AQUA
ENGINEERING

Heber Valley Special Service District

Impact Fee Facilities Plan

August 2021

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1. EXECUTIVE SUMMARY

1.1. INTRODUCTION

The Heber Valley Special Service District (HVSSD) operates a wastewater treatment system. The purpose of this report is to evaluate future needs for the treatment facility and determine what needs to be done so growth may continue in the valley.

1.2. POPULATION

The anticipated population growth is shown in Table 1. The total population served is currently about 38,408 residents and in 2050 the population is anticipated to be 73,390.

Table 1 Population Growth

Population Projections Including Second Homes				
Area	**2020**	**2030**	**2040**	**2050**
Charleston	840	1,260	1,733	2,258
Heber	20,440	26,320	31,136	36,400
Midway	8,160	11,150	12,840	15,050
Unincorporated WC	8,968	13,122	18,424	19,682
Total Population	38,408	51,852	64,132	73,390
Equivalent Residential Units (ERU)	12,310	16,619	20,555	23,522

1.3. DESIGN FLOW

The current hydraulic design capacity for the treatment system is 4.34 MGD. The anticipated flow in 2050 will be 5.5 MGD. It is anticipated that the hydraulic design capacity will be reached around 2035.

Table 2 Design Flow

Year	Population	Design Flow (MGD)
2020	38,408	2.88
2030	51,852	3.89
2040	64,132	4.81
2050	73,390	5.50

1.4. EXISTING TREATMENT SYSTEM

The existing treatment system has several bottle necks that reduces the treatment facilities true capacity. The limitations will need to be addressed to allow the current system to meet the design capacity. Once the bottlenecks are resolved the current plant should support a population of 57,866 which is anticipated to happen in about 2035. Although the existing hydraulic capacity is 4.34 MGD the firm capacity of the plant is approximately 2.85 MGD. The firm capacity will support about 38,000 people which is above the current population estimate. The following areas need to be adjusted to get the plant to the design capacity.

1.4.1. Disposal

The consumptive use for growing alfalfa in the Heber Valley allows for a 30.09-inches of water to be applied to the fields. Over the last five years HVSSD has applied an average of 40 inches per year on the fields. There are currently 375 acres available for irrigation. In 2021 an additional 80 acres will be added to the farm which will increase the total farm to 455 acres. Accounting for evaporation and infiltration the lagoon disposal system is limited to 674 Million gallons a year. This equates an average daily flow of 1.85 MGD. An additional 165 acres of irrigated land growing a crop is necessary to allow for the disposal of the full 2.34 hydraulic design capacity of the lagoons. It is anticipated that the district will need to acquire about 190 acres of land to allow for buffer zones and other areas that may not be irrigated.

1.4.2. Winter Storage

It is assumed that the winter storage pond needs to store 248 days of water during the non-irrigation season. The current winter storage can store 307 Million Gallons. This is equivalent to 1.96 MGD accounting for evaporation and infiltration. An additional 90 Million Gallons of storage is required to meet the hydraulic design flow of 2.34 MGD.

1.4.3. Mechanical Plant Upgrades

The existing mechanical needs additional aeration capacity to treat the higher loading. In addition, it is recommended to add solids handling to remove the solids load to the lagoons. This will increase the firm capacity by 1 MGD which will support an additional 13,333 people.

1.5. MIDWAY PUMP STATION

The midway pump station is overloaded. It is recommended that new pumps be installed to meet the actual flow at the pumps and additional flow for future growth.

1.6. FARM SHOP STORAGE

A new building to house the farm equipment and do maintenance on the equipment.

1.7. NEW LABORATORY

Equipment for monitoring the treatment plant was purchased in the previous upgrade but to save money the equipment was in the blower building. A new laboratory is recommended to make the equipment better accessible. This will allow for better operations at the treatment facility.

1.8. FUTURE EXPANSION

Based on the growth rate in the area it is anticipated the design flow of the current system will be reached in approximately 2035. To reach the 2050 design time frame an additional 1.2 MGD of capacity will be required. It is recommended that a 2 MGD treatment system be constructed at this time.

1.8.1. Mechanical

Expanding the mechanical treatment capacity to treat an additional 1.2 MGD would be required to meet the 2050 design time frame. Lagoon alternatives were evaluated but the land requirements prohibit the possibility of expanding using farming as a disposal method.

1.8.1.1. Rapid Infiltration Basins

Using mechanical treatment and RIBs it is anticipated method of expanding the treatment facility in the future. An application for a discharge permit should be submitted to the State to see if that is a potential alternative. However, with the current regulatory environment and the cost to expand the farm RIBs are the best alternative for future expansion.

1.9. SUMMARY

The schedule of projects assumes the full capacity of the RIBs and the mechanical system are being utilized. For the lagoon to reach design flow additional land is needed for irrigation. Land should be acquired when possible, to allow for the disposal of the treated wastewater. In addition, winter storage will be limited and will need to be expanded.

Based on the population increase it is anticipated that in about 2035 additional treatment capacity will be needed to meet the growth. Lagoon treatment could be continued only if large parcels of land can be acquired to support the irrigation disposal system, and this is unlikely to be available in the valley.

Changes to ground water quality requirements may limit the ability to use RIBs in the future. If they are still a viable disposal method, the land requirements will be much less than land application. Discharge alternatives should be explored because of the limited disposal alternatives and large land requirements. The more discharge alternatives the district has available, will allow flexibility in the future.

Table 3 is a summary of the major needs of the treatment facility over design period.

Table 3 Project Summary

Description	Current Design Capacity (MGD)	Design Capacity (Population)	Design Capacity (ERU)	Additional Capacity (MGD)	Population Expansion	ERU Expansion	Project Year	Cost	% to Impact Fees	Amount Benefiting Existing Development
Existing investment	4.43	59,067	18,931		37,602	12,052	NA	$33,000,908		
			.							
New Farm Shop			7,906			2,094	2022	$699,000	26%	$513,859.46
Lab			8,547				2021	$620,000	34%	$410,067.72
Generator			8,547				2021	$160,000	75%	$40,000.00
Upgrade HVSSD Lift Station			1,060		707	227	2021	$638,025	67%	$212,474.30
Land Disposal	1.85	24,667	7,906	0.49	6,533	2,094	2021	$13,083,750	100%	$0.00
Winter Storage	1.96	26,133	8,376	0.38	5,067	1,624	2021	$3,080,000	100%	$0.00
Mechanical Plant Aeration Upgrade	2.00	26,667	8,547	1.00	6,667	2,137	2025	$12,470,000	100%	$0.00
Increased Capacity				1.5	20000	6410		$30,750,775		
New Mechanical Plant / RIB's				2	26,667	8,547	2035	$50,000,000	100%	$0.00
Total				6.43	85,733	27,478		$80,750,775		$1,176,401.48

2. INTRODUCTION AND DESIGN CRITERIA

2.1. INTRODUCTION

In 1979 a new lagoon system was constructed for HVSSD. One of the primary purposes of the new treatment system was to remove the discharge to the Provo River. The treatment consisted of a 3 cell lagoon system with two winter storage cells. The water was used to irrigate approximately 370 acres of alfalfa that is then sold.

In about 2000 just before the winter Olympics a new primary wastewater cell was constructed. This cell expanded the treatment capacity in the system. However, at this time no additional disposal was constructed.

In 2012 a mechanical treatment was constructed. The additional facility included a new headworks, primary clarifier, activated sludge treatment system, final clarifiers, and a filter disinfection building. Rapid Infiltration Basins (RIB)s were used to dispose of the water from this side of the treatment facility.

2.2. BACKGROUND AND PURPOSE

The purpose of this report is to evaluate future needs for the treatment facility. Determine what needs to be done so growth may continue in the valley. Also, determine what treatment approach is needed to support additional connections into the future. One of the primary goals is to minimize the cost to the users. Therefore, maximizing the existing infrastructure should minimize the cost for additional growth.

2.3. DESIGN ASSUMPTIONS

The design assumptions are key to understanding what capacity is available for a treatment facility. Although the design was sized to allow for a certain population, discharges vary with time. As more low flow fixtures are installed the flows to the treatment plant may go down, but the strength of the wastewater will go up. As part of planning it is important to review what the design was along with what the actual sampled information show.

2.3.1. Mechanical

The mechanical treatment facility consists of a headworks, primary clarifier, an activated sludge treatment system, two final clarifiers, and a filter/UV building

2.3.1.1. Flow

The average design flow for the mechanical treatment facility is 2 MGD. It was assumed that this would be a constant flow and all peaking would be directed to the lagoon system.

2.3.1.2. Pollutants

The primary design for pollutants are:

- BOD 350 mg/L or 5,838 lbs/day
- TSS 300 mg/L or 5,004 lbs/day
- Ammonia 40 mg/L or 667 lbs/day

2.3.2. Lagoon

The lagoon consists of four aerated facultative treatment lagoons, two winter storage lagoons, a pressurized irrigation conveyance pipeline and irrigation disposal systems as shown in Figure 1.

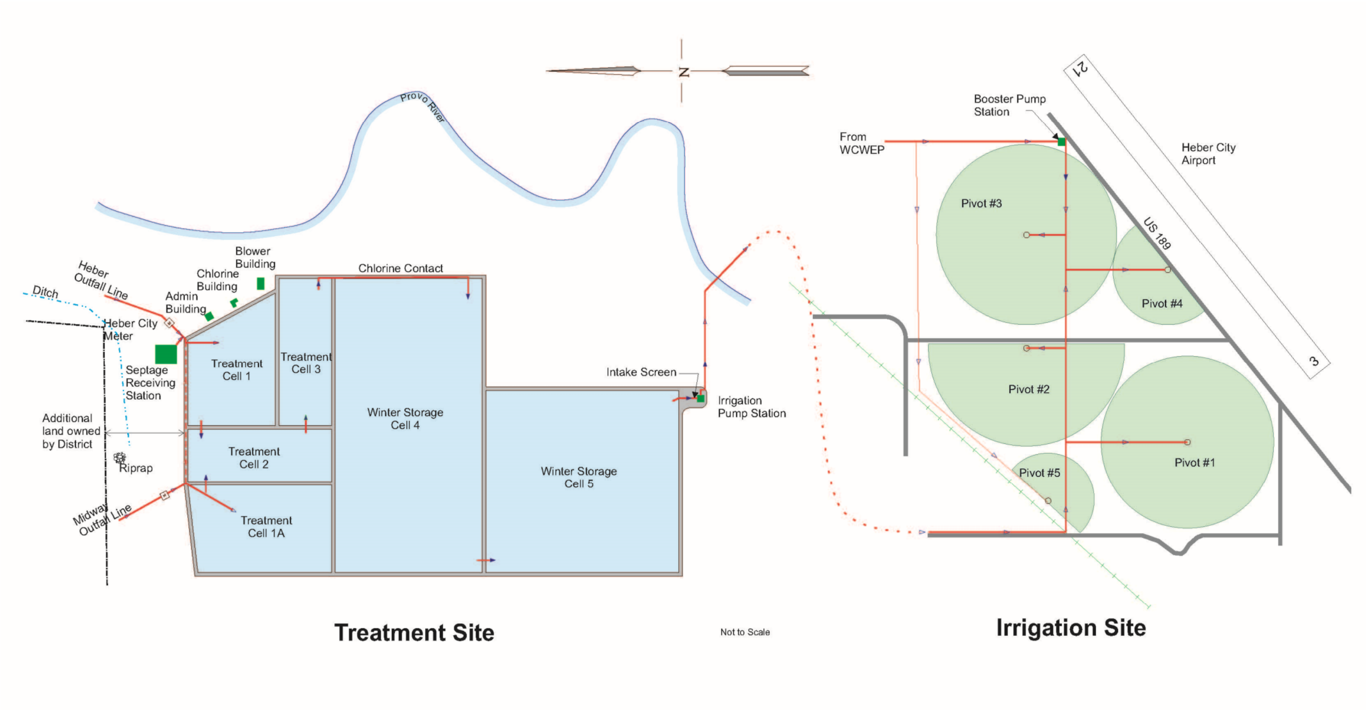

Figure 1. Lagoon Layout

2.3.2.1. Flow

The design flow for the lagoon system is 2.34 MGD with a peak flow of 4.34 MGD.

