Flathead County Septage Treatment & Biosolids Composting Facility

DRAFT Basis of Design Report

October 6, 2023

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1 Introduction

This section of the report will provide background to the project, describe the need for the project, list stakeholders involved, and define the purpose of this report.

1.1 Project Background & Project Need

Flathead County (County) is located in the northwestern portion of Montana and has a total population of approximately 105,000 citizens according to the 2020 U.S. Census. Recreation and tourism opportunities in the County have created rapid population growth. A set of waste management-related problems have materialized with that growth and are becoming more urgent with time:

- The current volume of septage being generated in the County, the diminishing amount of disposal options, and the anticipated increase in septage lead to environmental concerns.
- Delicate biological nutrient removal processes at local wastewater treatment plants coupled with stringent discharge nutrient limits create a challenging situation for portable toilet waste disposal.
- There is a need for sustainable options for wastewater treatment plant biosolids disposal as growth and development continues in the County.

Septage

According to the Flathead County Health Department (Health Department), there are approximately 30,000 on-site wastewater treatment systems (WWTS) in Flathead County. Septic tanks are an integral part of a WWTS and are used to settle solids from wastewater to provide primary treatment of the wastewater prior to being discharged to a drainfield. According to the Health Department, septic tanks need to be pumped every three to five years to prevent them from overfilling with solids. As the tank fills with solids the system's ability to provide primary treatment diminishes and eventually solids could overflow, subsequently plugging the downstream drainfield which would result in failure of the treatment system.

Historically in the County, after the contents of a septic tank, called septage, is pumped from the tank it has either been disposed of at a local wastewater treatment plant (WWTP) or land applied per Environmental Protection Agency (EPA), Montana Department of Environmental Quality (MDEQ), and Flathead County requirements. However, due to very strict effluent limits on waterbodies in Flathead County, and the very sensitive biological treatment processes at wastewater treatment plants required to meet the effluent limits, local municipalities have not accepted septage due to the impact that this high strength waste load has on the treatment process. As a result, land application has become the sole source of septage disposal in Flathead County.

Over the past decade, Flathead County has experienced growth rates as high as two percent per year and the availability of suitable land for disposal of septage has become very limited given both the value of land and the setback requirements for building near property used for land application. On many occasions during the various boom periods that have occurred since 2008, the Health Department has received numerous reports from septage haulers that there was no land available for disposal. This leads to the inability to pump septic tanks which results in homeowners not being able to properly maintain their WWTS. Further, land application of septage, which is high strength raw sewage that has only received primary treatment, represents a significant risk to public health and safety through either direct contact or vector transmission. The land application of the septage also results in the nutrient-rich water (high in nitrogen and phosphorus) ultimately being discharged to the groundwater which is hydraulically connected to the Flathead River and Flathead Lake, both of which are listed as impaired water bodies by MDEQ.

Portable Toilets

Several pumpers in Flathead County pump and dispose of portable toilet waste. Portable Toilets are commonly used at social events, festivals, construction sites, etc. Municipal WWTPs within the County do not accept, or are phasing out, the delivery of portable toilet waste as the product takes up capacity of their wastewater treatment systems, which could otherwise be used to handle further development. Portable toilet waste disposal can be especially challenging after large events like the “Under the Big Sky” music festival, since there is such a large volume of waste collected and in need of disposal over a short period of time. After these types of events, some pumpers have had no choice but to haul their septage to disposal facilities outside of the County due to the lack of disposal options within the County.

Wastewater Treatment Plant Biosolids

Rapid growth in Flathead County has created a problem related to the disposal of biosolids from wastewater treatment plants in the area. For many years the City of Kalispell has hauled its digested biosolids to the Glacier Gold composting facility in Olney, Montana. However, the Glacier Gold facility has reached its capacity for receiving and processing biosolids. In addition, Kalispell can’t take all their biosolids to the Glacier Gold facility, so there is serious concern about the company’s long-term viability. If Glacier Gold were to go out of business, then Kalispell would lose the disposal method for a significant portion of their biosolids. Kalispell also disposes of a portion of their biosolids at the Flathead County Landfill. However, the amount of biosolids the landfill will accept is very limited, leading to a situation where Kalispell would be out of options for biosolids disposal if the Glacier Gold facility closed. Biosolids from the Columbia Falls WWTP are disposed of at the landfill. Similar to Kalispell’s situation, this is not a viable long-term disposal option.

1.2 Stakeholders and Purpose

Through a collaborative effort with Flathead County, the cities of Kalispell and Columbia Falls have created a regional solution to mitigate the issues related to septage and biosolids in the County. Conversations with the City of Whitefish about receiving biosolids from their WWTP at the regional facility indicated that Whitefish intends to continue their current individual biosolids management approach. The shared solution developed by the County, as further described in this report, includes the construction of a regional septage treatment plant and a biosolids composting facility.

The proposed solution includes construction of a facility that will:

- Receive septage and biosolids.
- Treat the septage and discharge the resulting effluent to a local wastewater treatment plant.
- Compost biosolids from existing wastewater treatment facilities in Flathead County along with the solids from the septage receiving/treatment process.

This report serves as the basis for project design and combines past individual planning efforts into a regional concept. Past planning efforts include the 2018 Kalispell AWWTP Biosolids Management Plan, the 2019 Kalispell AWWTP Facility Plan Update, the 2018 City of Columbia Falls Wastewater Facility Plan Update, and the 2022 Columbia Falls Biosolids Dewatering and Management Plan. This report presents a summary of design criteria, the major elements of the various treatment processes, evaluation of the selected location for the facility, a preliminary business plan, and an opinion of probable project cost.

2 Design Criteria

This section of the report details the criteria necessary for the design of the septage treatment and composting facility.

2.1 Septage Quantity

As a starting point for septage treatment design, the current amount of septage in Flathead County was estimated. The total number of septic tanks in the service area was determined using Flathead City-County GIS septic system records for permitted systems combined with institutional knowledge from the Health Department about the suspected number of septic tanks that are unpermitted and in operation. The suspected number of unpermitted systems was corroborated by research performed in an unrelated study by the Flathead Basin Commission.

From the Flathead County System Permit Lookup interactive map the total number of recorded permits is currently 23,807. The Health Department suspected the actual number of active septic tanks was closer to 30,000. This number is supported by the Flathead Basin Commission research that identified approximately 8,000 parcels containing attributes that would indicate a residential occupancy such as nonpublic ownership and structures valued at more than $5,000 that were unpermitted. The approximation of 30,000 septic tanks is used as the year one design value.

If an average of 1,000 gallons is pumped from each septic tank once per four years, then the average annual amount of septage is 7,500,000 gallons. Data provided from the Montana Department of Environmental Quality (MDEQ) seems to indicate that there is a significant demand for septage disposal beyond the quantity of land that is currently permitted for land application. Table 1 provides a summary of the amount of waste by category that was land applied in 2021 and 2022, based on data reported to MDEQ.

Table 1. Land Applied Waste Summary

Year	Septage (gal)	Portable/Vault Toilets (gal)	Grease Trap (gal)	Sump (gal)	Total (gal)
2021	5,475,400	447,819	209,850	271,400	**6,404,469**
2022	4,029,250	287,720	290,250	255,100	**4,862,320**

Based on this data, the average amount of land applied waste of all categories is 5.6 million gallons per year. The average amount of land applied septage is 4.8 million gallons per year.

Another consideration is the amount of waste each parcel of land is permitted to land apply. Based on conversations with local septic pumpers, a large amount of land that has been used in recent years for land application will no longer be taking waste. For instance:

1. Pumper A pumps approximately 1,000,000 gallons per year. They are losing their current lease and moving to a new spot. They stated that it is very hard to find a spot for land application. They currently use 30 acres of land.
2. Pumper B pumps approximately 400,000 gallons per year. They found out recently that they are losing their land lease early this year and will be looking for a place to land apply.
3. Pumper C pumps approximately 3,000,000 gallons per year. They currently have one site to dump at and are looking for more.

