-04 lbs/day
Chrysene (PAH)	3.11E-02 ug/l	7.77E-04 lbs/day
Acenaphthylene (PAH)		
Anthracene (PAH)		
Dibenzo(a,h)anthracene (PAH)	3.11E-02 ug/l	7.77E-04 lbs/day
Indeno(1,2,3-cd)pyrene (PAH)	3.11E-02 ug/l	7.77E-04 lbs/day
Pyrene (PAH)	1.10E+04 ug/l	2.76E+02 lbs/day
Tetrachloroethylene	8.92E+00 ug/l	2.23E-01 lbs/day
Toluene	2.00E+05 ug/l	5.01E+03 lbs/day
Trichloroethylene	8.12E+01 ug/l	2.03E+00 lbs/day
Vinyl chloride	5.26E+02 ug/l	1.32E+01 lbs/day

Pesticides

Aldrin	1.40E-04 ug/l	3.51E-06 lbs/day
Dieldrin	1.40E-04 ug/l	3.51E-06 lbs/day
Chlordane	5.91E-04 ug/l	1.48E-05 lbs/day
4,4'-DDT	5.91E-04 ug/l	1.48E-05 lbs/day
4,4'-DDE	5.91E-04 ug/l	1.48E-05 lbs/day
4,4'-DDD	8.42E-04 ug/l	2.11E-05 lbs/day
alpha-Endosulfan	2.00E+00 ug/l	5.01E-02 lbs/day
beta-Endosulfan	2.00E+00 ug/l	5.01E-02 lbs/day
Endosulfan sulfate	2.00E+00 ug/l	5.01E-02 lbs/day
Endrin	8.12E-01 ug/l	2.03E-02 lbs/day
Endrin aldehyde	8.12E-01 ug/l	2.03E-02 lbs/day
Heptachlor	2.10E-04 ug/l	5.26E-06 lbs/day
Heptachlor epoxide		

PCB's

PCB 1242 (Arochlor 1242)	4.51E-05 ug/l	1.13E-06 lbs/day
PCB-1254 (Arochlor 1254)	4.51E-05 ug/l	1.13E-06 lbs/day
PCB-1221 (Arochlor 1221)	4.51E-05 ug/l	1.13E-06 lbs/day
PCB-1232 (Arochlor 1232)	4.51E-05 ug/l	1.13E-06 lbs/day
PCB-1248 (Arochlor 1248)	4.51E-05 ug/l	1.13E-06 lbs/day
PCB-1260 (Arochlor 1260)	4.51E-05 ug/l	1.13E-06 lbs/day
PCB-1016 (Arochlor 1016)	4.51E-05 ug/l	1.13E-06 lbs/day

Pesticide

**Utah Division of Water Quality
Salt Lake City, Utah**

Toxaphene	7.52E-04 ug/l	1.88E-05 lbs/day
Metals		
Antimony	ug/l	lbs/day
Arsenic	ug/l	lbs/day
Asbestos	ug/l	lbs/day
Beryllium		
Cadmium		
Chromium (III)		
Chromium (VI)		
Copper	ug/l	lbs/day
Cyanide	ug/l	lbs/day
Lead		
Mercury	ug/l	lbs/day
Nickel	ug/l	lbs/day
Selenium		
Silver		
Thallium	ug/l	lbs/day
Zinc		
Dioxin		
Dioxin (2,3,7,8-TCDD)	1.40E-08 ug/l	3.51E-10 lbs/day

**Metals Effluent Limitations for Protection of All Beneficial Uses
Based upon Water Quality Standards and Toxics Rule**

	Class 4 Acute Agricultura I ug/l	Class 3 Acute Aquatic Wildlife ug/l	Acute Toxics Drinking Water Source ug/l	Acute Toxics Wildlife ug/l	1C Acute Health Criteria ug/l	Acute Most Stringent ug/l	Class 3 Chronic Aquatic Wildlife ug/l
Aluminum		751.6				751.6	N/A
Antimony				4309.3		4309.3	
Arsenic	100.2	340.7			0.0	100.2	190.4
Barium						0.0	
Beryllium						0.0	
Cadmium	10.0	6.5			0.0	6.5	0.6
Chromium (III)		4444.6			0.0	4444.6	212.4
Chromium (VI)	100.2	16.0			0.0	16.03	11.02
Copper	200.4	39.5				39.5	23.9
Cyanide		22.0	220474			22.0	5.2
Iron		1002.2				1002.2	
Lead	100.2	331.5			0.0	100.2	12.9
Mercury		2.41		0.15	0.0	0.15	0.012
Nickel		1191.4		4609.9		1191.4	132.5
Selenium	50.1	20.0			0.0	20.0	4.6
Silver		25.1			0.0	25.1	

**Utah Division of Water Quality
Salt Lake City, Utah**

Thallium			6.3	6.3	
Zinc		304.7		304.7	304.7
Boron	751.6			751.6	

Summary Effluent Limitations for Metals [Wasteload Allocation, TMDL]

[If Acute is more stringent than Chronic, then the Chronic takes on the Acute value.]

	WLA Acute ug/l	WLA Chronic ug/l	
Aluminum	751.6	N/A	
Antimony	4309.27		
Arsenic	100.2	190.4	Acute Controls
Asbestos	0.00E+00		
Barium			
Beryllium			
Cadmium	6.5	0.6	
Chromium (III)	4444.6	212	
Chromium (VI)	16.0	11.0	
Copper	39.5	23.9	
Cyanide	22.0	5.2	
Iron	1002.2		
Lead	100.2	12.9	
Mercury	0.150	0.012	
Nickel	1191.4	132	
Selenium	20.0	4.6	
Silver	25.1	N/A	
Thallium	6.3		
Zinc	304.7	304.7	
Boron	751.62		

Other Effluent Limitations are based upon R317-1.

E. coli 126.0 organisms per 100 ml

X. Antidegradation Considerations

The Utah Antidegradation Policy allows for degradation of existing quality where it is determined that such lowering of water quality is necessary to accommodate important economic or social development in the area in which the waters are protected [R317-2-3]. It has been determined that certain chemical parameters introduced by this discharge will cause an increase of the concentration of said parameters in the receiving waters. Under no conditions will the increase in concentration be allowed to interfere with existing instream water uses.

The antidegradation rules and procedures allow for modification of effluent limits less than those based strictly upon mass balance equations utilizing 100% of the assimilative capacity of the receiving water. Additional factors include considerations for "Blue-ribbon" fisheries, special recreational areas, threatened and endangered species, and drinking water sources.

An Antidegradation Level I Review was conducted on this discharge and its effect on the

**Utah Division of Water Quality
Salt Lake City, Utah**

receiving water. Based upon that review, it has been determined that an **Antidegradation Level II Review is NOT Required**

XI. Colorado River Salinity Forum Considerations

Discharges in the Colorado River Basin are required to have their discharge at a TDS loading of less than 1.00 tons/day unless certain exemptions apply. Refer to the Forum's Guidelines for additional information allowing for an exceedence of this value.

XII. Summary Comments

The mathematical modeling and best professional judgement indicate that violations of receiving water beneficial uses with their associated water quality standards, including important downstream segments, will not occur for the evaluated parameters of concern as discussed above if the effluent limitations indicated above are met.

XIII. Notice of UPDES Requirement

This Addendum to the Statement of Basis does not authorize any entity or party to discharge to the waters of the State of Utah. That authority is granted through a UPDES permit issued by the Utah Division of Water Quality. The numbers presented here may be changed as a function of other factors. Dischargers are strongly urged to contact the Permits Section for further information. Permit writers may utilize other information to adjust these limits and/or to determine other limits based upon best available technology and other considerations provided that the values in this wasteload analysis [TMDL] are not compromised. See special provisions in Utah Water Quality Standards for adjustments in the Total Dissolved Solids values based upon background concentration.

XIV. Special Considerations

TMDL Issues and Calculations may adjust these values as appropriate. See TMDL Section of DWQ.

Prepared by:

William O. Moellmer, Ph.D.

Utah Division of Water Quality

801-538-6329

File Name: Payson January 14 2008

APPENDIX - Coefficients and Other Model Information

CBOD Coeff. (Kd)20 1/day 2.000	CBOD Coeff. FORCED (Kd)/day 0.000	CBOD Coeff. (Ka)T 1/day 0.843	REAER. Coeff. (Ka)20 (Ka)/day 925.945	REAER. Coeff. FORCED 1/day 0.000	REAER. Coeff. (Ka)T 1/day 592.852	NBOD Coeff. (Kn)20 1/day 0.400	NBOD Coeff. (Kn)T 1/day 0.094
Open Coeff. (K4)20 1/day	Open Coeff. (K4)T 1/day	NH3 LOSS (K5)20 1/day	NH3 (K5)T 1/day	NO2+NO3 LOSS (K6)20 1/day	NO2+NO3 (K6)T 1/day	TRC Decay K(CI)20 1/day	TRC K(CI)(T) 1/day

**Utah Division of Water Quality
Salt Lake City, Utah**

	0.000	0.000	4.000	1.687	0.000	0.000	32.000	10.700	
BENTHIC DEMAND (SOD)20 gm/m2/day	1.000	BENTHIC DEMAND (SOD)T gm/m2/day	0.306						
K1 CBOD {theta}	1.0	K2 Reaer. {theta}	1.0	K3 NH3 {theta}	1.1	K4 Open {theta}	1.0	K5 NH3 Loss {theta}	1.0
		K6 NO2+3 {theta}	1.0	K(CI) TRC {theta}	1.1	S Benthic {theta}	1.1		

**Level I Antidegradation Review for: Payson WWTP
Payson January 14 2008**

Major Parameter of concern:	TDS	
WQ Standard	1200.0	mg/l
Current Stream Conditions Above Discharge		
Flow, Average	0.0	cfs
Concentration	350.0	mg/l
Loading	3.4	tons/year
Flow, 7Q10 (20th Percentile)	0.0	cfs
Concentration (80th Percentile)	350.0	mg/l
Loading	3.4	
Remaining Assimilative Conc. Capacity @ 7Q10		
Concentration	850.0	mg/l
Loading	8.4	tons/year
Percentage	70.8%	
Current Discharge Conditions		
Flow	3.0	MGD
Concentration	350.0	mg/l
Loading	1597.8	tons/year
Projected Discharge Conditions		
Flow	1.4	MGD
Concentration	350.0	mg/l
Loading	745.7	tons/year
Current Stream Conditions Below Discharge		
Flow @ 7Q10	4.7	cfs
Concentration	350.0	mg/l
Loading	1601.3	tons/year
Projected Stream Conditions Below Discharge		
Flow @ 7Q10	2.2	cfs
Concentration	350.0	mg/l
Loading	749.1	tons/year
Proposed Discharge Conc. <= Current.	Yes	Off-ramped

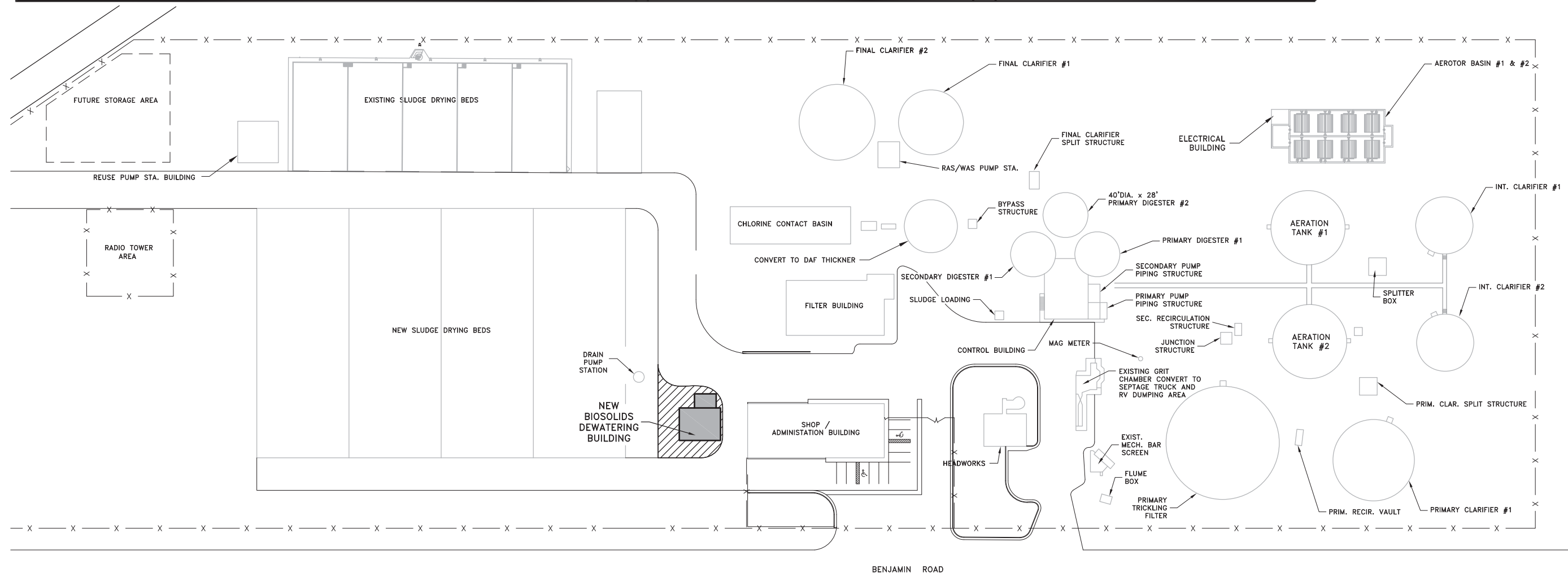
Appendix E
Overall Site Plan

DESIGN DATA			
INFLUENT CONDITION	DESIGN	CURRENT	PROJECTED
POPULATION	20,000	12,190	24,000
AVERAGE DESIGN FLOW			
CITY (MGD)	3.00	1.50	3.00
PER CAPITA FLOW (GPCD)	150	125	125
PEAK DAY AVERAGE FLOW			
CITY (MGD)	5.75	1.90	4.50
AVERAGE BIOCHEMICAL OXGEN DEMAND (BOD5)			
CITY (LBS/DAY)	4400	2,355	4,636
Total (MG/L)	176	188	188
City Per Capita Loading (lbs/capita)	0.22	0.19	0.19
PAYSON FRUIT GROWERS (LBS/DAY)	N/A	435	1200
AVERAGE AMMONIA			
CITY (LBS/DAY)	N/A	343	686
CONCENTRATION (MG/L)	N/A	27.40	27.40

2020 DESIGN DATA		
HEADWORKS		CAPACITY
SCREEN:		
(2) MECHANICAL FINE SCREEN 2'-6" CHANNEL		4.5 MGD (EA.)
FLOW MEASUREMENT:		
(1) 30" PALMER-BOWLUS FLUME (INFLUENT)		10.68 MGD
(2) 18" PARSHALL FLUME (EFFLUENT)		11.26 MGD
GRIT REMOVAL:		
(1) VORTEX GRIT CHAMBER		6.4 MGD
(2) COANDA GRIT WASHING PLANT		400 GPM
PRIMARY PUMP STATION		
NO. OF PUMPS - 3		
PUMPING CAPACITY (WITH ONE STANDBY PUMP) - 0.5 - 7.0 MGD		

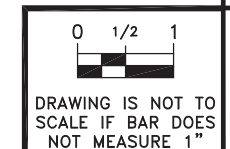
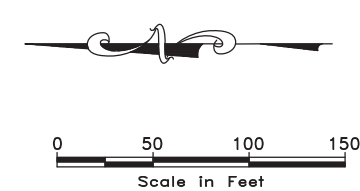
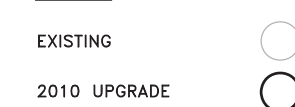
CLARIFIERS				
TYPES.	NO. OF UNITS	SIZE DIAMETER (FT.)	AVG. OVERFLOW RATE (GAL/DAY SQ. FT.)	AVG. FLOW WEIR LOADING RATE (GAL/DAY LF.)
PRIMARY	1	70	780	13,642
INTERMEDIATE	2	45	945	10,610
FINAL	2	(1) 60 (1) 70	450	6,730 8,365
TRICKLER FILTERS:				
TYPES.	NO. OF UNITS	DIAMETER (FT.)	ROCK MEDIA VOLUME (CU. FT.)	
PRIMARY	1	102	57,200	
AERATOR BASINS				
UNIT	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	VOLUME(CU FT)
(1)	23	15.5	87	30,837
(2)	23	15.5	87	30,837

AERATION TANKS			
UNIT	DIA (FT)	DEPTH (FT)	VOLUME(CU FT)
(1)	66	11	37,633
(2)	66	10	34,212
SECONDARY PUMP STATION			
NO. OF PUMPS - 3			
PUMPING CAPACITY (WITH ONE STANDBY PUMP) - 0.5 - 6.5 MGD			
PUMPING CAPACITY (WITH 3 OPERATING) - 9.0 MGD MAX.			
SAND FILTER			
TYPE: SHALLOW BED, TRAVELING BRIDGE RAPID SAND FILTER			
NO. OF UNITS: 2			
PEAK LOADING WITH ONE FILTER OFF LINE: 5 GPM/SQ. FT.			
AVERAGE LOADING WITH BOTH FILTERS OPERATING: 1.44 GPM/SQ. FT.			
MAX. BACKWASH RETURN: 15% AVERAGE INFLUENT FLOW			
AVERAGE BACKWASH RETURN: 7.5% AVERAGE INFLUENT FLOW			
CHLORINATION BASIN			
DESIGN CRITERIA: 40:1 CHANNEL LENGTH TO WIDTH RATIO			
DETENTION TIME: 60 MINUTES AT AVERAGE FLOW			



SLUDGE HANDLING CRITERIA				
ANAEROBIC SLUDGE DIGESTION				
TYPE	NO. OF UNITS	SIZE DIAMETER (FT.)	VOLUME (CU. FT.)	
PRIMARY	2	40	27,640	
		40	36,191	
SECONDARY	1	40	27,640	
DAF THICKENER				
	NO. OF UNITS	DIAMETER (FT)	VOLUME	
	(1)	45	12,723	
DE-WATERING PRESS				
NO. OF UNITS	TYPE	HP	SOLIDS LOADING	SOLIDS CONTENT
(1)	SCREW PRESS	(2)	500 lb/hr MAX.	3-4% 25 gpm 4% 33 gpm 3% 33 gpm
POLYMER FEED UNIT				
NO. OF UNITS	HP	DILUTION WATER	NET POLYMER	
(1)	N/A	120-1,200 GPM	0.3-3.0 GPM	
SHAFTLESS SCREW CONVEYOR:				
NO. OF UNITS	TYPE	HP	CAPACITY	
(1)	INCLINE (ANGLE = 29°)	(3)	1,000 lb/hr	
SLUDGE FEED PUMPS:				
NO. OF UNITS	HP	CAPACITY		
(1)	(5)	120 GPM		
SLUDGE DRYING BEDS				
TYPE	NO. OF UNITS	AREA (SQ. FT.)	TOTAL AREA (SQ. FT.)	
ASPHALT BEDS W/ UNDERDRAINS	5	5000	25,000	
	4	19,550	78,200	

LEGEND



NO.	DATE	DESIGN	DRAWN	CHECKED
B	2/22/2010	BP	KRB	BMR

CITY OF PAYSON
WASTEWATER TREATMENT FACILITY UPGRADE
SOLIDS DE-WATERING BUILDING
 DESIGN CRITERIA

AQUA
 ENGINEERING, INC.
 533 W. 2800 S., SUITE 275 BOUNTIFUL, UT 84010
 PHONE (801) 299-1327 FAX (801) 299-0153

SHEET
G-4

KRB 02/24/2010 X:\Payson Dewatering\09 BLDG\GENERAL\C-4.dwg

Appendix F
Phosphorus Chemical Removal Testing



Statepoint Engineering
Wastewater Processes
Evaluation & Training

TECHNICAL MEMORANDUM

TO: Jeff Hiatt
Payson City

Travis Jockumsen, PE
Payson City

FROM: Paul Krauth, PE
Statepoint Engineering

DATE: January 8, 2019

SUBJECT: Results of Chemical Phosphorus Dosing Study for Springville City

As per your request. I have completed the preliminary testing of various chemicals to achieve the new State mandated phosphorus limit of 1.0 mg/L.

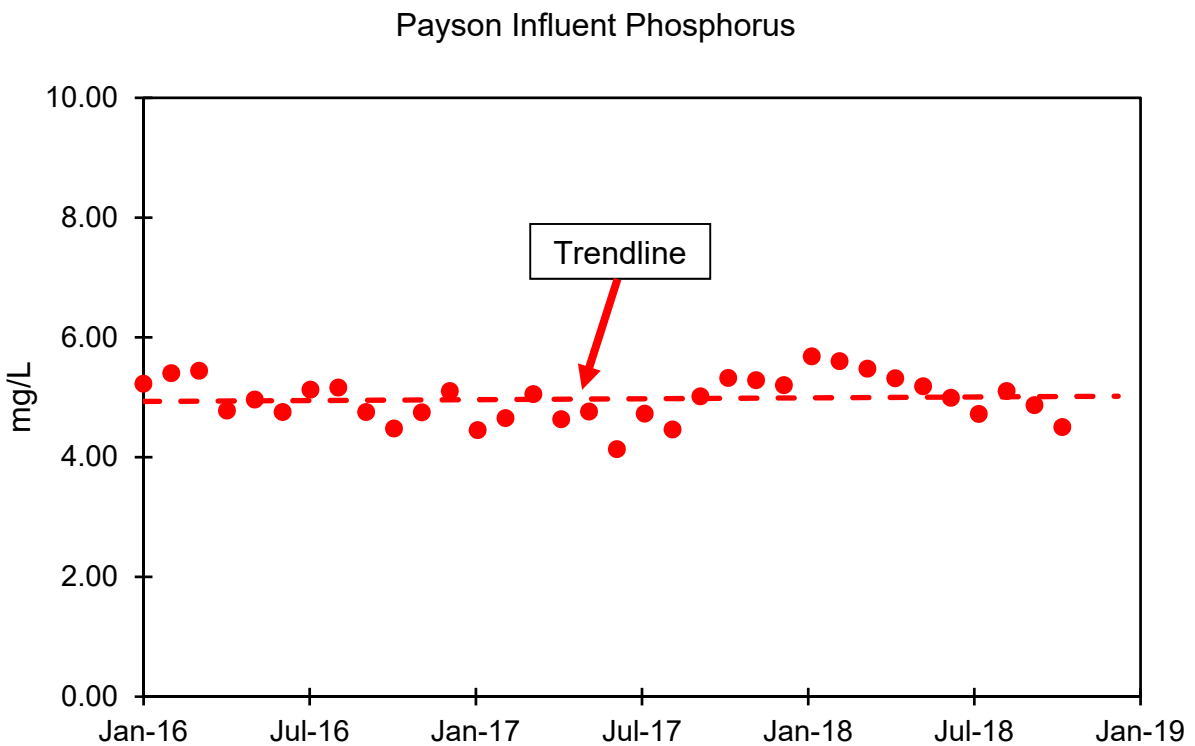
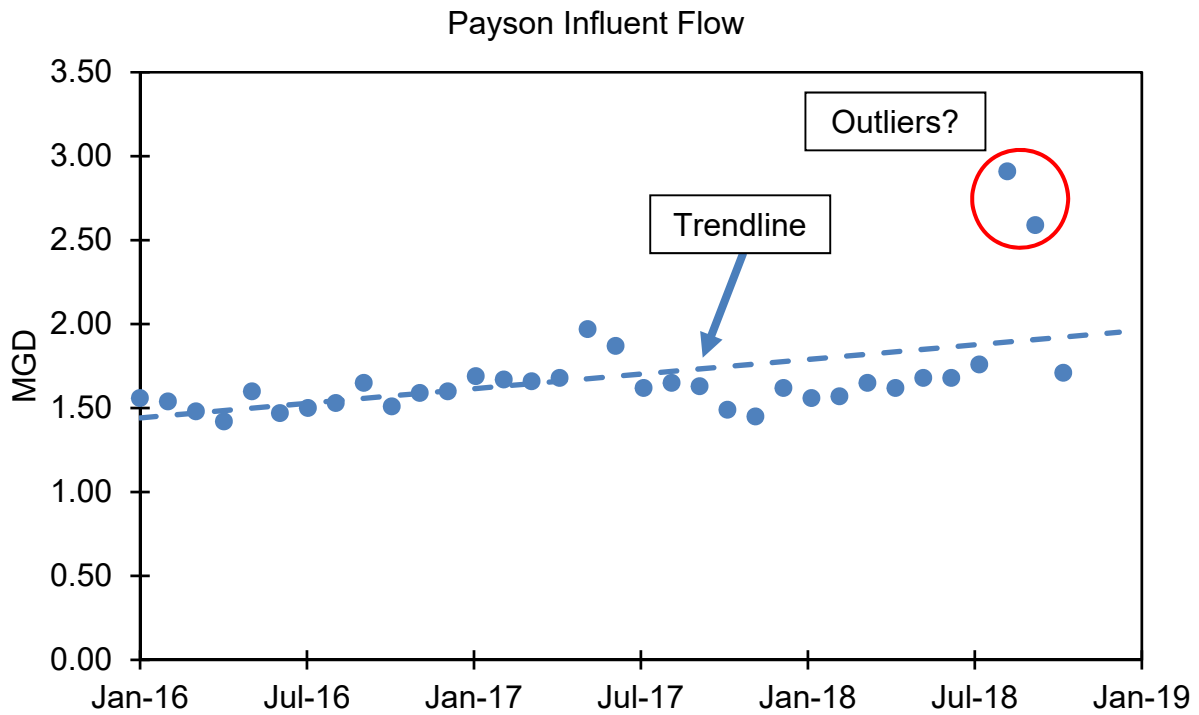
Since Payson City will be eventually use ultra violet light (UV) for disinfection, any iron based (ferric or ferrous) chemicals were eliminated from testing. This is mainly due to both staining issues and light scattering from the iron.

Current Conditions

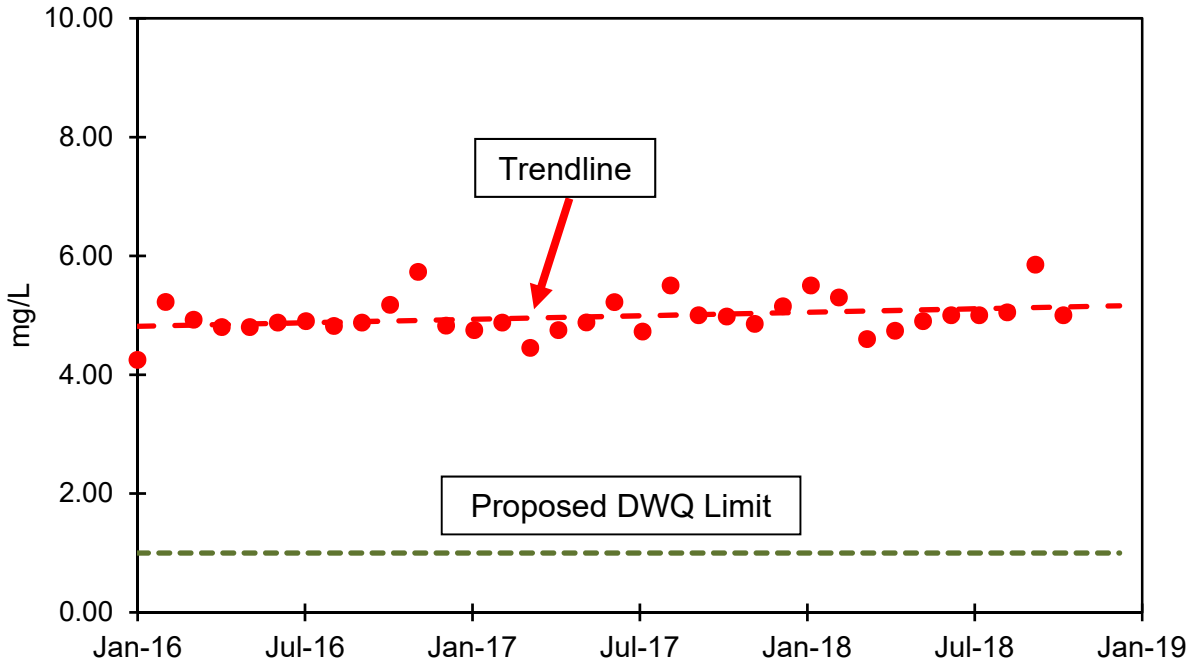
Payson has been sampling for both total phosphorus (TP) and ortho phosphorus (OP) in their influent and their effluent since July 2015.

Year	Averages						
	Flow MGD	Influent			Effluent		
		TP mg/L	OP mg/L	Percent	TP mg/L	OP mg/L	Percent
2016	1.54	5.00	3.01	63.5%	4.95	4.04	92.9%
2017	1.67	4.80	3.10	67.1%	4.93	4.52	94.9%
2018	1.87	5.14	3.57	64.7%	5.09	4.85	92.8%

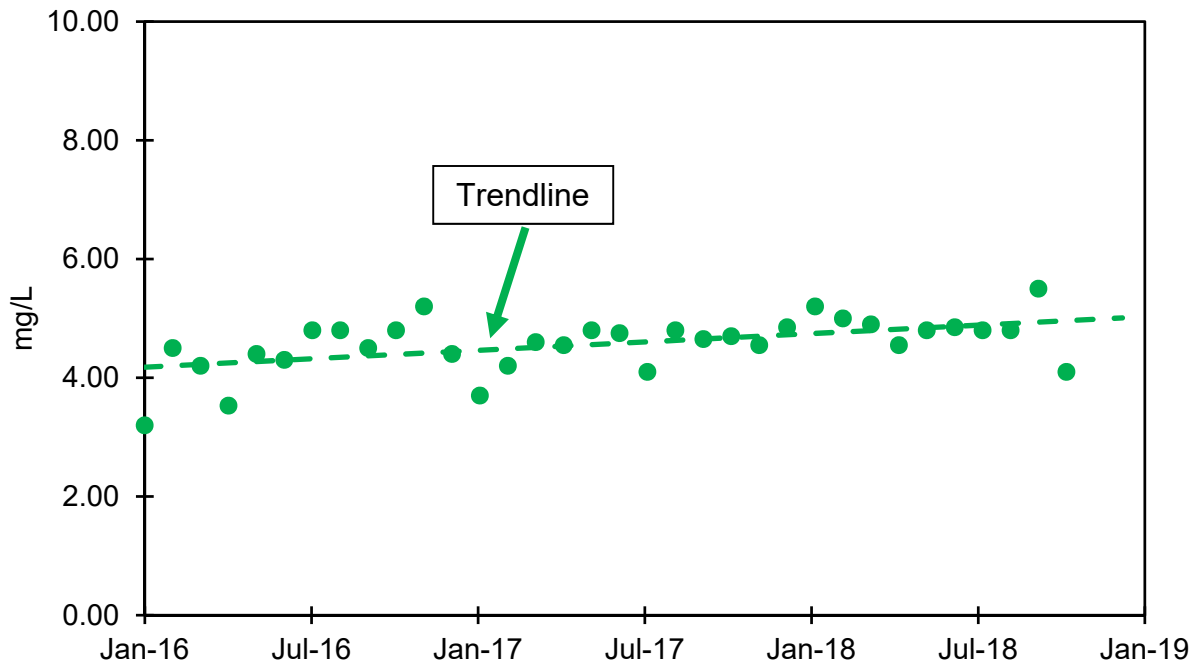
Plotting this data reveals to reveal any trends.



Payson Effluent Phosphorus



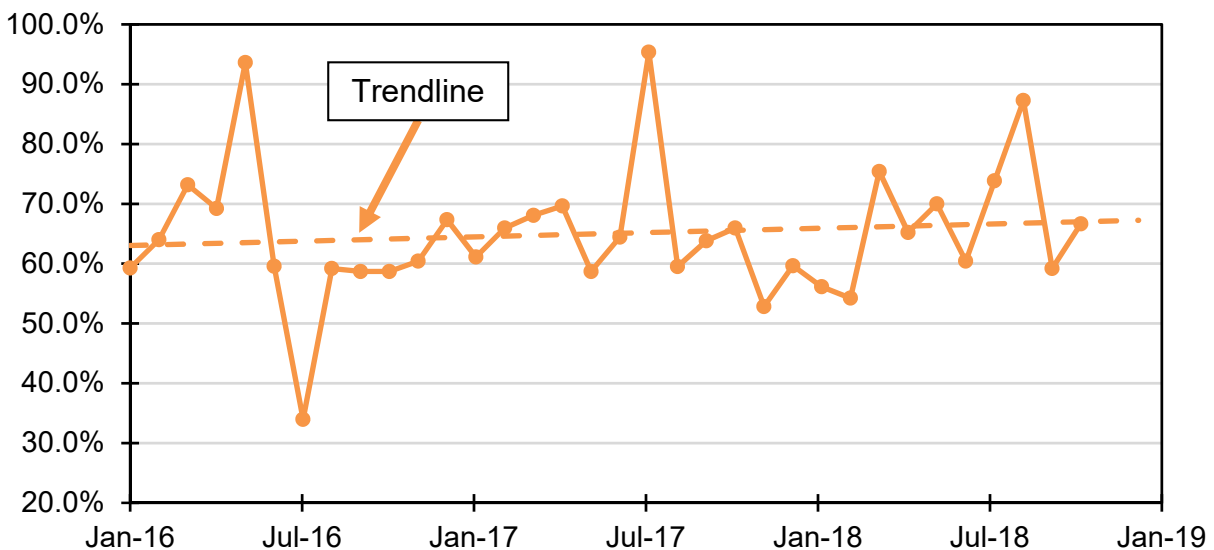
Payson Effluent Ortho Phosphorus



A quick discussion on total vs ortho phosphorus. Total phosphorus is a measurement of all the forms of phosphorus in the sample (orthophosphate, condensed phosphate, and organic phosphate). Orthophosphate is a measurement of the “reactive” phosphorus, it is referred to as “reactive” because of its three “extra” electrons which makes it very easy to make it bond with other compounds. The ortho phosphorus is the fraction that will react with the chemical dose. Since Payson will eventually have a limit total phosphorus, the ratio of total vs. ortho phosphorus will determine the target dosing of the flocculant chemicals.

Influent Ratio

The percentage of ortho phosphorus versus total phosphorus varies between 34% to 92% with an average of 67%, but this has been slowly increasing over the last 3 years.

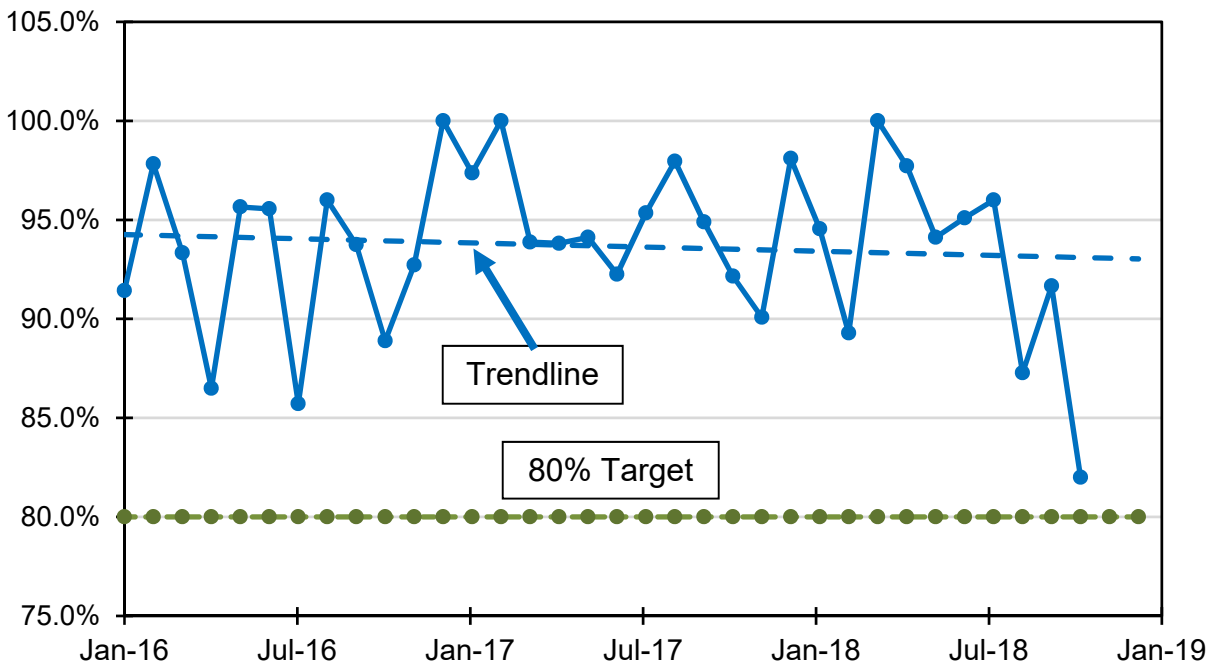


This implies that about one third of the influent phosphorus is “non-reactive” and not subject to chemical removal. But this is still a potential dosing location because of additional benefits to the plant outside of pure phosphorus removal.