2.3.2.2. Pollutants

The primary design for pollutants are:

- BOD 317 mg/L or 11,474 lbs/day
- TSS 300 mg/L or 10,859 lbs/day
- Ammonia 40 mg/L or 1,448 lbs/day

2.4. COMBINED DESIGN

- Flow – 4.34 Average with a peak flow of 6.34
- BOD – 17312 lbs/day
- TSS – 15863 lbs/day
- Ammonia – 2115 lbs/day

3. DEMOGRAPHICS

3.1. LOCATION

The facility is located southeast of Midway, Wasatch County, Utah see Figure 2. The Heber Valley Special Service District is a political subdivision of Wasatch County. It was originally set up to provide wastewater treatment and disposal services for:

- Heber City
- Midway Sanitation District
- Town of Charleston

At the present time Charleston has no sewer system and is not connected to the treatment facilities but remains part of the district. The Wasatch Mountain State Park and the Jordanelle Special Service District (JSSD) are presently serviced under a contract with the Midway Sanitation District (MSD). The Twin Creeks Special Service District (TCSSD) is serviced under a contract with Heber City and the North Village Special Service District (NVSSD) is serviced under contract with JSSD.

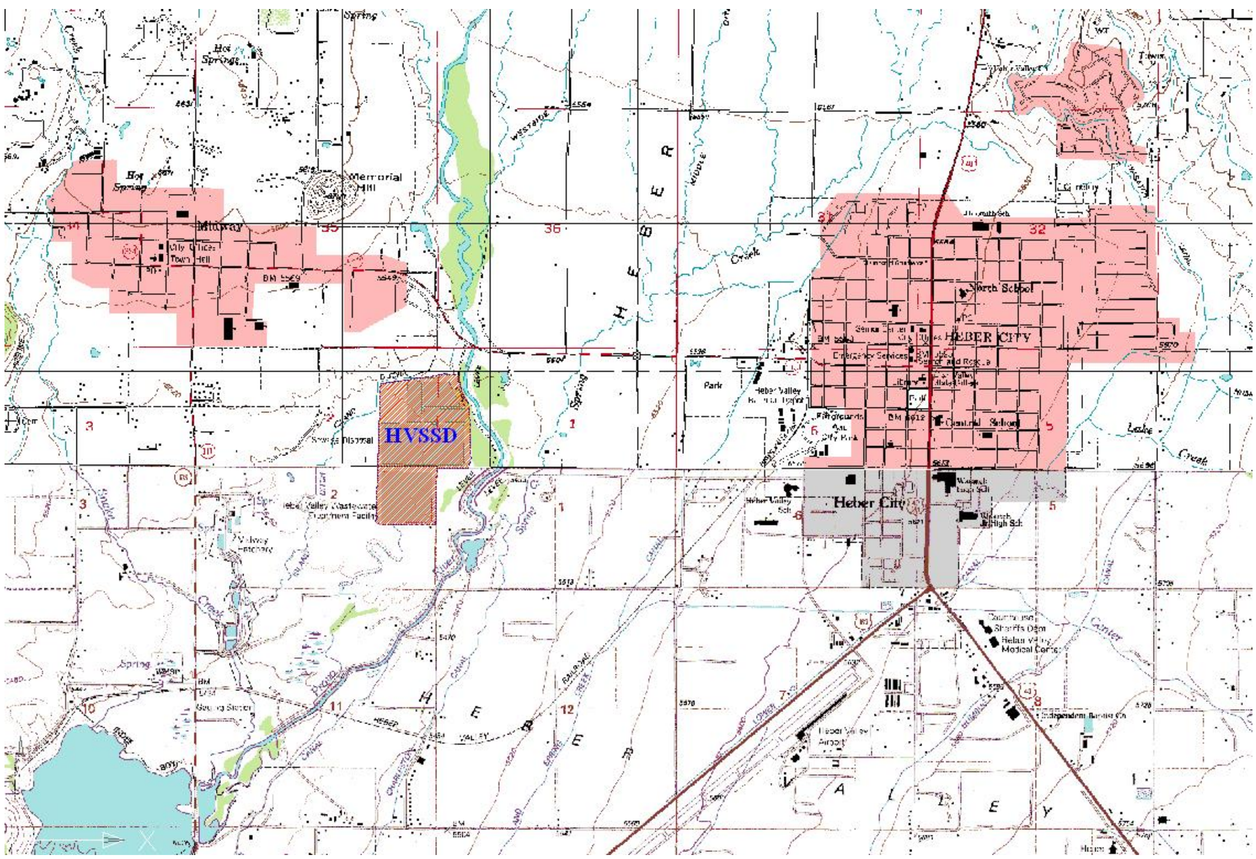

Figure 2. HVSSD Location on USGS Quad Map

3.2. POPULATION

The data for the populations was based on a mix of City Data and population projections from MAG.

The population projections do not include second homes. Table 4 lists the projected populations for each of the areas serviced by HVSSD.

Table 4 Population Projections

Permeant Residences, (Not including second homes)				
Area	2020	2030	2040	2050
Charleston	800	1,200	1,650	2,150
Heber	18,250	23,500	27,800	32,500
Midway	6,277	8,577	9,877	11,577
Unincorporated Wasatch County	7,473	10,935	15,353	16,402
Total Population	32,800	44,212	54,680	62,629

The population was adjusted for the second homes in each area. The estimated second homes are shown in Table 5.

Table 5 Estimated Second Homes

Estimated Number of 2nd homes	
Charleston	5%
Heber	12%
Midway	30%
Unincorporated Wasatch County	20%

Based on the assumptions described above the total population estimated for the HVSSD district is shown in Table 6. The total population will be used to determine the per capita flow for the district. Because the second homes utilize their services they will be included in the analysis. Chart 1 depicts the anticipated growth in the service area from 2020 to 2050.

Table 6 Total Population

Population Projections Including Second Homes				
Area	2020	2030	2040	2050
Charleston	840	1,260	1,733	2,258
Heber	20,440	26,320	31,136	36,400
Midway	8,160	11,150	12,840	15,050
Unincorporated WC	8,968	13,122	18,424	19,682
Total Population	38,408	51,852	64,132	73,390
Equivalent Residential Units (ERU)	12,310	16,619	20,555	23,522

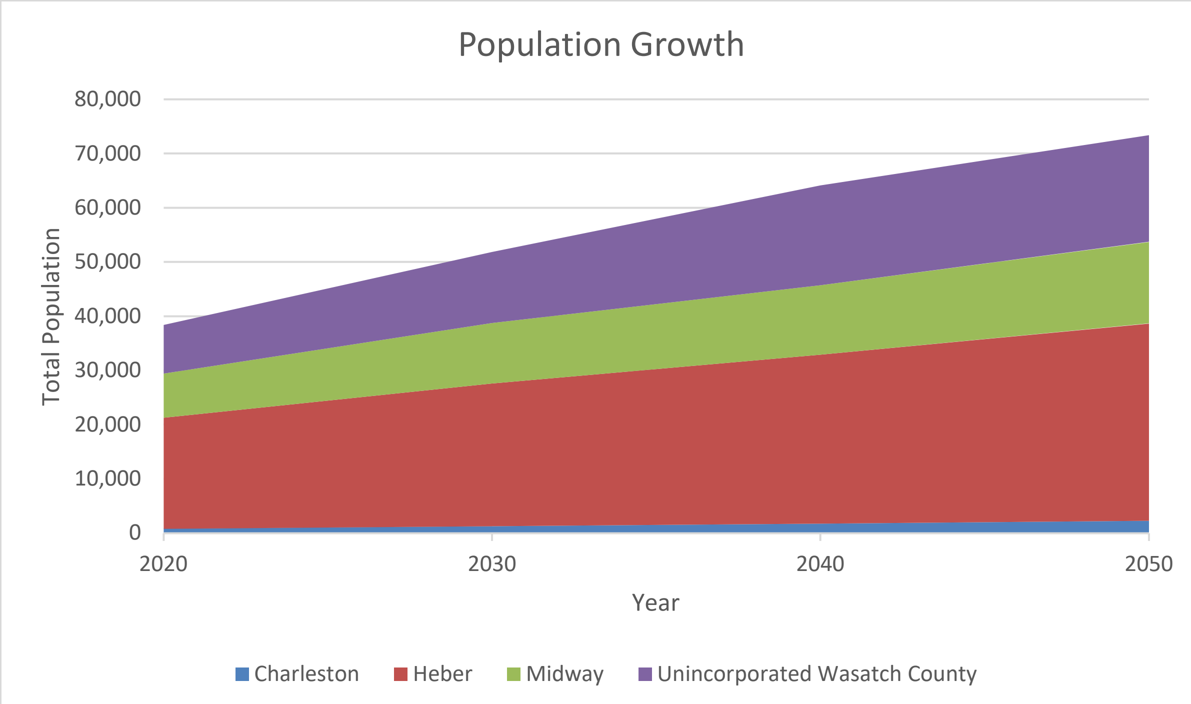

Chart 1 Population Growth

3.3. WASTEWATER FLOW

The flow to the wastewater treatment plant is growing at a similar rate as the population. The average daily flow is shown in Chart 2. The average daily flow for 2019 was 2.5 MGD.