4.8 million gallons per year is less than the expected septage based on the number of septic systems in the County. It is also significantly less than the sum of what the various pumpers dispose of in an average year based on interviews with these companies. The quantity of the total septage from three of the pumpers interviewed almost exceeds the quantity that was reported to MDEQ. This results in two potential conclusions:

- The amount of land applied waste is being under-reported to MDEQ
- Many County residents are not regularly maintaining their septic systems

At some point a large amount of waste will be required to be brought to the new facility simply due to the lack of land available for application. It is also expected that it will take time for pumpers to transition from land application of septage to use of the facility.

To calculate a future volume per day of septage the following assumptions were used:

- 30,000 existing septic tanks
- An average volume for a septic tank is 1,000 gallons.
- An average frequency for pumping a tank is 4 years.
- The regional septage receiving station is closed for 10 Federal Holidays, Saturdays, and Sundays, for a total of 250 days in service.
- 1.5% annual growth rate
- 20-year design horizon

The future septage flow calculation is as follows:

(30,000 tanks x 1,000 gallons / 4 years / 250 days) * 1.5% annual growth * 20 years =

40,000 gallons per day

According to Flathead County staff approximately 50% more pumping can be expected in the summer compared to winter. Therefore, a future septage max day quantity of 60,000 gallons per day was calculated. However, it should be noted that not all septage will be delivered to the County facility as some haulers will maintain a land application option. Should disposal regulations change that assumption could also change. It is currently anticipated that delivery of septage to the facility will start with a portion of all available septage and increase gradually each year. Table 2 below presents an estimate of the amount of septage that the County facility will receive from inception through the 20-year design horizon.

Table 2. Septage Design Quantities

Year	Total Available Septage – Estimated [1]	Assumed Percentage of Total to County Facility	Total Septage to County Facility
1	45,000 gal/d	30%	13,500 gal/d
5	47,760 gal/d	50%	23,880 gal/d
10	51,420 gal/d	70%	36,000 gal/d
15	55,380 gal/d	95%	52,610 gal/d
20	59,640 gal/d	95%	56,660 gal/d

1. Summer values are presented which are assumed to be approximately 50% greater than annual average values, i.e., a max day quantity.

2.2 Septage Characterization

The biological and chemical characteristics of septage are highly concentrated compared to municipal wastewater. The characteristics can also be highly variable depending on the source of septage. As a result, the design criteria for the proposed septage treatment plant will be based on both conservative values for septage characteristics and from random samples taken from septage pumpers. The expected concentrations of various septage constituents are presented in this section.

Initial Septage Sampling

Conservative values for septage characteristics from a Water Environment Federation manual, *Design of Municipal Wastewater Treatment Plants, Fourth Edition* are presented in Table 3 as compared to typical municipal wastewater. The application of these design parameters is discussed later in this section.

Table 3. Septage and Municipal Wastewater Characteristics

Parameter	Septage	Wastewater
Total Solids (TS) in mg/L	40,000	720
Total Suspended Solids (TSS) in mg/L	15,000	220
Biological Oxygen Demand, 5 Day (BOD_5) in mg/L	7,000	220
NH_3-N in mg/L	150	25
Total Kjeldahl Nitrogen in mg/L	700	-
Total Phosphorous in mg/L	250	8
pH	6.0	-

A combination of textbook values and samples of septage obtained within the County were used to provide initial design data for the septage treatment system. The County septage sampling events were designed to be representative of the complete volume, liquid and solids, of septage. The samples were drawn from septic hauling trucks. Initial septage design data is provided in Table 4 which includes the textbook values from Table 3 for comparison.

Table 4. Initial Septage Design Data

Parameter (units)	Textbook Value	Local Septage Lab Results (Median Value)	Local Septage Lab Results (Range)
Total Solids (mg/L)	40,000	19,050	4,130 - 39,000
Total Suspended Solids (mg/L)	15,000	8,400	1,620 - 26,600
5-day Biochemical Oxygen Demand (mg/L)	7,000	5,400	3,300 - 7,700
Ammonia as N (mg/L)	150	128	67 – 8,000
Total Kjeldahl Nitrogen (mg/L)	700	806	292 - 3860
Total Phosphorous (mg/L)	250	118	39 - 511
pH (S.U.)	6.0	6.5	5.2 – 8.6

Using this data, preliminary design of a septage treatment facility proceeded with the goal of treating the septage down to typical domestic wastewater concentrations that would then allow discharge to a municipal wastewater treatment facility for further treatment. The target effluent concentrations for the septage treatment system were:

- Total Suspended Solids (TSS) = 250 mg/L
- 5-day Biochemical Oxygen Demand (BOD_5) = 250 mg/L
- Total Kjeldahl Nitrogen (TKN) = 40 mg/L
- Total Phosphorous (TP) = 7 mg/L

The preliminary design resulted in a facility that would be very expensive to operate, primarily due to the large air demand that would be required to treat such a high strength waste load. Ultimately there was concern about the viability of such a facility.

Further review of the design assumptions indicated that the reduction in waste strength normally experienced by a primary settling process should be considered. Anecdotal evidence discussed in Water Environment Federation publication *Septage Handling; Manual of Practice No. 24* indicates that primary clarification in an example septage-only treatment facility reduced BOD_5 strength by an average of 70%. The manual also discusses further removal being possible with chemical addition; however, little operational data is provided in the manual.

Additional Septage Sampling

The biological reduction of pollutants in wastewater treatment is responsible for much of the treatment costs, both construction and operation. Without good information on which to base a design there is a potential to over-design the treatment process and over-estimate the operating costs. Either of which could negatively affect project design decisions going forward. To address these concerns, a series of septage sampling events were performed with the following goals:

- The primary goal of the septage sampling program is to provide data upon which to base the design of the treatment facility. Primary data of concern is:
  - The rate at which the solids settle. This data is needed as a basis for sizing a primary clarification stage.
  - The strength of septage after a primary clarification stage.
- The secondary goals of the septage sampling program are to provide data to confirm water quality concentrations from initial sampling and learn about the performance of chemical addition in further reducing the strength of the septage after the primary settling stage.

Sampling Procedures

Samples were gathered from the Helena, MT area, local to engineering staff performing the work. The City of Helena WWTP accepts septage, but after visiting the facility and talking to staff, it was discovered that few septage haulers made routine use of the facilities. A local septage hauler was contacted that agreed to assist in providing septage from residential-only sources. The company owns a lagoon facility east of Helena where the sampling took place.

Testing the settling rate of septage was performed on-site at the lagoon using a settlometer. A settlometer is an acrylic cylinder with graduated markings that allows observation of the liquid/solids interface in a sample. Readings of the interface are taken over time to assess how readily the solids separate from the liquid portion. Settlometers are typically used in wastewater treatment plants to assess the settleability of biological solids.

Testing of chemical and physical properties of the samples was then performed by a certified laboratory.

Ten sampling events were planned as follows:

- All ten sample events would include capturing a sample of septage, allowing it to settle for a minimum of 30 minutes, then collecting samples. The resulting samples were designed to emulate primary clarifier effluent.
- The final four samples would each be split into two sets, referred to as “paired” samples.
  - The first set, labelled with an “A”, would emulate effluent from a primary clarifier as described above.
  - The second set, labelled with a “B”, would gather a second volume with the same characteristics as the “A” volume, add coagulant chemical, provide mixing to encourage the formation of floc, allow the floc to settle for a minimum of 30 minutes, then collect samples from the relatively clear liquid. Because designing an effective chemical treatment process in the field is very difficult, this process was designed only to provide insight into the potential for further reduction in septage strength using a coagulation/flocculation process.

After collecting the initial six sets of samples, and before proceeding with the paired sample sets, a series of septage samples were gathered to determine an effective coagulant dose.

The list of parameters presented in Table 5 were chosen for analysis.