Effluent Ratio

Through the treatment process (particular an activated sludge system) the “non-reactive” phosphorus (poly-phosphates) are broken down into orthophosphorus. This accounts for the higher percentage of the effluent total phosphorus being orthophosphorus. Thus, being more amenable to chemical removal.

The percentage of ortho phosphorus versus total phosphorus varies between 82% to 100% with an average of 88%, but this has been slowly declining over the last 3 years.



To ensure compliance with an annual average of 1.0 mg/L Total Phosphorus. A target of 0.8 mg/L (80%) Orthophosphorus was used in all the testing to ensure the ability to meet the 1.0 mg/L limit.

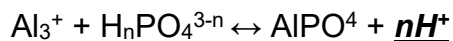
Example (82% being worst case)

$$\text{Total P } \frac{\text{mg}}{\text{liter}} \cong \frac{0.8 \frac{\text{mg}}{\text{liter}}}{82\% \frac{\text{op}}{\text{tp}}} \cong 0.98 \frac{\text{mg}}{\text{liter}}$$

This would meet the proposed permit limits

Aluminum as a Coagulant Considerations

Alum or hydrated aluminum is used precipitating phosphates and aluminum phosphates (AlPO₄). The simplified reaction is:

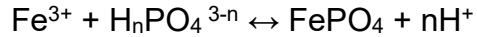


This reaction is actually not occurring above a pH of 6, so it is only used to show the impact on pH (nH⁺). There are many competing side reactions, effects on alkalinity, pH, colloidal solids need to be considered in actual applications. In practice, 80-90% removal rates can be achieved at coagulant dosage rates between 50 and 200 mg/L. High doses of Aluminum coagulants can adversely affect the microbial population in activated sludge, especially protozoa and rotifers, typically at dosage rates higher than 150 mg/L.

A Water Environment Research Foundation (WERF) study in 2010 found that when aluminum was added to WAS, a lower percentage of volatile solids destruction was observed. The decrease in volatile solids reduction is approximately 2 percent.

Iron as a Coagulant Considerations

Ferric chloride or sulphate and ferrous sulphate are all widely used for phosphorous removal, although the actual reactions are not fully understood. The basic reaction is:



This reaction is actually not occurring above a pH of 6, so it is only used to show the impact on pH ($n\text{H}^+$). There are many competing side reactions, effects on alkalinity, pH, colloidal solids need to be considered in actual applications.

Sampling Locations for Study

There are numerous chemical dosing locations that could be used by Payson. The three main options for chemical additions are.

1. Pre-precipitation - treatment of raw/primary influent
2. Side stream-precipitation - treatment of the higher concentrations in side streams
3. Post-precipitation - treatment of final effluent

Pre-precipitation

Application Point	Advantages	Disadvantages
Primary Clarifiers	Removes additional BOD & Solids Uses lower stoichiometric dose	Does not remove polyphosphates – converted in bioprocess Competing reactions decrease dose efficiency Removes alkalinity before nitrification More primary sludge production

While the removal of additional BOD and Solids would have the advantage of reducing the loadings on the aerator. The possible impacts of aluminum on volatile solids reduction along with the cost differential versus iron typically precludes dosing Aluminum salts at this location.

Side stream-precipitation

Application Point	Advantages	Disadvantages
Pressate and Digester Decant Return Line	<p>Reduces phosphorus load to liquid treatment process</p> <p>More stable operation for liquid treatment</p> <p>Optimal use of chemicals – can work at lower Molar ratios</p>	<p>Additional operational complexity</p> <p>Removes alkalinity before nitrification</p>

While this location would have the highest efficiency in both removal percentage and chemical usage Payson’s digester limitation of uncontrolled decant, the controls needed for this would precludes dosing at this location. A sample was taken of the digester overflow on August 15 (which may or may not have pressate in it). This sample had an Orthophosphorus of 17.2 mg/L. but since there is no way to measure the flow, the loading rate is unknown.

Post-precipitation

Application Point	Advantages	Disadvantages
Secondary Clarifiers	<p>Polyphosphates converted so most of phosphorus is available</p> <p>May help improve TSS removal in clarifiers</p>	<p>Removing alkalinity within the biological nitrification process</p> <p>MLSS increase with inerts</p> <p>More secondary sludge production</p>

The industry standard for meeting a 1.0 mg/L phosphorus limit is dosing into (before) the secondary clarifiers. The advantage to this is a single application point and through the return activated sludge (RAS) any remaining chemical will continue to react until exhausted. Given these facts, both Pre-precipitation in the raw influent. And Post-precipitation of the mixed liquor were chosen to for the study.

Theoretical Calculations

The stoichiometric amounts of for both aluminum and iron were calculated based upon following assumptions

Flow	Annual Ortho	Target Ortho	Removal %
2.00 MGD	3.60 mg/L	0.80 mg/L	80%

Pounds of orthophosphorus to be removed

$$P \frac{lbs}{day} = 8.34 \frac{lbs}{gal} \times 2.00 \text{ MGD} \times (3.60 - 0.80) \frac{mg}{L} \cong 47 \frac{lbs}{day}$$

Calculate the Weight of Ferric Chloride

$$\text{Ferric Chloride} \frac{lbs}{gal} = 8.34 \frac{lbs}{gal} \times \text{specific gravity Ferric Chloride}$$

From SDS sheet Hi-Valley Chemical

FeCl₃ specific gravity = 1.37

$$\text{Ferric Chloride} \frac{lbs}{gal} = 8.34 \frac{lbs}{gal} \times 1.37 \cong 11.43 \frac{lbs}{gal}$$

Calculate the Actual Metal in the Solution

$$\text{Iron} \frac{lbs}{gal} = 11.43 \frac{lbs}{gal} \times \text{percent metal}$$

From SDS sheet (14%)

$$\text{Iron} \frac{lbs}{gal} = 11.43 \frac{lbs}{gal} \times 14\% \cong 1.60 \frac{lbs}{gal}$$

Calculate Required Dose of Iron to Remove Phosphorus

$$\text{Dose Iron} \frac{lbs}{day} = \text{Phosphorus Removed} \frac{lbs}{day} \times \text{Weight Ratio}$$

Fe : P Weight Ratio = 1.8 : 1

$$\text{Dose Iron} \frac{lbs}{day} \cong 47 \frac{lbs}{day} \times 1.8 \cong 85 \frac{lbs}{day}$$

Finally Calculate Dosing Rate

$$\text{Dose FeCl}_3 \frac{gal}{day} \cong \frac{85 \frac{lbs}{day}}{1.60 \frac{lbs}{gal}} \cong 53 \frac{gal}{day}$$

This is just used as a starting basis, typically the required dose is often 4 to 5 times greater to account for side reactions and pH ranges.

Now looking at Weight of Aluminum Sulfate (Alum)

$$\text{Alum} \frac{\text{lbs}}{\text{gal}} \cong 11.13 \frac{\text{lbs}}{\text{gal}}$$

Aluminum in the Solution

Assume worst case (8%)

$$\text{Aluminum} \frac{\text{lbs}}{\text{gal}} = 11.13 \frac{\text{lbs}}{\text{gal}} \times 8\% \cong 0.89 \frac{\text{lbs}}{\text{gal}}$$

Dose of Aluminum to Remove Phosphorus

Al : P Weight Ratio = 0.87 : 1

$$\text{Dose Aluminum} \frac{\text{lbs}}{\text{day}} \cong 47 \frac{\text{lbs}}{\text{day}} \times 0.87 \cong 41 \frac{\text{lbs}}{\text{day}}$$

Stoichiometric Dosing Rate

$$\text{Dose } \text{Al}_2(\text{SO}_4)_3 \frac{\text{gal}}{\text{day}} \cong \frac{41 \frac{\text{lbs}}{\text{day}}}{0.89 \frac{\text{lbs}}{\text{gal}}} \cong 46 \frac{\text{gal}}{\text{day}}$$

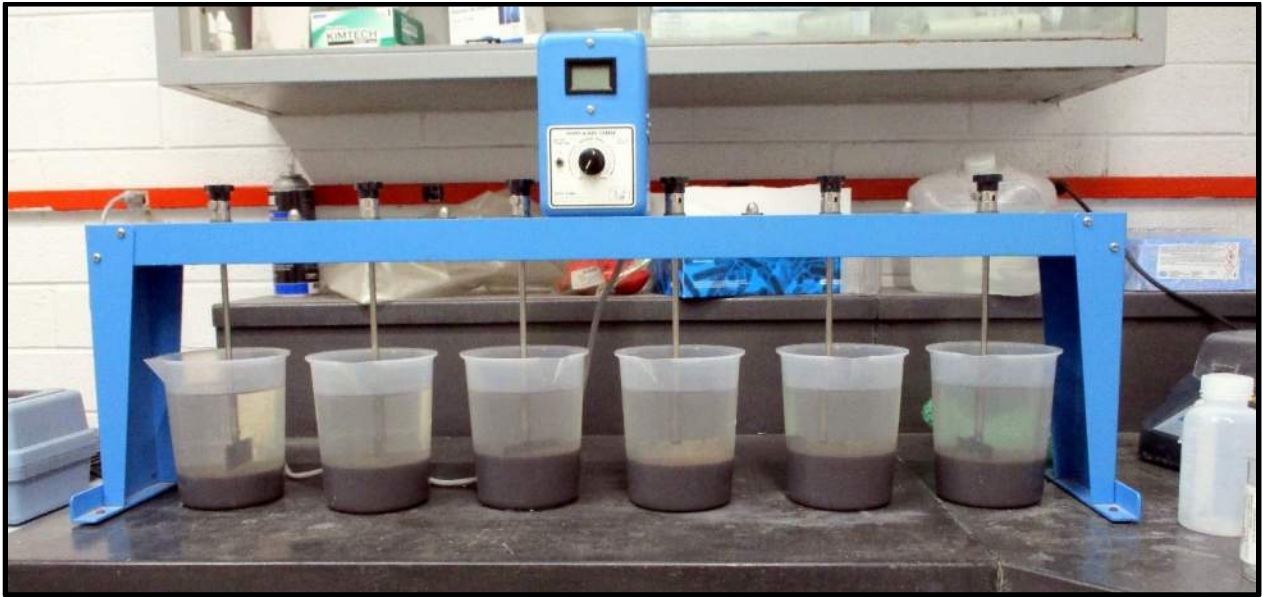
This is just used as a starting basis, typically the required dose is often 4 to 5 times greater to account for side reactions and pH ranges.

As shown from the jar testing these assumptions are nowhere near what was encountered onsite at the plant.

Testing Method

A series of jar tests were conducted to determine the approximate dosage necessary for effective phosphorus removal using a 6-gang stirrer.

Raw influent or mixed liquor samples were taken, then they were injected with varying chemicals and doses. Each sample was flashed mixed for five minutes at 100 rpm, then flocculated for 10 minutes at 20-25 rpm and allowed to settle for 30 minutes. The supernatant was then analyzed for ortho phosphorus and pH



+

Results

There were six different chemicals tested during study.

From ATS chemical

ATS 809
RE300 (two tests only as proof of concept)

From High-Valley Chemical

Ferric Chloride
Ferric Sulfate

From Thatcher chemical

Aluminum Sulfate
Sodium Aluminate

Both the Ferric Chloride and Ferric Sulfate were diluted to 50:1 ratio, and 100:1 ratio
While all other were diluted to a 100:1 ratio as a laboratory safety precaution

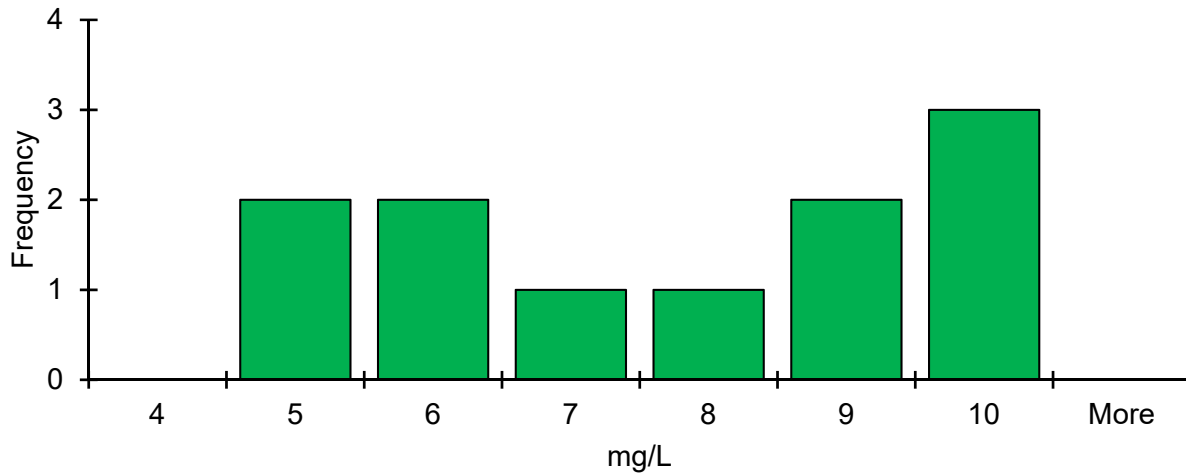
During these tests a total of 148 orthophosphorus samples were run at a variety of chemical concentrations.

Raw Influent

The raw was treated using either Ferric Chloride or Ferric Sulfate, no other chemicals were used on the raw sewage

Of the 11 separate raw grab samples, all of them had an orthophosphorus higher than expected two to three times higher than the compliance composite samples.

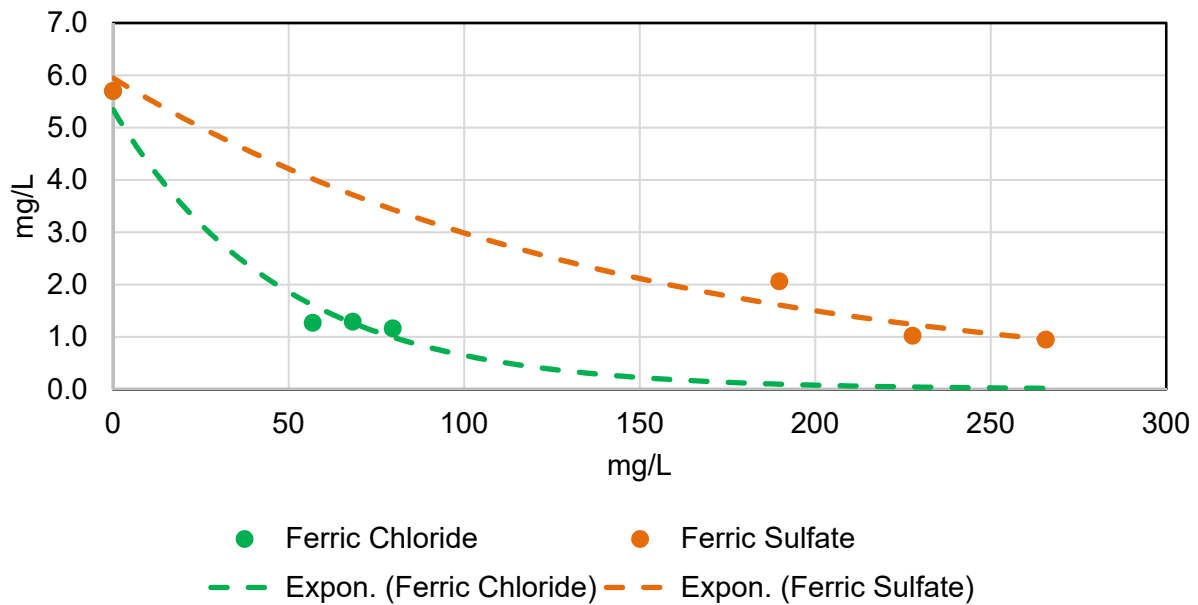
Influent Orthophosphorus Distribution



As shown, there was no discernable pattern to the influent orthophosphorus concentrations.

First run (8/26 - 10:00) using both Ferric Chloride and Ferric Sulfate (at 50:1)

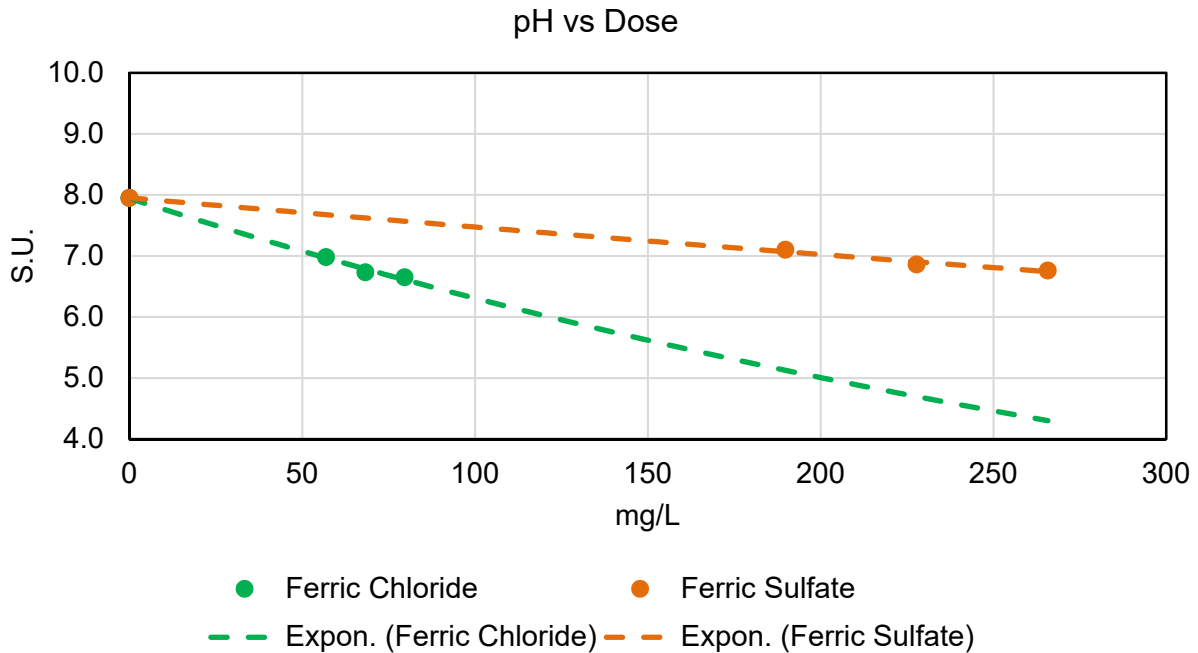
Orthophosphorus vs Dose



Estimating from, the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 5.70 mg/L would appear to suggest a dose of 90 mg/L of Ferric Chloride or a dose of 285 mg/L of Ferric Sulfate. While the Ferric Chloride dose is **realistic** the Ferric Sulfate is completely **unrealistic** from a cost standpoint.

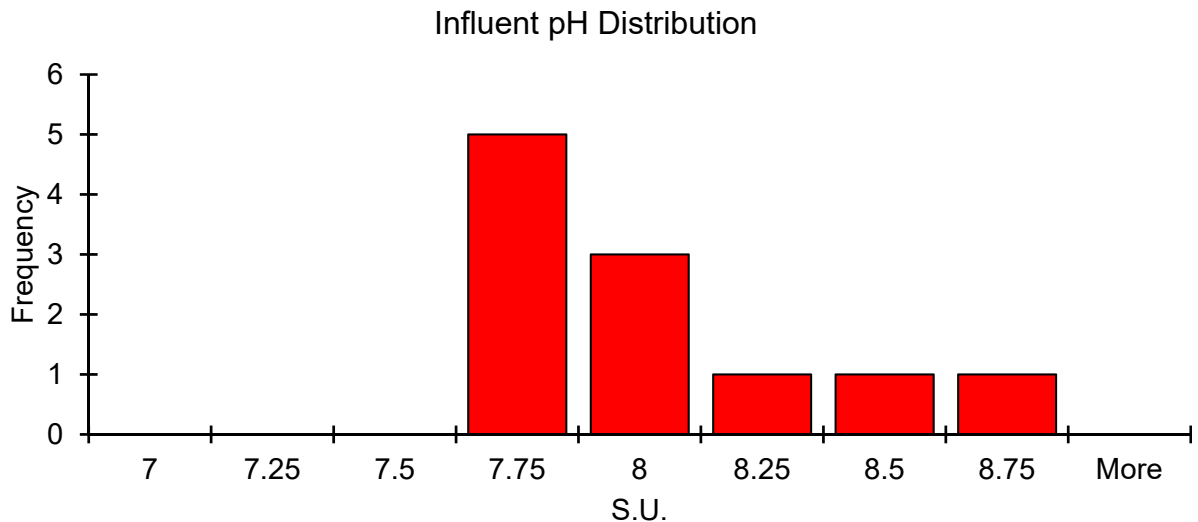
Payson high influent pH maybe contribution to this high demand. The optimal pH range for coagulation is 6 to 7 when using aluminum and 5.5 to 6.5 when using iron. For high alkalinity water, excessive amounts of coagulant may be needed to lower the pH to the optimal pH range.

Looking at the dose's impact on the pH



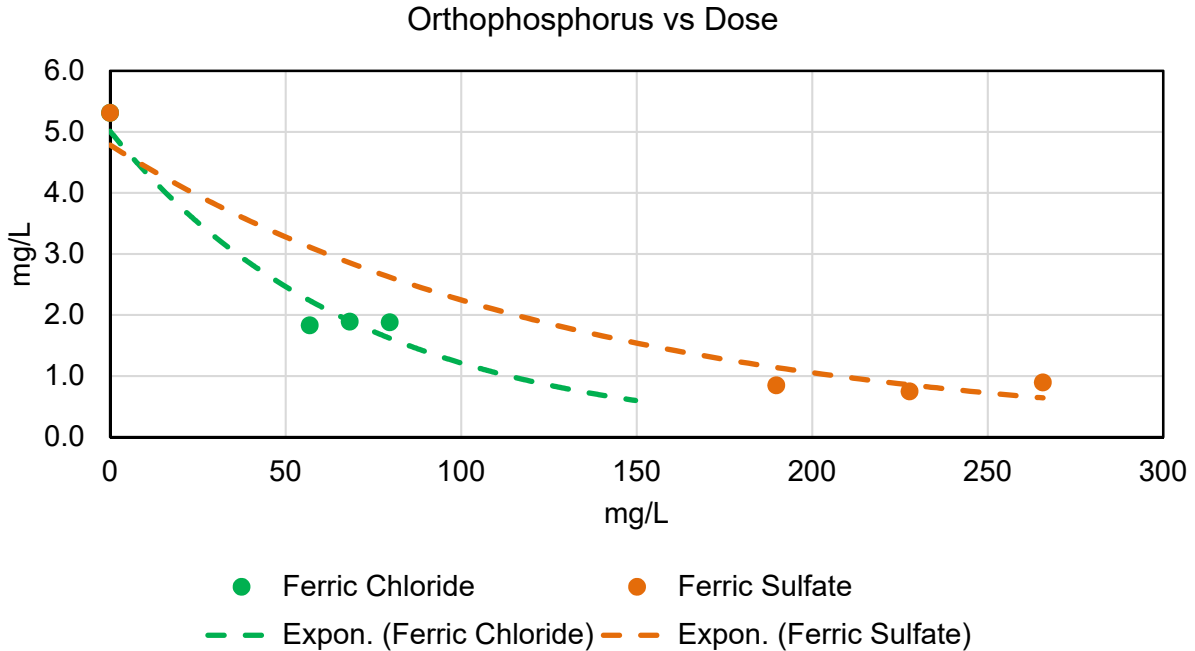
As you can see the Ferric Chloride suppresses the pH at a much lower dose.

Looking at the influent pH distribution at the time of sampling shows a high degree of alkalinity.



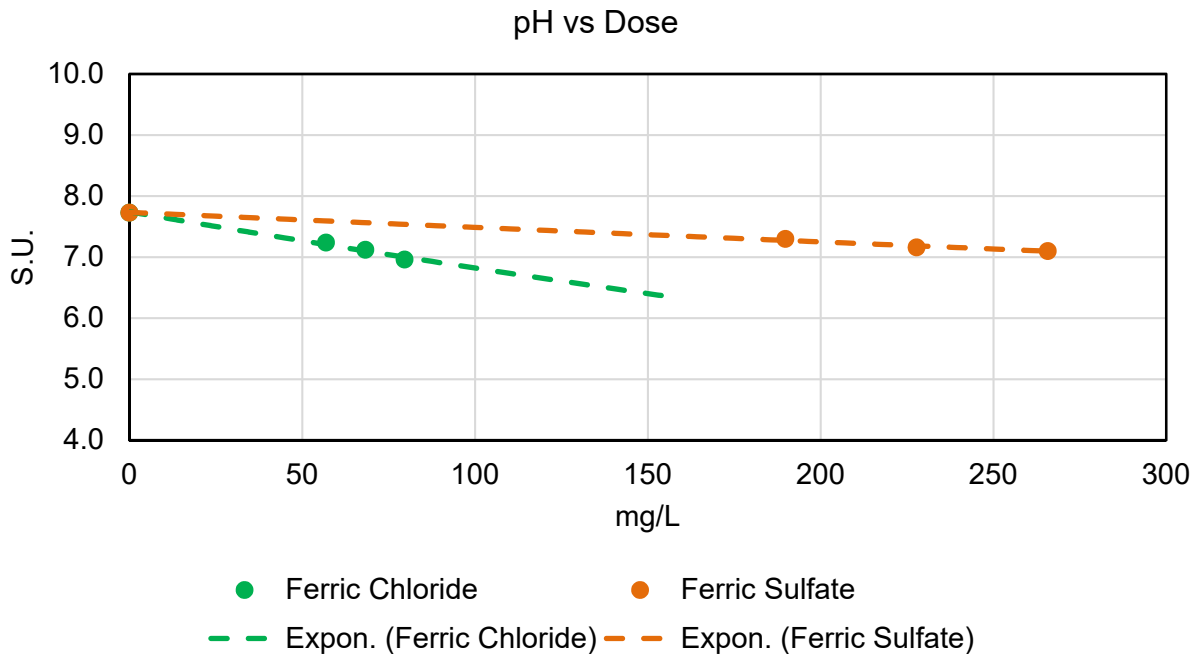
The influent pH ranges from 7.65 to 8.65 S.U. The higher the pH the more chemical will be needed to lower the pH to form the metal floc. This large of range will make optimizing the chemical usage difficult.

Second run (8/26 - 13:10) using both Ferric Chloride and Ferric Sulfate (at 50:1)

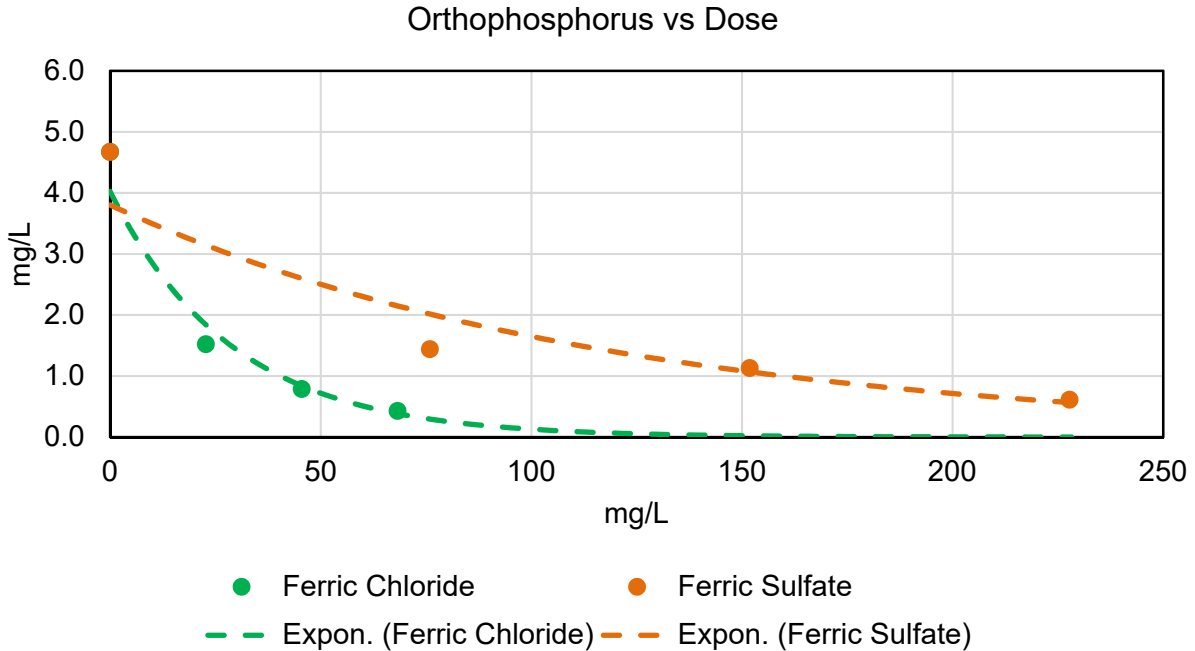


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 5.31 mg/L would appear to suggest a dose of 130 mg/L of Ferric Chloride or a dose of 215 mg/L of Ferric Sulfate. Again, these are completely **unrealistic** from a cost standpoint.

The impact of pH on dosage is shown by a small pH change (7.95 vs 7.73), reducing the amount of Ferric Sulfate need by 65 mg/L for nearly the same influent phosphorus (5.70 vs 5.31).

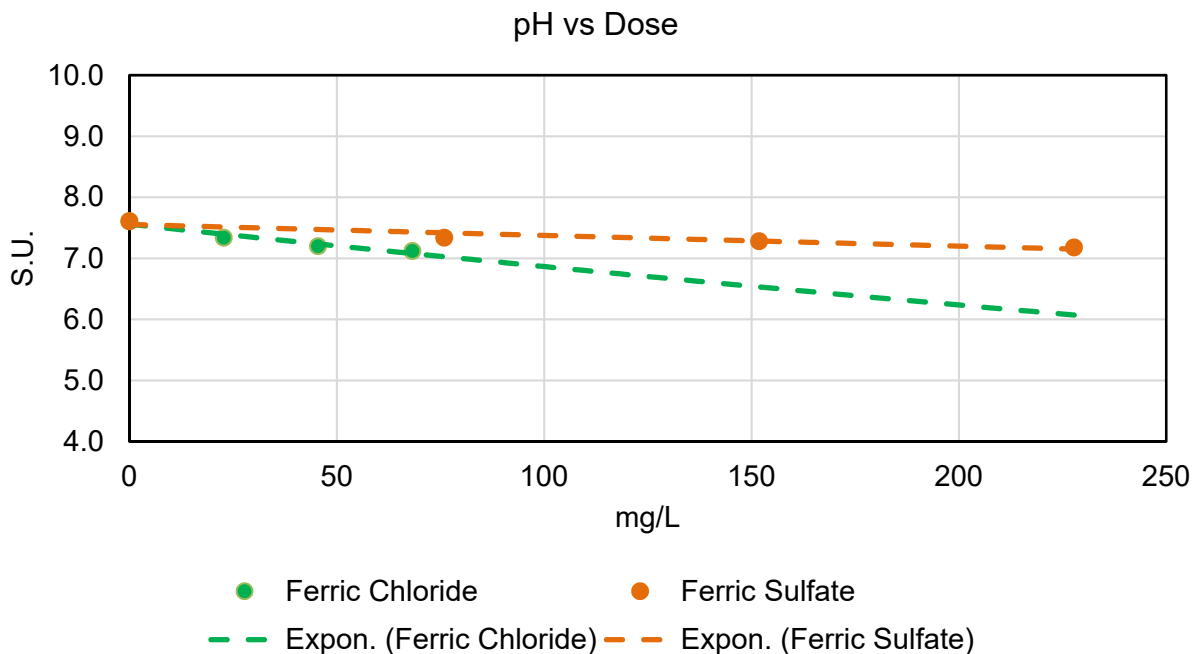


Third run (8/26 - 15:30) using both Ferric Chloride and Ferric Sulfate (at 50:1)

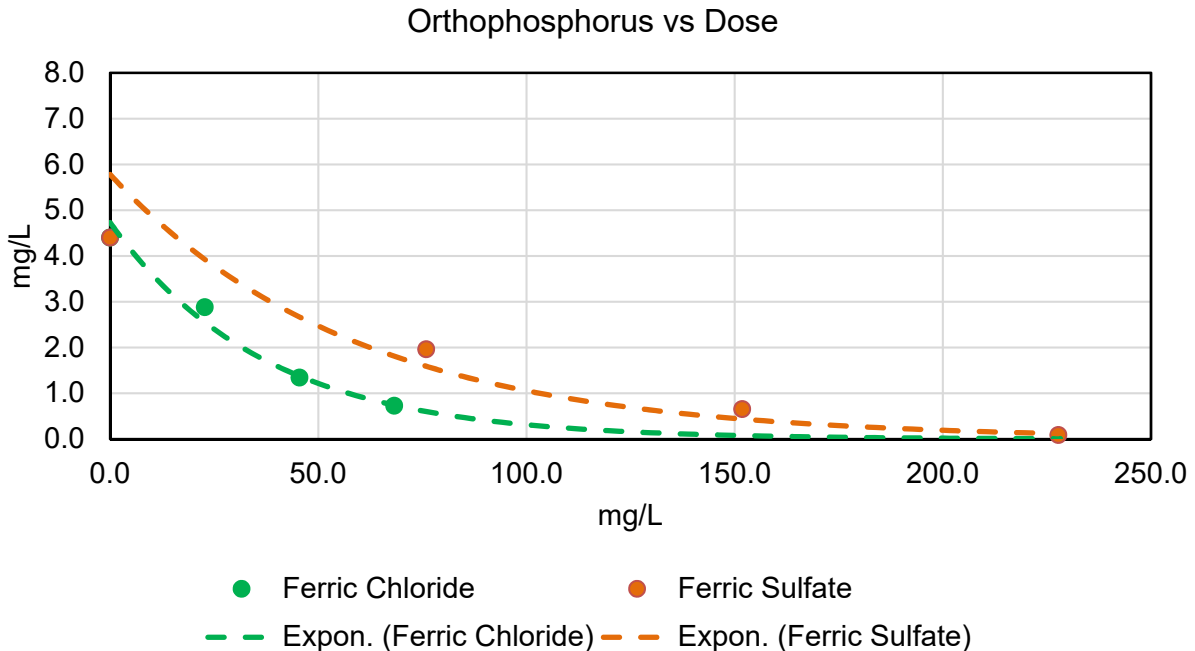


Estimating from the exponential **curve** fit the required dose to reach 0.80 mg/L from initial concentration 4.67 mg/L would appear to suggest a dose of 50 mg/L of Ferric Chloride or a dose of 195 mg/L of Ferric Sulfate. While the Ferric Chloride dose is **realistic** the Ferric Sulfate is completely **unrealistic** from a cost standpoint.

While the phosphorus was lower (4.67 vs 5.31), the impact of pH on dosage is shown by a small pH change (7.73 vs 7.61), reducing the amount of Ferric Chloride needed by 80 mg/L.