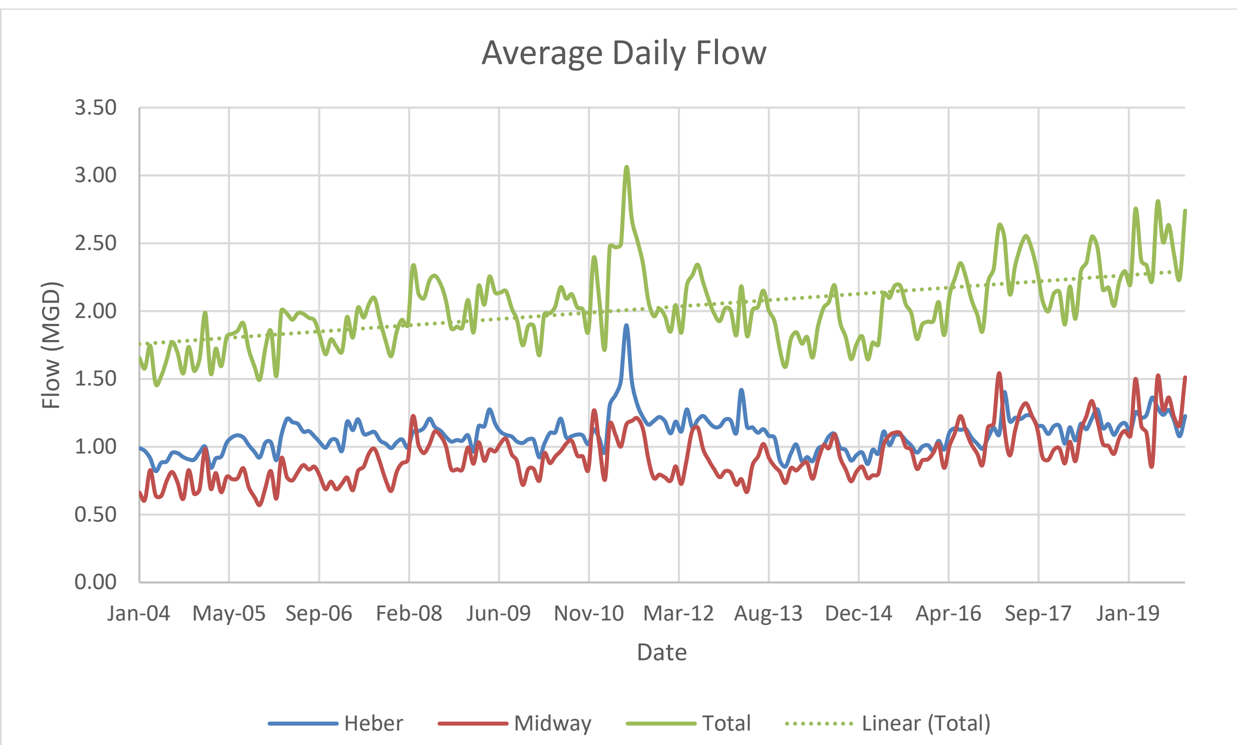

Chart 2 Average Daily Flow

3.4. PER CAPITA FLOW

The average per capita flow will be used to project future design requirements. The current data will be used to determine the per capita flow.

3.4.1. Average Daily flow

The average daily flow for 2019 was 2.5 MGD. The Peak monthly flow was 2.8 MGD

3.4.2. Population

The average population in 2020 will be used for calculating the per capita flow. The following summarize the population for each of the different areas that are connected to HVSSD as shown in Table 6:

Charleston – 840
Heber – 20,440
Midway – 8,160
Unincorporated Wasatch County – 8968
Total – 38,408

3.5. DESIGN FLOW

The average per capita flow is 65 gallons per capita per day. The peak month per capita flow is 73 gallons per capita per day. Typical design criteria is 100 gallons per capita per day.

For flow projections will be based on the peak monthly per capita flow which is 75 gallons per capita per day.

3.6. FUTURE FLOW PROJECTIONS

Chart 3 shows the anticipated growth in flows based on the population projections. It is anticipated the flow will increase from about 2.8 MGD to 5.5 MGD in 2050. The current system would reach hydraulic capacity near 2035. An additional 1.2 MGD will be required to for the 2050 design flows.

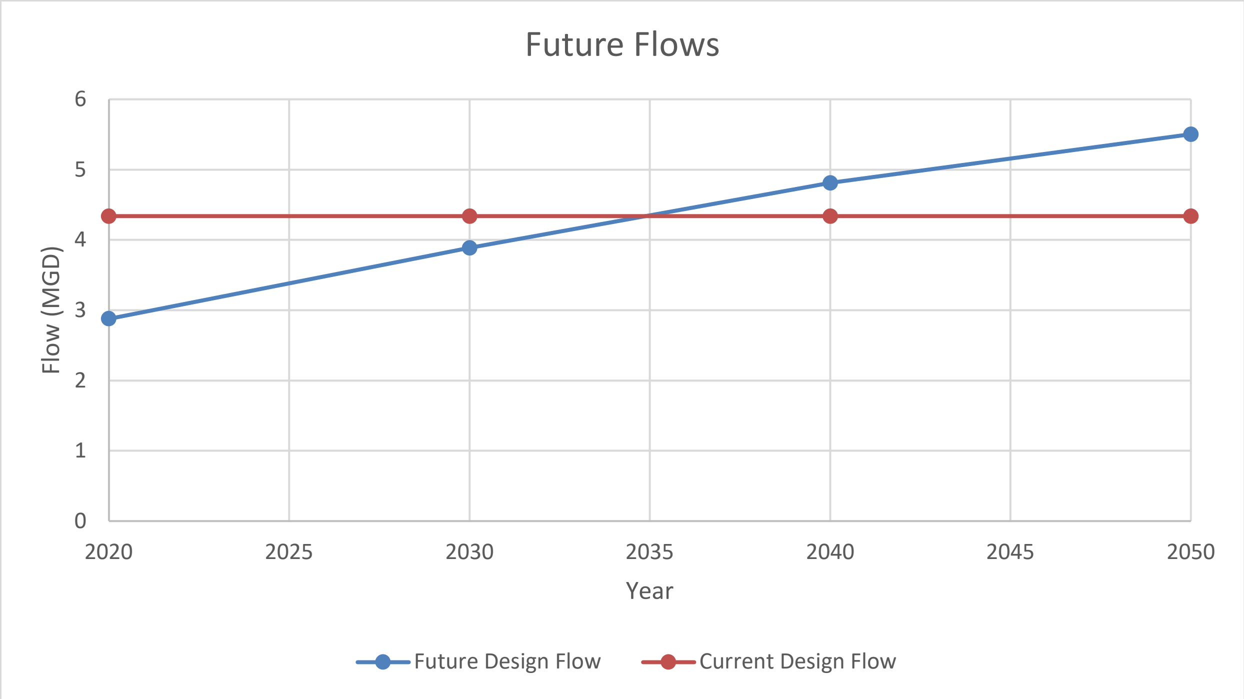

Chart 3 Projected Flows

3.7. ERU FLOW

Equivalent Residential Flow, "ERU", is the measurement used to adequately project water usage based upon the total connections made in a system. This is due to single-family homes being the most common type of service with relatively uniform water use. In 2020 there were 12,310 ERU's connected to the system. Based on the ERU count there are on average 3.12 people in an ERU. The flow per ERU is 234 gallons.

3.8. PER CAPITA COD LOAD

HVSSD samples COD on the influent flow. It will be assumed that the BOD to COD ratio is 2. This assumption would indicate a COD concentration of 100 mg/l would equate to a 50 mg/l BOD concentration or 100 lbs of COD would equal 50 lbs of BOD. Chart 4 shows the COD loading for the last two years. In early 2018 the plant was being overloaded from an industrial user. The loadings have substantially decreased after the City started working with the industry in the City.

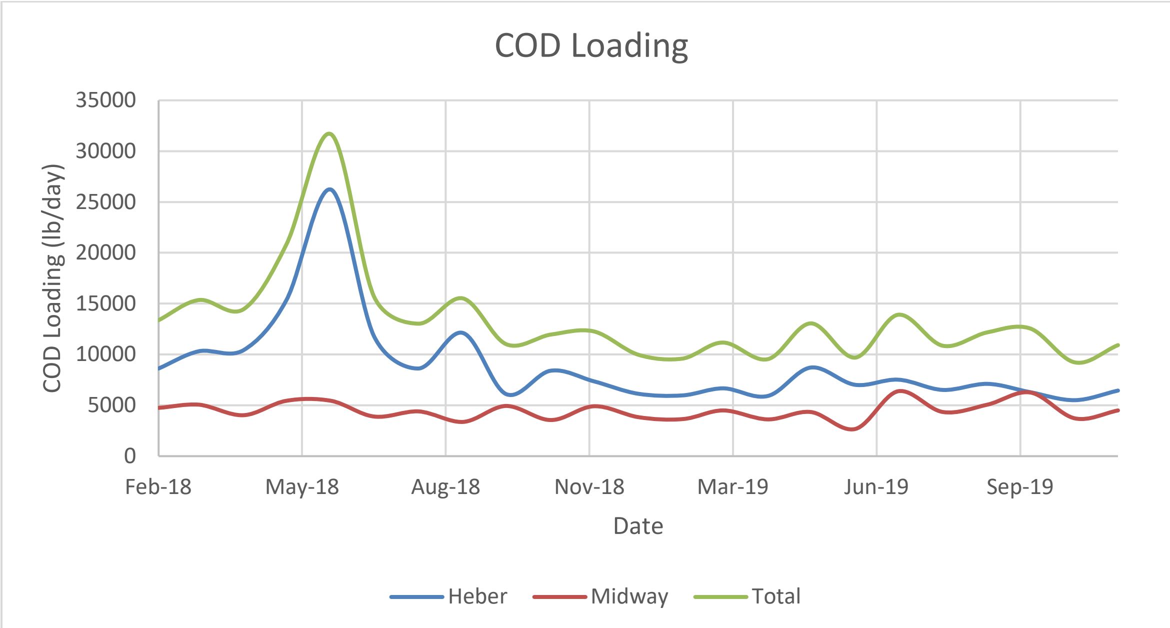

Chart 4 COD Loading

3.8.1. Daily COD Load

2019 Average – 11061 lbs/day
2019 Max – 13914 lbs/day

3.8.2. Daily Load Per Capita

The average per capita load is 0.29 lbs per capita per day. The peak month per capita load is 0.36 lbs per capita per day. This would equate to 0.14 lbs BOD per capita day on average and 0.18 lbs BOD per capita per day peak. Typical design values for BOD range from 0.17 to 0.22 lbs per capita per day. For future projections the higher 0.36 lbs per capita per day will be used. Chart 5 illustrates the anticipated biological loading at the treatment facility. Industrial dischargers could dramatically change the projection.

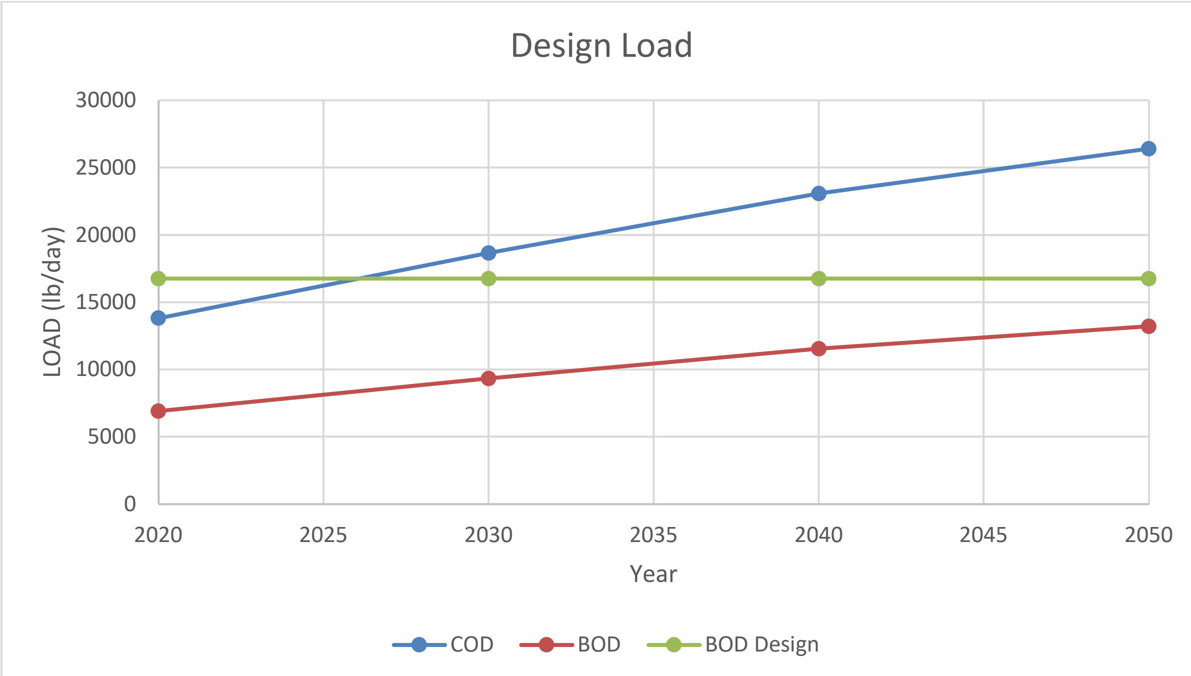

Chart 5 Projected Biological Loading

4. WASTEWATER DISPOSAL

4.1. INTRODUCTION

The primary driver for treatment requirements is based on the disposal of the wastewater. Surface water discharges have different requirements than groundwater discharges. Different beneficial uses have different water quality requirements that require different treatment. It is critical to determine the disposal method prior to determining the treatment technology. Currently HVSSD does not have a surface water discharge permit.