Table 5. Sample Analysis Parameters/Methods

Test Name	Analytical Method
Composite Septage Decant - Aqueous	
pH	A4500-H B
Solids, Total Suspended TSS @ 105 C	A2540 D
Solids, Volatile Suspended	A2540 E
Solids, Total	A2540 B
Alkalinity, Total as CaCO3	A2320 B
Bicarbonate as HCO3	A2320 B
Carbonate as CO3	A2320 B
Cyanide, Total	Kelada-01
Oxygen Demand, Chemical (COD)	E410.4
Biochemical Oxygen Demand, 5 day	A5210 B
Nitrogen, Ammonia as N	E350.1
Nitrogen, Kjeldahl, Total as N	E351.2
Nitrogen, Nitrate+Nitrite as N	E353.2
Phosphorus, Total as P	E365.1
Metals by ICP/ICPMS, Total (Arsenic, Barium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Nickel, Silver, Tin, Zinc)	E200.8
Mercury	E245.1
Oil and Grease (HEM)	E1664A
Composite Septage Solids	
Moisture	D2974
Solids, Total Volatile	A2540 G
Solids, Total	A2540 G
Nitrogen, Kjeldahl, Total as N	E351.2
Ammonia as N, KCL Extract	ASA33-7
Nitrate as N, KCL Extract	ASA33-8
Metals by ICP/ICPMS, Total (Arsenic, Cadmium, Chromium, Copper, Lead, Molybdenum, Nickel, Selenium, Zinc)	SW6020
Phosphorus	SW6010B
Mercury	SW7471B
PFAS Compounds	
PFAS Compounds in Aqueous Matrices	E537M
PFAS Compounds in Soil	E537M

Sampling Equipment

Because the chosen sampling parameters included Per-and Polyfluoroalkyl Substance (PFAS) compounds, care was necessary in choosing sampling equipment. Guidance published by the California State Water Quality Control Board and the Michigan Department of Environment, Great Lakes, and Energy was reviewed when choosing sampling equipment and developing procedures.

Acceptable materials for sampling equipment include:

- High-density polyethylene (HDPE)
- Low-density polyethylene (LDPE)
- Polypropylene
- Silicone
- Stainless Steel

Sample Preparations

Prior to collecting samples, and between sampling events, all equipment that would be in contact with the samples was cleaned with a solution of Alconox and rinsed with distilled water. To minimize the possibility of PFAS cross-contamination, sampling procedures followed the guidance cited above. Appendix A includes guidance for performing PFAS sampling.

A significant volume of liquid is required to perform the chosen sampling. Table 6 lists the volume requirements for each set of samples. The total volume required for the aqueous samples of each event is 7,250 mL or 1.92 gallons. To accommodate the required volume, four 5-gallon buckets were used to collect septage samples. This was increased to six 5-gallon buckets for the final four sets of samples. The sample volume for the solids portion of the analysis is relatively small at 1,250 milliliters (mL) in comparison.

Table 6. Sample Volume Required

Test Name	Volume (mL)
Aqueous Samples	
PFAS Compounds in Aqueous Matrices	750
Biochemical Oxygen Demand, 5-day	1000
Solids, Total Suspended TSS; Solids, Volatile Suspended; Solids, Total	2000
Oxygen Demand, Chemical (COD); Nitrogen, Ammonia as N; Nitrogen, Kjeldahl, Total as N; Nitrogen, Nitrate+Nitrite as N; Phosphorus, Total as P	500
Mercury; Metals by ICP/ICPMS, Total	250
Cyanide, Total	500
Oil and Grease	2000
pH; Alkalinity	250
Solids Samples	
Moisture; Solids, Total Volatile; Solids, Total; Nitrogen, Kjeldahl, Total as N; Ammonia as N; Nitrate as N; Metals by ICP/ICPMS, Total; Phosphorus; Mercury	1000
PFAS Compounds in Soil	250

Sample Collection

Samples were obtained in February and March 2023, when the ice cover on the septage disposal lagoon was thick enough to support human traffic. Samples were obtained by directing the discharge of the septage truck into a series of 5-gallon buckets prior to discharging the balance of the truck's contents into the lagoon through a hole in the ice. The samples obtained in this manner were believed to be representative of the liquid volume of the truck based on two assumptions:

- The process of sucking the volume of the septic tank into the truck resulted in the volume in the truck being well-mixed, and
- The liquid volume did not have the opportunity to settle while the truck was in transit to the disposal site.

It is likely that the liquid-to-solids ratio of the sample was not representative of the truck's volume so there was no attempt to quantify the solids volume.

Ten sets of samples were taken as described above. The first six sample sets were labeled "Sample 1" through "Sample 6". The procedure for the first six samples was as follows:

- Samples were obtained as described above, using four 5-gallon buckets. The contents of one of the buckets was mixed and a portion of the contents transferred to the settlometer.
- Settlometer readings were taken over the next 60 minutes.
- After allowing to settle for a minimum of 30 minutes, the sample containers provided by the laboratory were filled with liquid from the top of the buckets. Sample volumes were drawn as much as possible from all buckets for each of the samples.
- After all the aqueous samples were obtained, the liquid from the top of two or more buckets was poured off, leaving as many solids as possible. The remaining solids were combined into one bucket and the contents mixed. The containers provided by the lab for solids samples were filled with the mixed solids.
- Samples were delivered to the lab immediately after they were obtained.

The final four sets of samples were used to assess the performance of chemical addition to the aqueous portion of the sample volume. The primary coagulant used in testing was aluminum sulfate (alum). The alum product used contains 48.5% active aluminum sulfate. Dosage numbers cited below are of the raw product. Therefore, to determine an actual aluminum sulfate dosage, the cited values needed to be reduced accordingly. A cationic polymer was also used in testing as described below. Details about the products are included in Appendix B and C.

After the first six samples were obtained, a series of tests were conducted using alum to find a dose that was effective in coagulating the solids out of the decanted liquid. It was decided to proceed with the final four samples using alum doses of 550, 600, 650 and 700 mg/L of the alum product with the final sample having an additional 10 mg/L of polymer.

Each of the final four samples was divided into two volumes, one of which was handled as described above, and the second of which had the coagulant dose added to it. The last four sample sets were labeled as "A" and "B" pairs ("Sample 7A", and "Sample 7B", for example) where the "A" sample was obtained after settling, similar to the first six samples. The "B" sample was taken after the addition of chemical coagulant.

The procedure for the last four sample sets is as follows:

- Samples were obtained as described above, using six 5-gallon buckets. The volume was allowed to settle for 15 minutes.
- Liquid was drawn from the top of the buckets and put in another bucket with volume markings. The bucket was filled with decanted liquid to the 14-liter mark.
- The chosen coagulant dose was added to the bucket and mixed vigorously for one minute. The bucket contents were then stirred slowly for 15 minutes.
- After stirring, a volume of the mixture was transferred to the settlometer, and readings taken over a 60-minute period.
- Between taking settlometer readings, samples for the “A” set were transferred to bottles provided by the laboratory in the manner described above for the first six samples.
- After the chemically treated bucket was allowed to settle for at least 30 minutes, sample bottles for the “B” set were transferred to the bottles provided by the lab. Except for sample 8B (discussed below), the first sample drawn was for the PFAS aqueous sample. The remaining aqueous samples were drawn in a similar manner to the “A” samples. The solids samples for the “B” set could be drawn directly from the bottom of the bucket without disturbing the remaining volume.
- Samples were delivered to the lab immediately after they were obtained.

Samples were generally collected in the order of constituents listed in Table 6 above. Two of the samples proved to be problematic:

- The septic tank that was the source of Sample 6 was described by the truck driver as being “long overdue” for pumping and had a large proportion of solids. As a result, it was difficult to obtain the required volume for the aqueous samples. It is likely that the lab sample containers filled later in the series contained more solids than those collected first. The Oil & Grease sample was not collected because of the larger volume required.
- Sample 8B was a sample with coagulant added. The coagulant dose, in this case, resulted in poor settling and therefore little clear liquid was available for analysis. The PFAS sample, usually the first sample gathered, was omitted to allow enough volume for the other samples. This resulted in sufficient volume for the BOD_5 sample to be obtained with few floc solids, but the remainder of the samples contained increasing proportions of solids. The Cyanide and Oil & Grease samples were also omitted due to lack of available volume.

Laboratory Analysis

All samples were analyzed by Energy Laboratories. Sample containers were picked up and delivered to the Helena laboratory location.