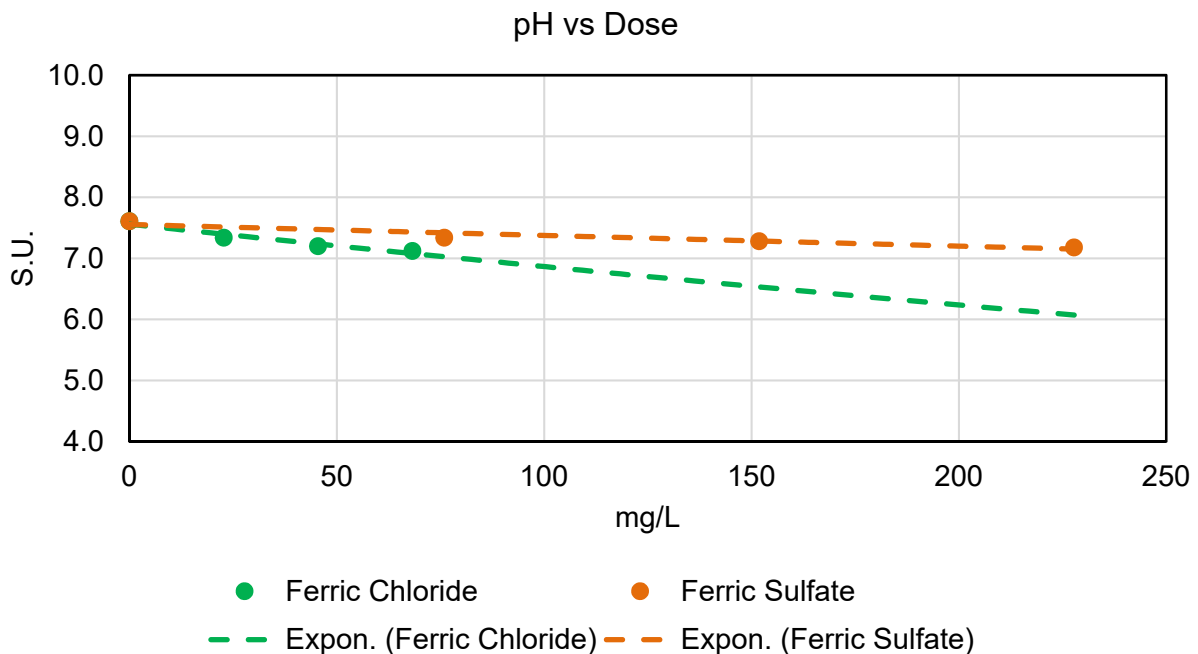


Fourth run (8/29 - 8:30) using both Ferric Chloride and Ferric Sulfate (at 50:1)

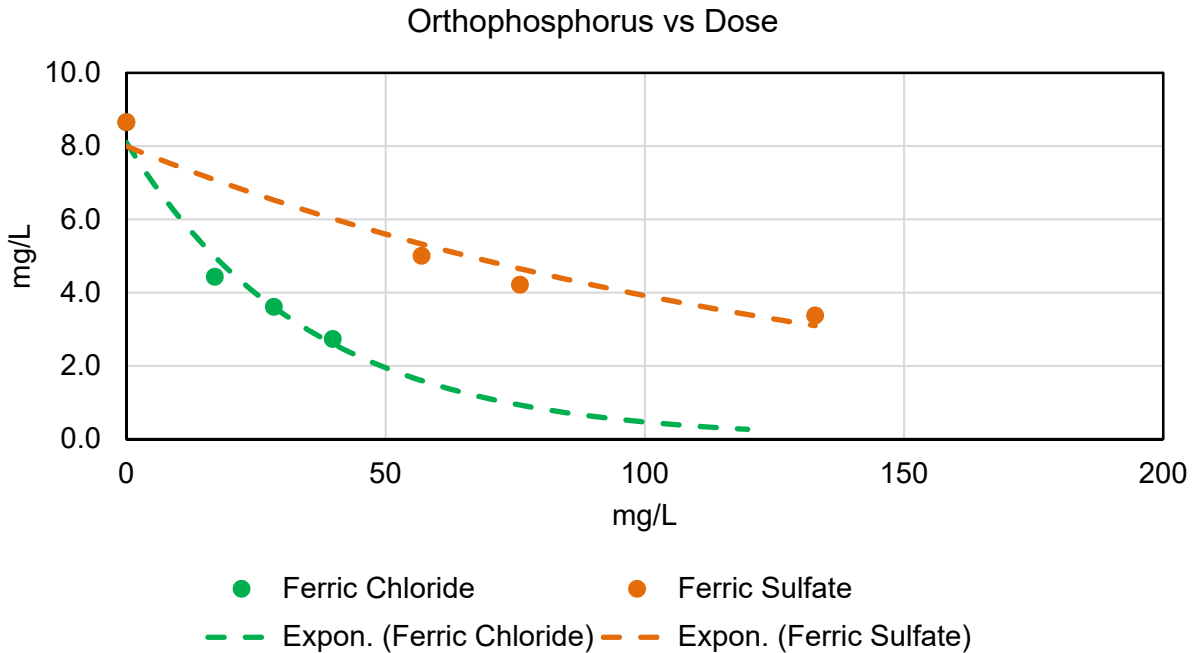


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 4.40 mg/L would appear to suggest a dose of 65 mg/L of Ferric Chloride or a dose of 115 mg/L of Ferric Sulfate. Both the Ferric Chloride and Ferric Sulfate doses is completely **realistic** from a cost standpoint.

While the phosphorus was lower (4.67 vs 4.40), the impact of pH on dosage is shown by a small pH change (7.61 vs 7.74), increased the amount of Ferric Chloride need by 15 mg/L.

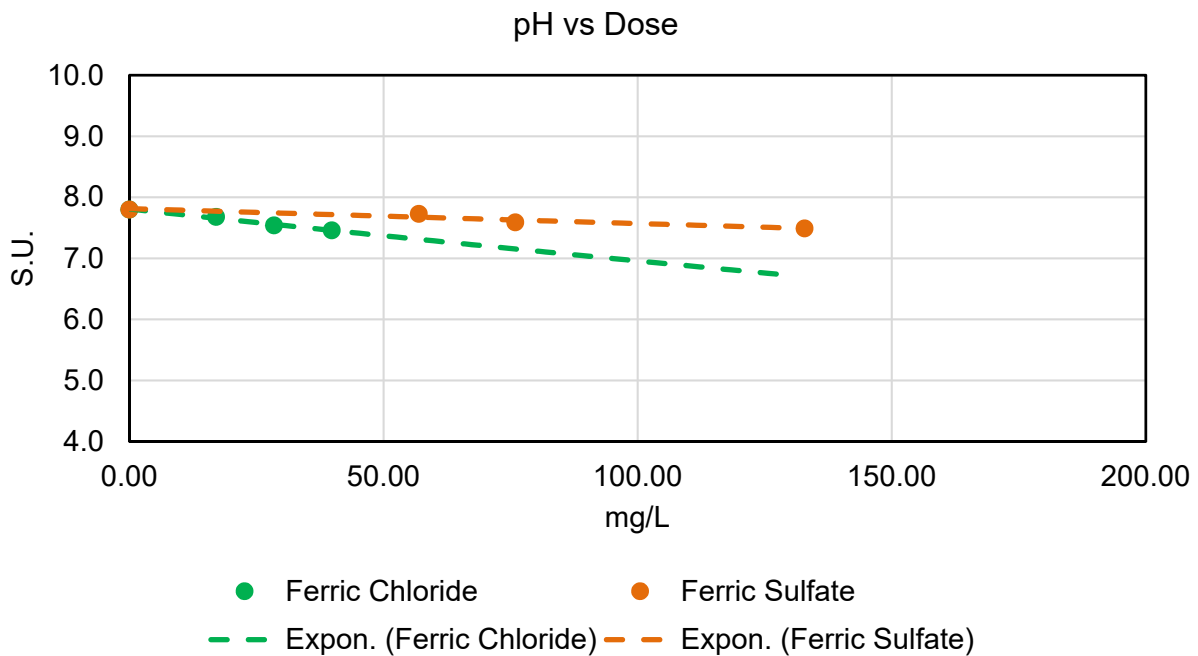


Fifth run (9/5 - 8:15) using both Ferric Chloride and Ferric Sulfate (at 100:1)

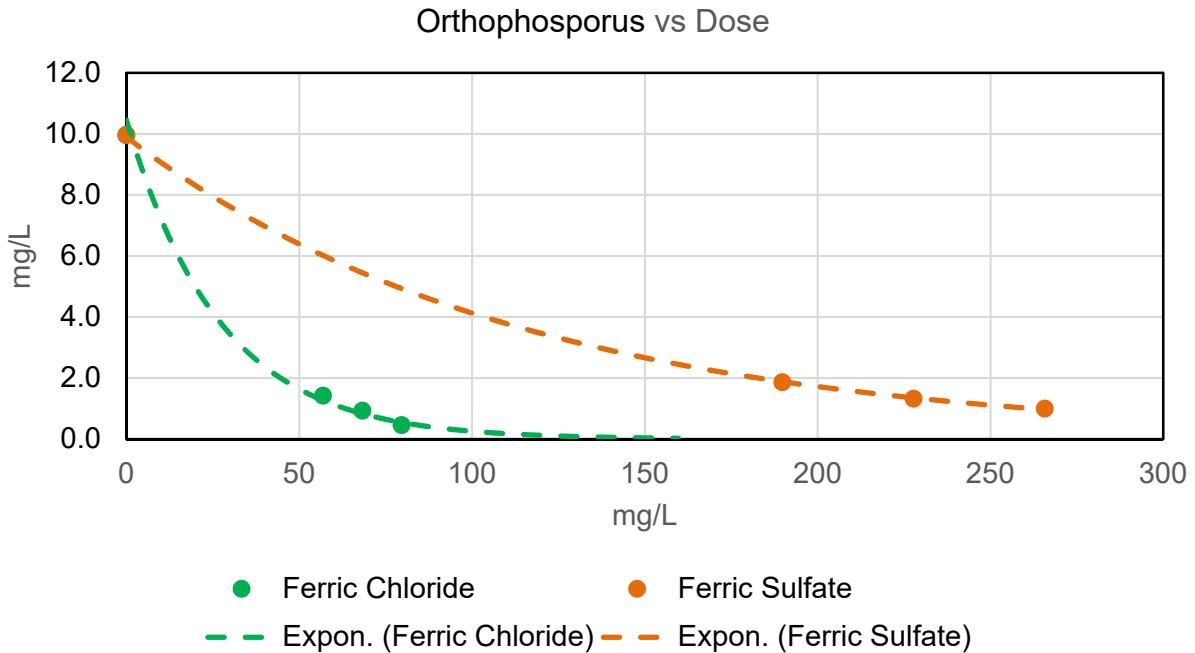


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 8.65 mg/L would appear to suggest a dose of 80 mg/L of Ferric Chloride or a dose of 330 mg/L of Ferric Sulfate. While the Ferric Chloride dose is **realistic** the Ferric Sulfate is completely **unrealistic** from a cost standpoint.

This was a sample where the influent phosphorus was high along with the pH being high, the worst-case scenario for dosing.

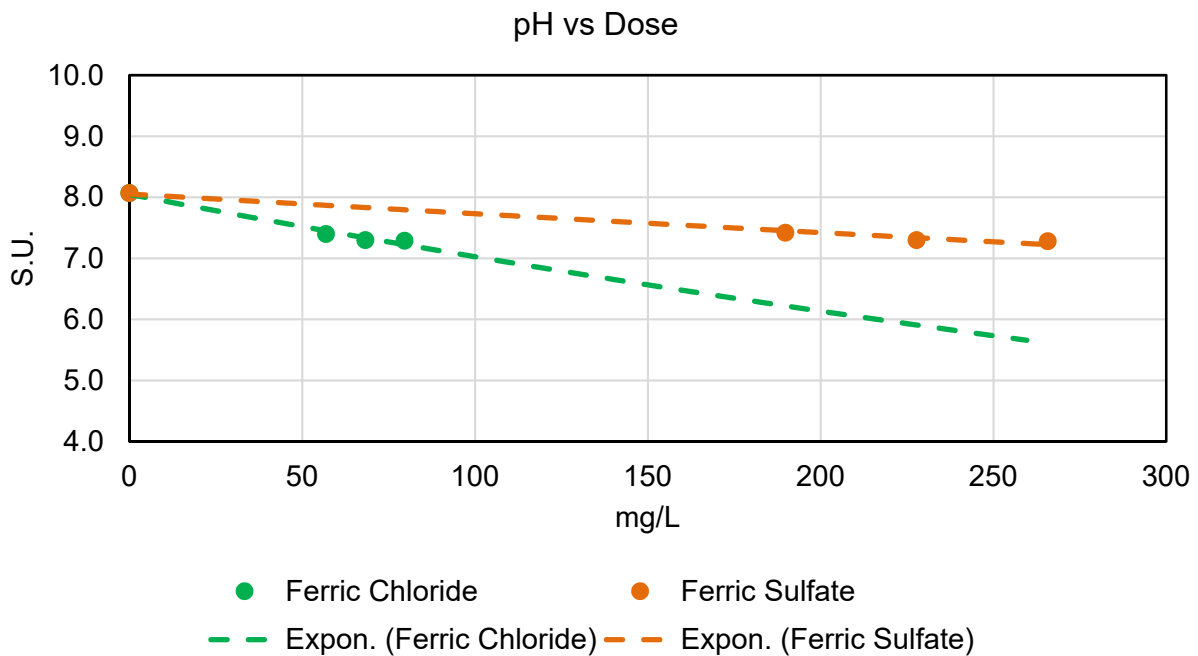


Sixth run (9/5 - 9:50) using both Ferric Chloride and Ferric Sulfate (at 100:1)

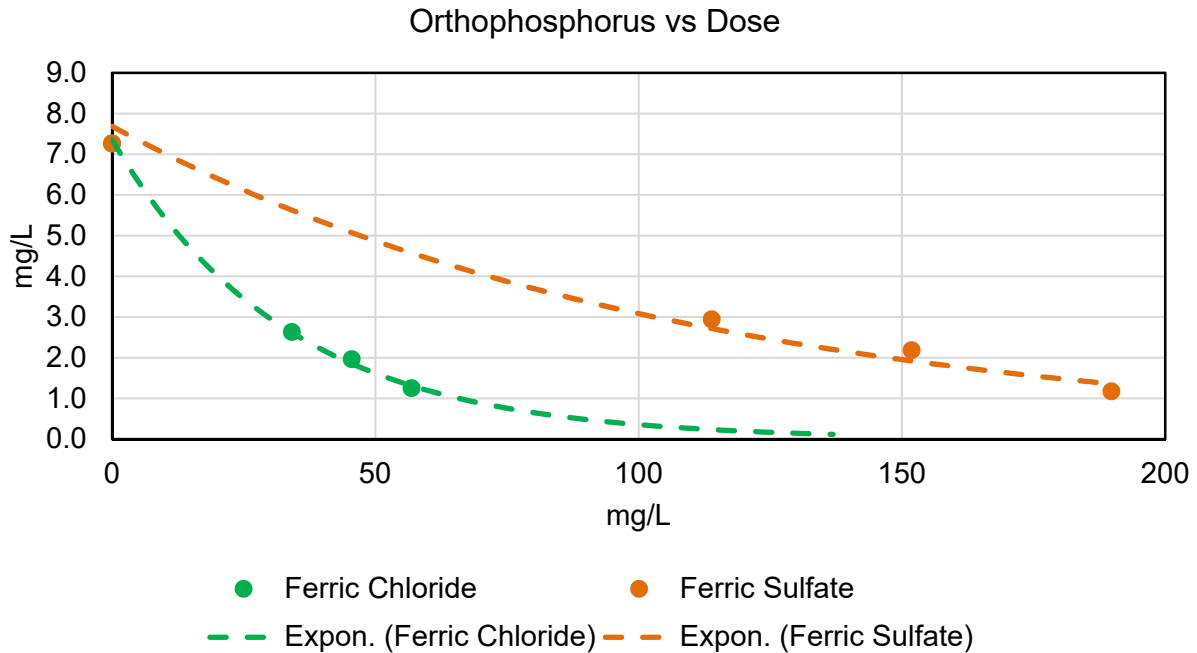


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 9.96 mg/L would appear to suggest a dose of 70 mg/L of Ferric Chloride or a dose of 280 mg/L of Ferric Sulfate. While the Ferric Chloride dose is **realistic** the Ferric Sulfate is completely **unrealistic** from a cost standpoint.

This was a sample where the influent phosphorus was high along with the pH being high, the worst-case scenario for dosing.

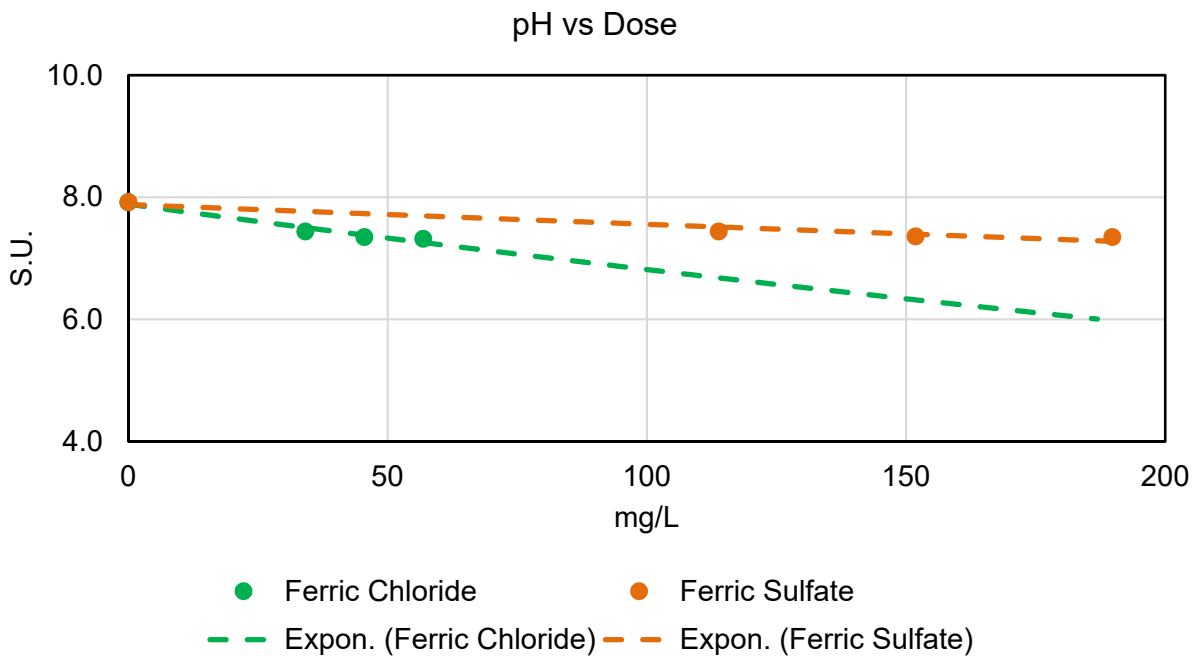


Seventh run (9/12 - 8:30) using both Ferric Chloride and Ferric Sulfate (at 100:1)

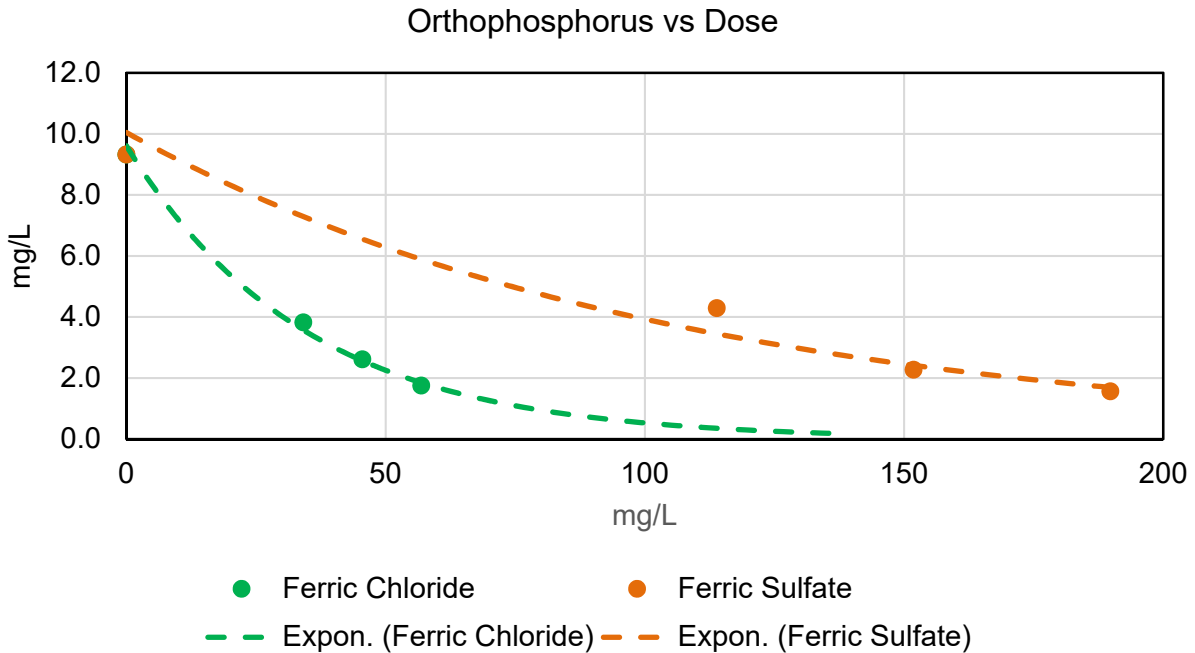


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 7.30 mg/L would appear to suggest a dose of 75 mg/L of Ferric Chloride or a dose of 250 mg/L of Ferric Sulfate. While the Ferric Chloride dose is **realistic** the Ferric Sulfate is completely **unrealistic** from a cost standpoint.

Again, this was a sample where the influent phosphorus was high along with the pH being high, the worst-case scenario for dosing.

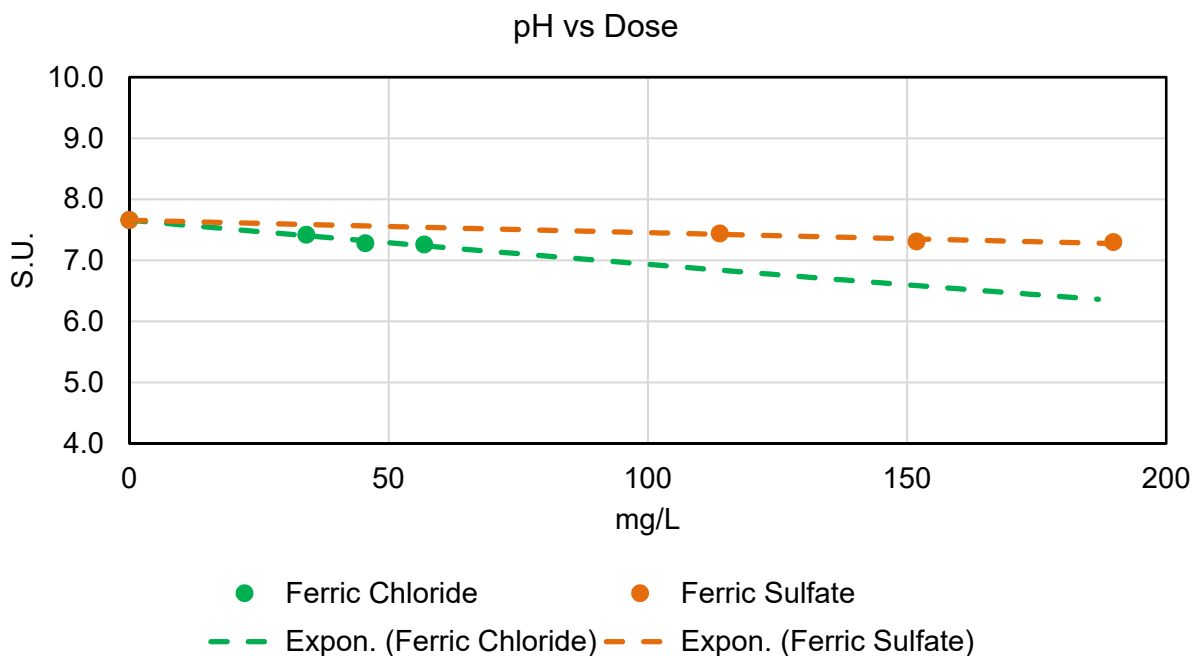


Eighth run (9/12 - 8:30) using both Ferric Chloride and Ferric Sulfate (at 100:1)

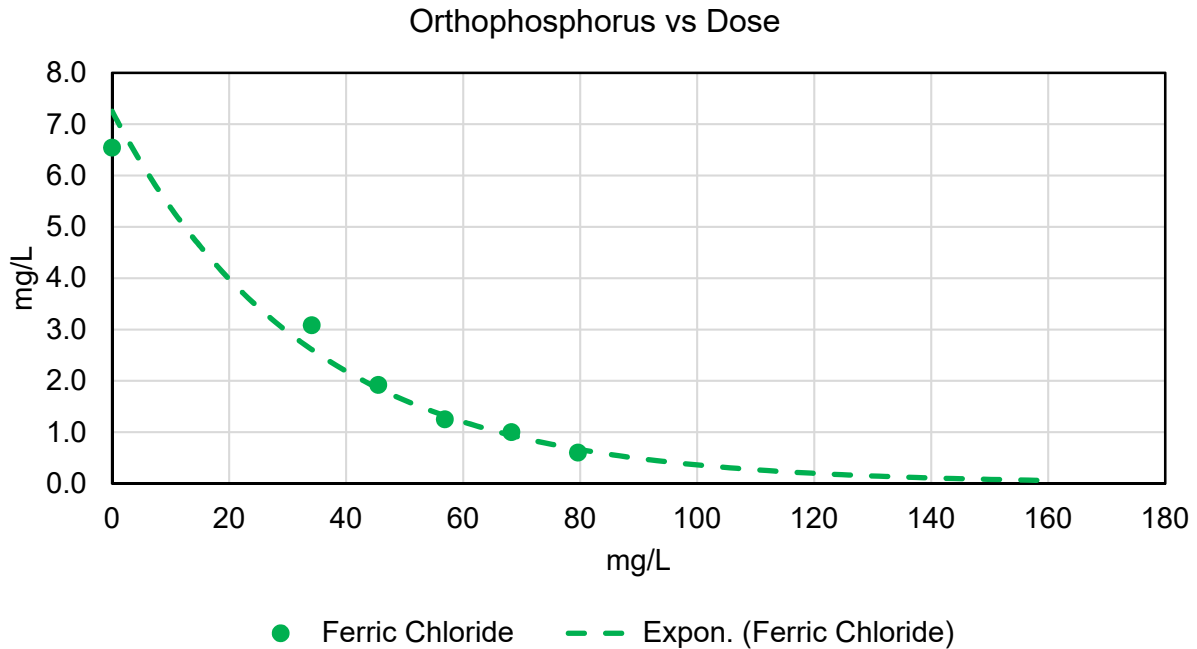


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 9.32 mg/L would appear to suggest a dose of 85 mg/L of Ferric Chloride or a dose of 280 mg/L of Ferric Sulfate. While the Ferric Chloride dose is **realistic** the Ferric Sulfate is completely **unrealistic** from a cost standpoint.

Again, this was a sample where the influent phosphorus was high along with the pH being high, the worst-case scenario for dosing.

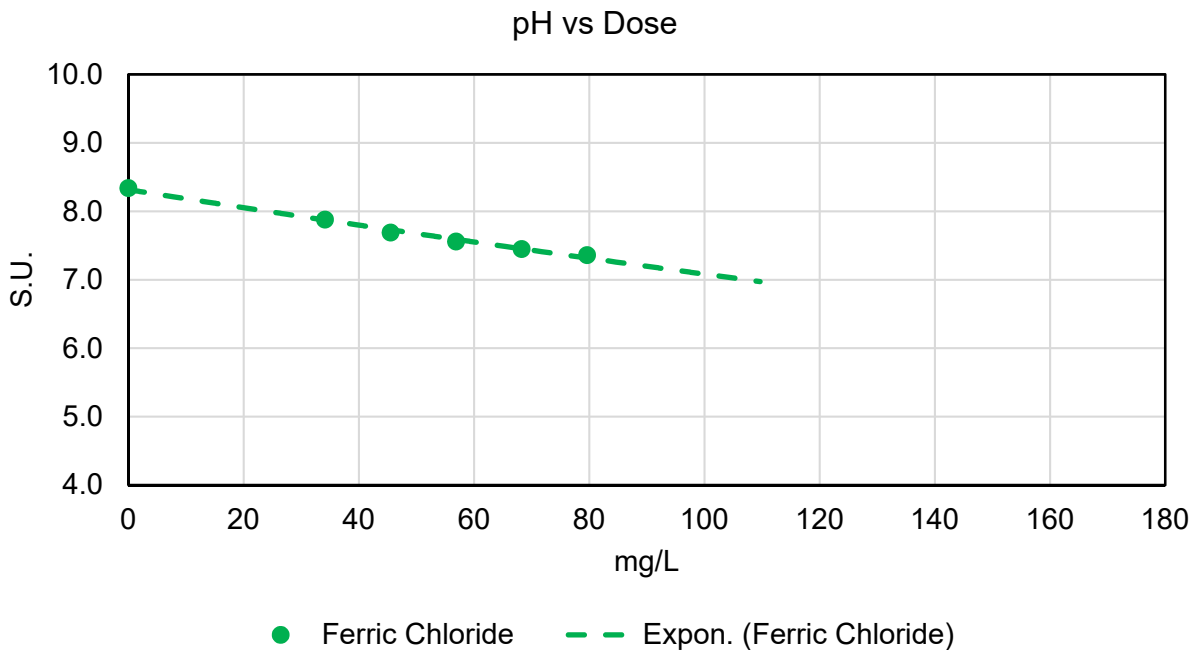


Ninth run (9/20 - 8:15) using only Ferric Chloride (at 100:1)

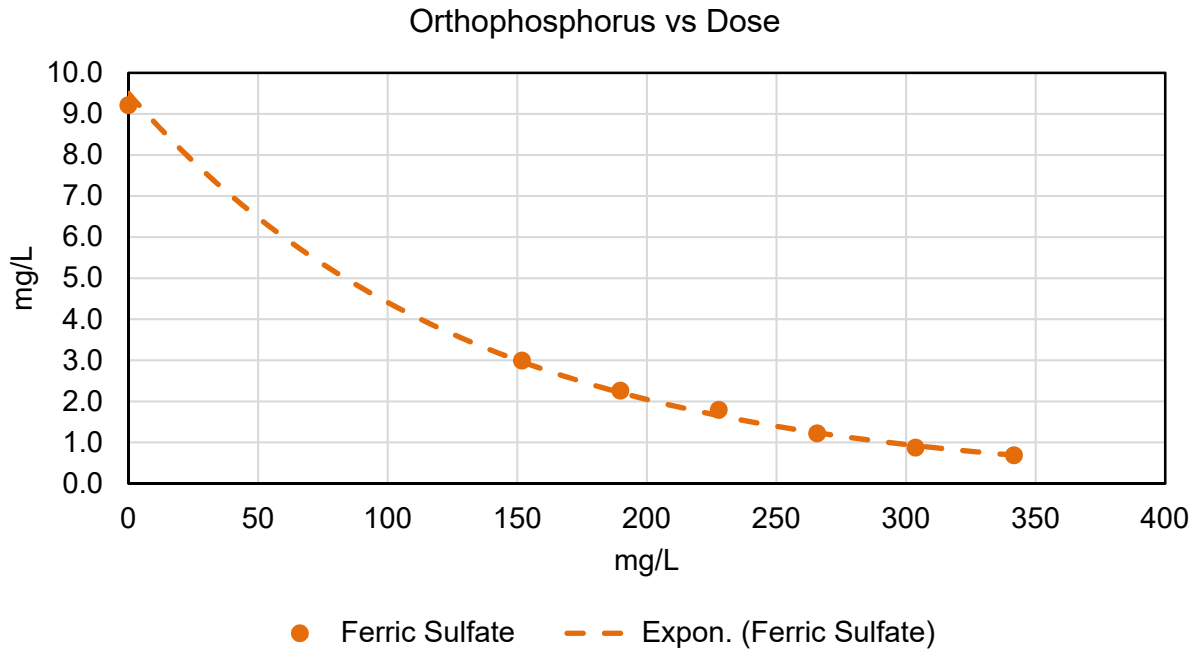


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 6.54 mg/L would appear to suggest a dose of 75 mg/L of Ferric Chloride. The dose on the Ferric Chloride is **reasonable** from a cost standpoint.

Again, this was a sample where the influent phosphorus was high along with the pH being high, the worst-case scenario for dosing.

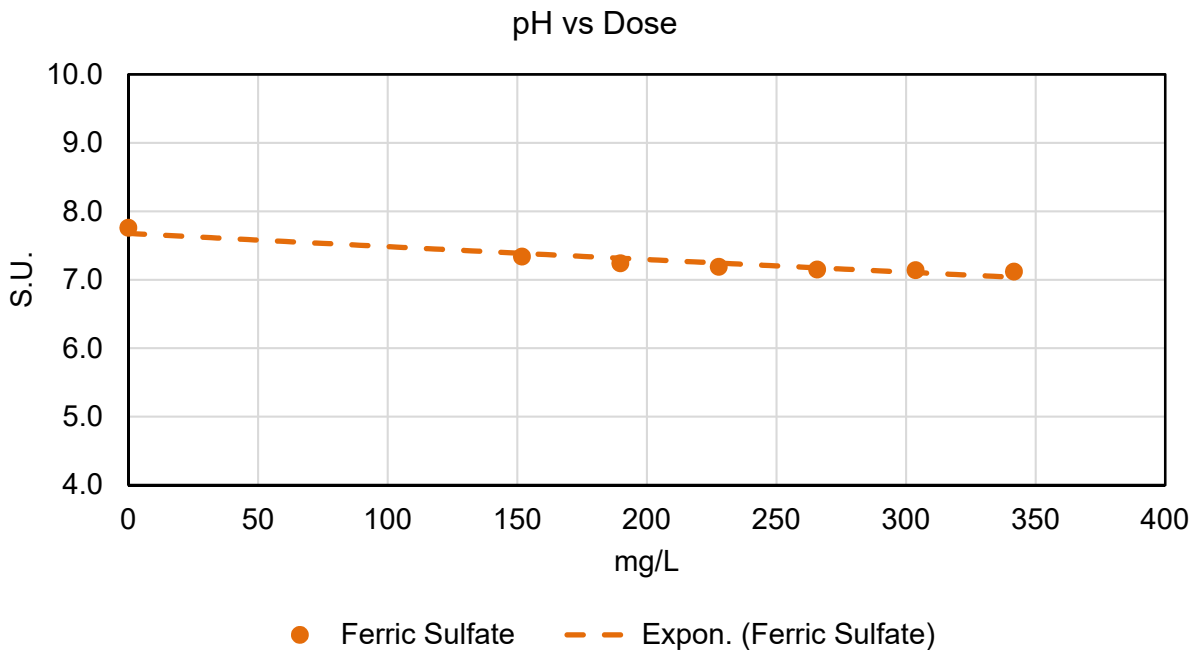


Tenth run (9/20 -10:00) using only Ferric Sulfate (at 100:1)

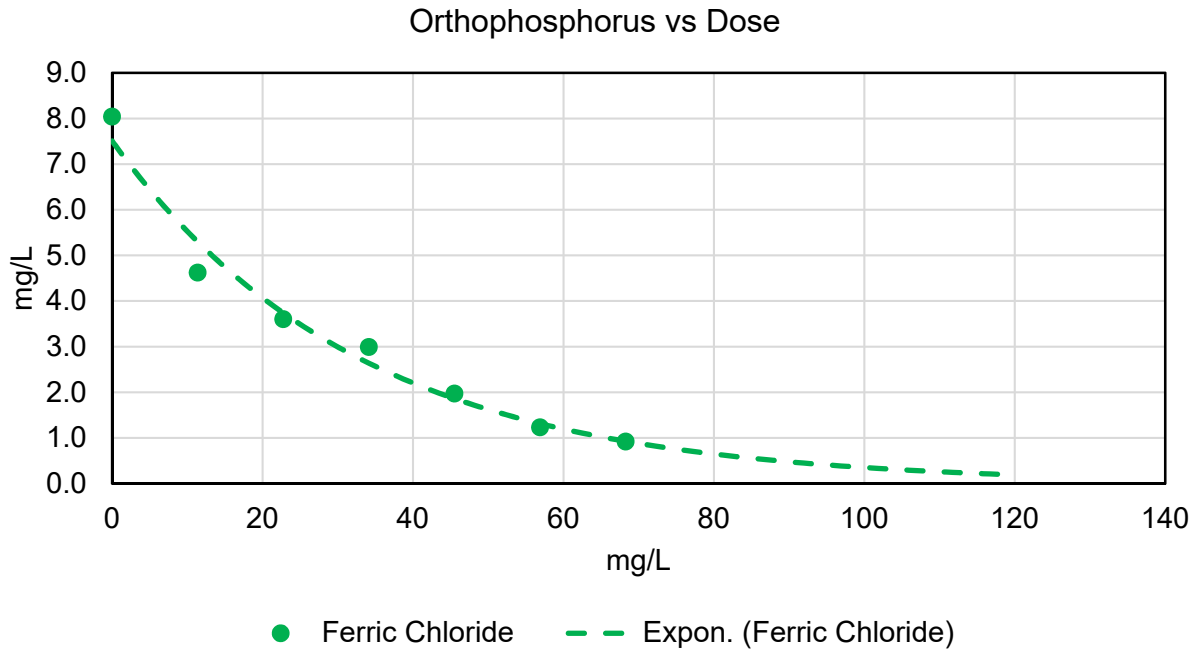


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 9.21 mg/L would appear to suggest a dose of 310 mg/L of Ferric Sulfate. The dose on the Ferric Sulfate is **unreasonable** from a cost standpoint.