4.2. DISPOSAL METHODS

The primary disposal methods for HVSSD are

- Irrigation
- Evaporation
- Infiltration
- Rapid Infiltration Basins

4.2.1. Irrigation

Currently HVSSD irrigates 375 acres of alfalfa as the primary disposal method of the wastewater for the lagoon treatment system. The original farm consisted of 360 irrigated acres and in 2020 an additional 15 acres was added to the farm. In 2020 an additional 80 acres was acquired and is currently being permitted and modified to accept irrigation. At that time, the total available acreage for irrigation will be 455 acres. The irrigation is being applied throughout an extended season to dispose of the available treated wastewater. Table 7 is a summary of the last 5 years of irrigation application for the farm. The average application rate is 40 inches per year. It will be assumed that the average of 40 inches will continue to be applied to the farm. Based on the 375 acres of alfalfa grown by HVSSD and the treated wastewater that can be disposed on the existing fields would be 925 acre-ft or 300 million gallons.

Table 7 Irrigation Water Applied

Land Application Flow					
Year	2016	2017	2018	2019	2020
Total Water Applied	366000000	393175000	468000000	396130000	349960000
Irrigated Acres	360	360	360	360	375
Gallons / Acre	1,016,666.67	1,092,152.78	1,300,000.00	1,100,361.11	933,226.67
Inches applied per acre	37.44	40.22	47.87	40.52	34.37

Research Report 145 developed by Utah Agricultural Experiment Station Utah State University was used to determine the consumptive use for irrigating alfalfa in the Heber Valley. Table 8 summarizes the consumptive use for alfalfa at several sites in the Heber Valley. For this report it will be assumed the consumptive use for irrigation is 30.09 inches a year. This is from a station near the Deer Creek Dam which is closely located to irrigation site. It is assumed that approximately 10 inches of water are applied to the farm that is not used consumptively. However, this additional water helps flush the salts beyond the root zone and is important for the continued production of the crop on the farm. One of the benefits of the farm is the alfalfa that is grown consumes nutrients from the wastewater and is harvested to reduce the nutrients going back into the environment.

Table 8 Alfalfa Water Usage in Heber Valley

Site	Apr	May	Jun	Jul	Aug	Sep	Oct	Season Total
Alfalfa Water Use (inches)								
Deer Creek Dam	0.13	5.41	6.73	7.78	5.69	4.35		30.09
Heber	0.13	5.07	6.52	7.58	5.58	4.27	0.33	29.48
Snake Creek		3.85	7.21	6.07	5.3	4.31	0.22	26.96

Based on the total available farmland of 455 acres of alfalfa being grown, HVSSD can dispose of 1517 acre-ft or 494 million gallons. This is equivalent to an average flow in the lagoons of 1.3 MGD.

4.2.2. Evaporation

The lagoons act as large evaporation ponds. There are about 100 surface acres of ponds at the HVSSD treatment facility. Table 9 is a summary of the average evaporation rates in the Heber Valley from Research Report 145. The Deer Creek Dam site will be used to determine the total evaporation from the lagoon system. Annually it is anticipated that the lagoon system will lose a total of 173 acre-ft or 56 million gallons due to evaporation. This is equivalent to an average flow in the lagoons of 0.15 MGD.

Table 9 Evaporation Rates

Site	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Season Total
Net Evaporation (inches)									
Deer Creek Dam		0.74	3.3	4.13	4.98	4.39	2.55	0.65	20.74
Heber	0.44	1.21	3.38	4.19	4.88	4.38	2.68	1.04	22.20
Snake Creek		0.58	2.92	3.84	4.48	3.82	2.27	0.48	18.39

4.2.3. Infiltration

The lagoons are clay lined. It is assumed that they will lose 1/8-inch per day from infiltration. Based on 100 acres the lagoons that would be 380 acre-ft or 124 million gallons. This is equivalent to an average treatment flow in the lagoons of 0.33 MGD

4.3. TOTAL LAGOON DISPOSAL

Table 10 is a summary of the disposal available with the lagoon system. The total disposal available is 2070 acre-ft or 674 million gallons a year. This equates to an average of 1.85 MGD which is slightly below the treatment capacity for the lagoon.

Table 10 Total Lagoon Disposal

	acre-ft	Million Gallons
Irrigation	1517	494
Evaporation	173	56
Infiltration	380	124
Total	2070	674

4.3.1. Population Equivalent for Lagoon Disposal

Based on 1.85 MGD disposal and design capacity of 75 gallons per capita per day the disposal system can support a population of 24,667 people or 7,906 ERU's.

4.3.2. Additional Land Requirements

The lagoon system has the primary limitation of disposal compared to the treatment capacity of the lagoons. The lagoon average design flow is 2.34 MGD and the average disposal available is 1.85 MGD. Therefore, an additional 0.49 MGD of irrigation capacity is necessary to fully utilize the lagoon treatment system. The irrigation area required to dispose of the additional 0.49 MGD would be 165 acres. This would support an additional 2,094 ERU's

4.3.3. Cost Estimate for Irrigation Disposal

It is assumed the Lagoons can treat up to 2.23 MGD but the disposal is limited to 1.85 MGD. An additional 165 acres of land that can be irrigated will be necessary to treat the design flow from the lagoons. It is assumed an additional 15% of land will be purchased to allow for area that cannot be irrigated. The total property used for the cost estimate is 190 acres. The cost estimate for the land is shown Table 11.

Table 11 Irrigation Cost Estimate

Description	Quantity	Units	Cost	Total Cost
Land	190	acres	$ 65,000	$ 12,333,750
Irrigation System	3	Lump	$ 250,000	$ 750,000
Total				$ 13,083,750

4.4. RAPID INFILTRATION BASIN DISPOSAL

4.4.1. Rapid Infiltration Basins

Currently the Rapid Infiltration Basins (RIB) are rated at 2 MGD. This would allow an annual disposal through the RIB to be 2240 acre-ft or 730 million gallons.

4.4.2. Population Equivalent for Rapid Infiltration Basin Disposal

Based on a 2.0 MGD disposal and a design capacity of 75 gallons per capita per day the RIB's can support a population of 26,667 or 8,547 ERU's

4.5. TOTAL DISPOSAL CAPACITY

Table 12 is a summary of the available annual capacity to dispose of wastewater in the HVSSD wastewater treatment system. This equates to an average daily flow of 3.85 MGD. The lagoon system has the primary limitation of disposal compared to the treatment capacity of the lagoons. The lagoon average design flow is 2.34 MGD and the average disposal available is 1.85 MGD. Therefore, an additional 0.49 MGD of irrigation capacity is necessary to fully utilize the lagoon treatment system. The irrigation area required to dispose of the additional 0.49 MGD would be 165 acres.

Table 12 HVSSD Disposal Capacity

	acre-ft	Million Gallons
Lagoons	2070	674
Rapid Infiltration Basin	2240	730
Total	4310	1404

4.5.1. Population Equivalent for available disposal

Combining the Lagoon system and the Mechanical system, the total disposal capacity for the system would support a total population of 51,333. Based on these population projections it is anticipated that this population will be reached sometime in the next 10 years.

4.6. FUTURE DESIGN DISPOSAL CAPACITY

Table 10 shows the needed capacity for wastewater disposal at the HVSSD.

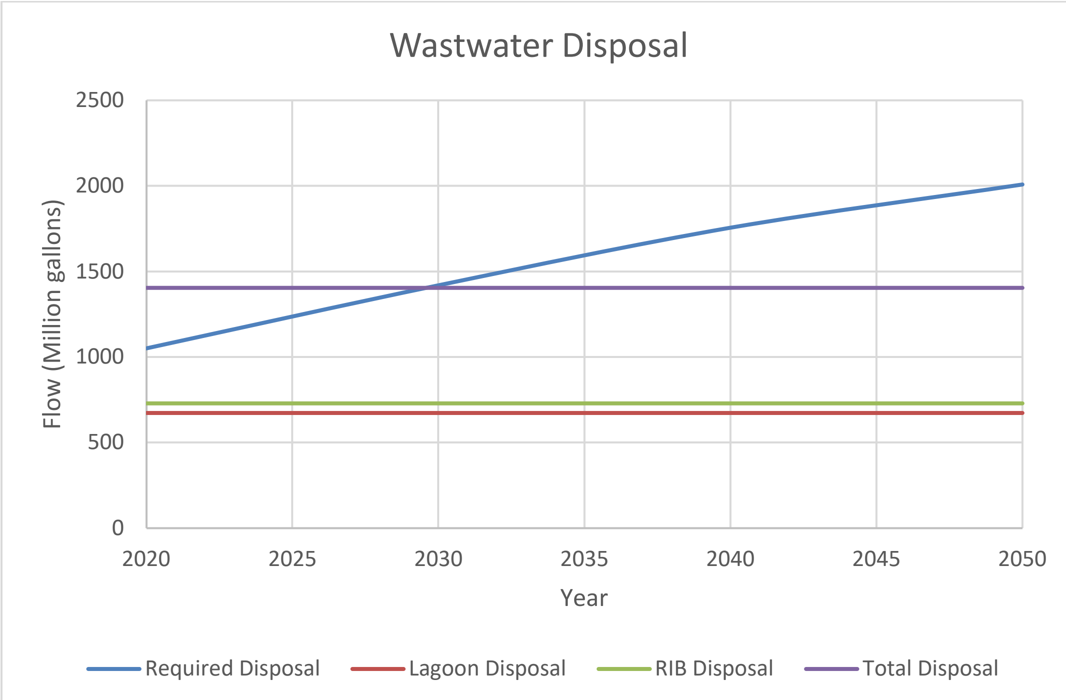

Chart 6 Disposal Capacity

4.6.1. Additional Land Required for Existing Treatment Capacity

An additional 165 acres is needed for the farm to allow the existing lagoon treatment system to be utilized at design capacity. It is estimated, in about 2029 based on the population growth the disposal at the farm will be at capacity. Chart 7 shows the irrigated land necessary to expand the facility to 2050 assuming all additional disposal would be done using irrigation. This would be slightly reduced based on evaporation and infiltration, but it is a good target for land acquisition. By 2050 an additional 557 acres would be required based on the population growth. It is unlikely that that much land can be found in the valley for farm operations. The 165 acres that is needed for the existing lagoon system should be found and incorporated into the system.