The PFAS analysis turned out to be problematic. After the bottles for the initial sample events (Sample 1 and Sample 2) were delivered to the lab, the sampling personnel were informed that the sediment remaining in the aqueous samples was causing interference with the analysis and the lab recommended to not complete this analysis.

The lab also reported that the PFAS analysis of the solids sample was being hindered because there was too much liquid in the sample. Energy Laboratories staff offered that they could decant the liquid off the sample prior to performing the analysis but warned it could result in a low-biased result. Sampling personnel directed the lab to proceed with the analysis after decanting the liquid.

The BOD_5 analysis for Sample 3 was analyzed outside the required holding time of 48 hours. The sample was obtained at 11:45 am on 2/13/2023. The analysis began at 12:08 pm on 2/15/2023; 23 minutes after the holding time expired.

The laboratory results for PFAS Compounds in Aqueous Matrices for Sample 10B came with the following note: "This sample was received preserved with TRIZMA, which does not follow methodology. The effects on analyte recoveries when using TRIZMA are not well known." The TRIZMA compound was in the sample bottles provided by Energy Laboratories and is used for drinking water samples.

Septage Sampling Results

The settlometer results and sample results are summarized in Appendix D and Appendix E, respectively. Settlometer data indicated satisfactory settling within approximately 30 minutes. Sample results are divided into two series:

- The ten sets of sample results designed to emulate effluent from a primary clarifier. This includes the "A" series of paired samples.
- The four sets of paired samples, including separate results of the "A" and "B" sample sets.

Table 7 and Table 8 provide a comparison to the initial septage design data that was presented in Table 4. As an initial approach, the settled septage data (Table 7) was used for preliminary sizing of a septage treatment system. If the size and operational costs of that system do not seem reasonable then chemical coagulant addition will be assumed and parameters from Table 8 will be used in the sizing of the septage treatment system.

Table 7. Settled Septage Results

Parameter (units)	Textbook Septage Value (for comparison) [1]	Lab Results (Median Value)	Lab Results (Range)
Total Solids (mg/L)	40,000	3,050	1,800 – 8,900
Total Suspended Solids (mg/L)	15,000	1,900	1,240 – 9,000
5 day Biochemical Oxygen Demand (mg/L)	7,000	1,200	600 – 3,300
Ammonia as N (mg/L)	150	78	40 - 153
Total Kjeldahl Nitrogen (mg/L)	700	200	72 - 359
Total Phosphorous (mg/L)	250	25.7	19.6 – 45.2
pH (S.U.)	6.0	7.0	6.2 – 7.3

1. Values are for unsettled septage

Table 8. Chemical Coagulant Results

Parameter (units)	Sample 7 A/B	Sample 8 A/B	Sample 9 A/B	Sample 10 A/B
Total Solids (mg/L)	3,100 / 1300	See Note 1	3,500 / 1,800	1,800 / 700
Total Suspended Solids (mg/L)	1,960 / 64	See Note 1	1,920 / 160	1,240 / 14
BOD_5 (mg/L)	700 / 170	1,100 / 380	1,500 / 640	600 / 110

Parameter (units)	Sample 7 A/B	Sample 8 A/B	Sample 9 A/B	Sample 10 A/B
Ammonia as N (mg/L)	128 / 127	See Note 1	40 / 35.2	85 / 78
Total Kjeldahl Nitrogen	240 / 144	See Note 1	151 / 58.1	137 / 84
pH (S.U.)	7.0 / 6.5	6.9 / 6.5	6.2 / 5.2	7.3 / 6.3
Alum dose (ppm) See Note 2.	550	600	650	700
Polymer dose (ppm)	0	0	0	10

Note 1: Except for the BOD_5 and pH samples, an excess of solids in the sample negatively affected the sample results. See discussion in the report text.

Note 2: The alum dose listed is the dose of the neat product. The aluminum sulfate content of the product is 48.5%, therefore actual aluminum sulfate dose is 48.5% of the listed value.

2.3 Portable Toilet Waste

Portable toilet waste is a high strength waste that also contains additives such as dyes, fragrances, and compounds to lower the freezing point. Porta potty haulers in Flathead County and in Madison County were contacted to obtain product information for additives that they typically use. Safety Data Sheets (SDSs) for those additives are included Appendix F. Continued use of these chemicals will need to be coordinated with the selected septage treatment process and downstream treatment facilities accepting effluent from the County to mitigate against upsets in treatment processes. The use of brine products that may impact pH and any materials with a high toxicity will need to be avoided. If necessary, the use of such products may be discontinued, which would be communicated early with local porta potty haulers.

The information listed below is based on data from the Columbia Falls WWTP collected in 2021 and summarizes the volume and characteristics of porta potty waste taken to the plant. These values fall within the range of values of the local septage sample results in Table 4 of Section 0.

- Volume of porta potty waste taken to the Columbia Falls WWTP in 2021 = 389,904 gallons
- Average BOD = 7,149 mg/L
- Average TSS = 15,829 mg/L
- Average Phosphorus = 250 mg/L
- Average TKN = 3,065 mg/L

The volume of portable toilet waste available within the County, and what proportion is assumed to be delivered at the County facility, were calculated similar to the method used to estimate septage quantity. Based on conversations with some porta potty companies in the County, it appears that the County facility will receive a significant amount of porta potty septage. Therefore, it is anticipated that a majority of the portable toilet waste in the County will be received at the County treatment facility in the early years of operation due to the lack of other local options and high costs associated with trucking the material long distances for disposal. All portable toilet waste collected within the County is assumed to be delivered at the County treatment facility by year five of operation. Similar to septage hauling, it is assumed that approximately 50% more porta potty hauling will occur the summer compared to winter (Table 9).

Table 9. Portable Toilet Waste Design Quantities

Year	Total Available Porta Potty Waste – Estimated [1]	Assumed Percentage of Total to County Facility	Total Porta Potty Waste to County Facility
1	2,400 gal/d	85%	2,040 gal/d
5	2,640 gal/d	100%	2,640 gal/d
10	2,940 gal/d	100%	2,940 gal/d
15	3,240 gal/d	100%	3,240 gal/d
20	3,540 gal/d	100%	3,540 gal/d

1. Summer values are presented which are assumed to be approximately 50% greater than annual average values, i.e., a max day quantity.

2.4 Biosolids

The City of Kalispell and Columbia Falls both have well established solids handling processes and detailed historical data including hauling tonnages, tipping fees, Specific Oxygen Uptake Rates (SOUR) when applicable, and percent solids. This data is very useful in understanding treatment capabilities within the region where climate, available technology, monetary implications, operator training, and hauling routes all contribute to the quality and value of the final product.

The expected biosolids from septic systems in the County do not yet have established biosolids records. Therefore, the process for estimating these values is described below.

Biosolids Quantity

The City of Kalispell hauls biosolids to the Flathead County Landfill weekly on Mondays and Wednesdays with the remaining loads being hauled to Glacier Gold Composting. Loads to Glacier Gold typically consist of two loads on Monday and one load every day the rest of the week. Historical data from the Kalispell WWTP hauling records are tabulated in Table 10.

Table 10. Kalispell WWTP Solids Hauling Records (Dry Tons)

	2018	2019	2020	2021
Glacier Gold	588 [1]	477	476	502
County Landfill	151	201	197	195
Total Hauled	**739**	**678**	**673**	**697**

1. In 2018 the Digesters were down for two months resulting in a temporary increase in solids hauling volume.

The City of Columbia Falls hauls biosolids to the Flathead County Landfill on Tuesdays and Thursdays and averages 3 to 4 loads per week or 16 loads per month. The Columbia Falls tonnages are reported in wet tons along with the average percent solids, from which the dry tonnages were calculated. From the hauling records in 2020, the average percent solids was 13.8% whereas in 2021 the average percent solids was 14.9%.