Again, this was a sample where the influent phosphorus was high along with the pH being high, the worst-case scenario for dosing.

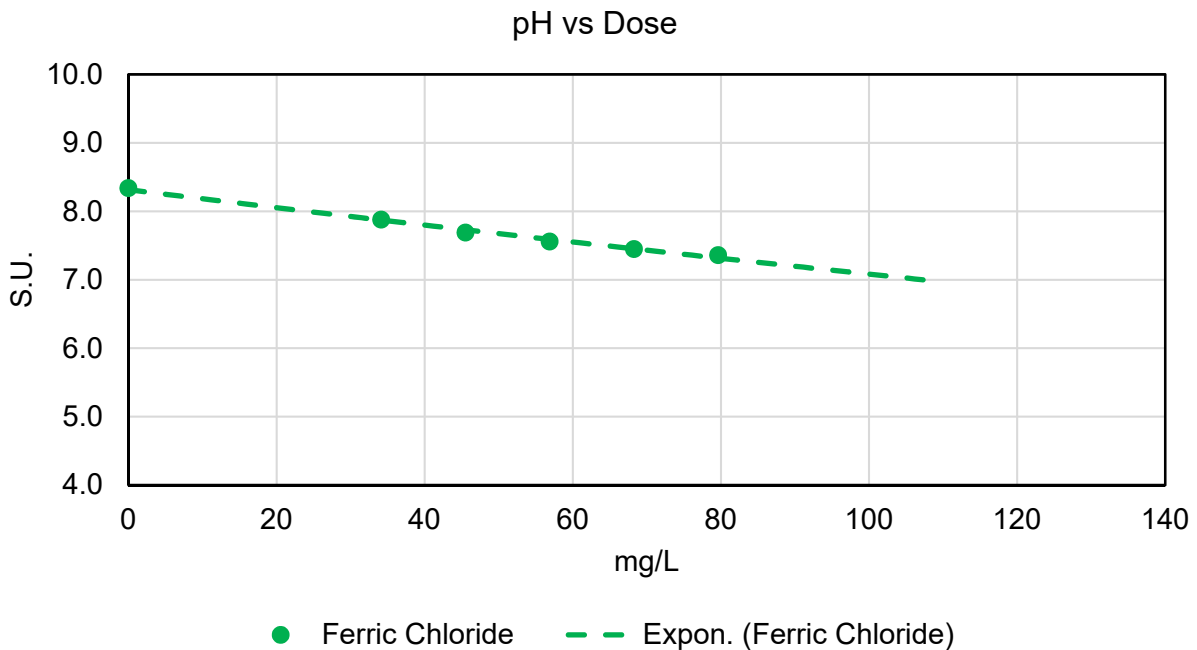


Eleventh run (10/8 -9:15) using only Ferric Chloride (at 100:1)

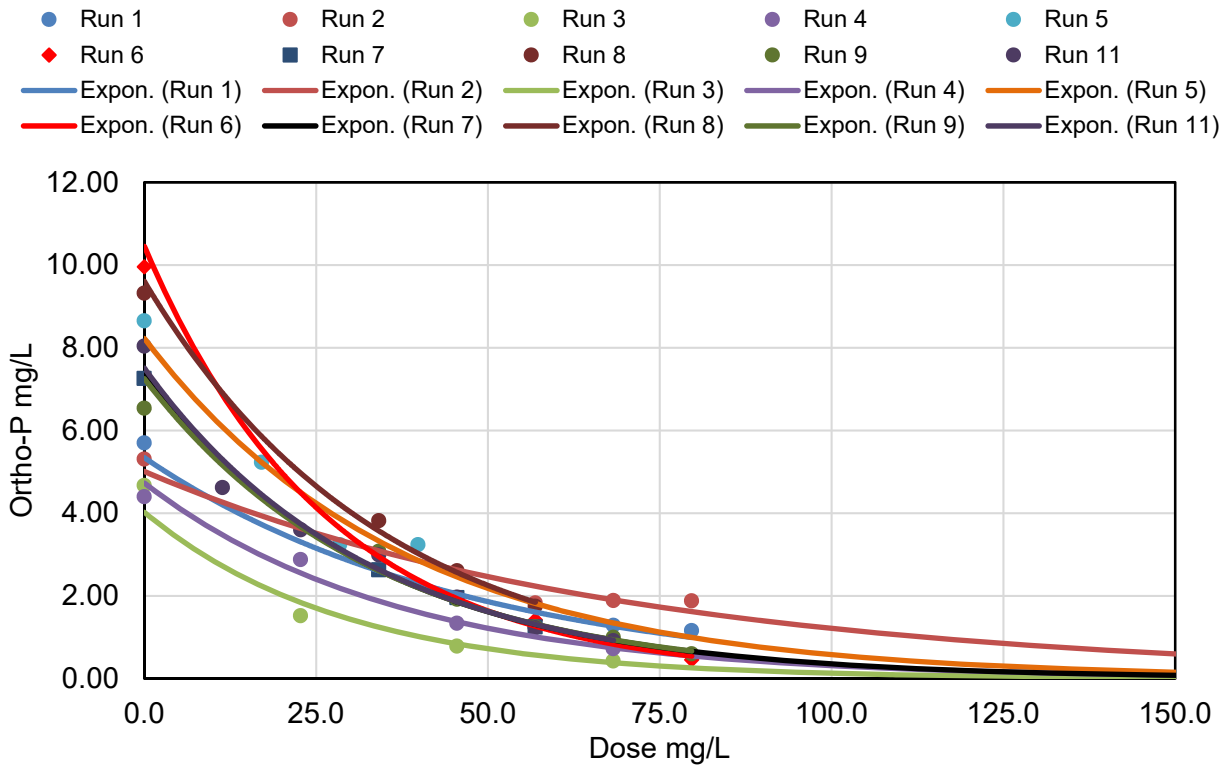


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 8.04 mg/L would appear to suggest a dose of 75 mg/L of Ferric Chloride. The dose on the Ferric Chloride is **reasonable** from a cost standpoint.

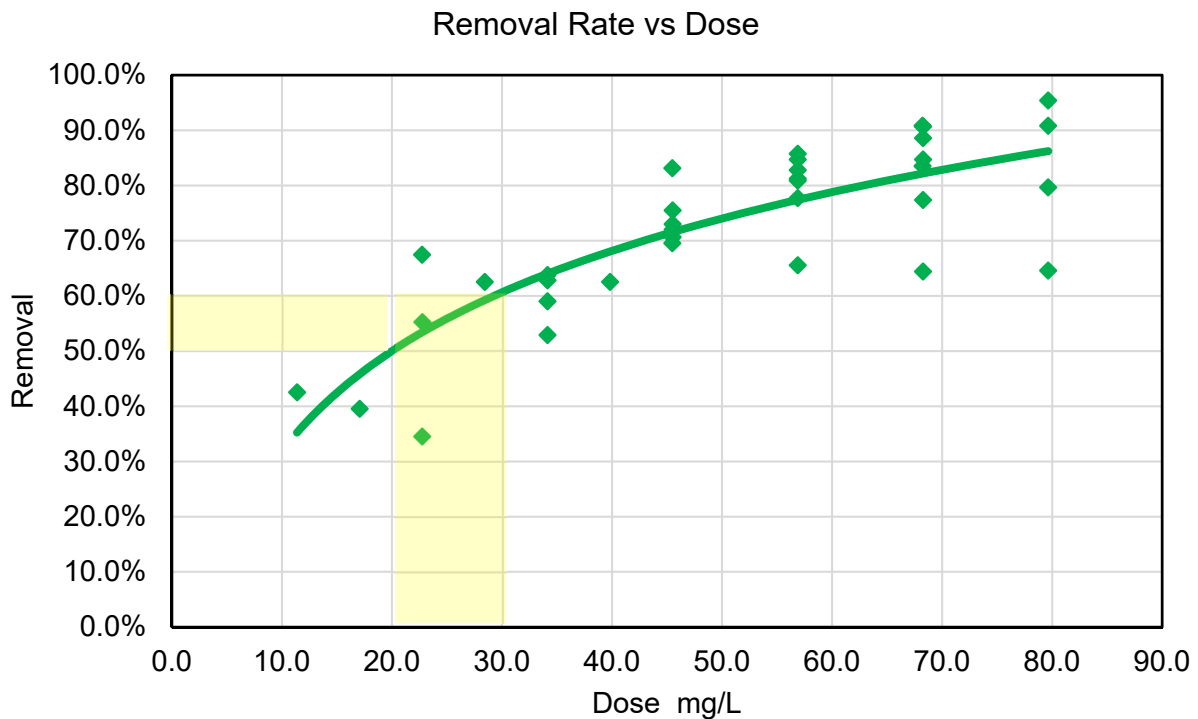
Again, this was a sample where the influent phosphorus was high along with the pH being high, the worst-case scenario for dosing.



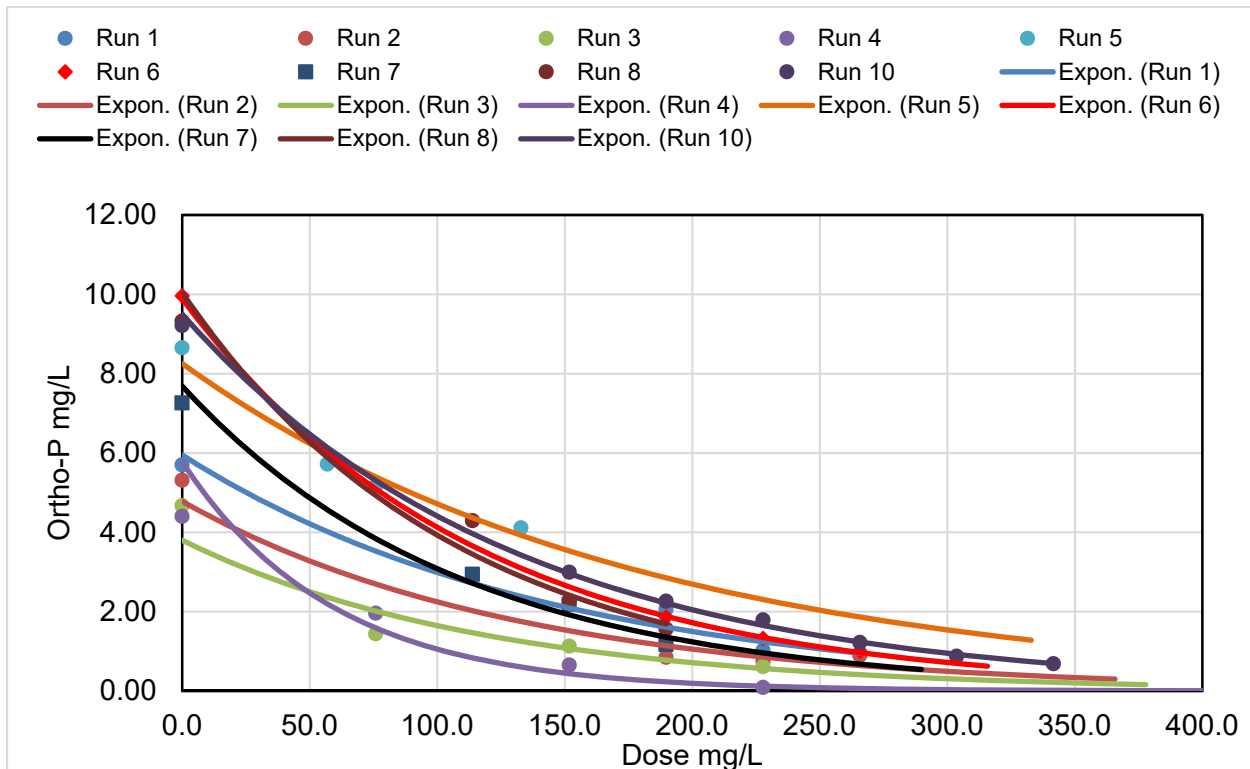
Compiling all of the exponential trendlines of the Ferric Chloride samples as a visual check on repeatability gives the following graph.



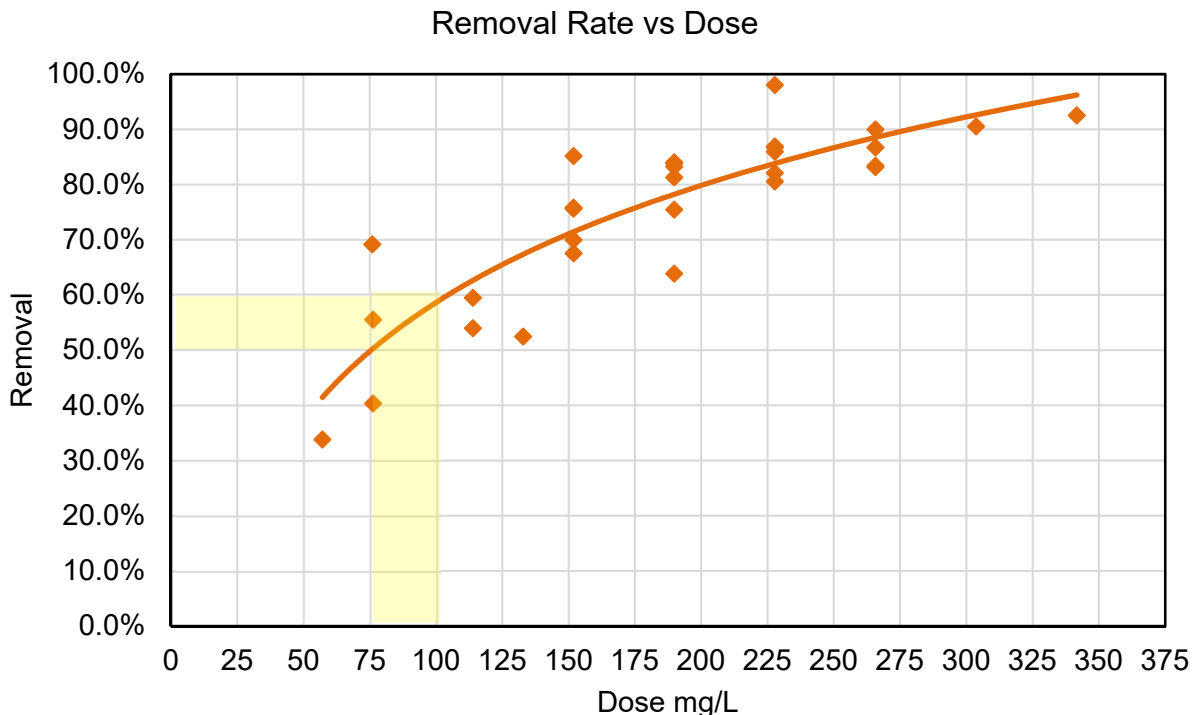
It is more interesting to look at the percent removal versus the dose. This graph tends to lead to a recommendation of a dose of between 20-30 mg/L of Iron from Ferric Chloride to target between 50-60% removal in the primaries of the “Orthophosphorus”. This would still require additional aluminum addition after the Aerotor’s but at a much lower dosing rate.



Compiling all of the exponential trendlines of the Ferric Sulfide samples as a visual check on repeatability gives the following graph.



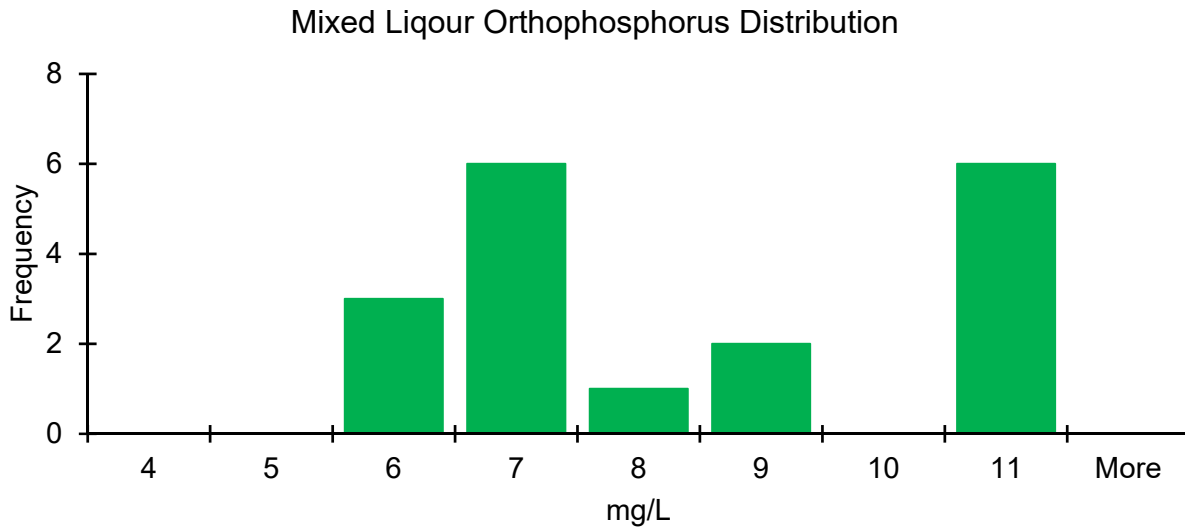
It is more interesting to look at the percent removal versus the dose. This graph tends to lead to a recommendation of a dose of between 75-100 mg/L of Iron from Ferric Chloride to target between 50-60% removal in the primaries of the “Orthophosphorus”. This would still require additional aluminum addition after the Aerotor’s but at a much lower dosing rate.



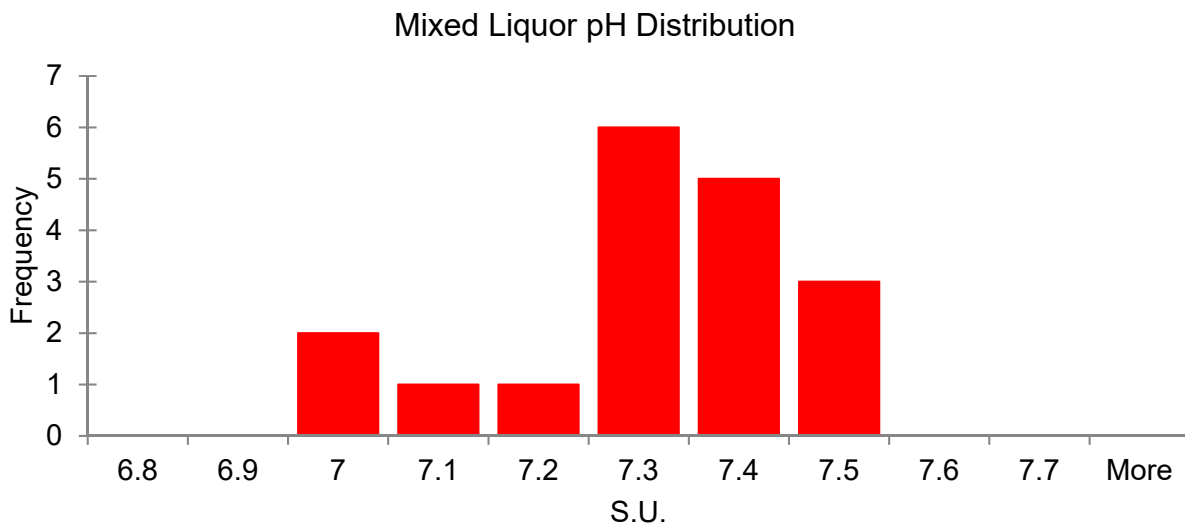
Mixed Liquor

The Mixed Liquor was treated using Ferric Chloride, Ferric Sulfate, ATS 809, Aluminum Sulfate Sodium Aluminate and RE300 (proof of concept)

Of the 18 separate mixed liquor grab samples, all of them had an orthophosphorus higher than expected two to three times higher than the compliance composite samples.

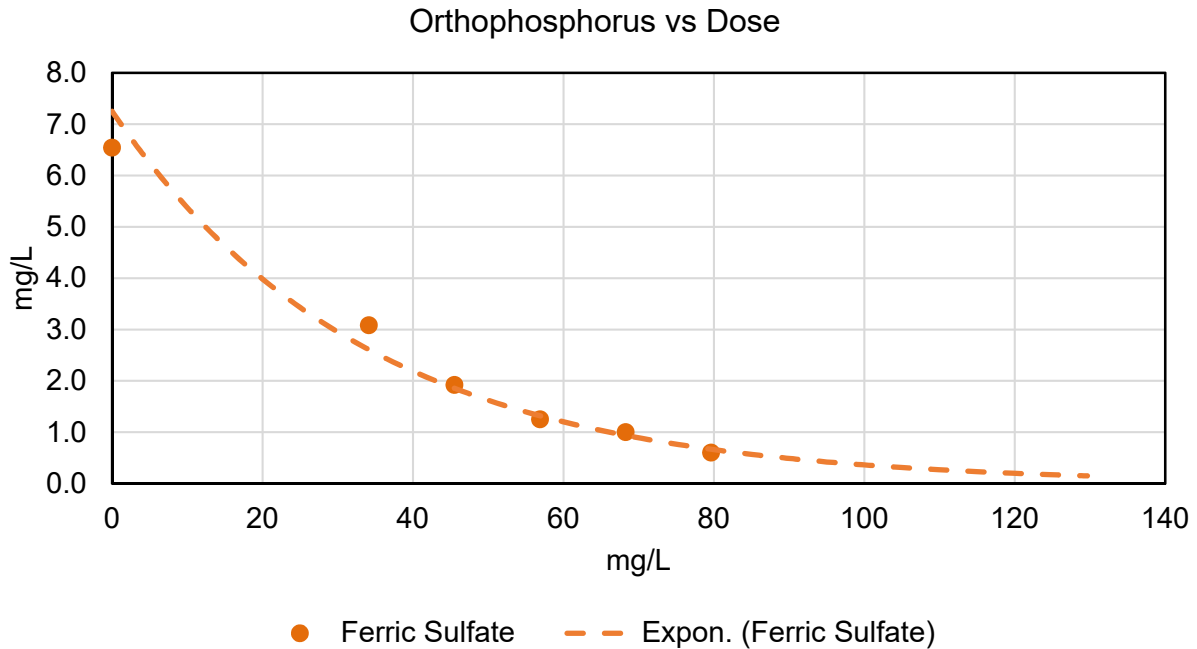


As with the influent orthophosphorus, there was no discernable pattern to the mixed liquor orthophosphorus concentrations. This indicates that close monitoring of the orthophosphorus to optimize the chemical dosing.



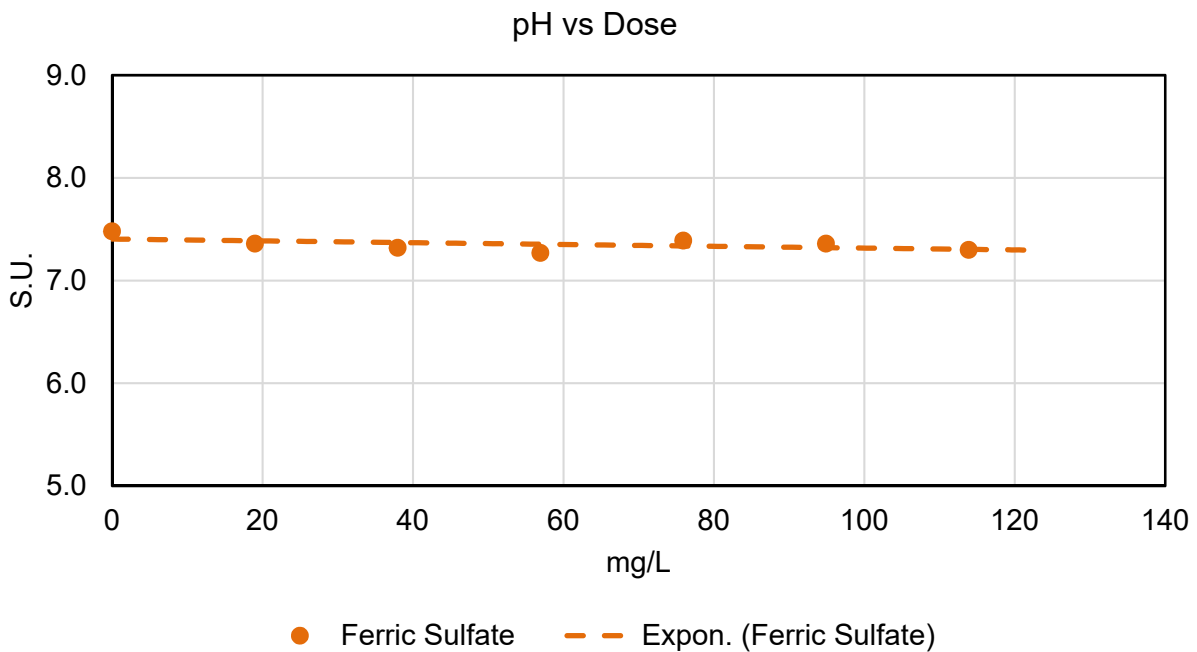
The activated sludge pH ranges from 6.91 to 7.48 S.U. This is lower than the influent pH as expected due to nitrification. The higher the pH the more chemical will be needed to lower the pH to form the metal floc. Again, this large of range will make optimizing the chemical usage difficult.

First run (7/31 – 8:05) using Ferric Sulfate (at 50:1)

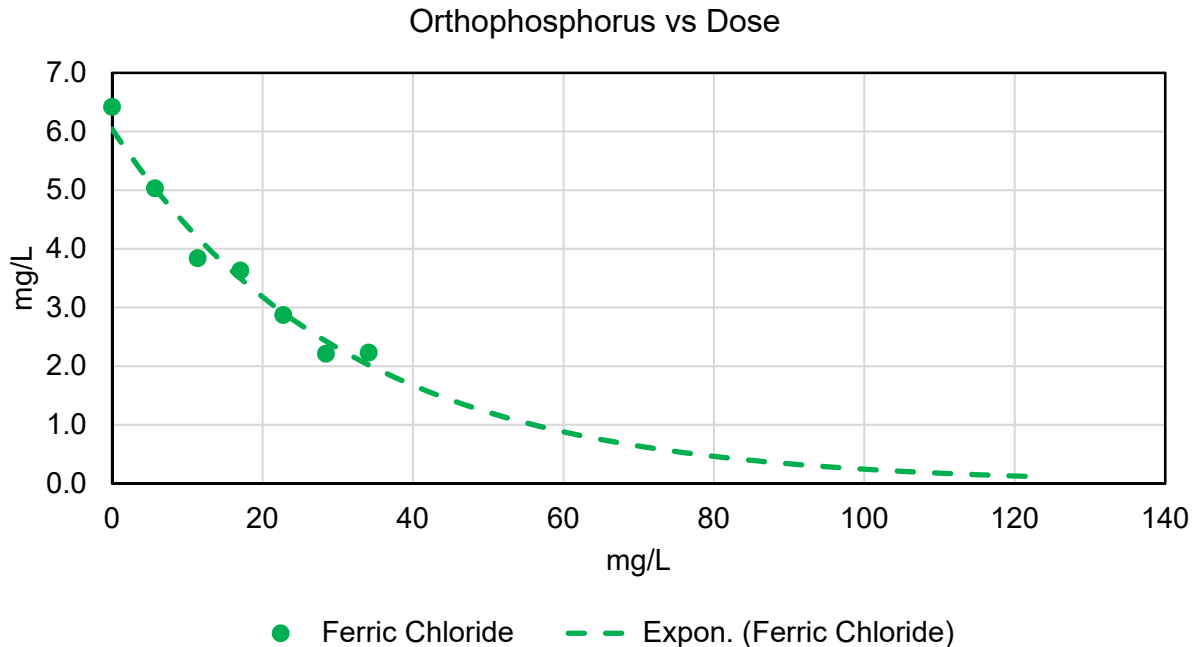


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 6.42 mg/L would appear to suggest a dose of 75 mg/L of Ferric Sulfate. This is completely **realistic** from a cost standpoint, but will not be available as an option after Payson goes to ultraviolet disinfection.

The impact of Ferric Sulfate on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance

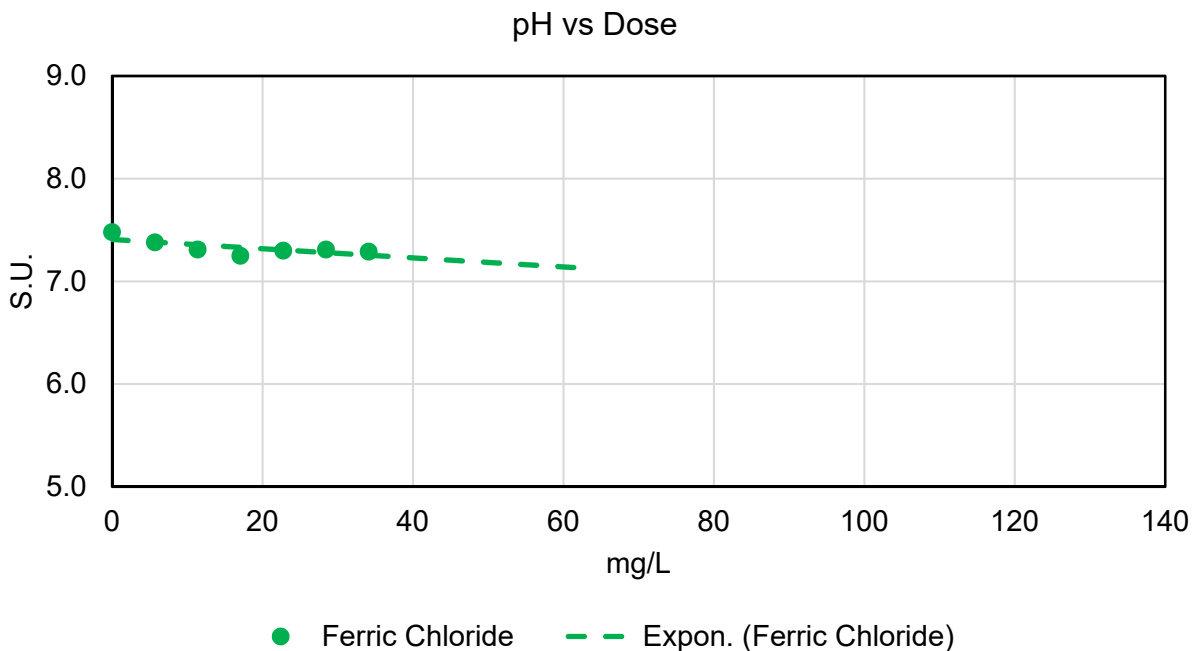


Second run (7/31 – 9:45) using Ferric Chloride (at 50:1)

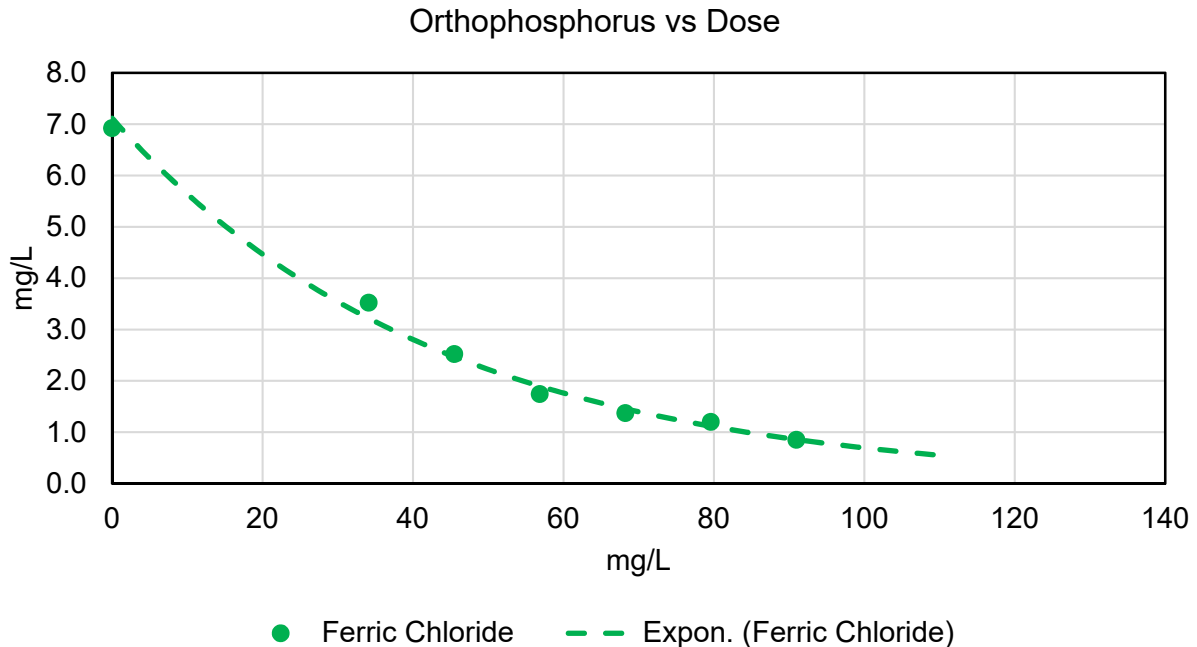


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 6.42 mg/L would appear to suggest a dose of 65 mg/L of Ferric Chloride. This is completely **realistic** from a cost standpoint, but will not be available as an option after Payson goes to ultraviolet disinfection. Interestingly there appears to be little different in the dose rate for Ferric Chloride or Ferric Sulfate.

The impact of Ferric Chloride on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance.

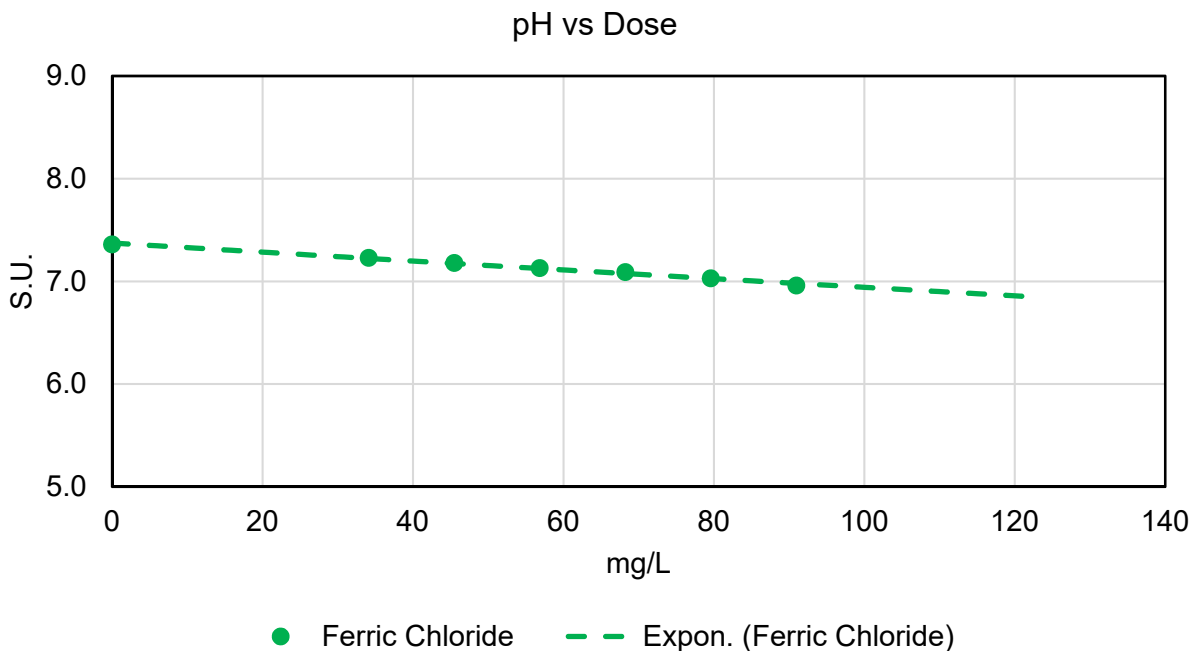


Third run (7/31 – 13:00) using Ferric Chloride (at 50:1)

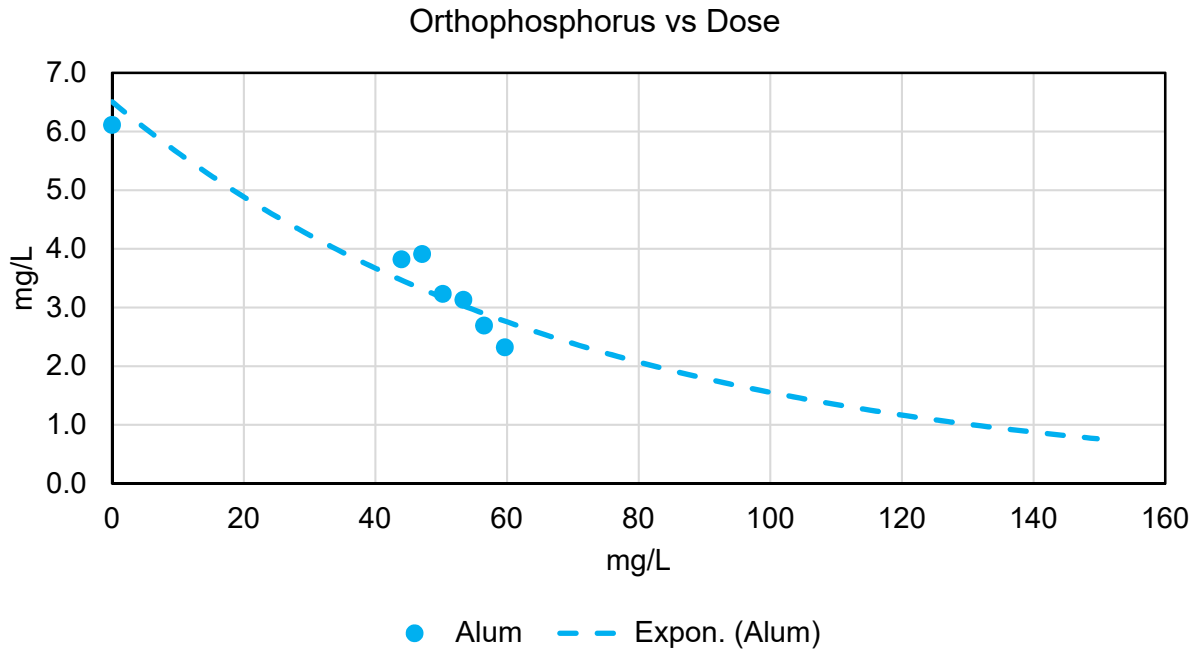


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 6.92 mg/L would appear to suggest a dose of 95 mg/L of Ferric Chloride. This is completely **realistic** from a cost standpoint, but will not be available as an option after Payson goes to ultraviolet disinfection. Interestingly there appears to be little different in the dose rate for Ferric Chloride or Ferric Sulfate.