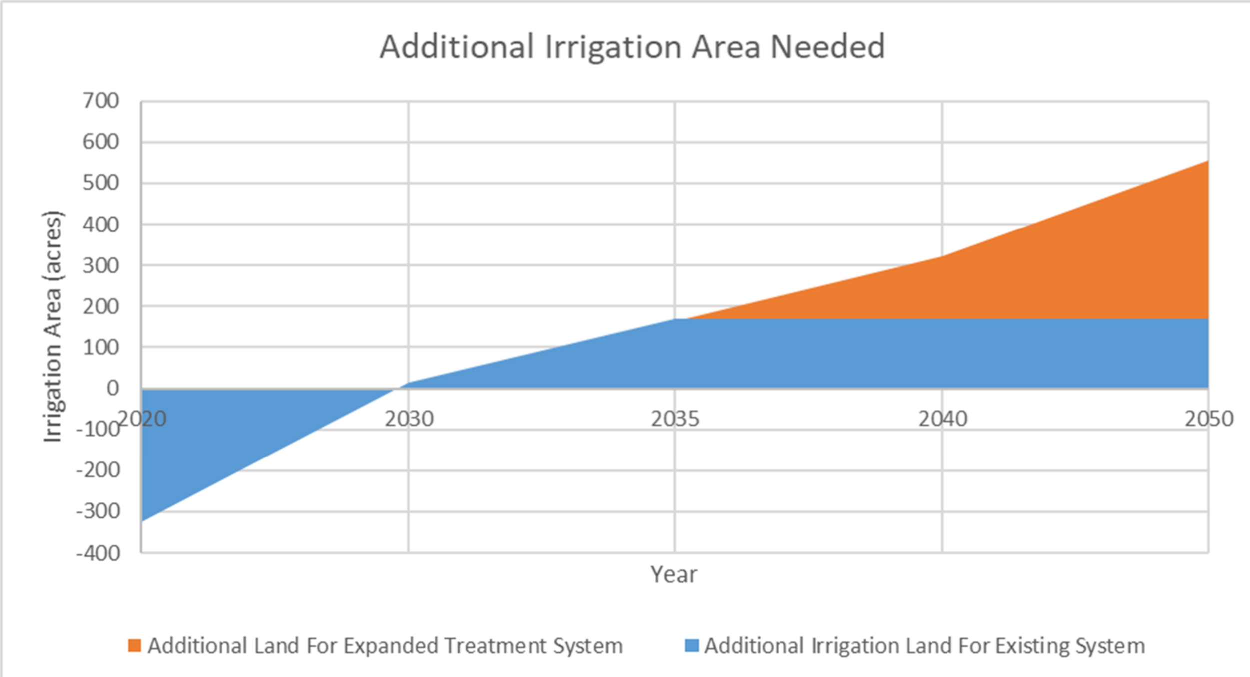

Chart 7 Additional Land For irrigation

4.7. RAPID INFILTRATION BASIN

The existing RIB utilizes about 6.5 acres. Assuming that a RIB was used to dispose of the additional wastewater beyond the current lagoon system it would require an additional 3.5 acres of area. It is anticipated that the additional space would require additional mechanical treatment to meet the nitrogen limit.

4.8. PROVO RIVER DISCHARGE

The discharge from HVSSD was removed from the Provo river to protect the drinking water source in Deer Creek. It would be prudent for HVSSD to apply for a discharge permit at some point in the future to have the flexibility to dispose of their water through a UPDES permit.

5. WINTER STORAGE

5.1. STORAGE CELL

Irrigation is not available during the winter. The wastewater is stored throughout the winter in a winter storage ponds. The ponds are drawn down during the summer to irrigate the irrigation site. The 1979 design criteria used 248 days for the winter storage. This report will make the same assumption.

5.1.1. Available Storage

Currently there are two ponds that are used for winter storage. The capacity in the ponds are:
Cell 4 -165 Million Gallons or 509 acre-ft
Cell 5 – 128 Million Gallons or 394 acre-ft
Total – 293 million Gallons or 903 acre-ft

5.1.2. Flow Capacity

Combining the 293 million gallons in storage and 65 million gallons of evaporation and 124 million gallons of evaporation, the average flow capacity for the winter storage design is 1.96 MGD

5.1.3. Population Equivalent for Storage

The winter storage will support a population of 26,133 people or 8,376 ERU's

5.1.4. Additional Winter Storage

The RIB is used for the mechanical side of the plant, so the storage is only needed for the lagoon system. Assuming the RIB's are being fully utilized the need for winter storage is shown in Chart 8. An additional 90 Million gallons is needed to meet the hydraulic design of the lagoon system. The additional storage will be needed in about 2032. The additional storage in 2040 would be dependent on the treatment chosen to expand the plant.

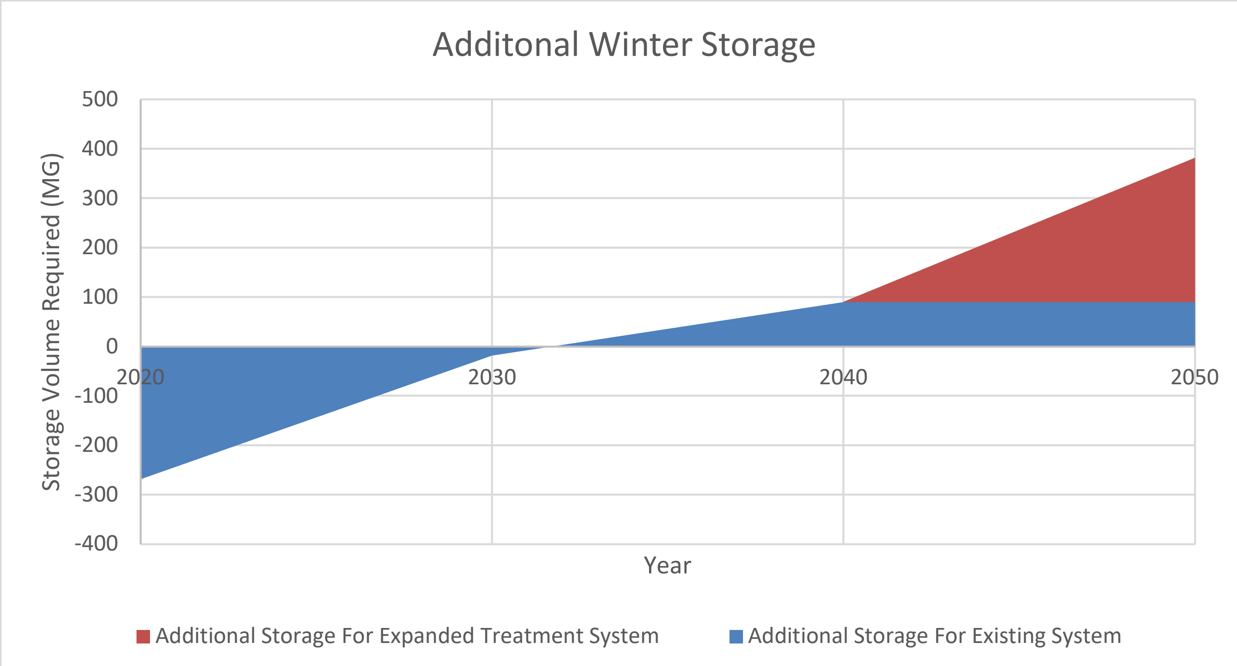

Chart 8 Additional Winter Storage

5.2. STORAGE ALTERNATIVES

5.2.1. Raising Existing Cell 5

There is a possibility to raise the dikes on cell five. The current water depth in Cell 5 is 18 feet. The water surface difference between Cell 4 and Cell 5 is 8-feet. Therefore, the most Cell 5 could be raised is 7.5-feet which would allow for enough head to transfer between cells. Based on these assumptions an additional 78 Million Gallons could be stored by raising the cell. The needed storage is 90 Million Gallons so there would still be a shortfall of 12 Million Gallons of storage. Raising Cell 5 would also require changing the pump station for the irrigation system.

5.2.2. Additional Winter Storage Cell

Assuming a new cell was constructed at the same water surface elevation of Cell 5 and matching the 18-foot depth. The pond would need to be approximately the size of the blue square shown in Figure 3.

Figure 3 Additional Storage Required

5.2.3. Cost Estimate for Winter Storage

The winter storage that is needed is assumed to be about 90 Million gallons. The cost estimate is based on excavating half of the material and using it for a bank to store the water.

Table 13 Winter Storage Cost Estimate

Description	Quantity	Units	Cost	Total Cost
Excavation	143000	cu. Yd.	$ 10	$ 1,430,000
Fill	110000	cu. Yd.	$ 15	$ 1,650,000
Liner	720000	sq. ft.	$ 1	$ 720,000
Total				$ 3,080,000

6. TREATMENT ALTERNATIVES

6.1. EXISTING TREATMENT SYSTEM

The existing Treatment system has some limitations to reach the hydraulic design capacity. The total design flow for the HVSSD is 4.34 MGD. However, there are limitations in unit processes that need to be addressed to reach the 4.34 MGD design flow. If all the unit processes are adjusted the existing treatment system should reach capacity in approximately 2035. Additional capacity will be needed to reach future flows.

6.1.1. Lagoon Treatment

The average design flow for the lagoon system is 2.34 MGD. There are both storage and disposal limitations for the existing lagoon treatment. The lagoons are functioning to treat the wastewater flow. Additional maintenance should be done on existing equipment such as blowers and diffusers, due to the age of the system. However, with continued maintenance the treatment system will function in the future. Peaking capacity is included in the lagoon treatment system.

6.1.2. Mechanical Treatment

The mechanical treatment plant is designed for an average 2 MGD design flow. All the peaking is assumed to be transferred to the lagoon system. The cloth filter system is not functioning and if type I reuse water is ever needed the filter would need to be repaired. The UV system is currently not being used but would need to be operated for Type I reuse also.

6.1.3. Mechanical Treatment Limitations

The loading in the treatment facility seems to be higher than originally estimated. Due to this estimation, it is believed the mechanical treatment system only provides oxygen for a treatment of 1.0 MGD. This limitation was pointed out as part of the plant operations. When the flow exceeds 500,000 gpd on the treatment train the ability to meet the nitrogen limit is lost. Based on experimentation the flows were reduced to find the flow that meets the effluent requirements.

Additional aeration is needed to treat the higher load to reach the 2 MGD design Point. The proposed addition of a new aeration basin would be used to add the additional air into the system.

Anoxic basin volume is also required to continue to meet the nitrogen limit. It is anticipated the basins would be similar to the existing basins. However, the aeration system would use fine bubble diffusers and compressors. During this design, other aeration systems could be evaluated in more detail.