Table 11. Columbia Falls WWTP Biosolids Hauling Records to County Landfill

Timeframe	Wet Tons	Percent Solids	Dry Tons
2020 - Quarter 1	288.92	13.82%	39.9
2020 – Quarter 2	236.71	13.82%	32.7
2020 – Quarter 3	267.61	13.82%	37.0
2020 – Quarter 4	302.61	13.82%	41.8
2021 – Quarter 1	279.10	14.89%	41.6
2021 – Quarter 2	260.81	14.48%	37.8
July 2021	109.32	14.29%	15.6
August 2021	107.13	14.73%	15.8
Annual Average	1,136.4	14.21%	131.1

The Flathead County population is derived from census data by subtracting the number of connections on sewer within the several Cities and Districts from the total Flathead County population of approximately 105,000 in the 2020 Census. This is not an exact amount and is used to ground truth the number of suspected septic tanks in the County. While there are a suspected 30,000 septic tanks in the County, and approximately 60,000 people within Flathead County that are not on sewer, the actual amount of biosolids from septic tanks will be realized once the facility is in operation.

Using the septage characteristics in Section 2.2 for total solids, assuming the 30,000 septic tanks are pumped every four years and dewatered to 12% solids, the annual and per capita biosolids tonnages were estimated. Table 12 provides the estimated biosolids generated from septic tanks in Flathead County.

Table 12. Biosolids from Septic Tanks

Description	Year 2020 Value	Year 2044 Value
Flathead County Septic Tanks	30,000	44,607
TS in Septic Tanks (mg/L)	20,000	20,000
Biosolids Generated Annually (wet tons)	625	929
Assumed Percent Solids	12%	12%

Description	Year 2020 Value	Year 2044 Value
Biosolids Generated Annually (dry tons)	75	111
Biosolids Generated Per Capita Per Year (lbs)	10	10

It is estimated that there are approximately 60,000 people in Flathead County that are not connected to a mechanical treatment plant and thus would contribute to the septage volumes. However, the contributing population would be on a 4-year cycle. Therefore, the population used to estimate the annual biosolids is 15,000 citizens. Furthermore, the rapid growth in Flathead County is estimated at 500 new septic tanks per year. This information is used in Table 13 for developing future projections.

The hauling records and estimated biosolids can be used to estimate the per capita biosolids from each contributing population. The per capita numbers can then be used to estimate the biosolids loading to be expected and project future loads based on population growth.

Table 13. Future Biosolids Projections

	2020 Population	Expected Growth Rate	Per Capita Per Year Biosolids (lbs)	2044 Biosolids Projection (Dry Tons)
Kalispell Evergreen	24,558 [1] 5,784 [2]	2%	46	1,122
Columbia Falls Meadow Lake	5,308 [1] 867 [3]	2%	47	233
Dewatered Septic Solids to Composting Facility	15,000 [4]	1.67%	15	181
Total	**59,268**		**146**	**1,536**

[1] 2020 Census

[2] 2,111 connections reported by Evergreen x 2.74 PPH from 2020 Census

[3] 2018 Columbia Falls WWTP Facility Plan

[4] Unsewered connections in the County on a 4-year cycle.

High-Carbon Amendment

The biosolids tonnage calculated, and known solids content, were used to determine the quantity of high-carbon amendment, e.g. wood chips, required to create a successful composting blend. The optimal ratio of amendment to biosolids is dependent on several variables and can change depending on the material composition. The moisture levels in the amendment and biosolids are the primary influences on the ratio. As the moisture content increases, the amendment required increases. An amendment to dewatered biosolids ratio is anticipated to range from 5:1 to 7:1

(amendment : biosolids). Using a 6:1 ratio, the required annual carbon amendment quantities would be 18,000 and 25,000 tons annually for 2024 and 2044, respectively.

The Flathead County Landfill is a possible source for high-carbon amendment. Based on data obtained from the County, the current quantity of high-carbon amendment (brush and limbs) available is approximately 3,000 tons, annually. Based on the quantity of high-carbon amendment estimated for effective composting, there will be a deficit of 15,000 tons (2024) and 22,000 tons (2044) that will need to be acquired from other sources. Possible other sources of high-carbon amendment could be the local timber industry or increasing and encouraging residential and commercial collection of green waste.

3 Codes, Rules, Regulations, and Permit Requirements

3.1 Purpose and Content

The Flathead County Septage Treatment and Biosolids Composting Facility will require various permits for construction and operation. Design standards presented in this section provide a uniform approach to designing facilities to satisfy the requirements necessary to obtain permits in an efficient and economical manner.

The applicable codes and standards are divided into the following categories: building codes, Administrative Rules of Montana, MDEQ Standards, and MDNRC Standards.

3.2 Building Codes

This section is intended to provide project designers with guidance to applicable codes and standards for the civil, structural, architectural, mechanical, and electrical design disciplines. The codes are applied and enforced to any project submitted on or after June 11, 2022.

- 2021 International Building Code (IBC)
- 2021 Uniform Plumbing Code (UPC)
- 2021 International Mechanical Code (IMC)
- 2020 National Electric Code (NEC)
- 2021 International Energy Conservation Code (IECC)
- 2021 International Fire Code (IFC)

Civil and Process

Applicable standards relative to civil and process work include the following:

- Montana Public Works Standard Specifications (MPWSS), 7th Edition, 2021
- Project Plans and Specifications
- 2021 IFC
- OSHA Regulations

- Montana Department of Environmental Quality Storm Water Management During Construction Field Guide for Best Management Practices, current edition
- Minimum Standards for Design and Construction for Flathead County, Montana, 2017

Structural

Any structural design will be consistent with accepted engineering practices and shall comply with the building codes, regulations, design manuals, and associated standards listed. Where revision numbers or dates are not listed, the latest version will be used. In the case of this section's overlap or conflict with governing codes and standards, the more stringent interpretation or directive will be followed:

- Aluminum Association
  - ADM1-20, Aluminum Design Manual
- American Concrete Institute (ACI)
  - 207.1-05, Guide to Mass Concrete
  - 318-14, Building Code Requirements for Concrete Buildings
  - 350-20, Code Requirements for Environmental Engineering Concrete Structures
  - 350.3-20, Seismic Design of Liquid-Containing Concrete Structures
  - 350.4R-04, Design Considerations for Environmental Engineering Concrete Structures
  - 351.3R-18, Report on Foundations for Dynamic Equipment
  - Manual of Concrete Practice
- American Institute of Steel Construction (AISC)
  - 341-16, Seismic Provisions for Structural Steel Buildings
  - 360-16, Specification for Structural Steel Buildings
  - Design Guide 27, Structural Stainless Steel
- American Iron and Steel Institute (AISI)
  - S100-16, North American Specification for the Design of Cold-Formed Steel Structural Members
- American Society of Civil Engineers (ASCE)/Structural Engineering Institute (SEI):
  - 7-16, Minimum Design Loads for Buildings and Other Structures
- ASTM
  - Applicable ASTM standards referenced within Materials of Construction section
- American Welding Society (AWS)
  - D1.1, Structural Welding Code - Steel
  - D1.6, Structural Welding Code - Stainless Steel
  - D1.8, Structural Welding Code - Seismic Supplement

- American Water Works Association (AWWA)
  - D110-13(R18): Wire and Strand-Wound, Circular, Prestressed Concrete Water Tanks
  - D115-20: Tendon-Prestressed Concrete Water Tanks
- Applied Technology Council (ATC)
  - Hazards by Location Program, https://hazards.atcouncil.org/
- Crane Manufacturer's Association of America (CMAA)
  - Specification 70, Multiple Girder Cranes: Specification for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes
  - Specification 74, Single Girder Cranes: Specification for Top Running and Under Running Single Girder Electric Cranes Utilizing Under Running Trolley Hoists
- International Code Council (ICC)
  - IBC, 2018 International Building Code with Southern Nevada Amendments
- Portland Cement Association (PCA)
  - Circular Concrete Tanks without Pre-stressing (PCA 1993a)
  - Rectangular Concrete Tanks (PCA 1993b)
- Steel Deck Institute (SDI)
  - Roof Deck Design Manual
  - Floor Deck Design Manual
  - Diaphragm Design Manual
- Steel Joist Institute (SJI)
  - Standard Specifications and Load and Weight Tables for Steel Joists and Joist Girders
- The Masonry Society (TMS)
  - 402/602-16: Building Code Requirements and Specification for Masonry Structures United States Bureau of Reclamation (USBR)
  - Engineering Monograph 27, Moments and Reactions for Rectangular Plates (USBR 1990)

Architectural

Architectural improvements will be designed in accordance with the current applicable provision of codes, standards, and recommended practices of the following organizations:

- Americans with Disabilities Act (ADA) as interpreted by 2009 ICC A117.1
- American Society for Testing and Materials (ASTM)
- American National Standards Institute (ANSI)
- Factory Mutual System (FM)
- National Fire Protection Association (NFPA)

- National Association of Architectural Metal Manufactures (NAAMM)
- Occupational Safety and Health Administration (OSHA)
- Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- Steel Structures Painting Council (SSPC)
- Underwriter's Laboratories, Inc. (UL)

Architectural work will be completed in accordance with the specific codes, standards, and recommended best practices, and specified to follow the applicable requirements listed below.