The impact of Ferric Chloride on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance.

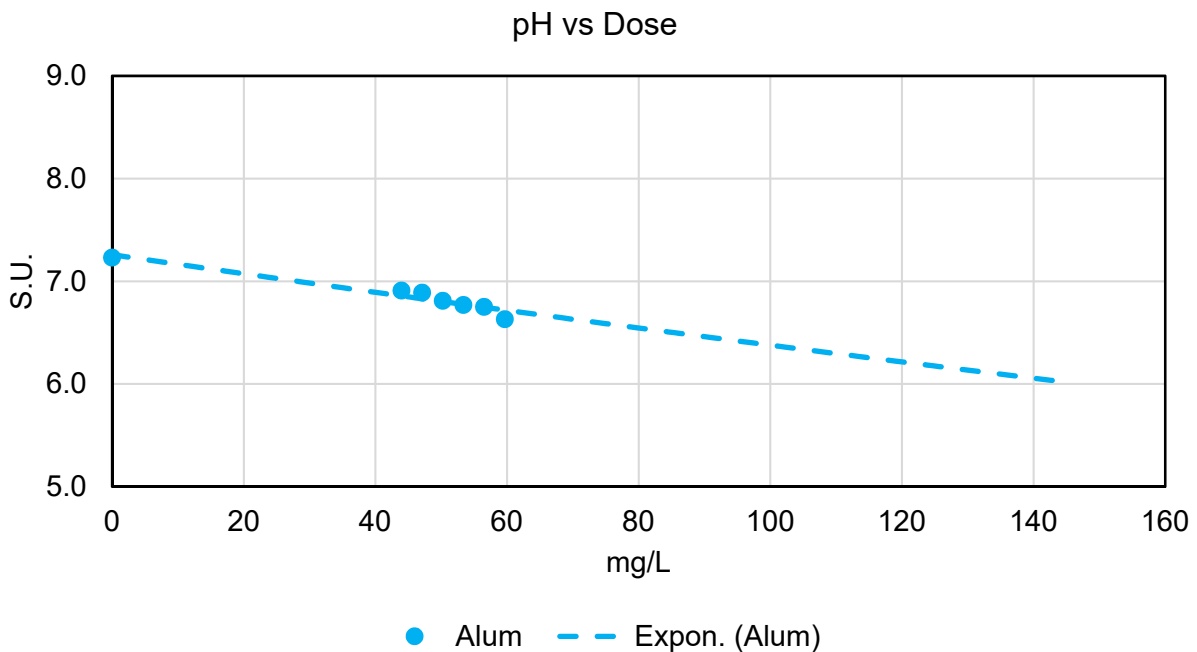


Fourth run (8/1 – 8:05) using Aluminum Sulfate (Alum) (at 100:1)

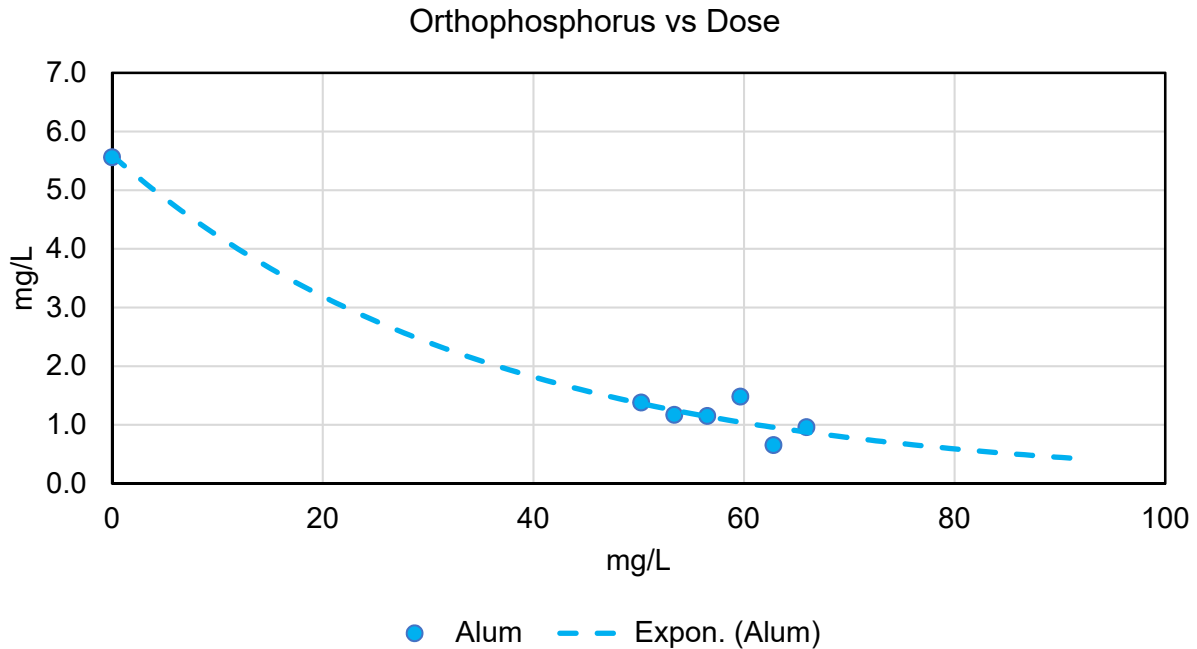


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 6.92 mg/L would appear to suggest a dose of 150 mg/L of Alum. This is completely **unrealistic** from a cost standpoint.

The impact of Alum on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance. Projecting pH curve out to a dose of 150 mg/L would imply the pH would be below 6.5 S.U. which would violate the permit.

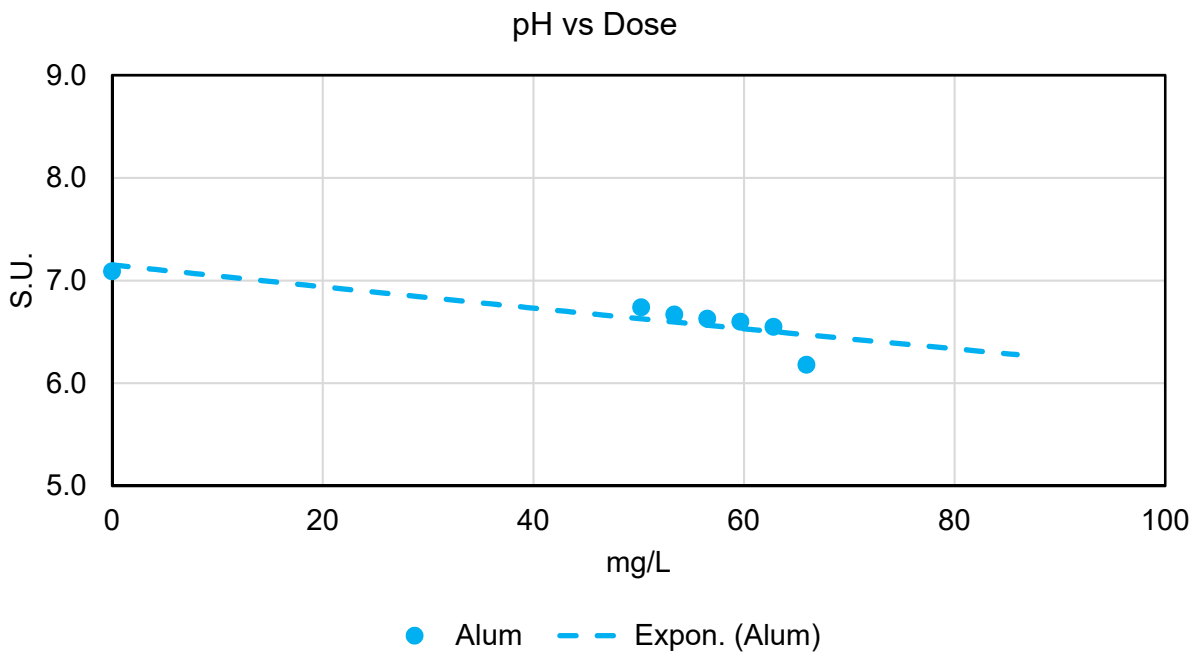


Fifth run (8/8 – 8:15) using Aluminum Sulfate (Alum) (at 100:1)

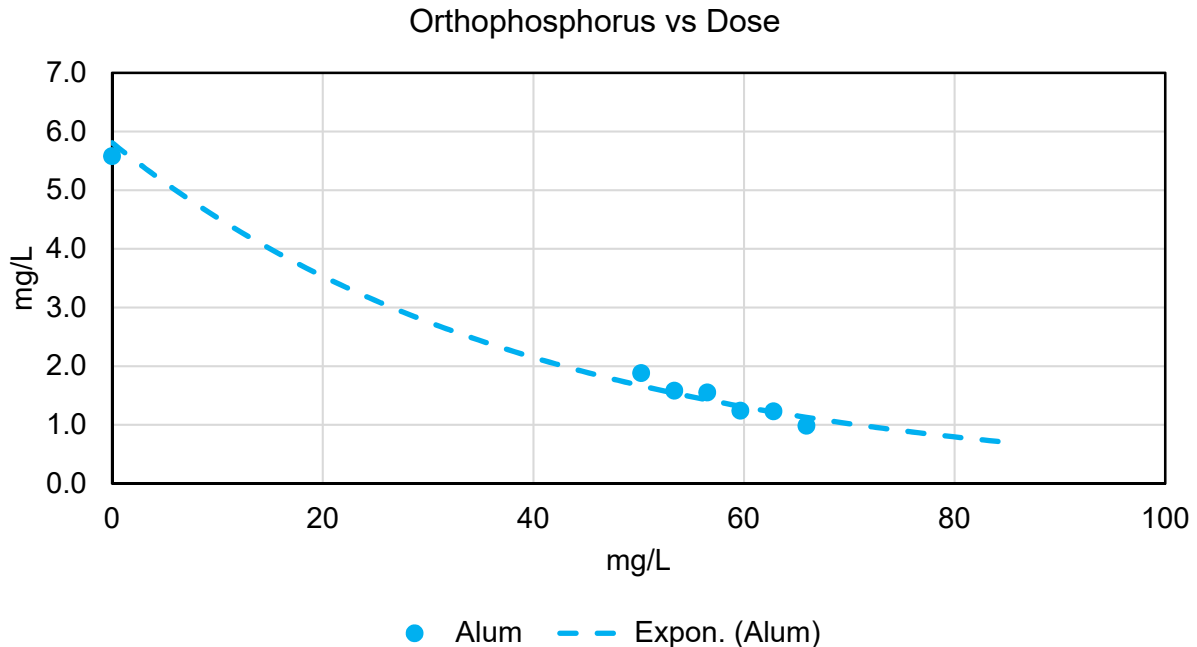


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 5.56 mg/L would appear to suggest a dose of 70 mg/L of Alum. This is completely **realistic** from a cost standpoint.

The impact of Alum on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance. Projecting pH curve out to a dose of 70 mg/L would imply the pH would be below 6.5 S.U. which would violate the permit.

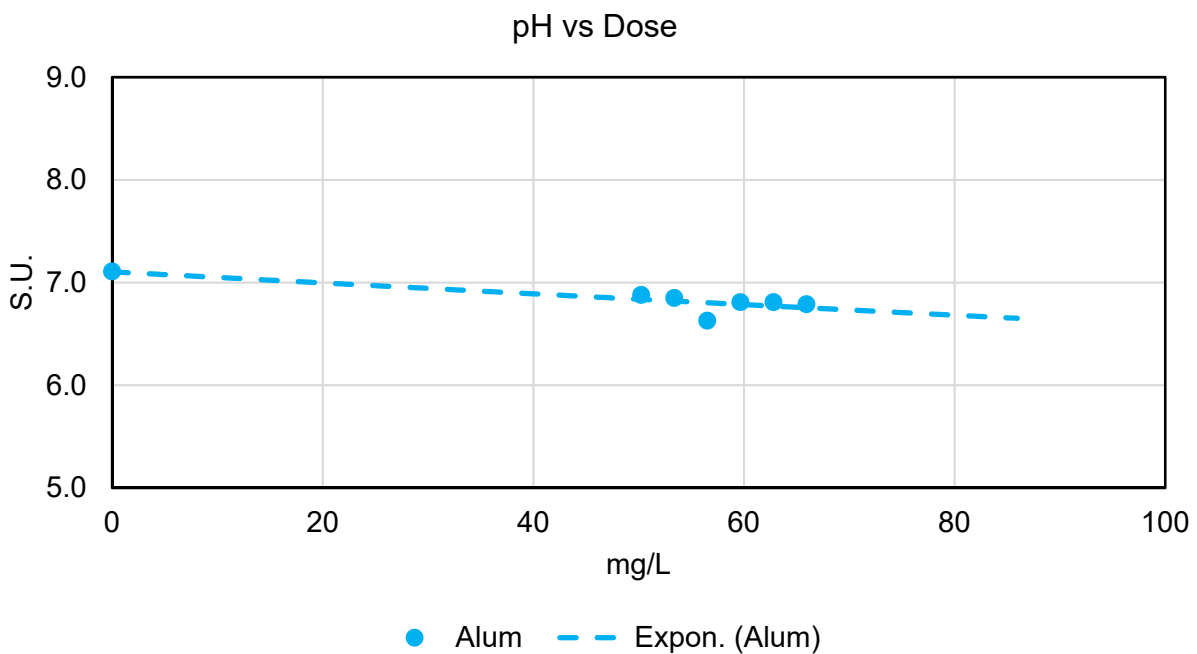


Sixth run (8/8 – 10:30) using Aluminum Sulfate (Alum) (at 100:1)

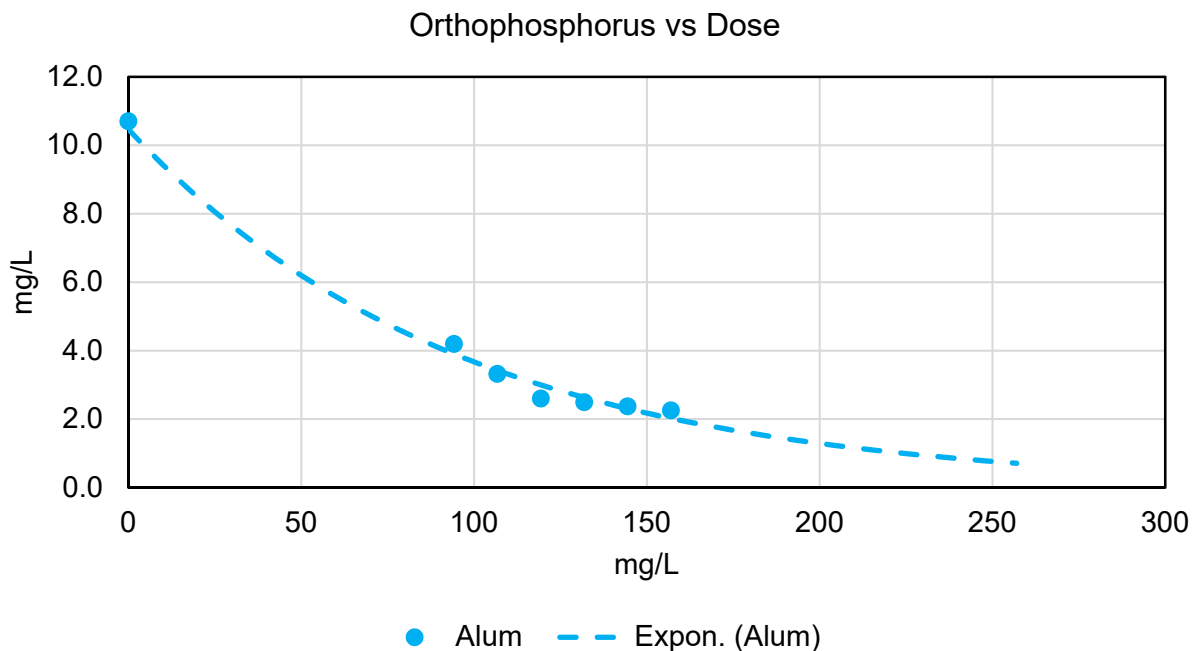


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 5.58 mg/L would appear to suggest a dose of 80 mg/L of Alum. This is completely **realistic** from a cost standpoint.

The impact of Alum on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance. Projecting pH curve out to a dose of 80 mg/L would imply the pH would be above 6.5 S.U. which would be in compliance with the permit.

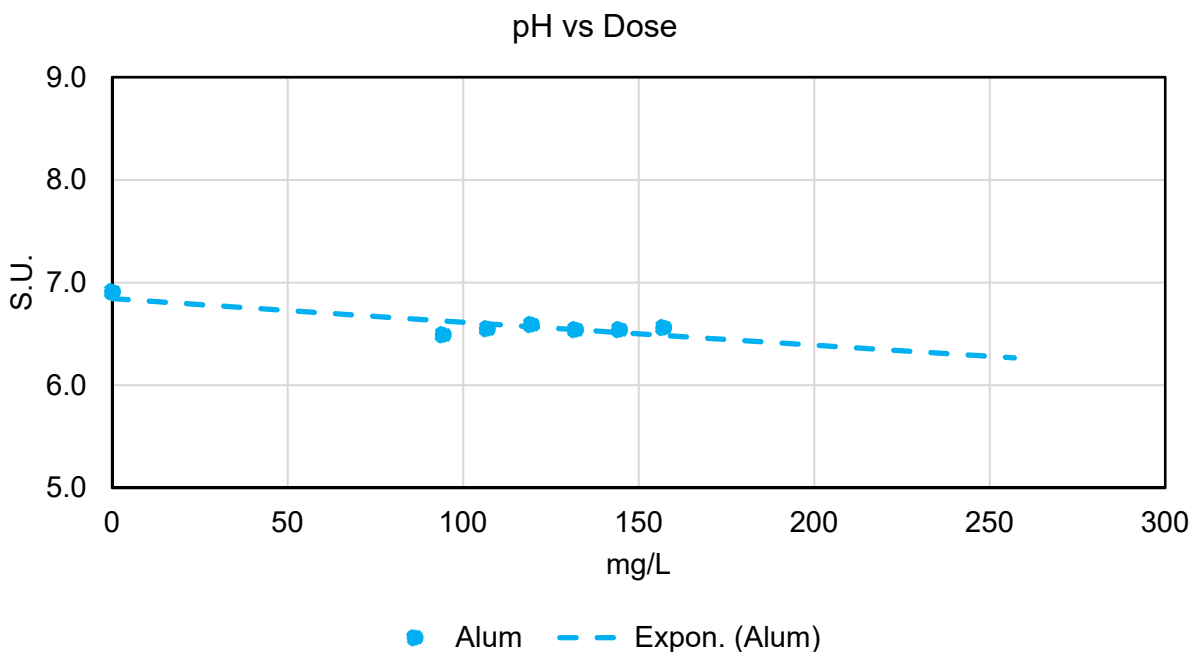


Seventh run (8/15 – 8:15) using Aluminum Sulfate (Alum) (at 100:1)

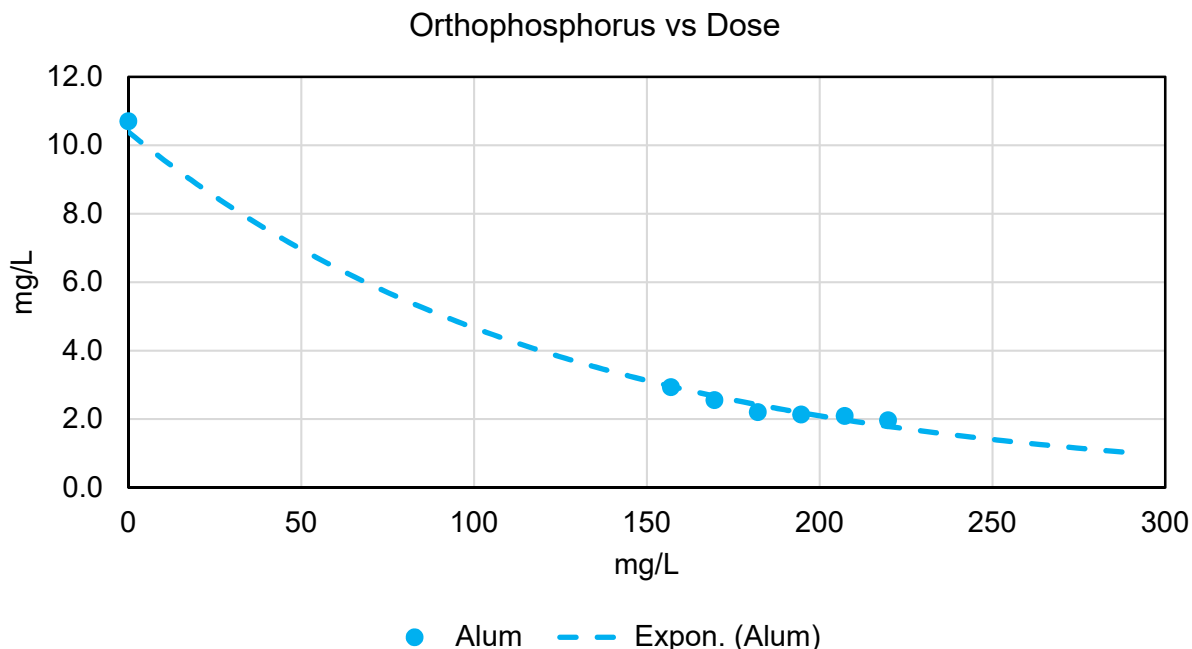


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 10.70 mg/L would appear to suggest a dose of 260 mg/L of Alum. This is completely **unrealistic** from a cost standpoint.

The impact of Alum on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance. Projecting pH curve out to a dose of 260 mg/L would imply the pH would be below 6.5 S.U. which would violate the permit

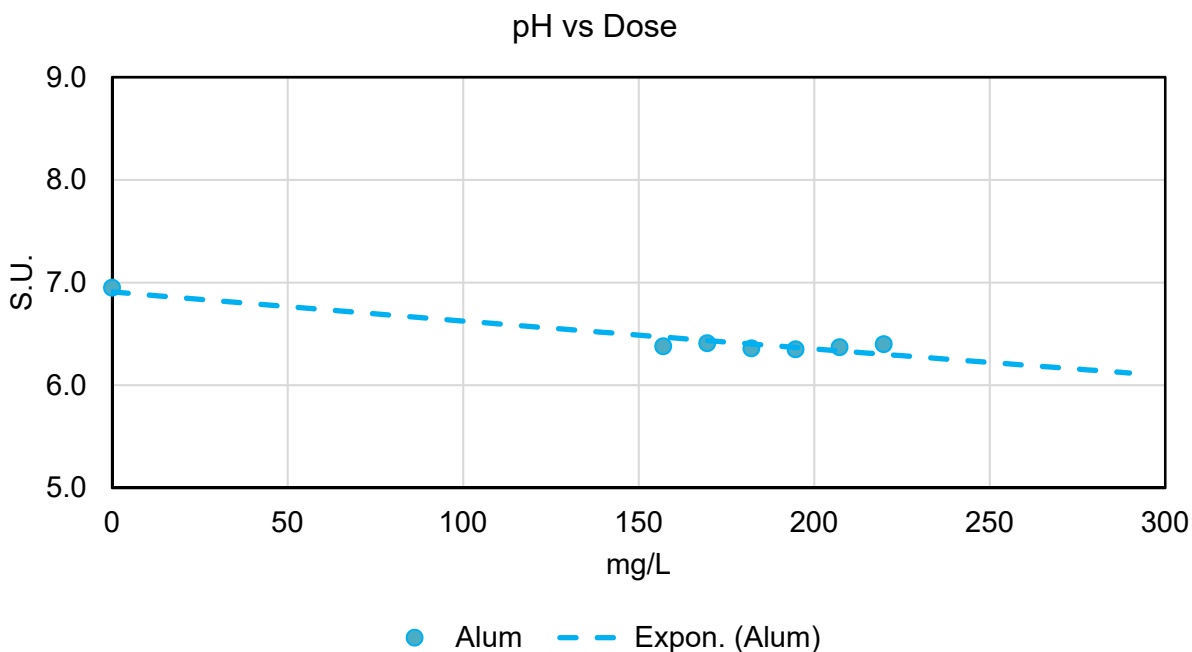


Eighth run (8/15 – 9:45) using Aluminum Sulfate (Alum) (at 100:1)

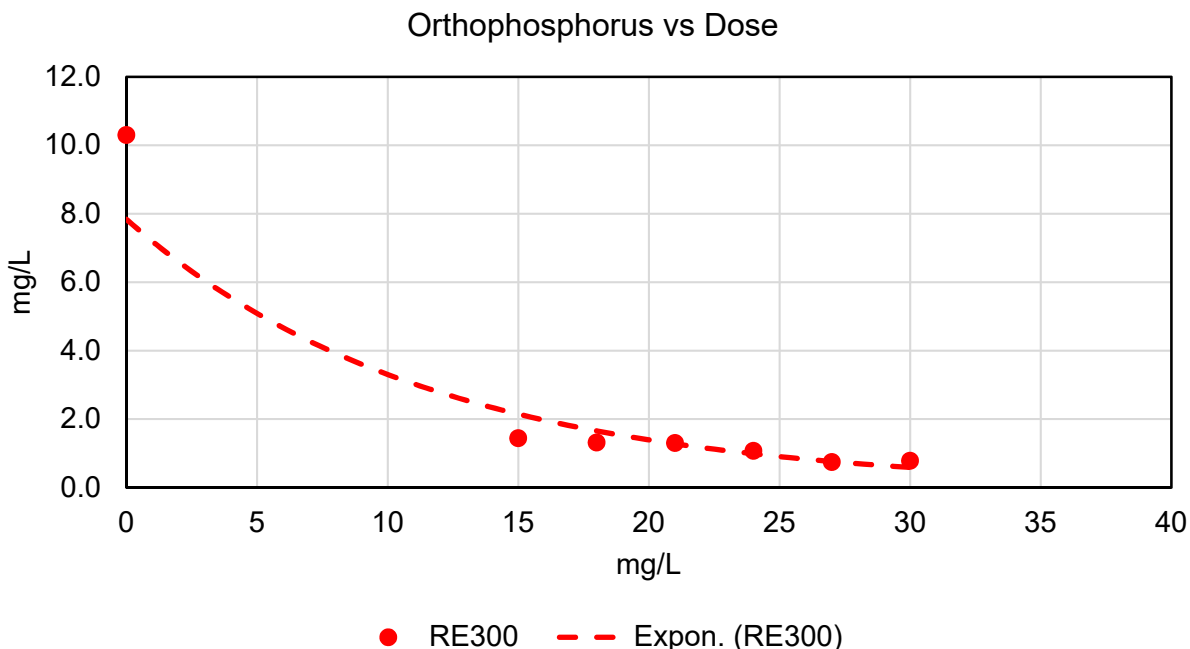


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 10.70 mg/L would appear to suggest a dose of 320 mg/L of Alum. This is completely **unrealistic** from a cost standpoint.

The impact of Alum on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance. Projecting pH curve out to a dose of 320 mg/L would imply the pH would be below 6.5 S.U. which would violate the permit.

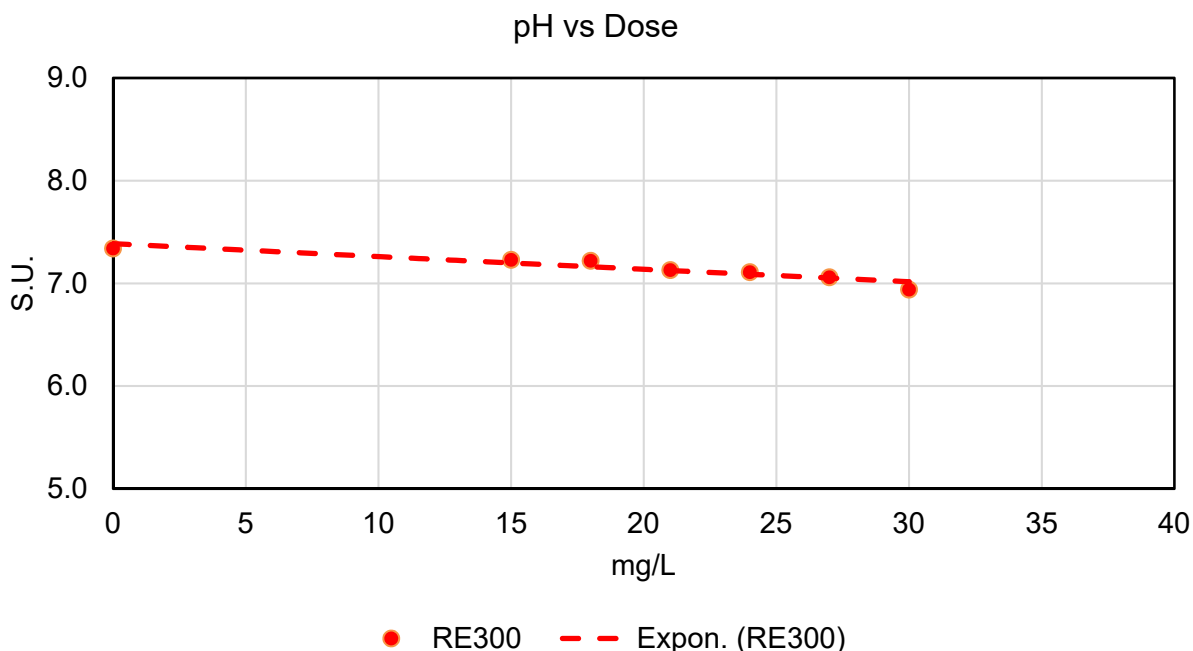


Ninth run (8/17 – 8:25) using RE300 (Rare Earth) (at 100:1)

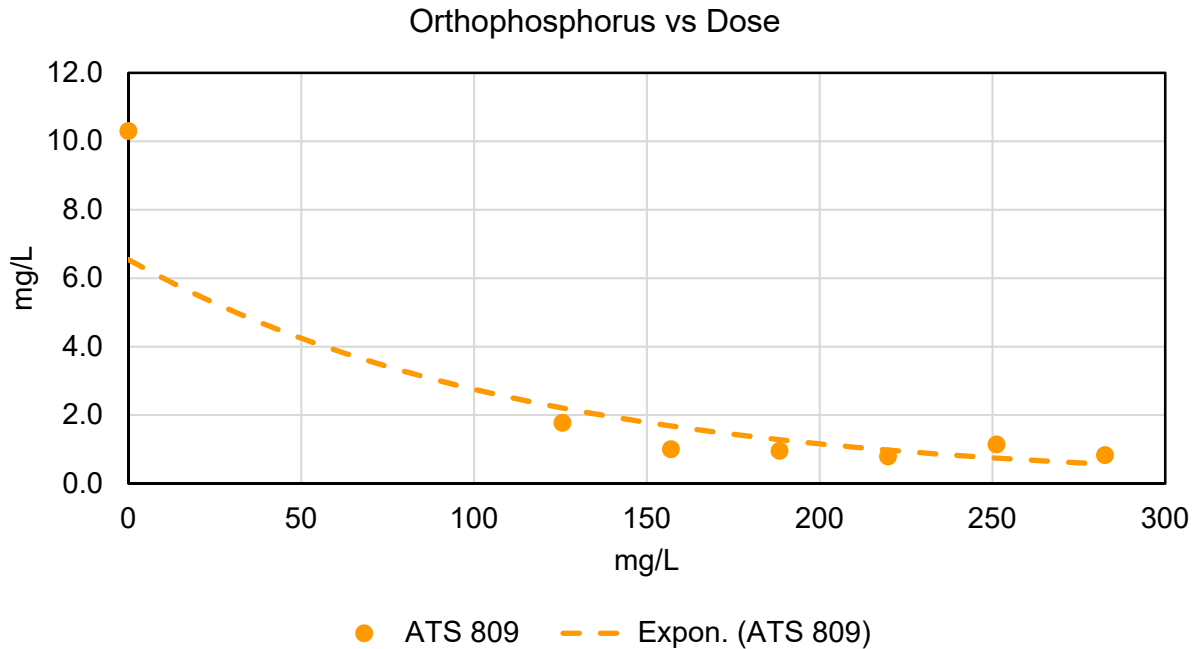


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 10.30 mg/L would appear to suggest a dose of 25 mg/L of RE300. This is completely **unrealistic** from a cost standpoint though.

The impact of RE300 on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance. Projecting pH curve out to a dose of 25 mg/L would imply the pH would be above 6.5 S.U. which would be in compliance with the permit.