The general flow sheet for the addition is shown in Figure 4

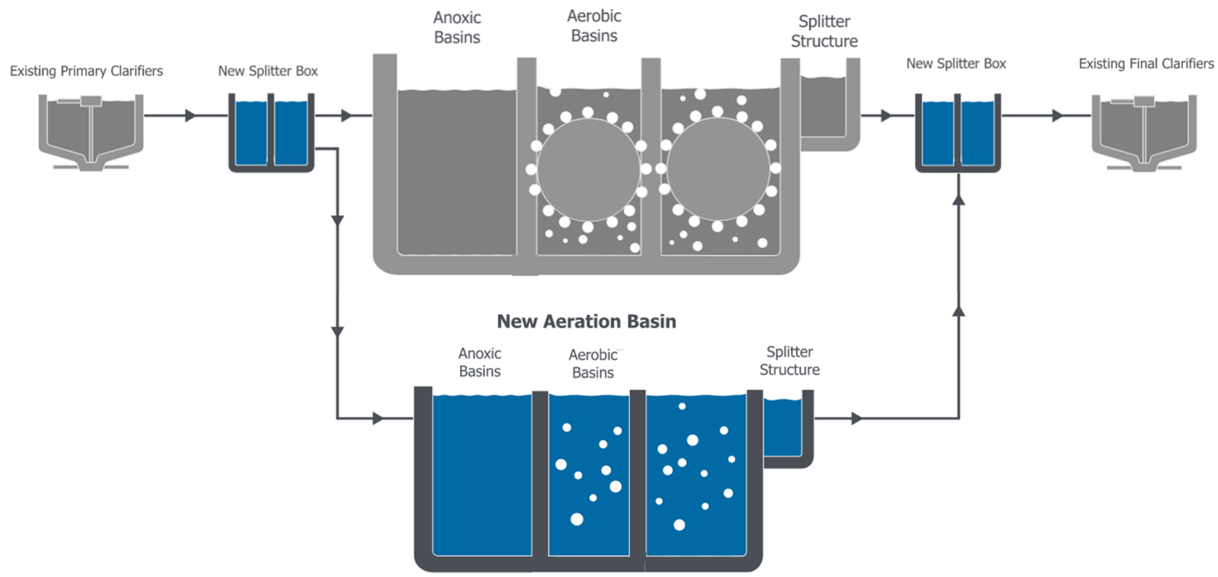

Figure 4 Additional Aeration Flow Sheet

6.1.4. Solids Handling

The current mechanical treatment system sends all solids to the existing lagoon system. The solids in the lagoons are accumulating and need to be removed. To reduce the solids delivered to the lagoons anaerobic digesters will be installed to digest the solids from the mechanical treatment plant. The digested solids will be dewatered and then landfilled.

The flow sheet for the solids handling addition is shown in Figure 5.

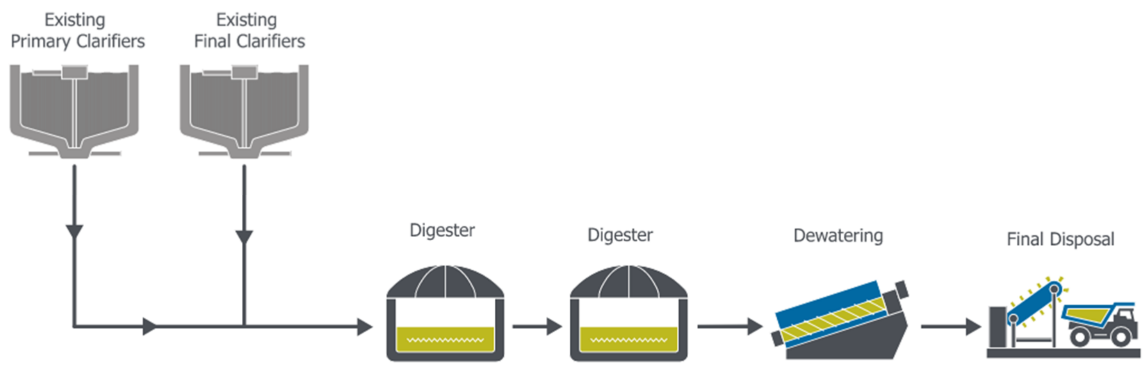

Figure 5 Solids Handling Flow Sheet

6.1.5. Mechanical Treatment Rehab Cost Estimate

Description	Quantity	Units	Cost	Total Cost
Site Work / Excevation	1	lump	$ 250,000	$ 250,000
Anoxic Basin	350000	gal	$ 2.00	$ 700,000
Aeration Basin	850000	gal	$ 2.00	$ 1,700,000
Aeration Equipment	1	lump	$ 250,000	$ 250,000
Blowers	3	ea	$ 150,000	$ 450,000
Blower Building	600	sq. ft.	$ 200	$ 120,000
Mechanical Instalation	1	lump	$ 300,000	$ 300,000
Yard Piping	1	lump	$ 120,000	$ 120,000
Splitter Structures	2	ea	$ 40,000	$ 80,000
Digesters	2	ea	$ 2,000,000	$ 4,000,000
Digester Mixers	2	ea	$ 300,000	$ 600,000
Heating System	1	lump	$ 500,000	$ 500,000
Dewatering Equipment	2	ea	$ 300,000	$ 600,000
Dewatering Building	4000	sq. ft.	$ 200	$ 800,000
Electrical				$ 2,000,000
Total				$ 12,470,000

Table 14 is the estimated cost to expand the existing mechanical treatment system and supply enough oxygen for the increased loading.

Description	Quantity	Units	Cost	Total Cost
Site Work / Excevation	1	lump	$ 250,000	$ 250,000
Anoxic Basin	350000	gal	$ 2.00	$ 700,000
Aeration Basin	850000	gal	$ 2.00	$ 1,700,000
Aeration Equipment	1	lump	$ 250,000	$ 250,000
Blowers	3	ea	$ 150,000	$ 450,000
Blower Building	600	sq. ft.	$ 200	$ 120,000
Mechanical Instalation	1	lump	$ 300,000	$ 300,000
Yard Piping	1	lump	$ 120,000	$ 120,000
Splitter Structures	2	ea	$ 40,000	$ 80,000
Digesters	2	ea	$ 2,000,000	$ 4,000,000
Digester Mixers	2	ea	$ 300,000	$ 600,000
Heating System	1	lump	$ 500,000	$ 500,000
Dewatering Equipment	2	ea	$ 300,000	$ 600,000
Dewatering Building	4000	sq. ft.	$ 200	$ 800,000
Electrical				$ 2,000,000
Total				$ 12,470,000

Table 14 Mechanical Treatment Aeration Expansion

7. FUTURE TREATMENT SYSTEMS

Assuming the limitations of the existing system are improved so the total design flow reaches the 4.3 MGD capacity. The existing system will reach its capacity about 2035. The two primary expansion alternatives will be either mechanical or using lagoons. The additional design flow for the future system is anticipated to be about 1.2 MGD to get to 2050 future design capacity.

7.1.1. Lagoon Expansion

Assuming the lagoon was expanded, it would require additional space for the treatment ponds, additional winter storage, and additional land application sites. A representation of the area required for a lagoon expansion is shown Figure 6.

7.1.1.1. Treatment Ponds

The existing facility has about 30 acres of treatment cells. The future expansion would require an additional 15 acres of treatment ponds. Figure 6 shows the area needed for the lagoon expansion in a mustard color.

7.1.1.2. Winter Storage

The additional winter storage required would be about 300 Million Gallons. The required storage area is shown in Figure 6 as the green cell. It is assumed the blue cell is needed for expanding the existing system to meet the current design capacity.

7.1.1.3. Disposal

An additional 522 acres would be needed to dispose of the additional 1.2 MGD generated by expanding the lagoon system.

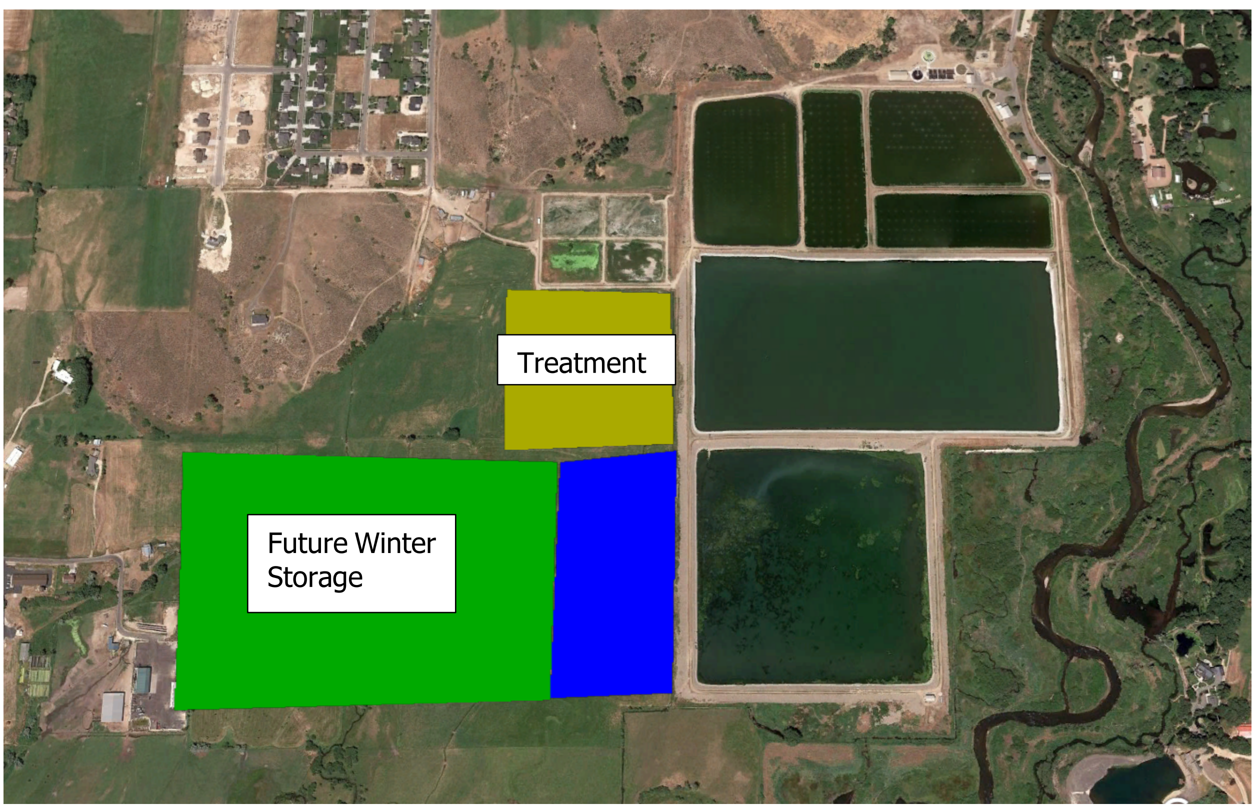

Figure 6 Lagoon Expansion

7.1.2. Mechanical Expansion

There are many different mechanical treatment alternatives. The existing system could be copied with a similar footprint. The existing mechanical treatment system is designed for an average flow of 2 MGD. The expansion would need to meet peaking flow so the hydraulic structures would be similar sized.

7.1.2.1. Rapid Infiltration Disposal

The RIB basins could be expanded to meet the additional 1.2 MGD design flow. The approximate area required for the additional 1.2 MGD would be 3.5 acres. Figure 7 shows the approximate size for the additional RIBs.