- 2021 IBC
- 2021 IFC
- 2020 NEC
- 2021 IMC
- 2021 UPC
- 2021 IECC
- NFPA
- NAAMM
- OSHA
- General industry safety orders

Mechanical

Building mechanical systems (i.e., heating, ventilation, and air conditioning [HVAC] and plumbing) improvements will be designed in accordance with the current applicable provision of codes, standards, and recommended practices of the following organizations:

- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
- ASTM
- ANSI
- FM
- NFPA
- SSPC
- SMACNA
- UL
- OSHA

Building mechanical systems (i.e., HVAC and plumbing) work will be completed in accordance with the specific codes, standards, and recommended best practices, and specified to follow the applicable requirements listed below.

- Fire Protection in Wastewater Treatment and Collection Facilities NFPA 820, 2024
- 2021 IBC
- 2021 IECC
- 2021 IFC
- 2021 International Fuel Gas Code and Appendices A, B, C, and D
- 2021 International Mechanical Code (IMC)
- 2021 International Residential Code
- 2021 Uniform Plumbing Code (UPC)
- ASHRAE Standards 90.1 – Energy Standard for Buildings Except Low Rise Residential Buildings
- ASHRAE Standard 62.1 – Ventilation for Acceptable Indoor Air Quality
- ASHRAE, HVAC Applications Handbook
- NFPA Standard 90A, "Installation of Air Conditioning and Ventilation Systems."
- Industrial Ventilation: Handbook of Recommended Practice
- American Industrial Hygiene Association (AIHA) ANSI/AIHA Standard Z9.5-93, Laboratory Ventilation
- SMACNA – Thermoset FRP Duct Construction Manual.

Fire and Life Safety

Overall Design Approach

A code analysis, including fire protection and life safety evaluations, will be developed in accordance with the codes listed below. Code Analysis and Life Safety sheets will be developed at a later design stage.

The design will be consistent with accepted engineering practices and will comply with all applicable regulations, instructions, manuals, building codes, and life safety codes. The authorities having jurisdiction (AHJs) for this project include the following:

- The Montana Department of Labor & Industry's Business Standards Division, Building & Commercial Measurements Bureau, Building Codes Program (BC Program)
- The Montana Division of Criminal Investigation (DCI) at the Montana Department of Justice, Investigations Bureau, Fire Prevention and Investigation Section, Montana State Fire Marshal's Office

The adopted publications applicable to Fire Protection and Life Safety design for this project include the following:

- 2021 IBC
- 2021 IFC

- 2024 NFPA 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities

Construction Type, Occupancy Classifications, Occupancy Separations, and Fire Separation Distance

The facility buildings are proposed to be noncombustible Type IIB construction.

In alignment with the design intent of IBC, occupancy classification has been used for construction type, allowable building height and area, building separation, etc.

The currently anticipated construction types (which are subject to change as the project develops) and occupancy classifications for the new buildings on this project include the following:

- Septage Treatment Building: Type IIB Construction, Moderate Hazard Group F-1
- Office Building: Type IIB Construction, Group B
- Grinding Building: Type IIB Construction, Moderate Hazard Group F-1
- Compost Building: Type IIB Construction, Group S-2
- Compost Curing Building: Type IIB Construction, Group S-2
- Storage Building: Type IIB Construction, Group S-2

HDR had initially anticipated the compost, curing, and storage buildings to be Type VB construction. However, preliminary discussions with builders suggested that Type IIB construction would be more suitable for the large size of the structures, and likely cheaper.

HDR met with Montana State Building Code officials to discuss the project and get insight on the best path forward for the facility to comply with the code. Code officials recommended qualifying the compost, curing, and storage buildings as S-2 occupancy, which would allow them to be considered a single, one-story, non-sprinklered, unlimited area building per sections 503.1.2 and 507.3, The grinding building would then be an F-1 Moderate Hazard accessory occupancy per Sections 306.2, 507.1.1, and 508.2. The two requirements to go this route are qualifying the buildings as S-2 and providing 60 feet of clearance around the entire unlimited area building. The latter requirement is already met based on the preliminary site plan. To meet the other requirement, the building code official requested documentation that shows one or both of the following:

- The composting process and compost material has low hazard and flammability characteristics. This could be written statements or emails from compost operators in Montana or other states sharing experience regarding self-combustion of compost.
- Provide other examples of these types of buildings being used and shown as S-2 occupancy.

Another alternative that was discussed was the use of fire walls to separate the larger buildings into separate buildings to stay below the allowable area per sections 706 and 506.2. This would remove the requirement for the 60 feet of clearance but would still require qualifying the buildings as S-2.

No occupancy separations are anticipated to be required.

Fire separation distances will comply with Chapter 7 of the 2021 IBC.

Automatic Sprinkler Systems and Hazardous Materials Assessment

The Septage Treatment Building, as a Group F-1, will be kept under the thresholds in IBC §903.2.4 that require an automatic sprinkler system to be provided. Likewise, the Grinding Building is expected to have a Group F-1 fire area of approximately 8,800 square feet, which below the threshold of 12,000 square feet for Group F-1 and thus an automatic sprinkler system is also not required per §903.2.4.

The Group B and Group S-2 occupancies for this project do not require sprinklers per IBC §903.2.

The use of any Hazardous Materials (Hazmat's) needed for the Wastewater Treatment processes, such as Aluminum Sulfate (a Corrosive) will be in accordance with the 2021 IBC and 2021 IFC.

Fire Alarm and Detection Systems

No fire alarm and detection systems are required for Groups B, F, or S-2 per the IBC and IFC.

The only fire alarm requirement that is anticipated is for the Septage Treatment Building per requirements for screening, grit handling, dewatering, and sludge conveyance per Rows 1, 2, 12, and 13 of Table 6.2.2(a) of 2024 NFPA 820. A fire alarm and detection system will thus be provided for the Septage Treatment Building.

Portable Fire Extinguishers

Per IBC Section 906, fire extinguishers shall be installed throughout the Septage Treatment Building, Office Building, and Grinding Building. Portable fire extinguishers will be provided and installed in accordance with NFPA 10.

It is anticipated that the front-end loader and skid steer used for carrying compost will have portable fire extinguishers onboard and thus the Exception for Group S-2 in §906.1 will apply for the Compost Building, Compost Curing Building, and the Storage Building.

Fire Protection Water Supply

The project site is located in a rural, un-zoned area of the County where there are no nearby municipal water supplies. Surrounding properties are served by individual wells, and there is not an existing well on the property. A new well is proposed to be drilled onsite with a maximum flow rate of 35 gpm.

HDR met with the Montana State Fire Marshal to discuss the facility and discuss options for fire flow. IFC Appendix B allows the use of NFPA 1142 to reduce the Fire-Flow Requirement. The meeting resulted in the recommendation of providing 30,000 gallons of fire protection water storage onsite and providing a 20 to 25-foot wide vegetation break around the large compost buildings.

The 30,000 gallons of storage was calculated using the NFPA 1142 the Septage Treatment Building because it will be the largest normally occupied building and it has the highest hazard classification on site (Group F-1 moderate hazard with some NEC Hazardous Location Classification areas). The water volume calculation is presented in Table 14.

Table 14. NFPA 1142 Water Volume Calculation for Septage Building

Description	Value	Units
Structure Area =	10,000	sf
Structure Height =	20	ft
Structure Volume =	200,000	gal
OHC =	5	Moderate hazard
CC =	0.75	Type IIB construction
Water Volume =	**30,000**	**gal**

The vegetation break is proposed to be a compacted gravel surface to allow for fire department access around the buildings.