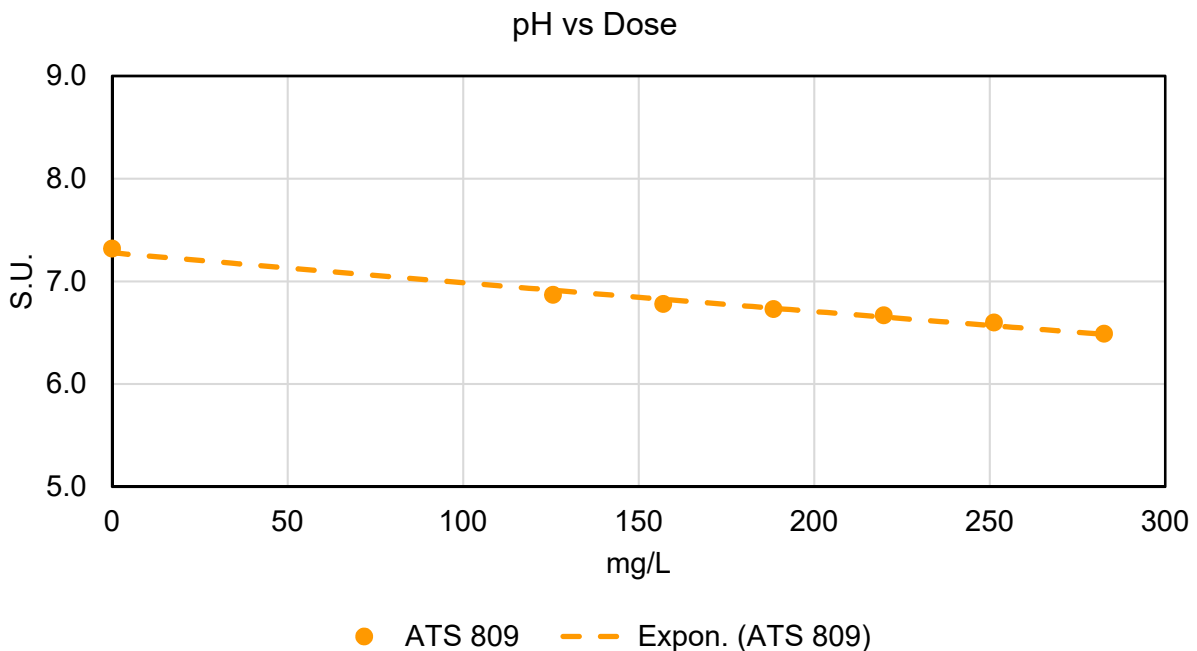


Tenth run (8/17 – 10:25) using ATS 809 (at 100:1)

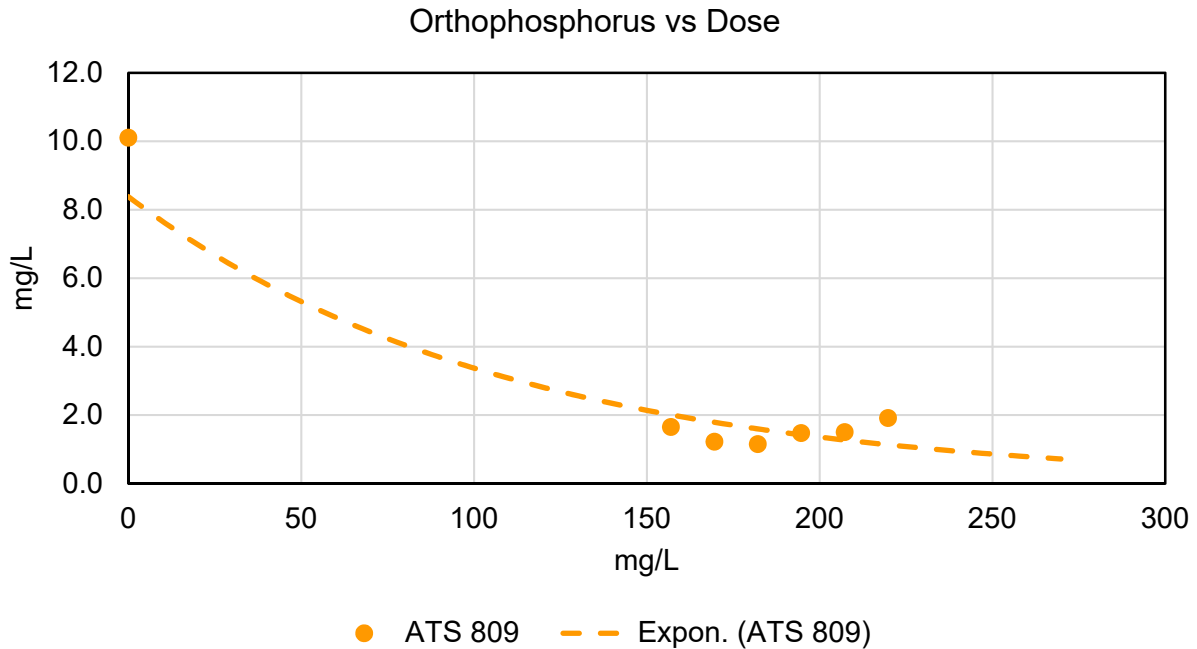


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 10.30 mg/L would appear to suggest a dose of 235 mg/L of ATS 809. This is completely **unrealistic** from a cost standpoint.

The impact of ATS 809 on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance. Projecting pH curve out to a dose of 235 mg/L would imply the pH would be above 6.5 S.U. which would be in compliance with the permit.

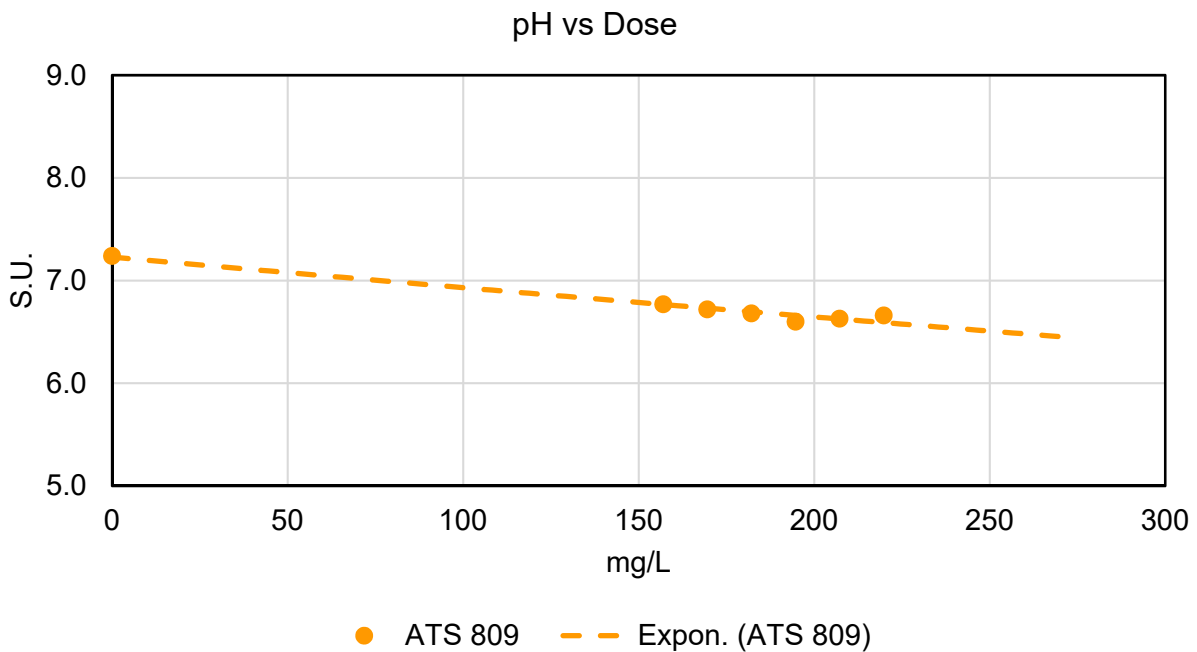


Eleventh run (8/17 – 12:30) using ATS 809 (at 100:1)

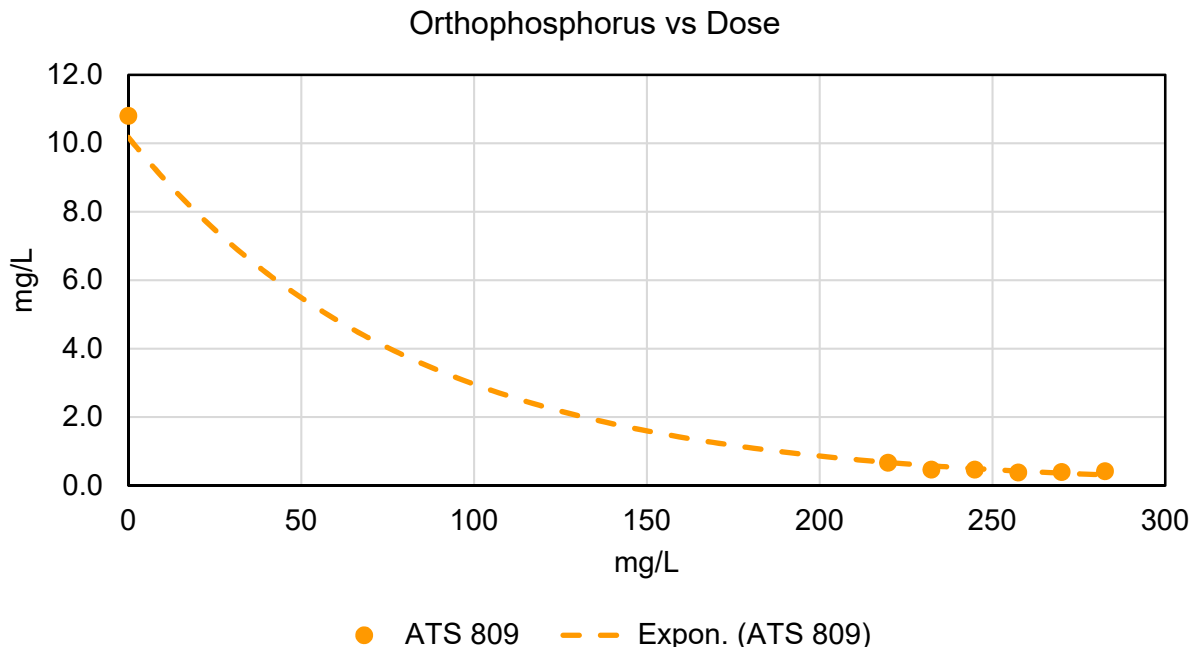


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 10.10 mg/L would appear to suggest a dose of 260 mg/L of ATS 809. This is completely **unrealistic** from a cost standpoint.

The impact of ATS 809 on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance. Projecting pH curve out to a dose of 260 mg/L would imply the pH would be below 6.5 S.U. which would violate the permit.

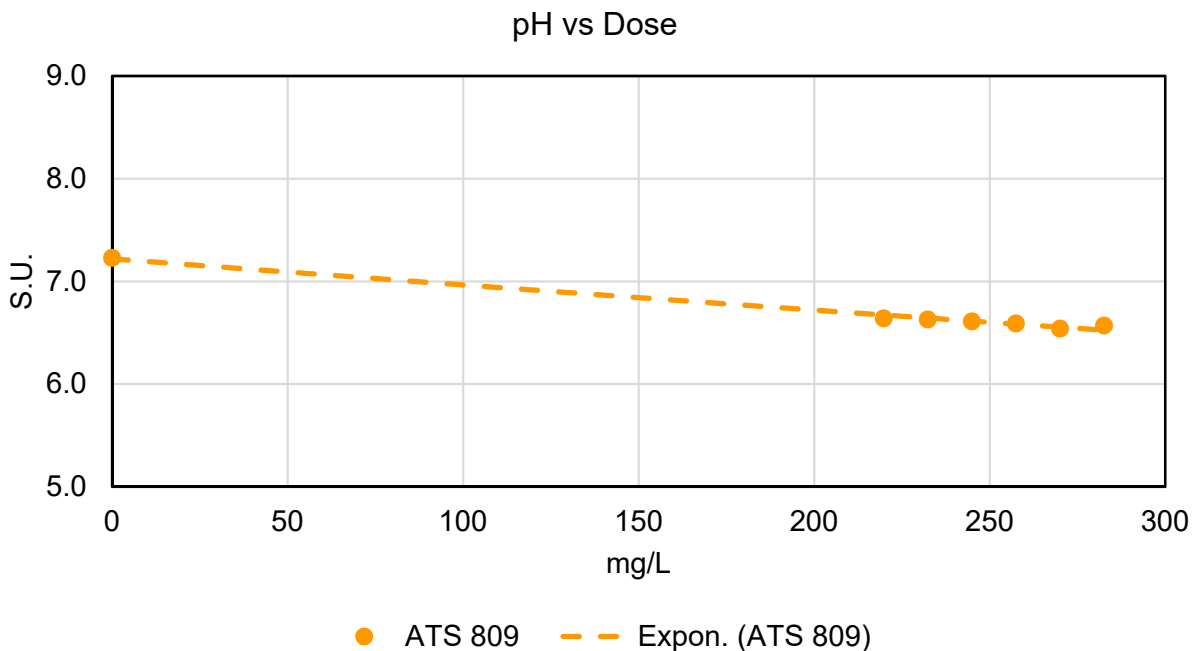


Twelfth run (8/17 – 13:50) using ATS 809 (at 100:1)

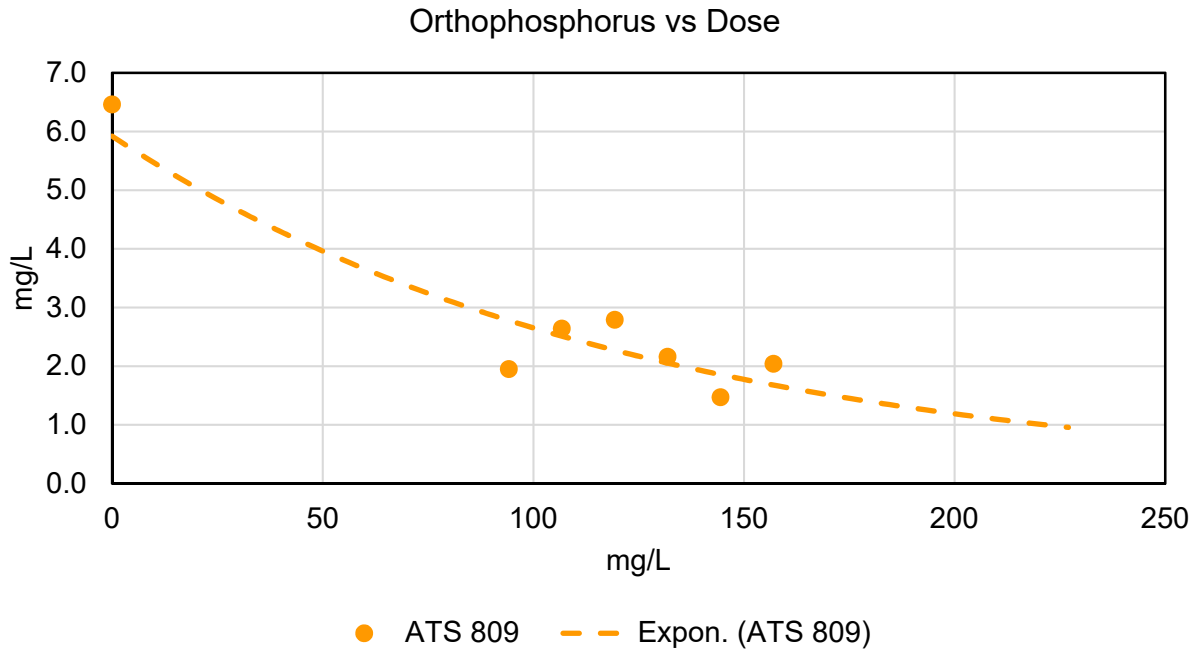


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 10.80 mg/L would appear to suggest a dose of 210 mg/L of ATS 809. This is completely **unrealistic** from a cost standpoint.

The impact of ATS 809 on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance. Projecting pH curve out to a dose of 210 mg/L would imply the pH would be above 6.5 S.U. which would be in compliance with the permit.

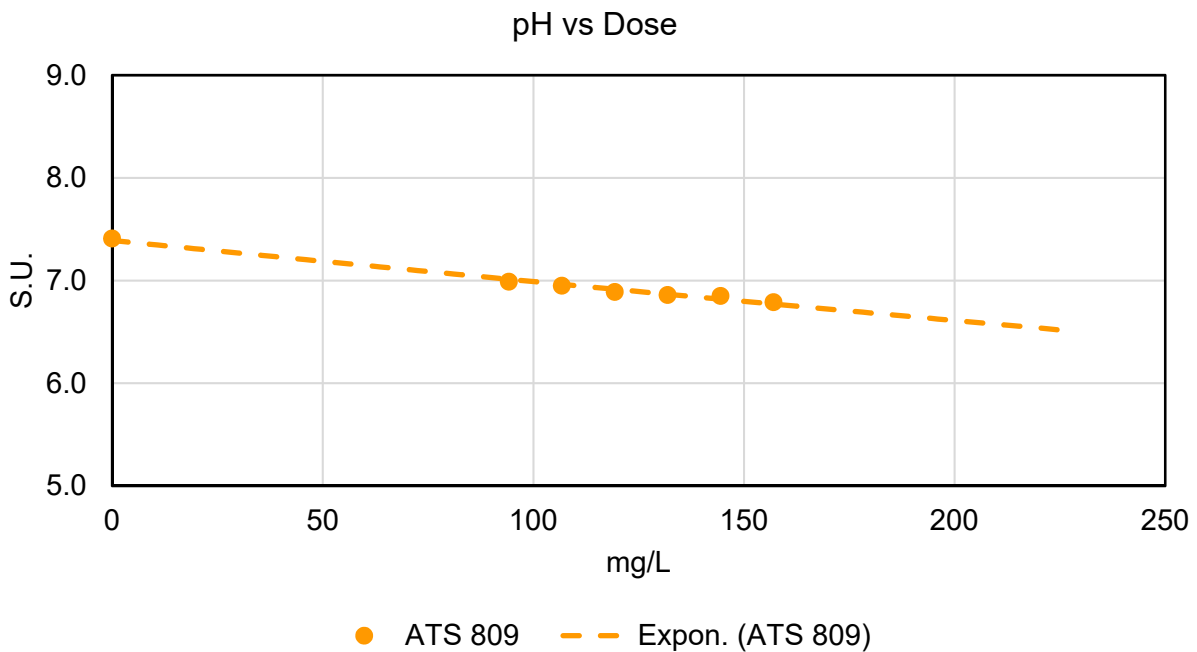


Thirteenth run (8/20 – 8:15) using ATS 809 (at 100:1)

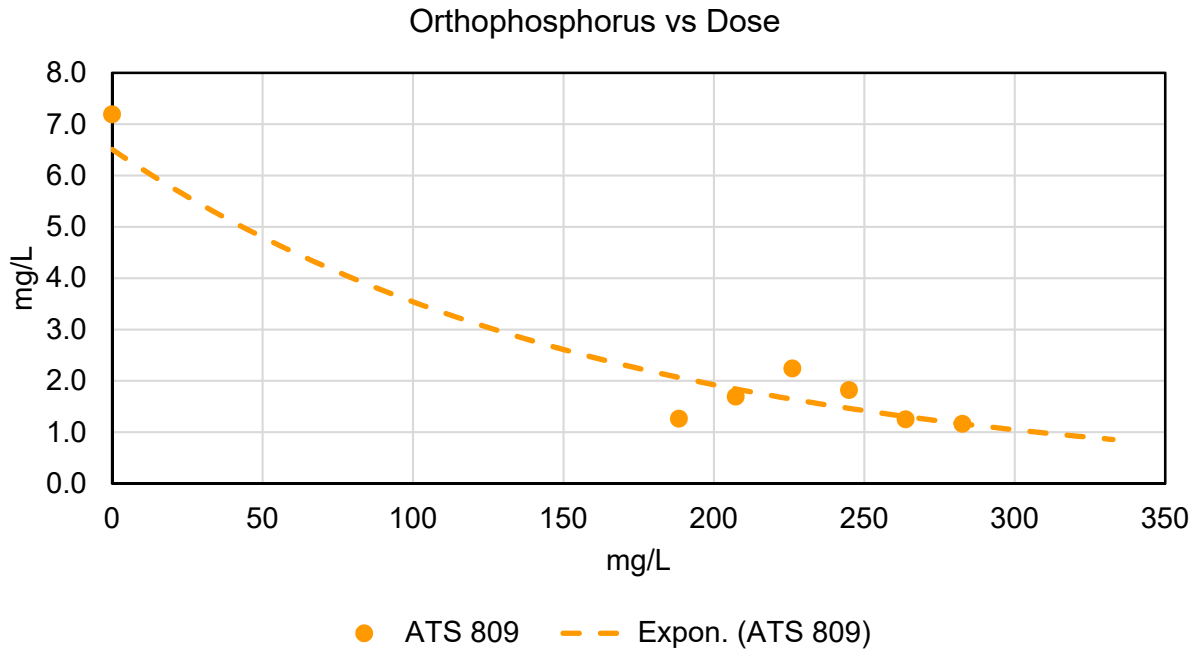


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 6.46 mg/L would appear to suggest a dose of 235 mg/L of ATS 809. This is completely **unrealistic** from a cost standpoint.

The impact of ATS 809 on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance. Projecting pH curve out to a dose of 235 mg/L would imply the pH would be below 6.5 S.U. which would violate the permit.

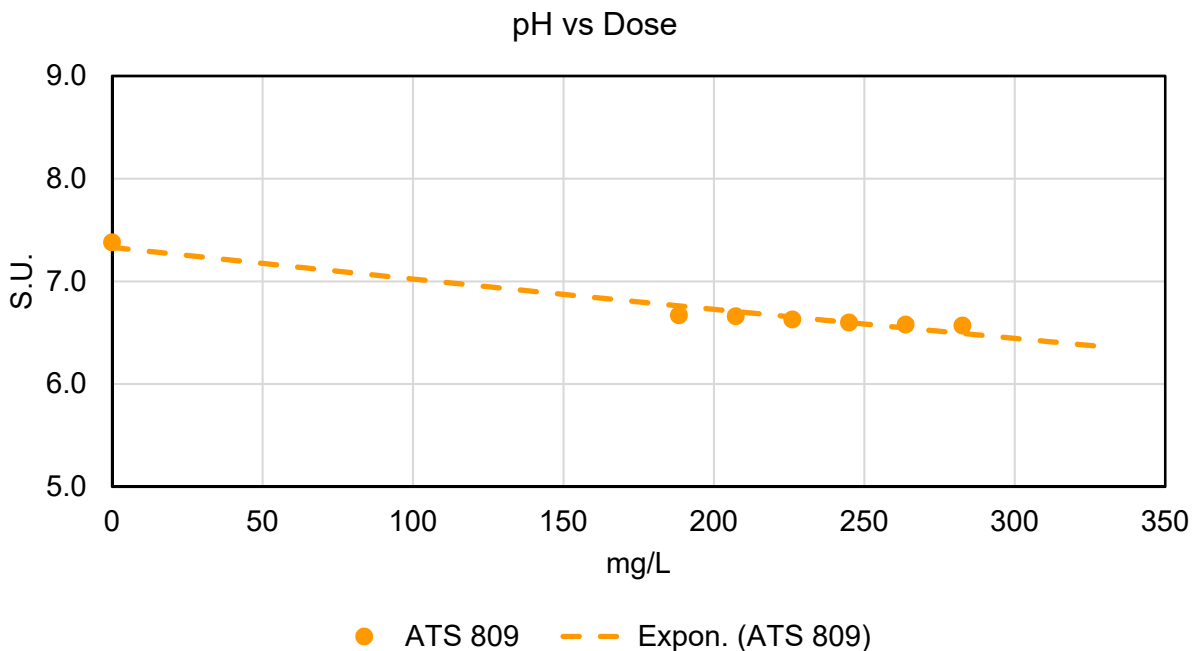


Fourteenth run (8/20 – 10:30) using ATS 809 (at 100:1)

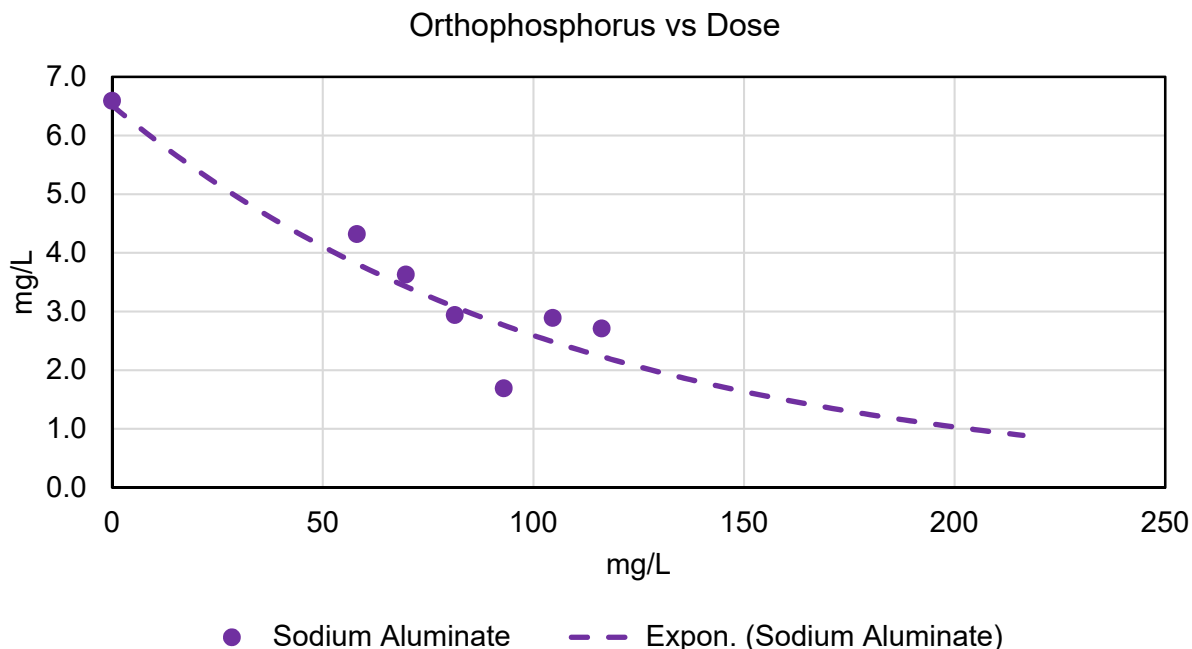


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 7.19 mg/L would appear to suggest a dose of 345 mg/L of ATS 809. This is completely **unrealistic** from a cost standpoint.

The impact of ATS 809 on pH on dosage is shown below. As long as the pH is above 6.50 Payson will remain in Permit compliance. Projecting pH curve out to a dose of 235 mg/L would imply the pH would be above 6.5 S.U. which would be in compliance with the permit.

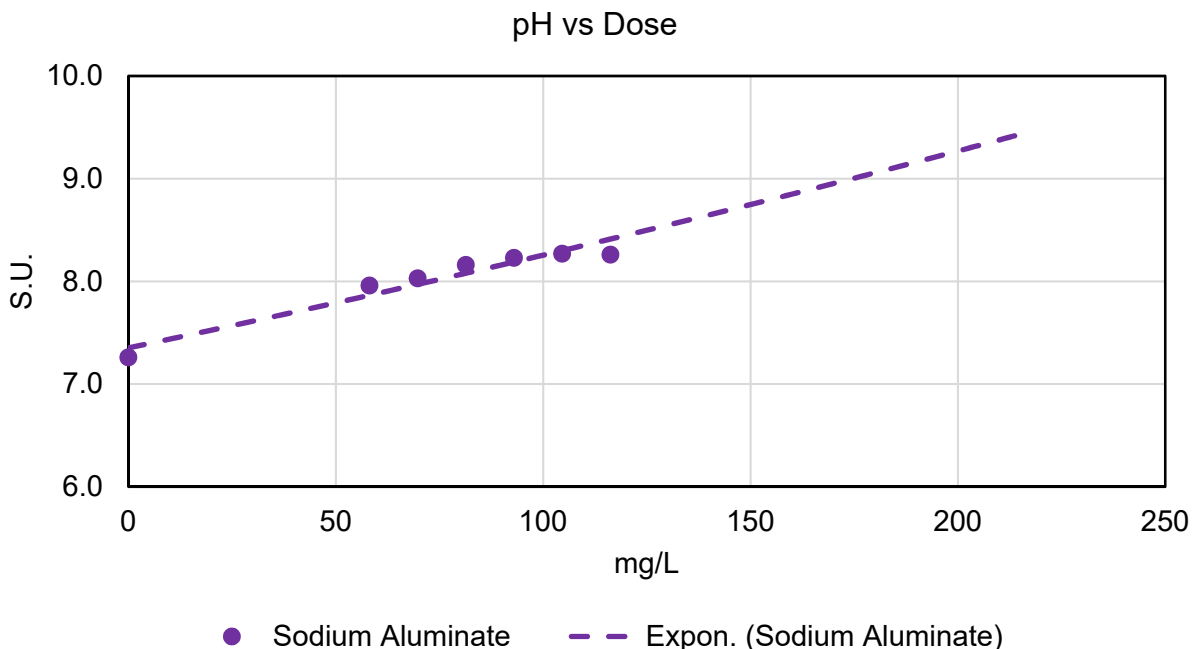


Fifteenth run (8/20 – 13:20) using Sodium Aluminate (at 100:1)

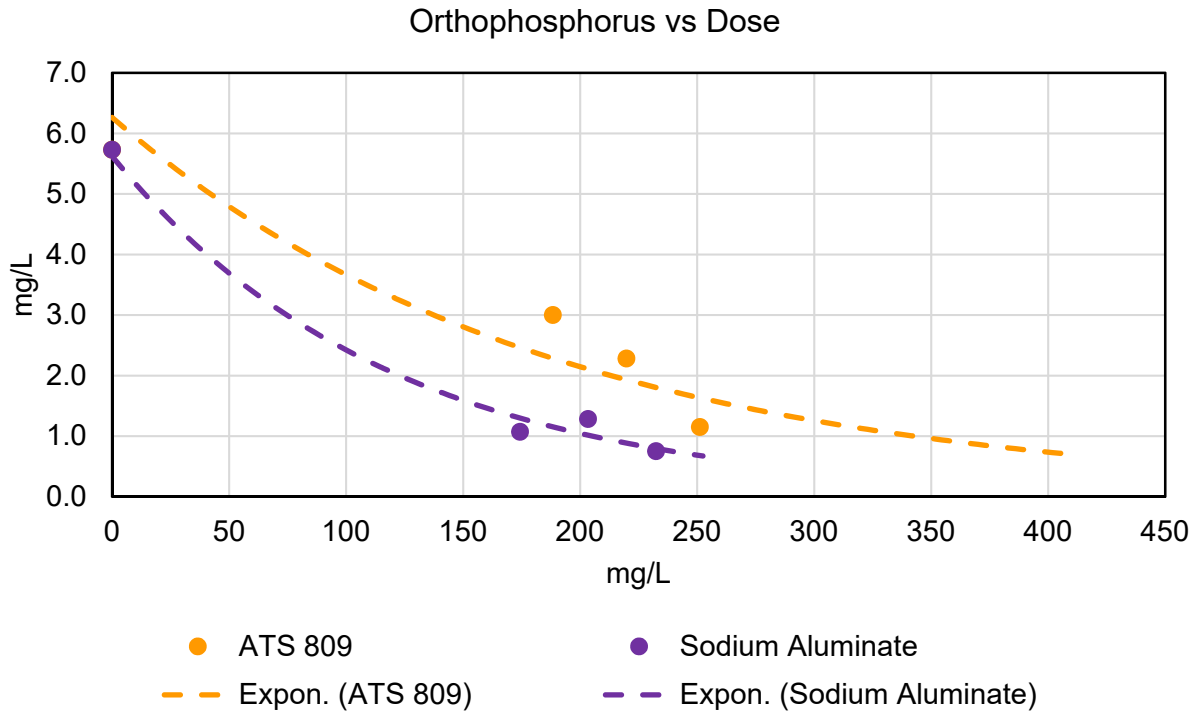


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 6.59 mg/L would appear to suggest a dose of 230 mg/L of Sodium Aluminate. This is completely **unrealistic** from a cost standpoint.

The impact of Sodium Aluminate on pH on dosage is shown below. Sodium Aluminate is a base so as long as the pH is below 9.00 Payson will remain in Permit compliance. Projecting pH curve out to a dose of 230 mg/L would imply the pH would be above 9.0 S.U. which would violate the permit.

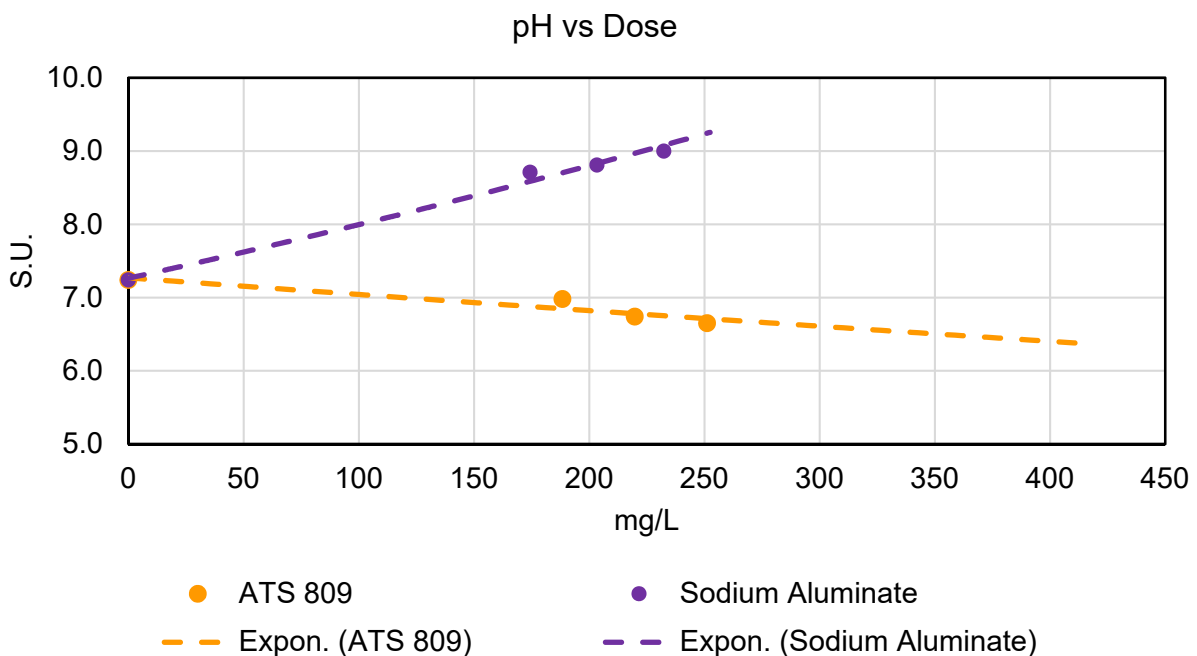


Sixteenth run (8/22 – 8:10) using ATS 809 and Sodium Aluminate (at 100:1)

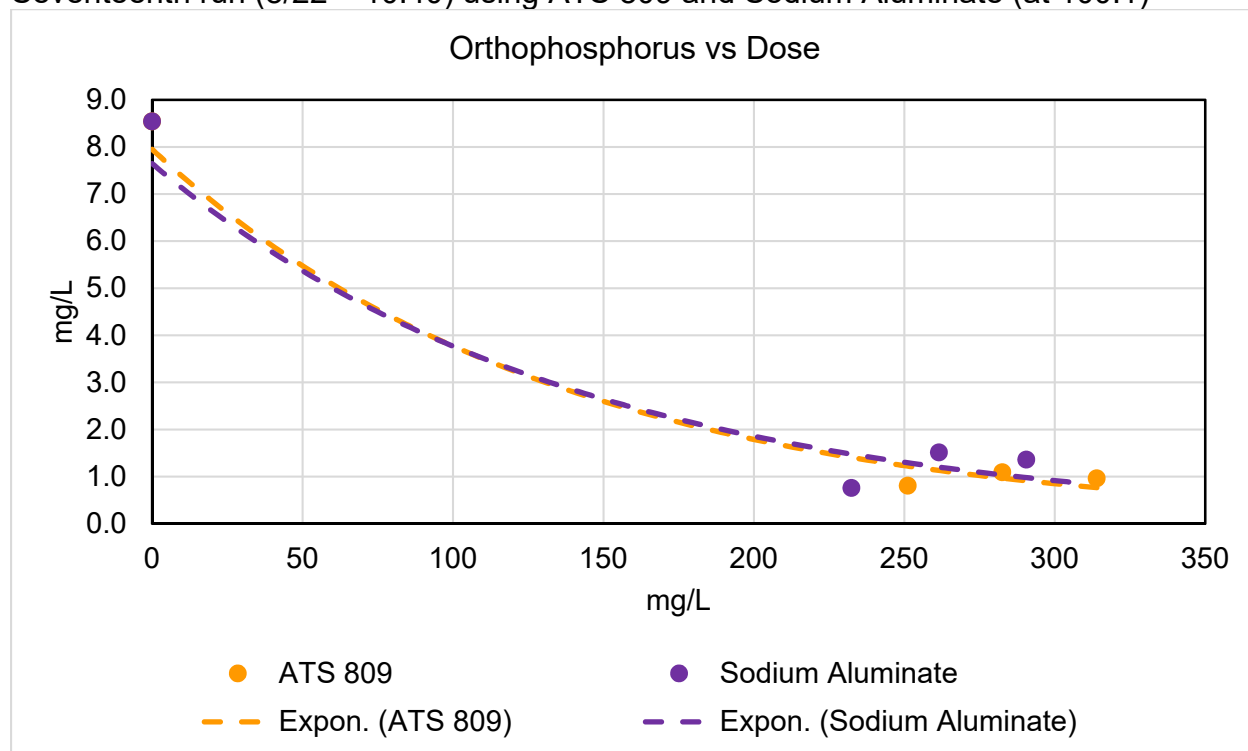


Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 5.73 mg/L would appear to suggest a dose of 415 mg/L of ATS 809, and a dose of 245 mg/L of Sodium Aluminate. Both of these are **unrealistic** from a cost standpoint.

The impact of ATS 809 and Sodium Aluminate on pH on dosage is shown below. Sodium Aluminate is a base so as long as the pH is below 9.00 and above 6.5 Payson will remain in Permit compliance. Projecting pH curves both would violate the permit.