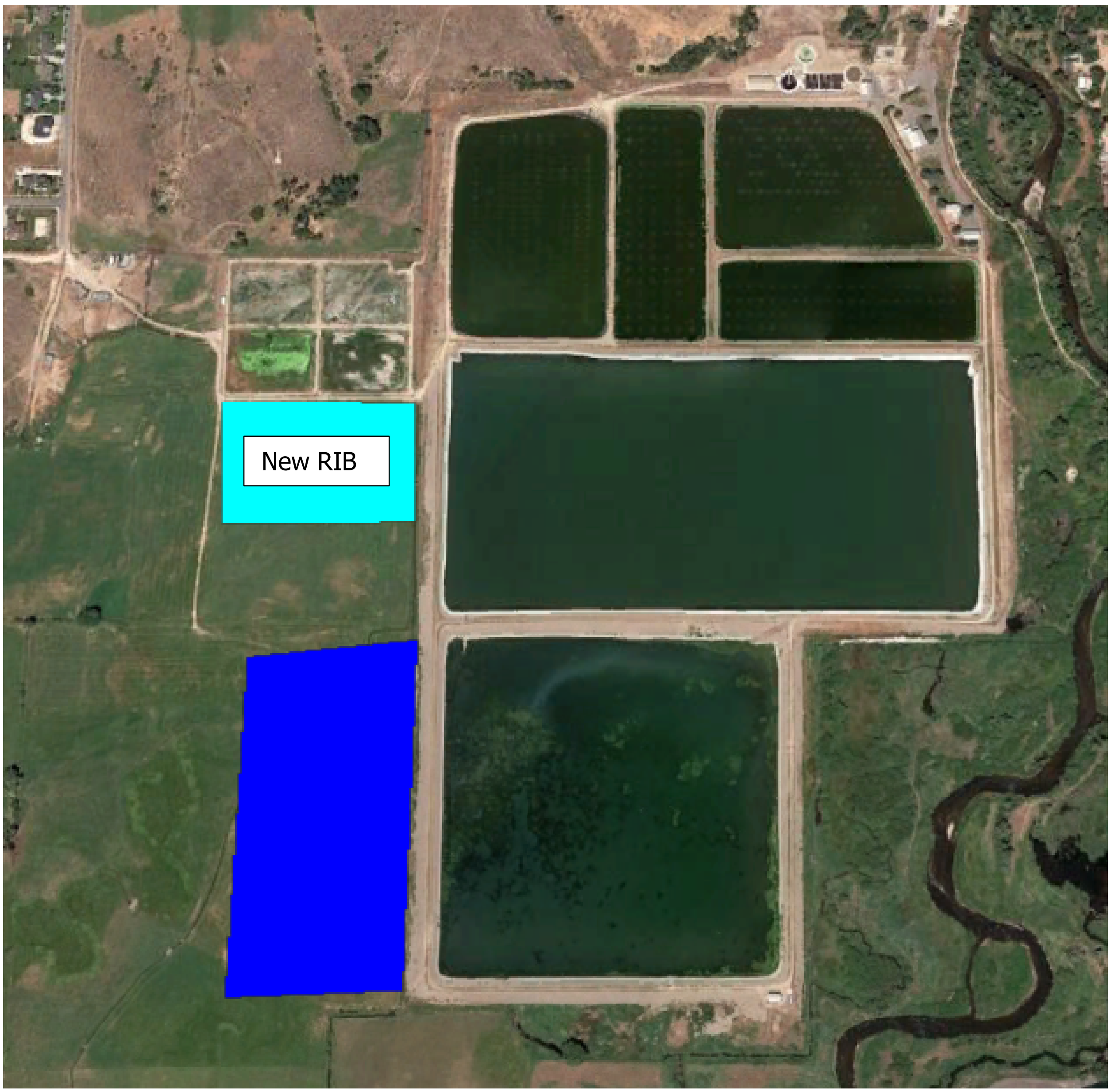

Figure 7 Mechanical Expansion

7.1.3. Mechanical Treatment Cost Estimate

An expansion of the mechanical treatment system will not be needed for a while. To estimate the cost for an expanded system with solids handling it is assumed the cost will be about $25/ gallon. The estimated cost is shown in Table 15.

Table 15 Mechanical Treatment Cost Estimate

Description	Quantity	Units	Cost	Total Cost
Treatment System	2000000	gal	$ 25	$ 50,000,000
Total				$ 50,000,000

7.1.4. Rapid Infiltration Basin

There is currently a ground water study under way in the Heber Valley. This ground water study could limit the use of the RIB. Currently, it is unknown the exact outcome of the study. However, it is important to watch to see what the recommendations from the study are to protect ground water in the valley.

7.1.5. RIB Cost Estimate

It is assumed that when a mechanical plant is expanded it will most likely be a 2 MGD facility. The area estimated for new RIB's is the same as the existing 2 MGD facility. Based on that information it is assumed an additional 6.5 acres of RIBs will be needed. Table 16 Is a summary of the cost estimate for a new RIB.

Table 16 RIB Cost Estimate

Description	Quantity	Units	Cost	Total Cost
Excavation	52434	cu. Yd.	$ 15	$ 786,510
Yard Piping	1	Lump	$ 200,000	$ 200,000
Total				$ 986,510

8. MIDWAY PUMP STATION

8.1. BACKGROUND

Heber Valley Special Service District (HVSSD) installed the Midway Pump Station in 1981. The pump station consists of a below grade concrete wet / dry well lift station. During installation of new flow meters on the existing pumps, it was discovered that the pumps currently only pump at 200 gpm. The original design for the lift station was 300 gpm. The Tate Lane lift station pumps to the Midway lift station. This surge in flow, along with inadequate pump performance, is backing wastewater up into the collection system until the Midway lift station catches up. An alternative was evaluated to connect the Tate lane lift station directly to the Midway lift station outfall line. However, even if that alternative were implemented the Midway lift station would remain undersized. Therefore, it is recommended to modify the existing wet / dry well and upsize the pumps in the Midway lift station so both systems will function as originally intended.

8.2. DESIGN FLOW

Based on the ERU flow of 325 gallons / day. Considering anticipated growth throughout this phase, for the Tate Lane and HVSSD pump zone boundaries, it is anticipated that 1,060 ERU's will be connected to the system within the next 20 years. Utilizing a peaking factor of 2.5, the calculated peak flow into the Midway Pump Station is 600 gallons / minute. Table 17 Summarizes the design flow for the lift station.

Table 17 Midway Pump Station Flow

Item	Description	Unit	Qty	
1	Equivalent Residential Unit	gal / day	1	325
2	Equivalent Residential Unit	gal / min	1	0.2257
3	Peaking Factor	gal / min	1	0.5642
4	Equivalent Residential Unit	Anticipated Growth	1	1060
5	Total Flow	gal / min	1	598.09

8.3. PUMP

The staff have used and experienced good performance with Gorman-Rupp self-priming pumps. These pumps also allow the relocation of the pumps to be above ground. This will greatly simplify the maintenance and upkeep of the pumps. Since the pumps will be relocated to the surface, the wetwell will be expanded into the dry well portion allowing for additional wetwell storage. It is recommended to install two pumps at this time as a duplex pump station. This allows the design flow to be met with a single pump, and if something on a pump is broken the other acts as a backup system. In the future, if flows exceed 600 gal / min, a third pump will be required to prevent wastewater from backing up into the collection system. When the third pump is added, the outfall line will need to be increased from a 6-inch line to an 8-inch line. The design point for this system is 600 gpm @ 133-feet. This would require two of the Gorman-Rupp pumps to operate simultaneously. The third pump in the lift station will be for backup once flows exceed 600 gal / min.

8.4. VAULT

The existing vault consists of a small wetwell section and a larger drywell area, separated by a 12" thick concrete wall. It is recommended this vault is modified by connecting the drywell to the wetwell and incorporating both sides as a single wetwell. The current capacity of the wetwell is approximately 1,615 gallons. The increased capacity will be 6,463 gallons.

8.5. RECOMENDATIONS

To provide HVSSD with the necessary increased flow capacity, it is recommended that the existing well's capacity is increased by utilizing both the dry and wet portions as a single wet well. Two Gorman-Rupp VS4A-B-1 pumps are to be placed as a duplex system above the well. Gorman-Rupp will provide the controls for this duplex system. To keep the equipment protected and extend its service life, a structure will be placed over the existing well.

In the event of a power failure, the existing 125 kW generator will be used as emergency backup power for this lift station. This generator is sufficiently sized to operate one 50 hp pump. In the event that additional pumps need to be operated together, the generator will need to be increased to a 250 kW unit.

8.6. COST ESTIMATE

Based on the recommendations provided, the cost estimate to increase the capacity at the Midway Pump Station is $638,025. This assumes the existing vault is modified and used with a block building built over the well. Table 18 shows the breakdown for this cost estimation.

Table 18 Midway Pump Station Cost Estimate

Item	Description	Unit	Qty	Unit Price	Total Cost
1	Remove Existing Equipment from Drywell	LS	1	$ 21,000	$ 21,000
2	Modify Well Dividing Wall	LS	1	$ 3,500	$ 3,500
3	Gorman - Rupp Pump / Control Package	LS	1	$ 207,400	$ 207,400
4	Piping	LS	1	$ 7,000	$ 7,000
5	Enclosure Package	LS	1	$ 140,000	$ 140,000
6	Electric Hoist w/ I-Beam Gantry	LS	1	$ 6,300	$ 6,300
7	General Electrical and Instrumentation	LS	1	$ 210,000	$ 210,000
8	Installation	LS	1	$ 42,825	$ 42,825
				Subtotal	$ 638,025

9. FARM SHOP STORAGE

9.1. SHOP EQUIPMENT STORAGE

The current farm equipment is stored in the weather and to facilitate better equipment life an equipment storage facility is recommended. The building is about 60 feet wide which will allow the equipment to be driven in and connected. Within this storage area there is a shop section that would be used to maintain the farm equipment. A crane rail system is desired to allow for moving large heavy items within the equipment storage/ shop area. The general layout for the building is shown in Figure 8.

9.2. SHELTERED STORAGE

The roof structure would be extended an additional 60-feet with no walls. This will allow for additional storage protected from the weather, but the storage area would not be enclosed and heated. It is also anticipated the floor in this area will be graveled It is assumed that the floor will be constructed of gravel.