Electrical

Electrical improvements will be designed in accordance with the current applicable provision of codes, standards, and recommended practices of the following organizations:

- ANSI
- ASTM
- Electrical Testing Laboratories (ETL)
- Illuminating Engineering Society of North America (IESNA)
- Insulated Cable Engineers Association (ICEA)
- Institute of Electrical and Electronics Engineers (IEEE)
- The Instrumentation, Systems, and Automation Society (ISA)
- National Electrical Testing Association (NETA)
- National Electrical Manufacturers Association (NEMA)
- National Electrical Installation Standards (NEIS)
- National Electrical Contractor Association (NECA)
- NFPA
- OSHA
- UL

Any electrical work will be completed in accordance with the specific codes, standards, and recommended best practices, and specified to follow the applicable requirements listed below.

- NFPA 70 - NEC
- 2021 IECC
- ANSI/NEMA C84.1 American National Standard for Electric Power Systems and Equipment - Voltage Ratings (60 Hertz)

- ANSI/NEMA MG 1 Motors and Generators
- IEEE 141 (R 1999) IEEE Recommended Practice for Electric Power Distribution for Industrial Plants (Red Color Book)
- IEEE 242 IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (Buff Color Book)
- IEEE 399 IEEE Recommended Practice for Industrial and Commercial Power System Analysis
- IEEE 519 (Second Printing 15 June 2004 with correction) IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
- IEEE 551 IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems (Violet Color Book)
- IEEE 1015 IEEE Recommended Practice for Applying Low Voltage Circuit Breakers Used in Industrial and Commercial Power Systems (Blue Color Book)
- IEEE 1584 IEEE Guide for Performing Arc-Flash Hazard Calculations
- NECA 1 Standard for Good Workmanship in Electrical Construction (ANSI)
- NECA 101 Standard for Installing Steel Conduits (Rigid, IMC, EMT) (ANSI)
- NECA/NEMA 605 Installing Underground Nonmetallic Utility Duct (ANSI)
- NETA ATS (ANSI) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems
- NFPA 101 Life Safety Code
- NFPA 497 Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
- 2024 NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities
- UL 508A-2013 Standard for Industrial Control Panels

3.3 Administrative Rules of Montana

This section summarizes the Administrative Rules of Montana (ARM) that pertain to the project. The primary departments related to design of the facility include:

Department 17: Environmental Quality

Department 36: Natural Resources and Conservation

The composting operations must meet the setbacks specified in ARM 17.50.1703, which are summarized below:

- 100 feet from property lines
- 500 feet from residences or places of business
- 200 feet from potable water well or supply

- 200 feet from surface water body
- 150 feet from drainage swale

3.4 Montana Department of Environmental Quality Standards

This section summarizes the Montana Department of Environmental Quality (MDEQ) standards that apply to the project.

Montana DEQ Circulars

- DEQ 1 – Standards for Water Works
- DEQ 2 – Design Standards for Wastewater Facilities
- DEQ 20 – Standards for Nonpublic Water Systems
- PWS 6 – Source Water Protection Delineation

Montana Code Annotated (MCA)

- Title 75 – Environmental Protection
- Title 85 – Water Use

3.5 Montana Department of Natural Resources and Conservation

The requirements for obtaining water rights for the property depend on the required amount of flow. A Form 602 "Notice of Completion of Groundwater Development" will be used to acquire a Groundwater Certificate for a well with a maximum pumping rate of 35 gallons per minute (gpm) and an annual volume of less than or equal to 10 acre-feet per year. The form must be filled out after the well is drilled and water has been beneficially used. However, the Form 602 must be filed within 60 days of the water being put to beneficial use.

If more than 35 gpm will be necessary to serve the site, then an application for beneficial water use will need to be submitted to the DNRC. This process involves drilling and testing the production well prior to submitting an application.

4 Septage Receiving and Treatment

The first step of the proposed septage treatment process is a receiving station that would separate debris and rocks commonly found in septage and then wash and dewater the material prior to disposal. Septage would then be treated down to typical raw municipal wastewater concentrations prior to disposal. This section further describes those processes. Design criteria are presented in Table 15.

Table 15. Septage Receiving & Treatment Design Criteria

Year	Septage	Porta Potty Waste	Septage + Porta Potty Waste
1	13,500 gal/d	2,040 gal/d	15,540 gal/d
5	23,880 gal/d	2,640 gal/d	26,520 gal/d
10	36,000 gal/d	2,940 gal/d	38,940 gal/d
15	52,610 gal/d	3,240 gal/d	55,850 gal/d
20	56,660 gal/d	3,540 gal/d	60,200 gal/d

4.1 Septage Receiving

The septage receiving station would be similar to the Lakeside Raptor Complete Plant system (Figure 1). Septic haulers would connect to one of two station inlet valves with a cam lock to empty the contents of the truck. Septage first passes through a screening chamber to remove debris and then into an aerated grit chamber to remove grit. Spray water washes the organics from the solids which are then dewatered with an inclined auger prior to being discharged. Both dewatered screenings and dewatered grit are then discharged into a dumpster via a bagged system to contain odors. There is an option to include a grease trap where excess grease is removed by a motorized skimmer. The grease removal option is recommended as conversations with septic haulers indicate they use the same trucks to haul fat, oils, and grease (FOG) loads as they use to haul septage. Therefore, there may be some residual grease from the truck that could be introduced into the County treatment facility. Any grease collected would then be discharged into a dewatering dumpster prior to disposal.

Each septage load would be measured for billing purposes and monitored by sensors to reject loads not within acceptable parameters, e.g., loads having a low pH. The JWC Honey Monster (Figure 2 and Figure 3) was also considered for this project. The unit has a rock trap and a grinder but does not have grit or grease removal. Additional information for the Lakeside Raptor system and JWC Honey Monster systems are included in Appendix G.

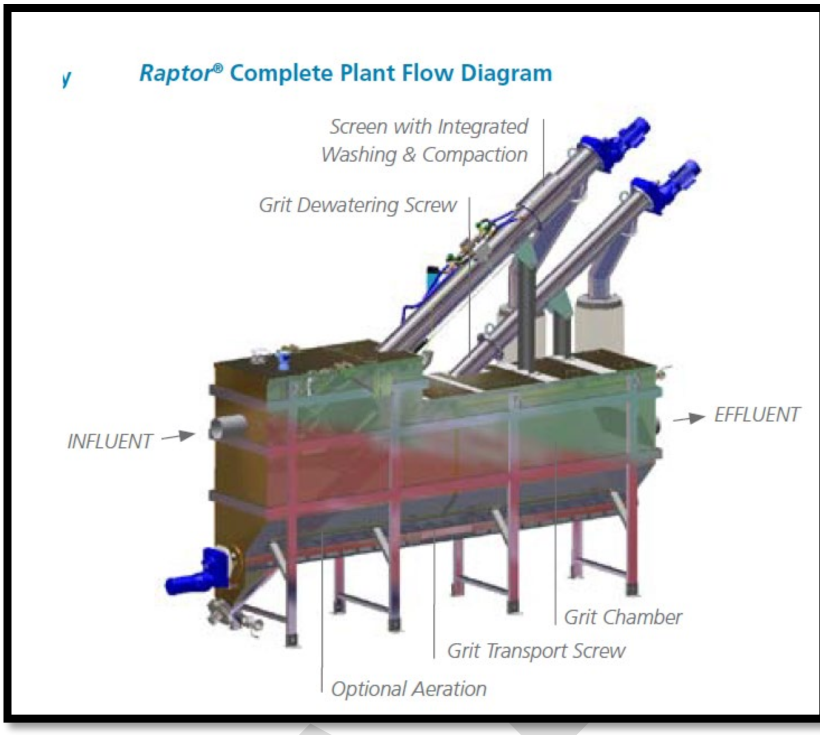

Figure 1. Lakeside Raptor Complete Plant

Figure 2. Septage Receiving Example – JWC Honey Monster

Figure 3. Septage Receiving Station Operation – JWC Honey Monster

1. Cam lock inlet, 2. Grinder, 3. Ultrasonic level sensor & modulating inlet valve, 4. Optional flow meter, 5. Perforated screen & washed solids, 6. Dewatered solids discharge, 7. Screened septage

4.2 Septage Treatment

Equalization and Primary Clarification

The screened and degritted septage exits the septage receiving station and will be pumped to equalization basins to attenuate peak hydraulic conditions. Flow will then be by gravity to a primary clarifier to achieve settling of solids which reduces loading and treatment requirements for the next stage of treatment. The equalization basins and primary clarifier will be adjacent to the secondary treatment process and will be covered for odor control. The equalization basins will be mixed using aeration air from the secondary treatment blowers. Solids collected in the primary clarifier will be sent to a dewatering process described below.