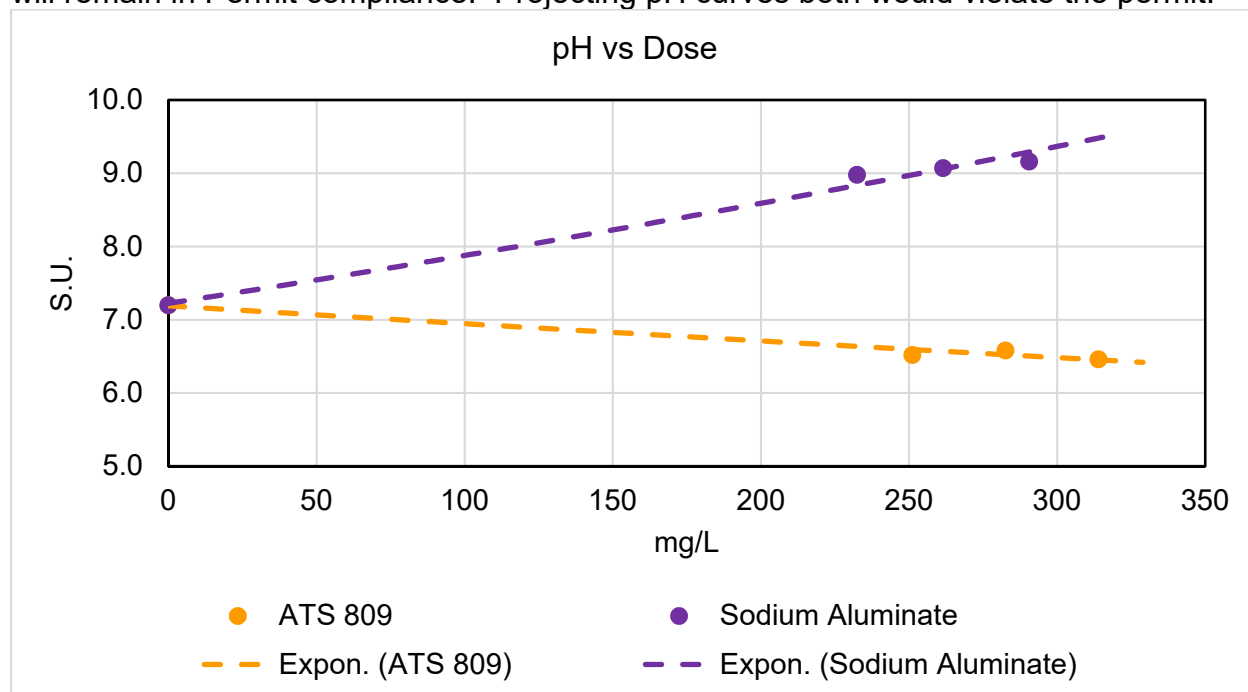


Seventeenth run (8/22 – 10:40) using ATS 809 and Sodium Aluminate (at 100:1)



Estimating from the exponential curve fit the required dose to reach 0.80 mg/L from initial concentration 8.54 mg/L would appear to suggest a dose of 330 mg/L of ATS 809, and a dose of 320 mg/L of Sodium Aluminate. Both of these are **unrealistic** from a cost standpoint.

The impact of ATS 809 and Sodium Aluminate on pH on dosage is shown below. Sodium Aluminate is a base so as long as the pH is below 9.00 and above 6.5 Payson will remain in Permit compliance. Projecting pH curves both would violate the permit.

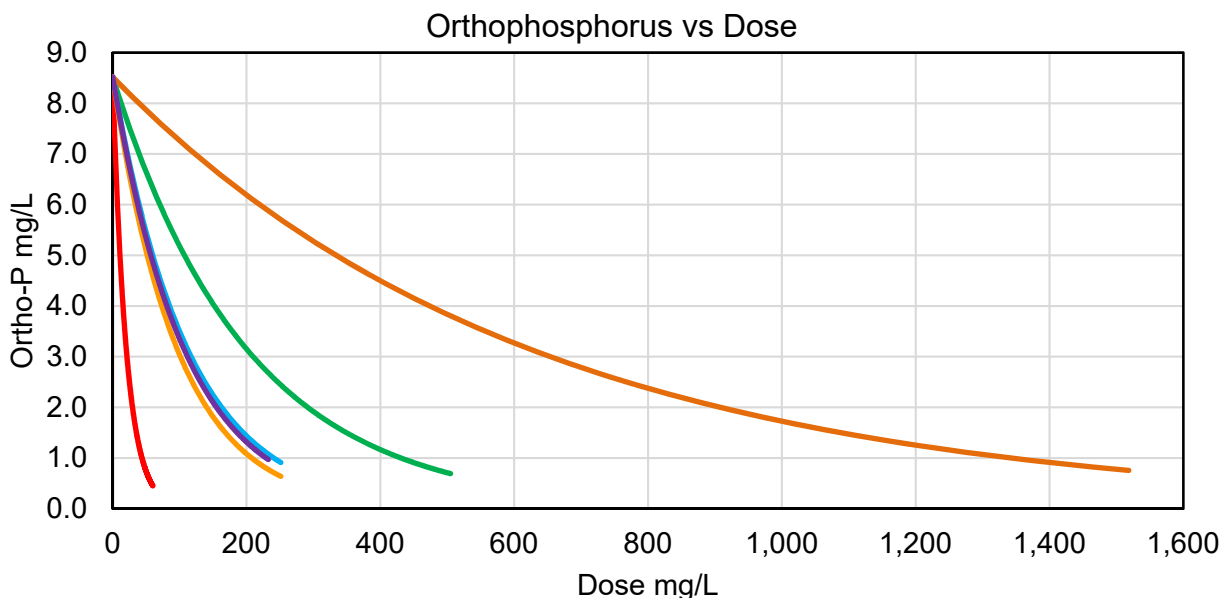


Eighteenth Run (8/26 – 8:00) This was a test using Ferric Chloride, Ferric Sulfate, Aluminum Sulfate, Sodium Aluminate, ATS 809 and RE300

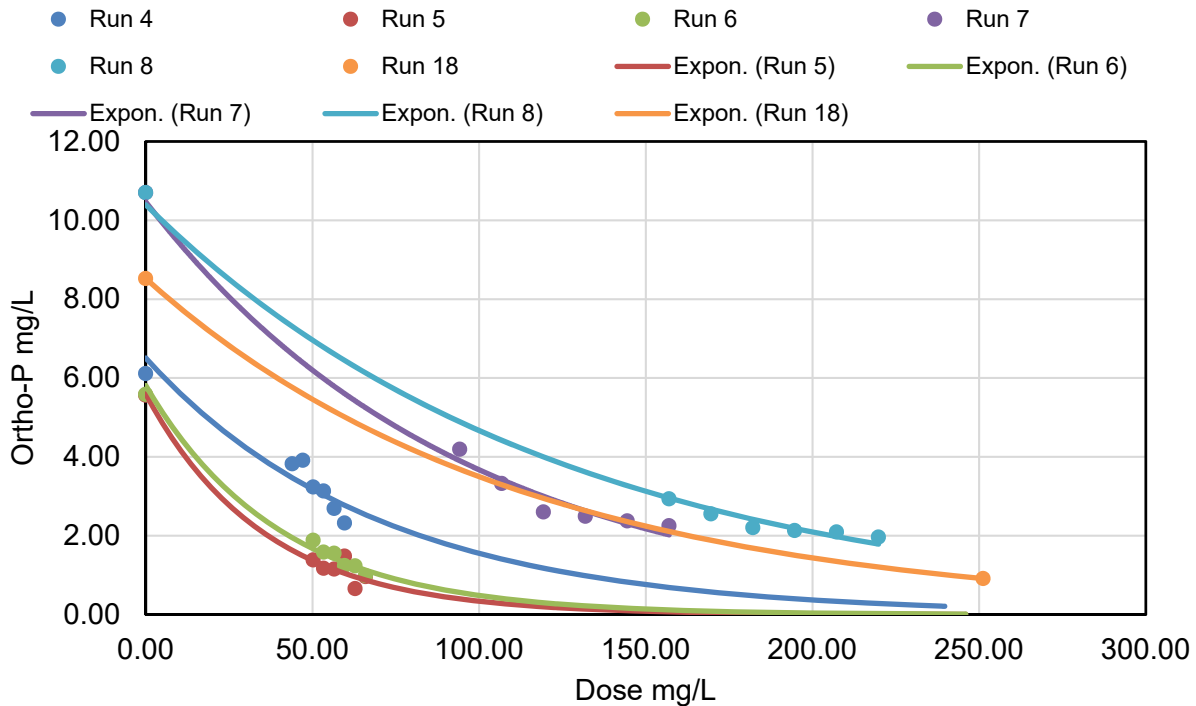
Each chemical was dose at 40 mL to see which would produce the lowest orthophosphorus, and the impact on pH. 40mL was used assuming that all would reach 0.80 mg/L.

Metal / Chemical	Dose mL	Dose mg/L	Initial OP mg/L	Final OP mg/L	Initial pH SU	Final pH SU
Iron						
Ferric Chloride	40	455	8.52	0.89	7.36	6.09
Ferric Sulfate	40	1,518	8.52	0.76	7.36	6.14
Aluminum						
Aluminum Sulfate	40	251	8.52	0.91	7.36	6.49
Sodium Aluminate	40	232	8.52	0.97	7.36	8.82
ATS 809	40	251	8.52	0.54	7.36	6.82
Lanthanum-Cerium						
RE300	40	60	8.52	0.45	7.36	6.91

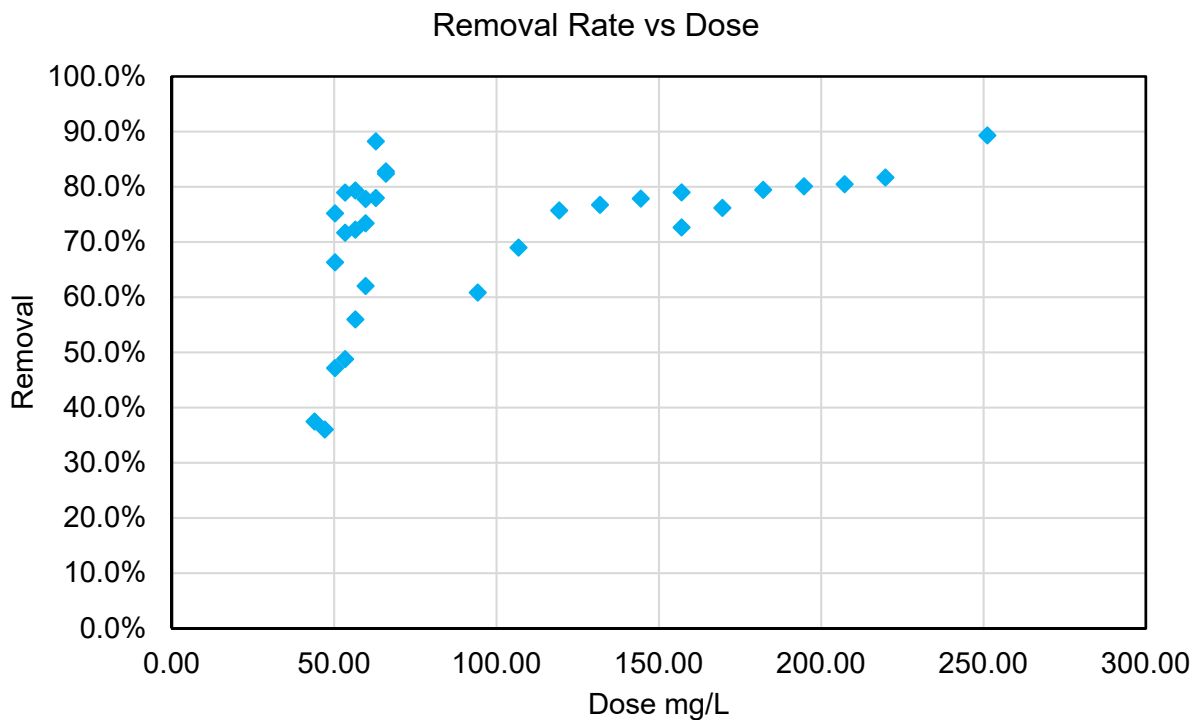
Plotting shows the Ferric Sulfate requiring the highest dose approximate 3 times the needed Ferric Chloride dose (as previously seem in the raw testing). Additionally, either would violate the Permit requirement of 6.5. All of the aluminum-based chemicals following similar dosing curves. And the Lanthanum/Cerium as expected required the lowest dose. Please note this are simple point only tests



Compiling all of the exponential trendlines of the Aluminum Sulfate (Alum) samples as a visual check on repeatability gives the following graph.

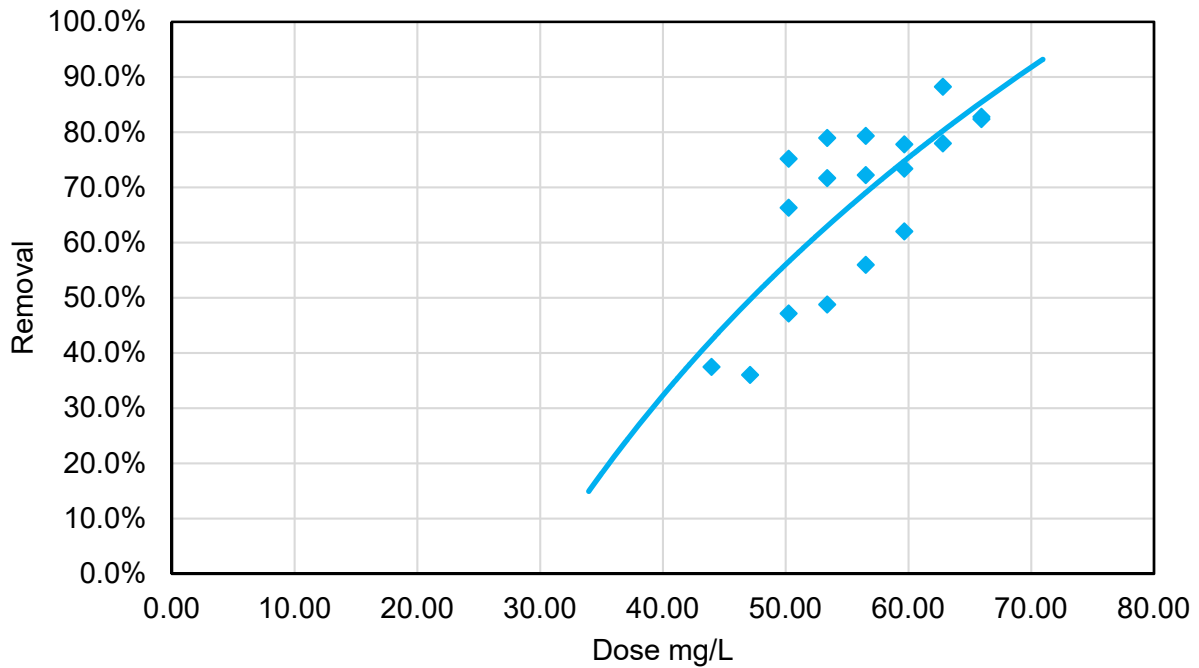


It is more interesting to look at the percent removal versus the dose.

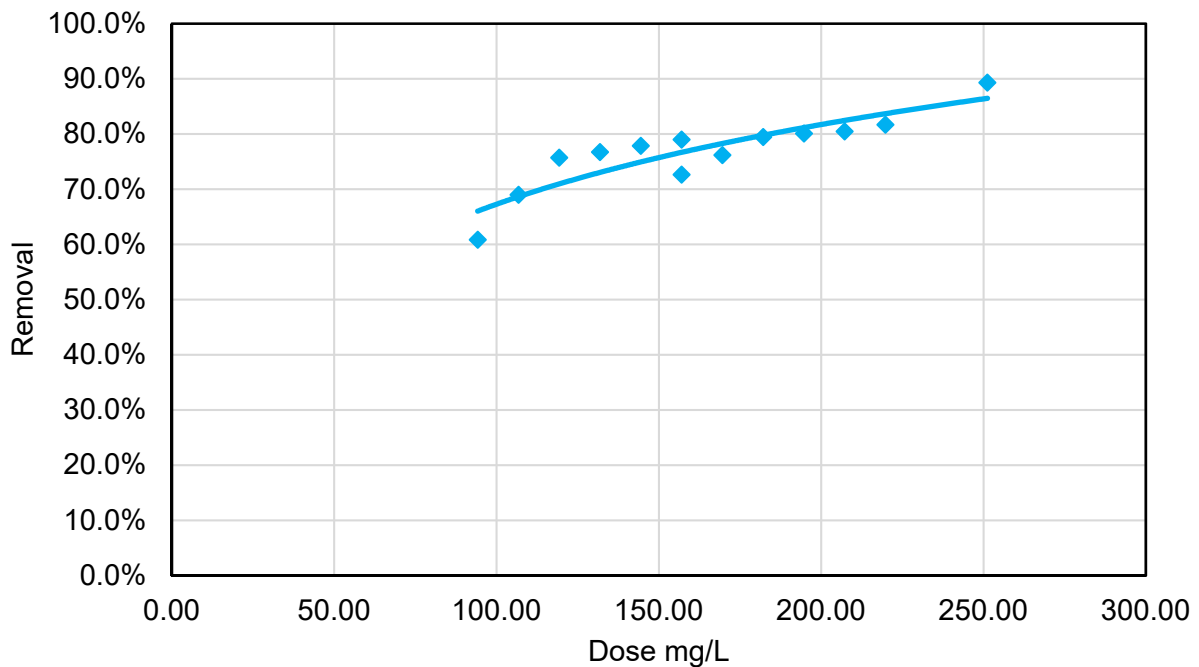


The above graph, appears to have two separate curves. Separating out the initial orthophosphorus samples into below 8.0 mg/L and above 8.0 mg/L, produces two differing curves.

All Samples below 8.0 mg/L
Removal Rate vs Dose

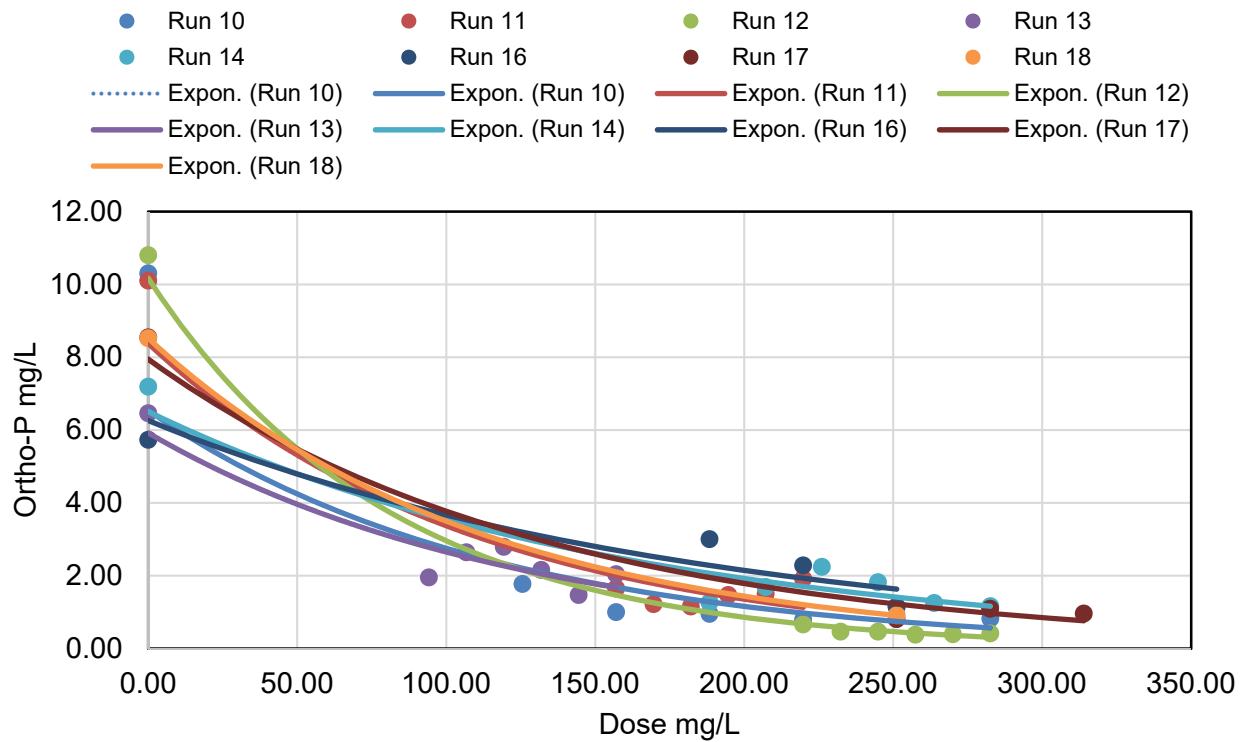


All Samples above 8.0 mg/L
Removal Rate vs Dose

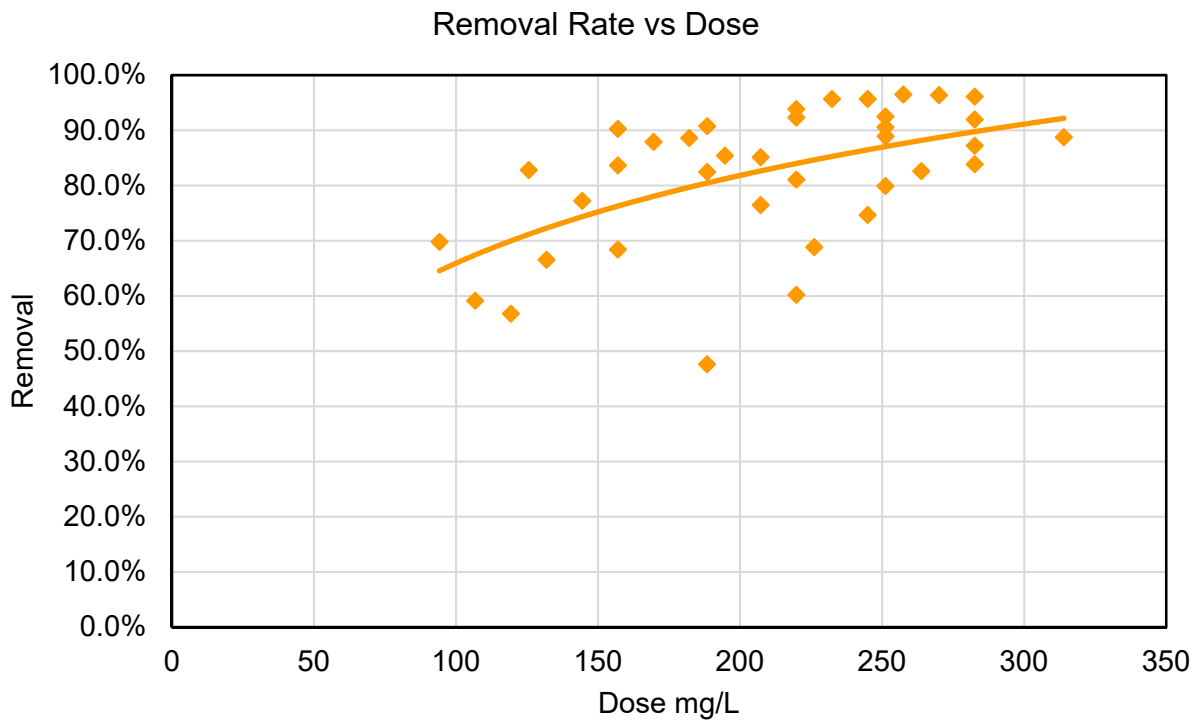


While this produces much better curve fits, it doesn't produce a general recommendation for dosage.

Compiling all of the exponential trendlines of the ATS 809 samples as a visual check on repeatability gives the following graph.

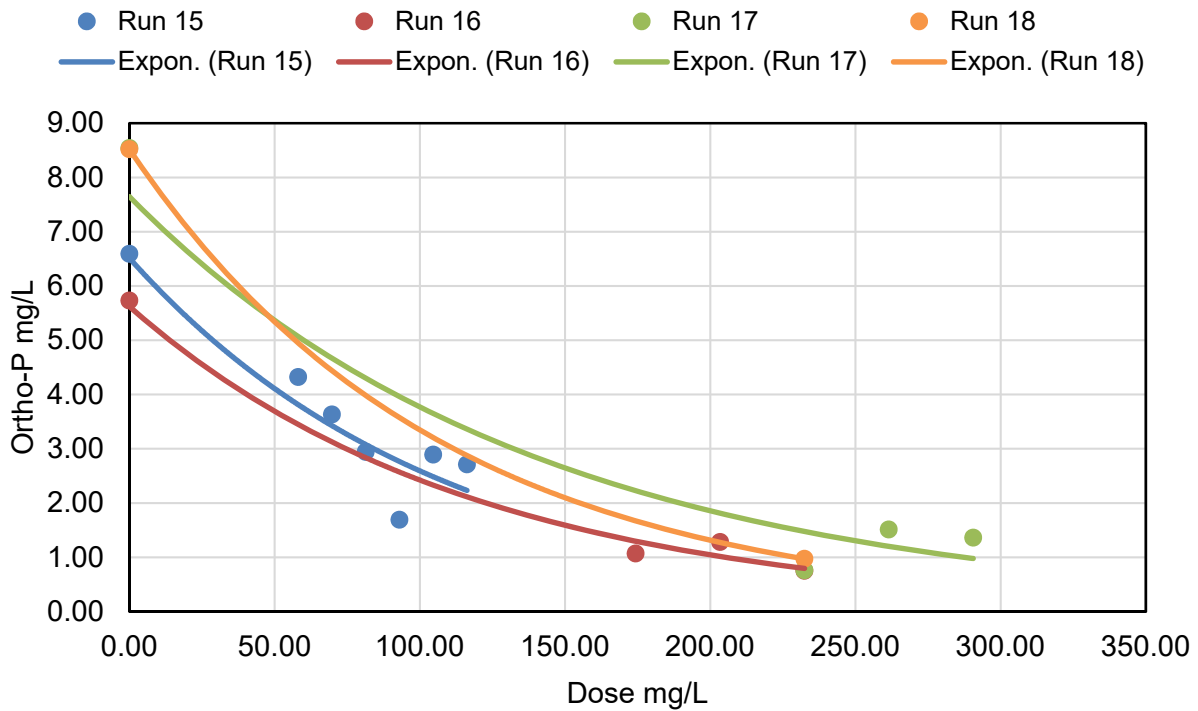


It is more interesting to look at the percent removal versus the dose.

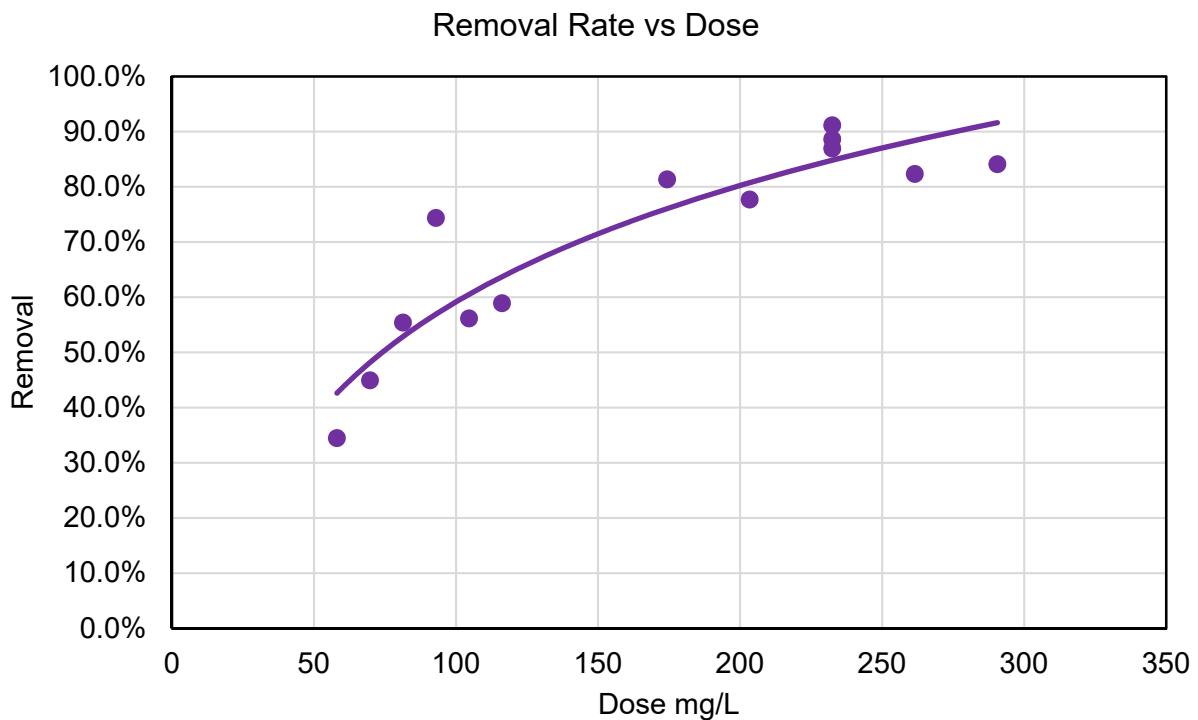


While this produces good curve fit, it doesn't produce a realistic recommendation for dosage it implies a need dose of 200 – 250 mg/L.

Compiling all of the exponential trendlines of the Sodium Aluminate samples as a visual check on repeatability gives the following graph.

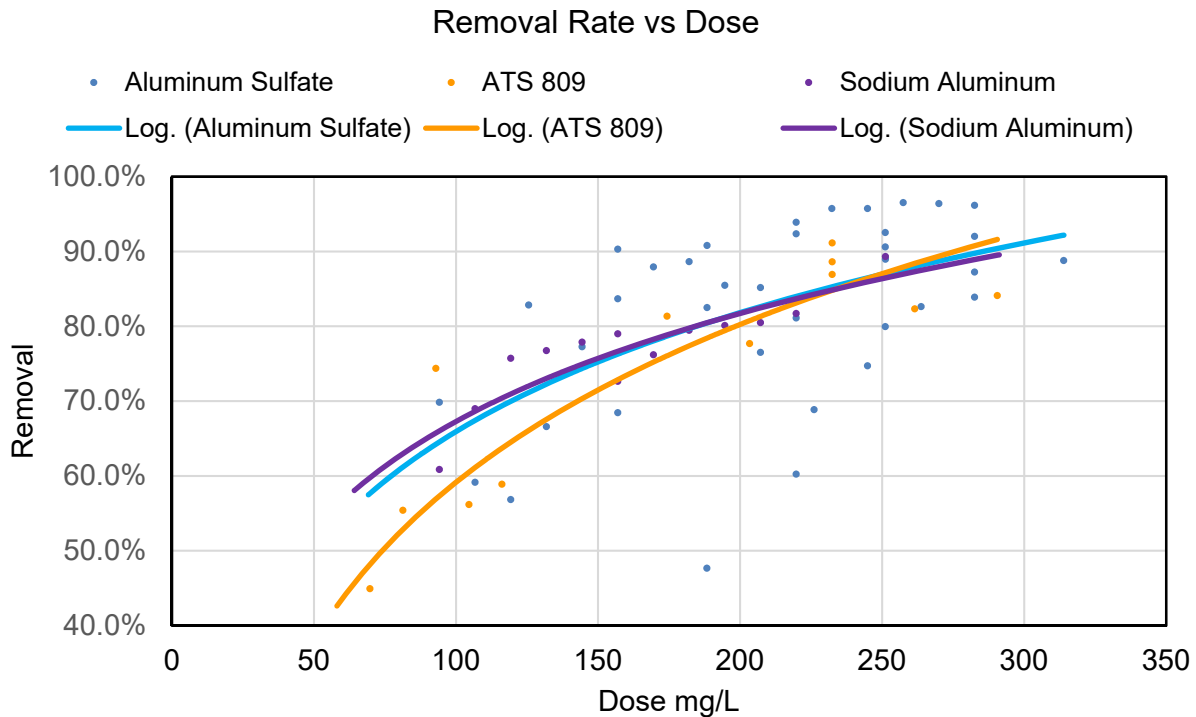


It is more interesting to look at the percent removal versus the dose.



While this produces good curve fit, it doesn't produce a realistic recommendation for dosage it implies a need dose of 200 – 250 mg/L.

Overlaying all of the Aluminum based chemicals



Based upon this graph the choice of chemical is more a cost consideration that a clear removal advantage.

Conclusions and Recommendations

The concentration of orthophosphorus that Payson needs to treat chemically is much higher than anticipated. The annual reported orthophosphorus in the effluent was 4.57 mg/L ranging from 3.20 mg/L to 5.50 mg/L. While the measured orthophosphorus during the testing averaged 7.94 mg/L ranging from 5.56 mg/L to 10.80 mg/L in the effluent. Payson will be able to meet the proposed phosphorus limit through chemical addition, but will require high doses. In order to reduce the overall chemical usage, use both Pre- and Post-precipitation. It appears that Payson could benefit from adding Ferric Chloride or Ferric Sulfate to the primary clarifiers to reduce the plant's phosphorus. Adding Iron here will have the additional benefit of increasing the density of the sludge in the primary clarifiers. By increasing density, this could reduce the volume pumped into the digestors. The potential for struvite formation will be reduced by this addition also. After the ultraviolet disinfection is installed Payson's choice for Post-precipitation chemical will be Aluminum based.

As the chemical is distributed throughout the aeration basin from return activated sludge, the actual dose may decrease. The impacted of the filtration should decrease the actual dose need also.

Recalculating theoretical dose of Iron versus Actual

Pounds of orthophosphorus to be removed

$$P \frac{lbs}{day} = 8.34 \frac{lbs}{gal} \times 2.00 \text{ MGD} \times (7.94 - 0.80) \frac{mg}{L} \cong 120 \frac{lbs}{day}$$

Calculate Required Dose of Iron to Remove Phosphorus

$$Dose \text{ Iron } \frac{lbs}{day} = \text{Phosphorus Removed } \frac{lbs}{day} \times \text{Weight Ratio}$$

Fe : P Weight Ratio = 1.8 : 1

$$Dose \text{ Iron } \frac{lbs}{day} \cong 120 \frac{lbs}{day} \times 1.8 \cong 216 \frac{lbs}{day}$$

From Jar Testing

Assume a dose of 80 – 100 mg/L needed

$$\text{Iron } \frac{lbs}{day} = 8.34 \frac{lbs}{gal} \times 2.00 \text{ MGD} \times 80 \frac{mg}{L} \cong 1,325 \frac{lbs}{day}$$

$$\text{Iron } \frac{lbs}{day} = 8.34 \frac{lbs}{gal} \times 2.00 \text{ MGD} \times 100 \frac{mg}{L} \cong 1,650 \frac{lbs}{day}$$

Recalculating theoretical dose of Aluminum versus Actual

Pounds of orthophosphorus to be removed

$$P \frac{lbs}{day} = 8.34 \frac{lbs}{gal} \times 2.00 \text{ MGD} \times (7.94 - 0.80) \frac{mg}{L} \cong 120 \frac{lbs}{day}$$

$$Dose \text{ Aluminum } \frac{lbs}{day} = \text{Phosphorus Removed } \frac{lbs}{day} \times \text{Weight Ratio}$$

Dose of Aluminum to Remove Phosphorus

Al : P Weight Ratio = 0.87 : 1

$$Dose \text{ Aluminum } \frac{lbs}{day} \cong 120 \frac{lbs}{day} \times 0.87 \cong 105 \frac{lbs}{day}$$

From Jar Testing

Assume a dose of 150 – 200 mg/L needed

$$\text{Iron } \frac{\text{lbs}}{\text{day}} = 8.34 \frac{\text{lbs}}{\text{gal}} \times 2.00 \text{ MGD} \times 150 \frac{\text{mg}}{\text{L}} \cong 2,500 \frac{\text{lbs}}{\text{day}}$$

$$\text{Iron } \frac{\text{lbs}}{\text{day}} = 8.34 \frac{\text{lbs}}{\text{gal}} \times 2.00 \text{ MGD} \times 200 \frac{\text{mg}}{\text{L}} \cong 3,325 \frac{\text{lbs}}{\text{day}}$$

The choice of which chemical to use will mainly depend on pricing that Payson can get from either Thatcher or ATS.