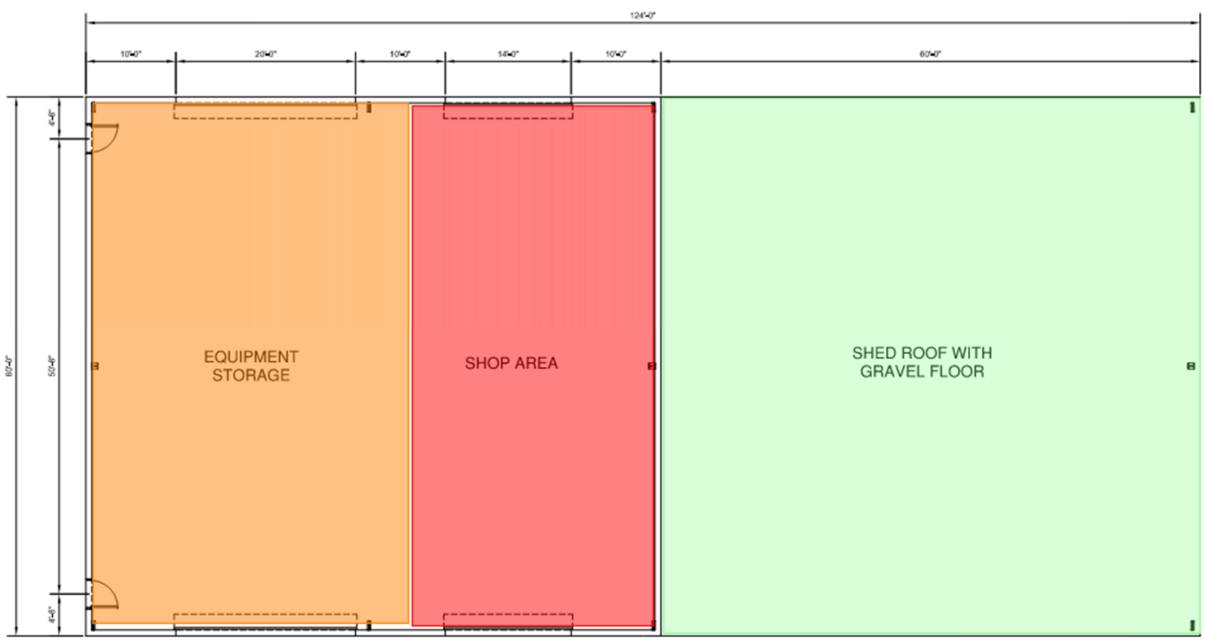

Figure 8 Farm Shop Storage

9.2.1. Cost Estimate

The exact location of the facility is unknown, but it is assumed to be somewhere on existing farm property. The cost estimate is based on the building area. It is assumed to be a pre-engineered metal building. It is anticipated that the cost for this building would be about $700,000.

Table 19 Farm Storage Cost Estimate

Description	Quantity	Units	Cost	Total Cost
Storage / Shop Area (60X64)	3840	sq. ft	$ 125	$ 480,000
Shed Roof Area (60X60)	3600	sq. ft	$ 40	$ 144,000
Overhead Crain Rail System	1	ls	$ 75,000	$ 75,000
Total				$ 699,000

10. LABORATORY

10.1. LABORATORY

The HVSSD wastewater treatment facility is planning to install a laboratory building. Much of the equipment for the lab was purchased as part of the 2012 mechanical plant upgrade. However, the equipment was placed in the blower building as a temporary location. This was to save money, but the laboratory use is increasing, and the equipment should be located in a better facility. The lab will perform tests on samples collected throughout the facility allowing the minimum turnaround time on the samples. The lab will be able to analyze samples for a wide variety of parameters and used to operate the facility. This will allow the plant to meet compliance requirements for state, federal, and local regulations.

10.1.1. Construction

It is anticipated the construction will be a block facility which will include additional office space and a shower area so operators can clean up if necessary. Figure 9 is the layout for the proposed facility.

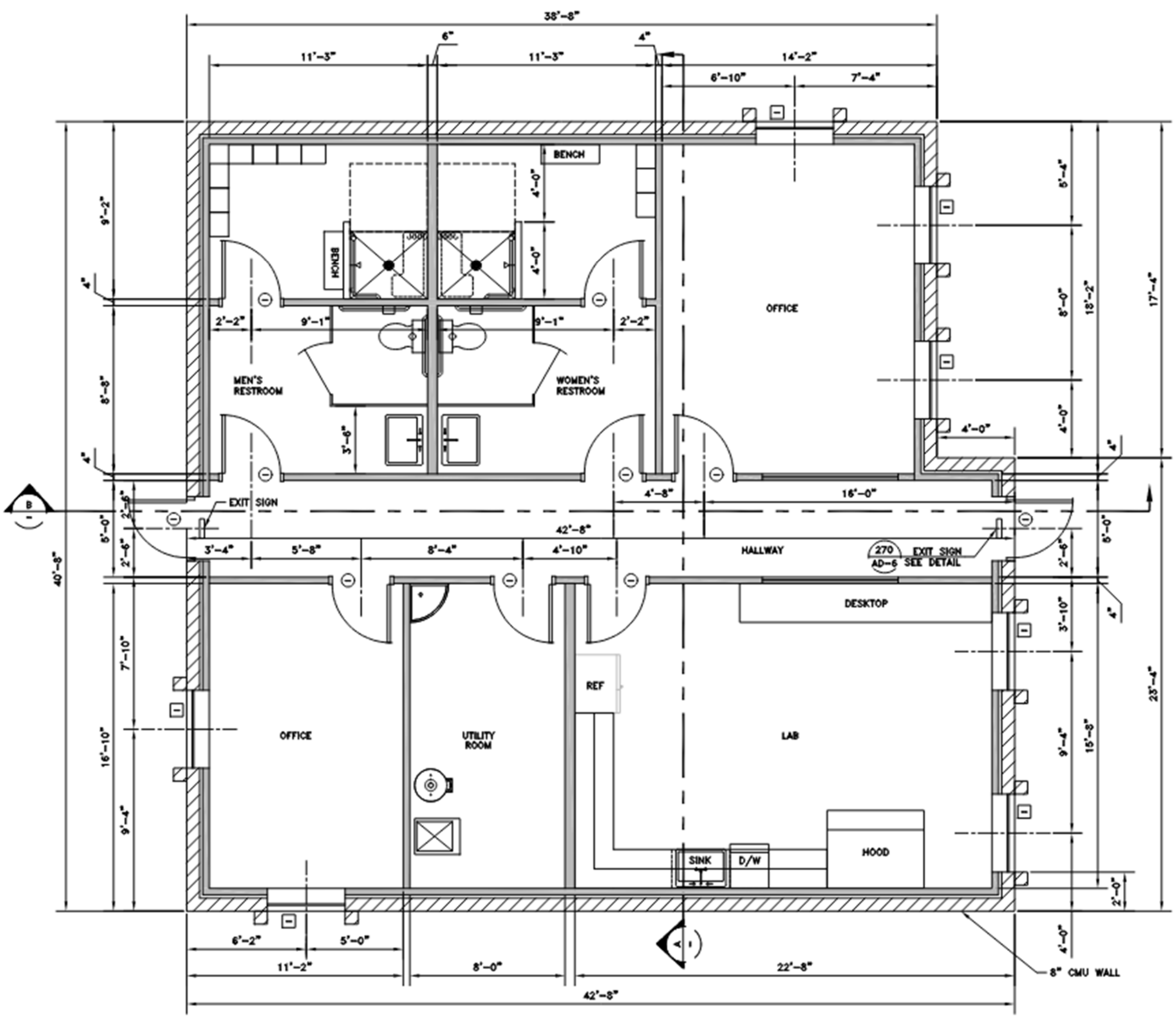

Figure 9 Laboratory Building

10.2. COST ESTIMATE

The anticipated cost for the structure is $620,000 the detail breakdown is shown in Figure 9.

Table 20 Laboratory Cost Estimate

Description	Quantity	Units	Cost	Total Cost
Site work	1	lump	$ 80,000	$ 80,000
Overhead and Permiting	1	lump	$ 10,000	$ 10,000
Building	1500	sq. ft.	$ 300	$ 450,000
Electrical	1	lump	$ 80,000	$ 80,000
Total				$ 620,000

11. EXISTING TREATMENT FACILITY

The costs of the existing treatment facility are shown in Table 15 below. The costs are based on the districts balance sheet.

Table 21 Existing Facility Assets

Facility Assets	Cost
Sewage Treatment Plant	$12,298,029
Ground Water Drains	$38,686
Midway Lift Station Fence	$3,878
Plant Equipment	$611,997
Farm Equipment	$1,738,206
Land	$8,195,455
Plant Expansion	$10,114,657
Total	$33,000,908

HVSSD has spent $33,000,908 on the existing improvements. Everyone connected to the system benefit from this previous investment. Much of this work was done several years ago so the new connections get to benefit from the value of the money that was invested in the past.

12. SUMMARY

12.1. PROJECT COST SUMMARY

This plan looks at the growth for the next 30 plus years. However, the impact fees are based on a much shorter outlook. Table 22 summarizes all the projects that need to be done to reach future treatment goals.

12.1.1. Existing Service Level

One of the prohibitions of the Impact Fee Act is charging impact fees for raising the level of service at the facility. The existing level of service at this facility includes treatment for BOD, TSS, ammonia, E.Coli, and total inorganic nitrogen as regulated by the State of Utah Department of Water Quality. As previously mentioned, while the HVSSD has additional hydraulic and biologic treatment, there are limitations in disposal capacity and biological capacity. The existing facility will be unable to treat additional flow to the existing level of service in terms of disposal capacity. Table 22 also summarizes the benefit for each of the different projects that is assigned to existing customers.

Table 22 Project Cost Summary

Description	Current Design Capacity (MGD)	Design Capacity (ERU)	Additional Capacity (MGD)	Population Expansion	ERU Expansion	Cost	% to Impact Fees	Amount Benefiting Existing Development
Existing investment	4.43	18,931		37,602	12,052	$33,000,908		
		.						
New Farm Shop		7,906			2,094	$699,000	26%	$513,859.46
Lab		8,547				$620,000	34%	$410,067.72
Generator		8,547				$160,000	75%	$40,000.00
Upgrade HVSSD Lift Station		1,060		707	227	$638,025	67%	$212,474.30
Land Disposal	1.85	7,906	0.49	6,533	2,094	$13,083,750	100%	$0.00
Winter Storage	1.96	8,376	0.38	5,067	1,624	$3,080,000	100%	$0.00
Mechanical Plant Aeration Upgrade	2.00	8,547	1.00	6,667	2,137	$12,470,000	100%	$0.00
Increased Capacity			1.5	20000	6410	$30,750,775		
New Mechanical Plant / RIB's			2	26,667	8,547	$50,000,000	100%	$0.00
Total			6.43	85,733	27,478	$80,750,775		$1,176,401.48

12.2. SCHEDULE

The project schedule is based on the growth assumptions presented earlier in the report. In addition to the growth, it is assumed that the district will purchase land for irrigation disposal prior to upgrading the biological capacity in the mechanical treatment plant. Table 23 lists the projects and the year that it is anticipated that project should be completed.

Table 23 Project Schedule

Description	Project Year	Cost
New Farm Shop	2022	$699,000
Lab	2021	$620,000
Generator	2021	$160,000
Upgrade HVSSD Lift Station	2021	$638,025
Land Disposal	2021	$13,083,750
Winter Storage	2021	$3,080,000
Mechanical Plant Aeration Upgrade	2025	$12,470,000
Increased Capacity		$30,750,775
New Mechanical Plant / RIB's	2035	$50,000,000
Total		$80,750,775

13. CERTIFICATION OF IMPACT FEE FACILITY PLAN BY CONSULTANT

In accordance with Utah Code Annotated, 11-36a-306(2), Brad Rasmussen on behalf of Aqua Engineering, makes the following certification:

I certify that the attached impact fee facilities plan:

1. includes only the costs of public facilities that are:
   a. allowed under the Impact Fees Act; and
   b. actually incurred; or
   c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid;

2. does not include:
   a. costs of operation and maintenance of public facilities;
   b. costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents; or
   c. an expense for overhead, unless the expense is calculated pursuant to a methodology that is consistent with generally accepted cost accounting practices and the methodological standards set forth by the federal Office of Management and Budget for federal grant reimbursement; and

3. complies in each and every relevant respect with the Impact Fees Act.

Date: 2021.10.14
11:03:05-06'00'

Brad Rasmussen, Aqua Engineering