Appendix G
Detailed Cost Estimate



Engineer's Opinion of Probable Cost

Client: Payson

5 MGD Expansion

ITEM	DESCRIPTION	Qty	Unit	Each	COST
Site Work and Yard Piping					
1	Sitework	1	lump	\$100,000	\$100,000
2	Yard Piping	1	lump	\$200,000	\$200,000
Subtotal					\$300,000
Plant Repairs					
3	Miscellaneous Upgrade	1	lump	\$150,000	\$150,000
Subtotal					\$150,000
Demolition					
4	Aeration Tank #1 & #2	800	ton	\$50	\$40,000
5	Aeration Tank Mechanical	1	lump	\$5,000	\$5,000
6	Old Trickling Filter Tank Concrete	350	ton	\$50	\$17,500
7	Trickling Filter Media Removal	3200	ton	\$10	\$32,000
8	Intermediate Clarifier	500	ton	\$50	\$25,000
9	Intermediate Clarifier Mechanical	1	lump	\$5,000	\$5,000
Subtotal					\$124,500
Headworks					
10	Building	250	sq ft	\$150	\$37,500
11	Screen	1	lump	\$80,000	\$80,000
12	Washpactor	1	lump	\$50,000	\$50,000
13	Installation	1	lump	\$15,000	\$15,000
Subtotal					\$182,500
Primary Lift Station					
14	Lift Station Basin	100	cu.yd.	\$1,000	\$100,000
15	Building	225	sq.ft.	\$150	\$33,750
16	Lift Pump	4	ea	\$35,000	\$140,000
17	Installation	1	lump	\$50,000	\$50,000
Subtotal					\$323,750
Anoxic Basin					
18	Eductor Mixer	4	basin	\$15,000	\$60,000
19	Concrete Basin	500	cu.yd.	\$1,000	\$500,000
20	Earthwork	6000	cu.yd.	\$20	\$120,000
21	Installation	1	lump	\$136,000	\$136,000
Subtotal					\$816,000

Aerobic Basin					
22	Concrete Basin	1400	cu.yd.	\$1,000	\$1,400,000
23	Earthwork	5000	cu.yd.	\$20	\$100,000
24	Diffuser	1	lump	\$50,000	\$50,000
25	Air Piping	1	lump	\$80,000	\$80,000
26	Blower	3	ea	\$100,000	\$300,000
27	Blower Building	1500	sq.ft.	\$100	\$150,000
28	Installation	1	lump	\$100,000	\$100,000
				Subtotal	\$2,180,000
Primary Clarifier					
29	Clarifier Tanks	700	cu.yd.	\$1,000	\$700,000
30	Clarifier Mechanisms	3	ea	\$300,000	\$900,000
31	Clarifier Pumps	2	ea	\$30,000	\$60,000
32	Earthwork	10000	cu.yd.	\$20	\$200,000
33	Installation	1	lump	\$70,000	\$70,000
				Subtotal	\$1,930,000
Final Clarifier					
34	Clarifier Tank	350	cu.yd.	\$1,000	\$350,000
35	Clarifier Mechanism	2	ea	\$300,000	\$600,000
36	Clarifier Pump	1	ea	\$30,000	\$30,000
37	Earthwork	5000	cu.yd.	\$20	\$100,000
38	Installation	1	lump	\$70,000	\$70,000
				Subtotal	\$1,150,000
Digester					
39	Digester Tank	300	cu.yd.	\$1,000	\$300,000
40	Mixer	1	ea	\$150,000	\$150,000
41	Digester Cover	1	ea	\$180,000	\$180,000
42	Piping	1	lump	\$150,000	\$150,000
43	Earthwork	5000	cu.yd.	\$20	\$100,000
44	Installation	1	lump	\$176,000	\$176,000
				Subtotal	\$1,056,000
Solid Handling					
45	Dewatering Mechanism	1	ea	\$300,000	\$300,000
46	Installation	1	lump	\$60,000	\$60,000
				Subtotal	\$360,000
Chemical Storage					
47	Chemical Bulding	1200	sq. ft.	\$100	\$120,000
48	Chemical Storage Tank	2	ea	\$40,000	\$80,000
49	Chemical Pumps	4	ea	\$8,000	\$32,000
50	Installation	1	lump	\$22,400	\$22,400
				Subtotal	\$254,400
UV Basin					
51	UV Lights	1	lump	\$1,500,000	\$1,500,000
52	Building	6000	sq.ft.	\$100	\$600,000
53	Installation	1	lump	\$300,000	\$300,000
				Subtotal	\$2,400,000

Reuse Pump Station Remodel					
54	Piping Upgrades	1	lump	\$30,000	\$30,000
55	Pumps	4	ea	\$20,000	\$80,000
Subtotal					\$110,000
Filter Building Upgrade					
56	New Cloth Filters	1	lump	\$810,000	\$810,000
57	Installation	1	lump	\$100,000	\$100,000
Subtotal					\$910,000
Boiler & DAF Building					
58	DAF Building	12000	sq.ft.	\$80	\$960,000
59	Boiler	3	ea	\$50,000	\$150,000
60	Heat Exchanger	3	ea	\$40,000	\$120,000
61	Piping	1	ea	\$70,000	\$70,000
62	Installation	1	lump	\$60,000	\$60,000
Subtotal					\$1,360,000
Electrical					
63	Electrical and Instrumentation	20	%	\$2,721,430.00	\$2,721,430
Subtotal					\$2,721,430
Construction Cost Subtotal					\$16,328,580
Contingency 20%					\$3,265,716
Construction Cost Total					\$19,594,296
Engineering, Construction Observation 10%					\$1,959,430
Legal & Permitting 5%					\$979,715
Total Probable Cost					\$22,533,440



Engineer's Opinion of Probable Cost

Client: Payson

5 MGD Expansion with ClearAs ABNR

ITEM	DESCRIPTION	Qty	Unit	Each	COST
Site Work and Yard Piping					
1	Sitework	1	lump	\$100,000	\$100,000
2	Yard Piping	1	lump	\$200,000	\$200,000
Subtotal					\$300,000
Plant Repairs					
3	Miscellaneous Upgrade	1	lump	\$150,000	\$150,000
Subtotal					\$150,000
Demolition					
4	Aeration Tank #1 & #2	800	ton	\$45	\$36,000
5	Aeration Tank Mechanical	1	lump	\$5,000	\$5,000
6	Old Trickling Filter Tank Concrete	350	ton	\$45	\$15,750
7	Trickling Filter Media Removal	3200	ton	\$10	\$32,000
8	Intermediate Clarifier	500	ton	\$45	\$22,500
9	Intermediate Clarifier Mechanical	1	lump	\$5,000	\$5,000
Subtotal					\$116,250
Headworks					
10	Building	250	sq ft	\$100	\$25,000
11	Screen	1	lump	\$80,000	\$80,000
12	Washpactor	1	lump	\$50,000	\$50,000
13	Installation	1	lump	\$15,000	\$15,000
Subtotal					\$170,000
Primary Lift Station					
14	Lift Station Basin	100	cu.yd.	\$1,000	\$100,000
15	Building	225	sq.ft.	\$100	\$22,500
16	Lift Pump	4	ea	\$35,000	\$140,000
17	Installation	1	lump	\$50,000	\$50,000
Subtotal					\$312,500
Aerobic Basin					
18	Concrete Basin	900	cu.yd.	\$1,000	\$900,000
19	Earthwork	3000	cu.yd.	\$20	\$60,000
20	Diffuser	1	lump	\$50,000	\$50,000
21	Air Piping	1	lump	\$80,000	\$80,000
22	Blower	3	ea	\$100,000	\$300,000
23	Blower Building	1500	sq.ft.	\$100	\$150,000
24	Installation	1	lump	\$100,000	\$100,000
Subtotal					\$1,640,000

Primary Clarifier					
25	Clarifier Tank	700	cu.yd.	\$1,000	\$700,000
26	Clarifier Mechanisms	3	ea	\$300,000	\$900,000
27	Clarifier Pump	2	ea	\$30,000	\$60,000
28	Earthwork	10000	cu.yd.	\$20	\$200,000
29	Installation	1	lump	\$35,000	\$35,000
Subtotal					\$1,895,000
Final Clarifier					
30	Clarifier Tank	350	cu.yd.	\$1,000	\$350,000
31	Clarifier Mechanism	2	ea	\$300,000	\$600,000
32	Clarifier Pump	1	ea	\$30,000	\$30,000
33	Earthwork	5000	cu.yd.	\$20	\$100,000
34	Installation	1	lump	\$70,000	\$70,000
Subtotal					\$1,150,000
Digester					
35	Digester Tank	300	cu.yd.	\$1,000	\$300,000
36	Mixer	1	ea	\$150,000	\$150,000
37	Digester Cover	1	ea	\$180,000	\$180,000
38	Piping	1	lump	\$150,000	\$150,000
39	Earthwork	5000	cu.yd.	\$20	\$100,000
40	Installation	1	lump	\$176,000	\$176,000
Subtotal					\$1,056,000
Solid Handling					
41	Dewatering Mechanism	1	ea	\$300,000	\$300,000
42	Installation	1	lump	\$60,000	\$60,000
Subtotal					\$360,000
Advanced Biological Nutrient Removal (3MGD Banded Flow Treatment)					
43	Photobioreactor Equipment	1	lump	\$6,820,000	\$6,820,000
44	Monitoring Eq, Proves, Integration	1	lump	\$590,000	\$590,000
45	Membrane, Permeate Pump, Blowers	1	lump	\$3,600,000	\$3,600,000
46	Centrifuge, Dewatering Pump	1	lump	\$1,370,000	\$1,370,000
47	Wet well, Pumps, Prescreen	1	lump	\$650,000	\$650,000
48	Site Work, Yard Piping	1	lump	\$500,000	\$500,000
49	Separation Eq (i.e., air piping, tanks)	1	lump	\$150,000	\$150,000
50	Carbon Dioxide System	1	lump	\$130,000	\$130,000
51	Greenhouse	1	lump	\$1,390,000	\$1,390,000
Subtotal					\$15,200,000
UV Basin					
52	UV Lights	1	lump	\$1,500,000	\$1,500,000
53	Installation	1	lump	\$300,000	\$300,000
Subtotal					\$1,800,000
Reuse Pump Station Remodel					
54	Piping Upgrades	1	lump	\$30,000	\$30,000
55	Pumps	4	ea	\$20,000	\$80,000
Subtotal					\$110,000

Boiler & DAF Building					
56	DAF Building	12000	sq.ft.	\$60	\$720,000
57	Boiler	3	ea	\$50,000	\$150,000
58	Heat Exchanger	3	ea	\$40,000	\$120,000
59	Piping	1	ea	\$70,000	\$70,000
60	Installation	1	lump	\$60,000	\$60,000
Subtotal					\$1,120,000
Electrical					
61	Electrical and Instrumentation	15	%	\$3,806,962.50	\$3,806,963
Subtotal					\$3,806,963
Construction Cost Subtotal					\$29,186,713
Contingency 20%					\$5,837,343
Construction Cost Total					\$35,024,055
Engineering, Construction Observation 10%					\$3,502,406
Legal & Permitting 5%					\$1,751,203
Total Probable Cost					\$40,277,663



Engineer's Opinion of Probable Cost

Client: Payson

5 MGD Expansion with ClearAs ABNR Aerobic Digestion

ITEM	DESCRIPTION	Qty	Unit	Each	COST
Site Work and Yard Piping					
1	Sitework	1	lump	\$100,000	\$100,000
2	Yard Piping	1	lump	\$200,000	\$200,000
Subtotal					\$300,000
Plant Repairs					
3	Miscellaneous Upgrade	1	lump	\$150,000	\$150,000
Subtotal					\$150,000
Demolition					
4	Aeration Tank #1 & #2	800	ton	\$45	\$36,000
Subtotal					\$36,000
Headworks					
5	Building	500	sq ft	\$100	\$50,000
6	Screen	1	lump	\$80,000	\$80,000
7	Washpactor	1	lump	\$50,000	\$50,000
8	Installation	1	lump	\$15,000	\$15,000
Subtotal					\$195,000
Primary Lift Station					
9	Lift Station Basin	100	cu.yd.	\$1,000	\$100,000
10	Building	225	sq.ft.	\$100	\$22,500
11	Lift Pump	4	ea	\$35,000	\$140,000
12	Installation	1	lump	\$50,000	\$50,000
Subtotal					\$312,500
Aerobic Basin					
13	Concrete Basin	1170	cu.yd.	\$1,000	\$1,170,000
14	Earthwork	3900	cu.yd.	\$20	\$78,000
15	Diffuser	1	lump	\$80,000	\$80,000
16	Air Piping	1	lump	\$100,000	\$100,000
17	Blower	3	ea	\$120,000	\$360,000
18	Blower Building	1500	sq.ft.	\$100	\$150,000
19	Installation	1	lump	\$100,000	\$100,000
Subtotal					\$2,038,000
Primary Clarifier					
25	Clarifier Tank	700	cu.yd.	\$1,000	\$700,000
26	Clarifier Mechanisms	3	ea	\$300,000	\$900,000
27	Clarifier Pump	2	ea	\$30,000	\$60,000
28	Earthwork	10000	cu.yd.	\$20	\$200,000
29	Installation	1	lump	\$35,000	\$35,000
Subtotal					\$1,895,000

Final Clarifier					
22	Clarifier Tank	350	cu.yd.	\$1,000	\$350,000
23	Clarifier Mechanism	2	ea	\$300,000	\$600,000
24	Clarifier Pump	1	ea	\$30,000	\$30,000
25	Earthwork	5000	cu.yd.	\$20	\$100,000
26	Installation	1	lump	\$70,000	\$70,000
Subtotal					\$1,150,000
Convert Anaerobic Digester to Aerobic Eq Tanks					
27	Remove Existing Lids	1	Lump	\$50,000	\$50,000
28	Blowers	2	ea	\$50,000	\$100,000
29	Diffusers	1	Lump	\$180,000	\$180,000
30	Piping	1	lump	\$50,000	\$50,000
Subtotal					\$380,000
Solid Handling					
31	Dewatering Mechanism	2	ea	\$300,000	\$600,000
32	Installation	1	lump	\$250,000	\$250,000
Subtotal					\$850,000
Advanced Biological Nutrient Removal (3MGD Banded Flow Treatment)					
33	Photobioreactor Equipment	1	lump	\$6,820,000	\$6,820,000
34	Monitoring Eq, Proves, Integration	1	lump	\$590,000	\$590,000
35	Membrane, Permeate Pump, Blowers	1	lump	\$3,600,000	\$3,600,000
36	Centrifuge, Dewatering Pump	1	lump	\$1,370,000	\$1,370,000
37	Wet well, Pumps, Prescreen	1	lump	\$650,000	\$650,000
38	Site Work, Yard Piping	1	lump	\$500,000	\$500,000
39	Separation Eq (i.e., air piping, tanks)	1	lump	\$150,000	\$150,000
40	Carbon Dioxide System	1	lump	\$130,000	\$130,000
41	Greenhouse	1	lump	\$1,390,000	\$1,390,000
Subtotal					\$15,200,000
UV Basin					
42	UV Lights	1	lump	\$700,000	\$700,000
43	Installation	1	lump	\$140,000	\$140,000
Subtotal					\$840,000
Reuse Pump Station Remodel					
44	Piping Upgrades	1	lump	\$30,000	\$30,000
45	Pumps	4	ea	\$20,000	\$80,000
Subtotal					\$110,000
Electrical					
46	Electrical and Instrumentation	15	%	\$3,518,475.00	\$3,518,475
Subtotal					\$3,518,475
Construction Cost Subtotal					\$26,974,975
Contingency 20%					\$5,394,995
Construction Cost Total					\$32,369,970
Engineering, Construction Observation 10%					\$3,236,997
Legal & Permitting 5%					\$1,618,499
Total Probable Cost					\$37,225,466



Engineer's Opinion of Probable Cost

Client: Payson

5 MGD Expansion Aerobic Stabilization

ITEM	DESCRIPTION	Qty	Unit	Each	COST
Site Work and Yard Piping					
1	Sitework	1	lump	\$100,000	\$100,000
2	Yard Piping	1	lump	\$200,000	\$200,000
Subtotal					\$300,000
Plant Repairs					
3	Miscellaneous Upgrade	1	lump	\$150,000	\$150,000
Subtotal					\$150,000
Demolition					
4	Aeration Tank #1 & #2	800	ton	\$50	\$40,000
5	Aeration Tank Mechanical	1	lump	\$5,000	\$5,000
6	Old Trickling Filter Tank Concrete	350	ton	\$50	\$17,500
7	Trickling Filter Media Removal	3200	ton	\$10	\$32,000
8	Intermediate Clarifier	500	ton	\$50	\$25,000
9	Intermediate Clarifier Mechanical	1	lump	\$5,000	\$5,000
Subtotal					\$124,500
Headworks					
10	Building	250	sq ft	\$150	\$37,500
11	Screen	1	lump	\$80,000	\$80,000
12	Washpactor	1	lump	\$50,000	\$50,000
13	Installation	1	lump	\$15,000	\$15,000
Subtotal					\$182,500
Primary Lift Station					
14	Lift Station Basin	100	cu.yd.	\$1,000	\$100,000
15	Building	225	sq.ft.	\$150	\$33,750
16	Lift Pump	4	ea	\$35,000	\$140,000
17	Installation	1	lump	\$50,000	\$50,000
Subtotal					\$323,750
Anoxic Basin					
18	Eductor Mixer	4	basin	\$15,000	\$60,000
19	Concrete Basin	500	cu.yd.	\$1,000	\$500,000
20	Earthwork	6000	cu.yd.	\$20	\$120,000
21	Installation	1	lump	\$136,000	\$136,000
Subtotal					\$816,000

Aerobic Basin					
22	Concrete Basin	1400	cu.yd.	\$1,000	\$1,400,000
23	Earthwork	5000	cu.yd.	\$20	\$100,000
24	Diffuser	1	lump	\$50,000	\$50,000
25	Air Piping	1	lump	\$80,000	\$80,000
26	Blower	3	ea	\$100,000	\$300,000
27	Blower Building	1500	sq.ft.	\$100	\$150,000
28	Installation	1	lump	\$100,000	\$100,000
Subtotal					\$2,180,000
Primary Clarifier					
29	Clarifier Tanks	700	cu.yd.	\$1,000	\$700,000
30	Clarifier Mechanisms	3	ea	\$300,000	\$900,000
31	Clarifier Pumps	2	ea	\$30,000	\$60,000
32	Earthwork	10000	cu.yd.	\$20	\$200,000
33	Installation	1	lump	\$70,000	\$70,000
Subtotal					\$1,930,000
Final Clarifier					
34	Clarifier Tank	350	cu.yd.	\$1,000	\$350,000
35	Clarifier Mechanism	2	ea	\$300,000	\$600,000
36	Clarifier Pump	1	ea	\$30,000	\$30,000
37	Earthwork	5000	cu.yd.	\$20	\$100,000
38	Installation	1	lump	\$70,000	\$70,000
Subtotal					\$1,150,000
Solid Handling					
39	Dewatering Mechanism	2	ea	\$300,000	\$600,000
40	Installation	1	lump	\$120,000	\$120,000
Subtotal					\$720,000
Chemical Storage					
41	Chemical Bulding	1200	sq. ft.	\$100	\$120,000
42	Chemical Storage Tank	2	ea	\$40,000	\$80,000
43	Chemical Pumps	4	ea	\$8,000	\$32,000
44	Installation	1	lump	\$22,400	\$22,400
Subtotal					\$254,400
UV Basin					
45	UV Lights	1	lump	\$1,500,000	\$1,500,000
46	Building	6000	sq.ft.	\$100	\$600,000
47	Installation	1	lump	\$300,000	\$300,000
Subtotal					\$2,400,000
Reuse Pump Station Remodel					
48	Piping Upgrades	1	lump	\$30,000	\$30,000
49	Pumps	4	ea	\$20,000	\$80,000
Subtotal					\$110,000

Filter Building Upgrade					
50	New Cloth Filters	1	lump	\$810,000	\$810,000
51	Installation	1	lump	\$100,000	\$100,000
Subtotal					\$910,000
Convert Anaerobic Digester to Aerobic Eq Tanks					
52	Remove Existing Lids	1	Lump	\$50,000	\$50,000
53	Blowers	2	ea	\$50,000	\$100,000
54	Diffusers	1	Lump	\$180,000	\$180,000
55	Piping	1	lump	\$50,000	\$50,000
Subtotal					\$380,000
Electrical					
56	Electrical and Instrumentation	20	%	\$2,386,230.00	\$2,386,230
Subtotal					\$2,386,230
Construction Cost Subtotal					\$14,317,380
Contingency 20%					\$2,863,476
Construction Cost Total					\$17,180,856
Engineering, Construction Observation 10%					\$1,718,086
Legal & Permitting 5%					\$859,043
Total Probable Cost					\$19,757,984



Engineer's Opinion of Probable Cost

Client: Payson

3 MGD Expansion

ITEM	DESCRIPTION	Qty	Unit	Each	COST
Site Work and Yard Piping					
1	Sitework	1	lump	\$70,000	\$70,000
2	Yard Piping	1	lump	\$150,000	\$150,000
3	Miscellaneous	1	lump	\$100,000	\$100,000
Subtotal					\$320,000
Plant Repairs					
4	Miscellaneous Upgrade	1	lump	\$150,000	\$150,000
Subtotal					\$150,000
Demolition					
5	Aeration Tank #1 & #2	800	ton	\$50	\$40,000
6	Aeration Tank Mechanical	1	lump	\$5,000	\$5,000
7	Old Trickling Filter Tank Concrete	350	ton	\$50	\$17,500
8	Trickling Filter Media Removal	3200	ton	\$10	\$32,000
Subtotal					\$94,500
Aerobic Basin					
9	Concrete Basin	1000	cu.yd.	\$1,000	\$1,000,000
10	Earthwork	3000	cu.yd.	\$20	\$60,000
11	Diffuser	1	lump	\$30,000	\$30,000
12	Air Piping	1	lump	\$50,000	\$50,000
13	Blower	2	ea	\$100,000	\$200,000
14	Blower Building	1500	sq.ft.	\$100	\$150,000
15	Installation	1	lump	\$70,000	\$70,000
Subtotal					\$1,560,000
Primary Clarifier					
16	Clarifier Tanks	350	cu.yd.	\$1,000	\$350,000
17	Clarifier Mechanisms	2	ea	\$300,000	\$600,000
18	Clarifier Pumps	1	ea	\$30,000	\$30,000
19	Earthwork	5000	cu.yd.	\$20	\$100,000
20	Installation	1	lump	\$35,000	\$35,000
Subtotal					\$1,115,000
Final Clarifier					
21	Clarifier Tank	350	cu.yd.	\$1,000	\$350,000
22	Clarifier Mechanism	2	ea	\$300,000	\$600,000
23	Clarifier Pump	1	ea	\$30,000	\$30,000
24	Earthwork	5000	cu.yd.	\$20	\$100,000
25	Installation	1	lump	\$70,000	\$70,000
Subtotal					\$1,150,000

Solid Handling						
26	Dewatering Mechanism	1	ea	\$300,000	\$300,000	
27	Installation	1	lump	\$60,000	\$60,000	
					Subtotal	\$360,000
Chemical Storage						
28	Chemical Building	1200	sq.ft.	\$150	\$180,000	
29	Chemical Storage Tank	2	ea	\$40,000	\$80,000	
30	Chemical Pumps	4	ea	\$8,000	\$32,000	
31	Installation	1	lump	\$22,400	\$22,400	
					Subtotal	\$314,400
UV Basin						
32	UV Lights	1	lump	\$600,000	\$600,000	
33	Building	6000	sq.ft.	\$100	\$600,000	
34	Installation	1	lump	\$120,000	\$120,000	
					Subtotal	\$1,320,000
Reuse Pump Station Remodel						
35	Piping Upgrades	1	lump	\$30,000	\$30,000	
36	Pumps	4	ea	\$20,000	\$80,000	
					Subtotal	\$110,000
Filter Building						
37	Disk Filters	1	lump	\$600,000	\$600,000	
38	Installation	1	lump	\$60,000	\$60,000	
					Subtotal	\$660,000
Boiler & DAF Building						
39	DAF Building	12000	sq.ft.	\$60	\$720,000	
40	Boiler	2	ea	\$50,000	\$100,000	
41	Heat Exchanger	1	ea	\$40,000	\$40,000	
42	Piping	1	ea	\$50,000	\$50,000	
43	Installation	1	lump	\$50,000	\$50,000	
					Subtotal	\$960,000
Electrical						
44	Electrical and Instrumentation	20	%	\$1,622,780.00	\$1,622,780	
					Subtotal	\$1,622,780
					Construction Cost Subtotal	\$9,736,680
					Contingency 20%	\$1,947,336
					Construction Cost Total	\$11,684,016
					Engineering, Construction Observation 10%	\$1,168,402
					Legal & Permitting 5%	\$584,201
					Total Probable Cost	\$13,436,618



Engineer's Opinion of Probable Cost

Client: Payson

3 MGD Expansion with ClearAs ABNR

ITEM	DESCRIPTION	Qty	Unit	Each	COST
Site Work and Yard Piping					
1	Sitework	1	lump	\$70,000	\$70,000
2	Yard Piping	1	lump	\$150,000	\$150,000
3	Miscellaneous	1	lump	\$100,000	\$100,000
Subtotal					\$320,000
Plant Repairs					
4	Miscellaneous Upgrade	1	lump	\$150,000	\$150,000
Subtotal					\$150,000
Demolition					
5	Aeration Tank #1 & #2	400	ton	\$45	\$18,000
6	Aeration Tank Mechanical	1	lump	\$3,000	\$3,000
7	Old Trickling Filter Tank Concrete	350	ton	\$45	\$15,750
8	Trickling Filter Media Removal	3200	ton	\$10	\$32,000
Subtotal					\$68,750
Aerobic Basin					
9	Concrete Basin	200	cu.yd.	\$1,000	\$200,000
10	Earthwork	3000	cu.yd.	\$20	\$60,000
11	Diffuser	1	lump	\$15,000	\$15,000
12	Air Piping	1	lump	\$50,000	\$50,000
13	Blower	2	ea	\$100,000	\$200,000
14	Blower Building	1500	sq.ft.	\$100	\$150,000
15	Installation	1	lump	\$70,000	\$70,000
Subtotal					\$745,000
Primary Clarifier					
16	Clarifier Tanks	350	cu.yd.	\$1,000	\$350,000
17	Clarifier Mechanisms	2	ea	\$300,000	\$600,000
18	Clarifier Pumps	1	ea	\$30,000	\$30,000
19	Earthwork	5000	ea	\$20	\$100,000
20	Installation	1	lump	\$35,000	\$35,000
Subtotal					\$1,115,000
Final Clarifier					
21	Clarifier Tank	350	cu.yd.	\$1,000	\$350,000
22	Clarifier Mechanism	2	ea	\$300,000	\$600,000
23	Clarifier Pump	1	ea	\$30,000	\$30,000
24	Earthwork	5000	cu.yd.	\$20	\$100,000
25	Installation	1	lump	\$70,000	\$70,000
Subtotal					\$1,150,000

Solid Handling					
26	Dewatering Mechanism	1	ea	\$300,000	\$300,000
27	Installation	1	lump	\$60,000	\$60,000
Subtotal					\$360,000
Advanced Biological Nutrient Removal (2MGD Blended Flow Treatment)					
28	Photobioreactor Equipment	1	lump	\$4,550,000	\$4,550,000
29	Monitoring Eq, Proves, Integration	1	lump	\$460,000	\$460,000
30	Membrane, Permeate Pump, Blowers	1	lump	\$2,600,000	\$2,600,000
31	Centrifuge, Dewatering Pump	1	lump	\$1,360,000	\$1,360,000
32	Wet well, Pumps, Prescreen	1	lump	\$490,000	\$490,000
33	Site Work, Yard Piping	1	lump	\$320,000	\$320,000
34	Separation Eq (i.e., air piping, tanks)	1	lump	\$100,000	\$100,000
35	Carbon Dioxide System	1	lump	\$90,000	\$90,000
36	Greenhouse	1	lump	\$1,000,000	\$1,000,000
Subtotal					\$10,970,000
UV Basin					
37	UV Lights	1	lump	\$600,000	\$600,000
38	Installation	1	lump	\$120,000	\$120,000
Subtotal					\$720,000
Reuse Pump Station Remodel					
39	Piping Upgrades	1	lump	\$30,000	\$30,000
40	Pumps	4	ea	\$20,000	\$80,000
Subtotal					\$110,000
Boiler & DAF Building					
41	DAF Building	12000	sq.ft.	\$60	\$720,000
42	Boiler	2	ea	\$50,000	\$100,000
43	Heat Exchanger	1	ea	\$40,000	\$40,000
44	Piping	1	ea	\$50,000	\$50,000
45	Installation	1	lump	\$50,000	\$50,000
Subtotal					\$960,000
Electrical					
46	Electrical and Instrumentation	15	%	\$2,500,312.50	\$2,500,313
Subtotal					\$2,500,313
Construction Cost Subtotal					\$19,169,063
Contingency 20%					\$3,833,813
Construction Cost Total					\$23,002,875
Engineering, Construction Observation 10%					\$2,300,288
Legal & Permitting 5%					\$1,150,144
Total Probable Cost					\$26,453,306



Engineer's Opinion of Probable Cost

Client: Payson

**3 MGD Expansion with ClearAs ABNR With
Aerobic Stabilization**

ITEM	DESCRIPTION	Qty	Unit	Each	COST
Site Work and Yard Piping					
1	Sitework	1	lump	\$70,000	\$70,000
2	Yard Piping	1	lump	\$150,000	\$150,000
Subtotal					\$220,000
Plant Repairs					
4	Miscellaneous Upgrade	1	lump	\$150,000	\$150,000
					\$150,000
Demolition					
5	Aeration Tank #1 & #2	800	ton	\$45	\$36,000
Subtotal					\$36,000
Aerobic Basin					
6	Concrete Basin	260	cu.yd.	\$1,000	\$260,000
7	Earthwork	3900	cu.yd.	\$20	\$78,000
8	Diffuser	1	lump	\$30,000	\$30,000
9	Air Piping	1	lump	\$50,000	\$50,000
10	Blower	2	ea	\$120,000	\$240,000
11	Blower Building	1500	sq.ft.	\$100	\$150,000
12	Installation	1	lump	\$70,000	\$70,000
Subtotal					\$878,000
Primary Clarifier					
13	Clarifier Mechanism	1	ea	\$300,000	\$300,000
14	Installation	1	lump	\$35,000	\$35,000
Subtotal					\$335,000
Final Clarifier					
15	Clarifier Tank	350	cu.yd.	\$1,000	\$350,000
16	Clarifier Mechanism	2	ea	\$300,000	\$600,000
17	Clarifier Pump	1	ea	\$30,000	\$30,000
18	Earthwork	5000	cu.yd.	\$20	\$100,000
19	Installation	1	lump	\$70,000	\$70,000
Subtotal					\$1,150,000
Solid Handling					
20	Dewatering Mechanism	2	ea	\$350,000	\$700,000
21	Installation	1	lump	\$250,000	\$250,000
Subtotal					\$950,000

Advanced Biological Nutrient Removal (2MGD Blended Flow Treatment)							
22	Photobioreactor Equipment	1	lump	\$4,550,000	\$4,550,000		
23	Monitoring Eq, Proves, Integration	1	lump	\$460,000	\$460,000		
24	Membrane, Permeate Pump, Blowers	1	lump	\$2,600,000	\$2,600,000		
25	Centrifuge, Dewatering Pump	1	lump	\$1,360,000	\$1,360,000		
26	Wet well, Pumps, Prescreen	1	lump	\$490,000	\$490,000		
27	Site Work, Yard Piping	1	lump	\$320,000	\$320,000		
28	Separation Eq (i.e., air piping, tanks)	1	lump	\$100,000	\$100,000		
29	Carbon Dioxide System	1	lump	\$90,000	\$90,000		
30	Greenhouse	1	lump	\$1,000,000	\$1,000,000		
					Subtotal	\$10,970,000	
Convert Anaerobic Digester to Aerobic Eq Tanks							
31	Remove Existing Lids	1	Lump	\$50,000	\$50,000		
32	Blowers	2	ea	\$50,000	\$100,000		
33	Diffusers	1	Lump	\$180,000	\$180,000		
34	Piping	1	lump	\$50,000	\$50,000		
					Subtotal	\$380,000	
UV Basin							
35	UV Lights	1	lump	\$600,000	\$600,000		
36	Installation	1	lump	\$60,000	\$60,000		
					Subtotal	\$660,000	
Reuse Pump Station Remodel							
37	Piping Upgrades	1	lump	\$30,000	\$30,000		
38	Pumps	4	ea	\$20,000	\$80,000		
					Subtotal	\$110,000	
Electrical							
39	Electrical and Instrumentation	15	%	\$2,375,850	\$2,375,850		
					Subtotal	\$2,375,850	
					Construction Cost Subtotal	\$18,214,850	
					Contingency 20%	\$3,642,970	
					Construction Cost Total	\$21,857,820	
					Engineering, Construction Observation 10%	\$2,185,782	
					Legal & Permitting 5%	\$1,092,891	
					Total Probable Cost	\$25,136,493	



Engineer's Opinion of Probable Cost

Client: Payson

3 MGD Expansion

ITEM	DESCRIPTION	Qty	Unit	Each	COST
Site Work and Yard Piping					
1	Sitework	1	lump	\$70,000	\$70,000
2	Yard Piping	1	lump	\$150,000	\$150,000
3	Miscellaneous	1	lump	\$100,000	\$100,000
Subtotal					\$320,000
Plant Repairs					
4	Miscellaneous Upgrade	1	lump	\$150,000	\$150,000
Subtotal					\$150,000
Demolition					
5	Aeration Tank #1 & #2	800	ton	\$50	\$40,000
6	Aeration Tank Mechanical	1	lump	\$5,000	\$5,000
7	Old Trickling Filter Tank Concrete	350	ton	\$50	\$17,500
8	Trickling Filter Media Removal	3200	ton	\$10	\$32,000
Subtotal					\$94,500
Aerobic Basin					
9	Concrete Basin	1000	cu.yd.	\$1,000	\$1,000,000
10	Earthwork	3000	cu.yd.	\$20	\$60,000
11	Diffuser	1	lump	\$30,000	\$30,000
12	Air Piping	1	lump	\$50,000	\$50,000
13	Blower	2	ea	\$100,000	\$200,000
14	Blower Building	1500	sq.ft.	\$100	\$150,000
15	Installation	1	lump	\$70,000	\$70,000
Subtotal					\$1,560,000
Primary Clarifier					
16	Clarifier Tanks	350	cu.yd.	\$1,000	\$350,000
17	Clarifier Mechanisms	2	ea	\$300,000	\$600,000
18	Clarifier Pumps	1	ea	\$30,000	\$30,000
19	Earthwork	5000	cu.yd.	\$20	\$100,000
20	Installation	1	lump	\$35,000	\$35,000
Subtotal					\$1,115,000
Final Clarifier					
21	Clarifier Tank	350	cu.yd.	\$1,000	\$350,000
22	Clarifier Mechanism	2	ea	\$300,000	\$600,000
23	Clarifier Pump	1	ea	\$30,000	\$30,000
24	Earthwork	5000	cu.yd.	\$20	\$100,000
25	Installation	1	lump	\$70,000	\$70,000
Subtotal					\$1,150,000

Solid Handling							
26	Dewatering Mechanism	1	ea	\$300,000	\$300,000		
27	Installation	1	lump	\$60,000	\$60,000		
					Subtotal	\$360,000	
Chemical Storage							
28	Chemical Building	1200	sq.ft.	\$150	\$180,000		
29	Chemical Storage Tank	2	ea	\$40,000	\$80,000		
30	Chemical Pumps	4	ea	\$8,000	\$32,000		
31	Installation	1	lump	\$22,400	\$22,400		
					Subtotal	\$314,400	
UV Basin							
32	UV Lights	1	lump	\$600,000	\$600,000		
33	Building	6000	sq.ft.	\$100	\$600,000		
34	Installation	1	lump	\$120,000	\$120,000		
					Subtotal	\$1,320,000	
Reuse Pump Station Remodel							
35	Piping Upgrades	1	lump	\$30,000	\$30,000		
36	Pumps	4	ea	\$20,000	\$80,000		
					Subtotal	\$110,000	
Filter Building							
37	Disk Filters	1	lump	\$600,000	\$600,000		
38	Installation	1	lump	\$60,000	\$60,000		
					Subtotal	\$660,000	
Convert Anaerobic Digester to Aerobic Eq Tanks							
39	Remove Existing Lids	1	Lump	\$50,000	\$50,000		
40	Blowers	2	ea	\$50,000	\$100,000		
41	Diffusers	1	Lump	\$180,000	\$180,000		
42	Piping	1	lump	\$50,000	\$50,000		
					Subtotal	\$380,000	
Electrical							
43	Electrical and Instrumentation	20	%	\$1,506,780.00	\$1,506,780		
					Subtotal	\$1,506,780	
					Construction Cost Subtotal	\$9,040,680	
					Contingency 20%	\$1,808,136	
					Construction Cost Total	\$10,848,816	
					Engineering, Construction Observation 10%	\$1,084,882	
					Legal & Permitting 5%	\$542,441	
					Total Probable Cost	\$12,476,138	