Secondary Treatment

The liquid stream will flow from the primary clarifier to a sequencing batch reactor (SBR). An SBR was selected due to the nature of how septage will be delivered to the facility. Most treatment processes require a steady flow to operate properly. However, an SBR is specifically designed to provide treatment of wastewater in intermittent batches and is therefore ideal for this application. Further, an SBR process, unlike a lagoon which could also be used for this application, can effectively reduce BOD and nutrients to acceptable levels for discharge to a publicly owned treatment plant or groundwater. In addition, odor can be controlled at an SBR facility which is a critical success factor for this project. Package SBR systems are produced by a number of manufacturers. Typically, packaged SBR treatment plants are installed in concrete tanks and can be located either outside (Figure 4) or in a temperature-controlled building. The manufacturer supplies the equipment; however, the tanks and buildings are usually constructed by the contractor. For this project, it is assumed the SBR tanks will be located in a temperature-controlled building.

Figure 4. Example Exterior SBR Installation - Aqua Aerobic

An SBR is a fill and draw activated sludge system providing treatment in a timed sequence (Figure 5). Wastewater is added to batch reactors during each cycle which then proceeds through various processes. The wasted solids from the SBR process would be dewatered and combined with WWTP biosolids for composting. Two proposals for a SBR system have been provided for this project (Appendix H).

1. **Fill Cycle.** The Fill cycle can be separated into two categories: The Anaerobic Fill period, where influent is brought into the tank without aeration, and the Anoxic Fill, where influent is brought in the tank while mixing is enabled.

2. **React Cycle.** The React treatment step involves mixing and aerating the tank without introducing new raw influent. The influent control valve is closed. Septage arriving at the site would be screened and placed in an equalization basin.

3. **Settle Cycle.** During the Settle period, all equipment (blowers and pumps) is off and all valves are closed.

4. **Decant/Draw Cycle.** During the Decant cycle the treated batch is discharged from the SBR system. The decant valve is automatically opened while the influent valve is closed and both pumps and blowers are off. The decant valve remains open until the liquid level in the tank reaches the bottom water level. After the effluent is drawn off, excess solids are wasted to the solids dewatering process.

5. **Idle Cycle.** The Idle step occurs after the previous batch treatment and prior to the next batch treatment. No aeration or mixing occurs, and all valves are closed.

Advantages to an SBR system include:

- The system performs equalization, biological treatment, and secondary clarification in a single tank providing a cost-effective treatment system.
- Minimal footprint.
- Provides for effective odor control.
- Operating flexibility and control.
- Potential capital cost savings by eliminating clarifiers and other equipment.

- Ideal for a batch type process like septage receiving.

The disadvantages for SBR systems are minimal but include:

- Higher level of control sophistication compared to a lagoon-based treatment option.
- Potential of discharging floating or settled sludge during the decant phase.
- Foaming can be an issue with SBR systems. For this facility the foam could be conveyed to the dewatering process.
- Requires use of effluent filtration to produce effluent for unrestricted reuse.
- Requirement of flow equalization after the SBR process for downstream processes.

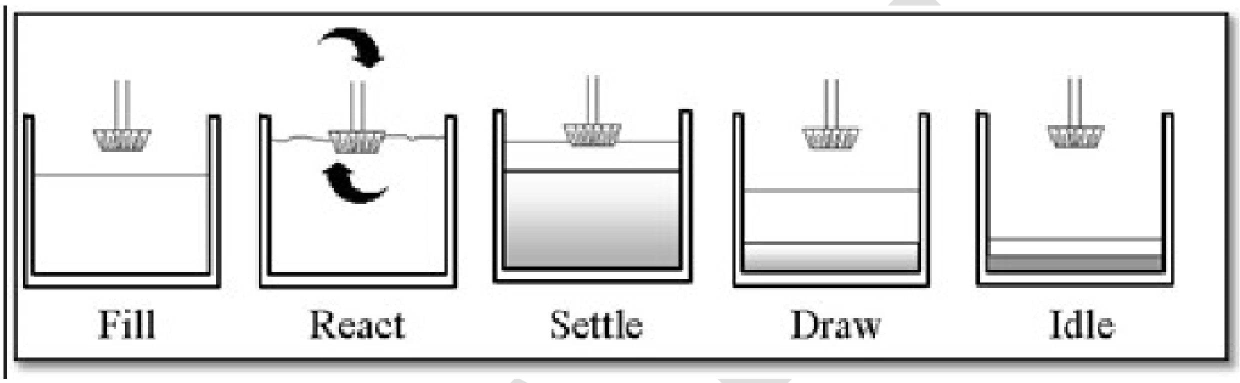

Figure 5. Typical SBR Flow Diagram

Preliminary sizing of an SBR system includes four individual treatment trains. The modular design enables phased and gradual use of the system as flows increase over time. An aluminum sulfate (alum) system will be provided as a backup phosphorous removal system. Effluent phosphorous concentrations will be monitored and chemical dosing will occur at the SBR effluent as needed.

Effluent Pumping

Two options for disposal of treated effluent from the septage treatment facility were considered: discharge to a publicly owned treatment works (POTW) or discharge to groundwater. MDEQ has indicated in preliminary discussions that they will require effluent filtration if groundwater discharge is utilized as the disposal method. The site is near a Lakeside County Water and Sewer District (LCWSD) treatment system, so sequencing batch reactor (SBR) effluent could be pumped there. It is assumed, for the purpose of this report, that the POTW would get credit for the additional nutrient loading and advanced nutrient removal would not be required. The SBR would need to treat the raw septage to typical domestic wastewater concentrations prior to discharge to the POTW. Effluent design criteria would be as follows:

- Pumping = 170 gpm
- TSS = 250 mg/L
- BOD_5 = 250 mg/L
- TKN = 40 mg/L
- TP = 7 mg/L

Costs associated with discharging to a POTW assumes that the facility’s effluent will be able to be pumped approximately one mile to LCWSD’s treatment system to the south of the site. Costs associated with a groundwater discharge are offset by a pump station and force main required to discharge to the POTW.

Biosolids Dewatering

As previously mentioned, the solids settled in the primary clarifier, waste activated sludge (WAS) and foam from the SBR process will be dewatered prior to incorporation into the composting facility. A belt filter press (Figure 6) is the dewatering technology assumed for this project due to the equipment’s robust operation and ability to handle coarse material. Preliminary design criteria for the belt filter sized by manufacturers are presented in Table 16. The belt filter press can be covered to contain and collect foul odorous air for odor mitigation treatment.

Figure 6. Belt Filter Press by BDP Industries

Table 16. Belt Filter Press Design Criteria

Description	Value
Solids Loading	500 lb/hr dry weight solids
Hydraulic Loading	25 – 50 gpm
Feed Solids Concentration	2.25 – 3.75%
Dewatered Cake Solids	20 – 26%
Polymer Usage	TBD

4.3 Septage Operations Building

A preliminary floor plan of the SBR Operations Building is presented in Figure 8. The building will house the septage receiving station, equalization basins, primary clarifier, SBR units, aeration blowers, pumps, solids dewatering equipment, odor control system, electrical system, and control panels.

The structure will be designed to be consistent with the rural nature of the area. It is anticipated the building will have an agricultural and/or equestrian design similar to that shown in Figure 7.

Figure 7. Example Building Type

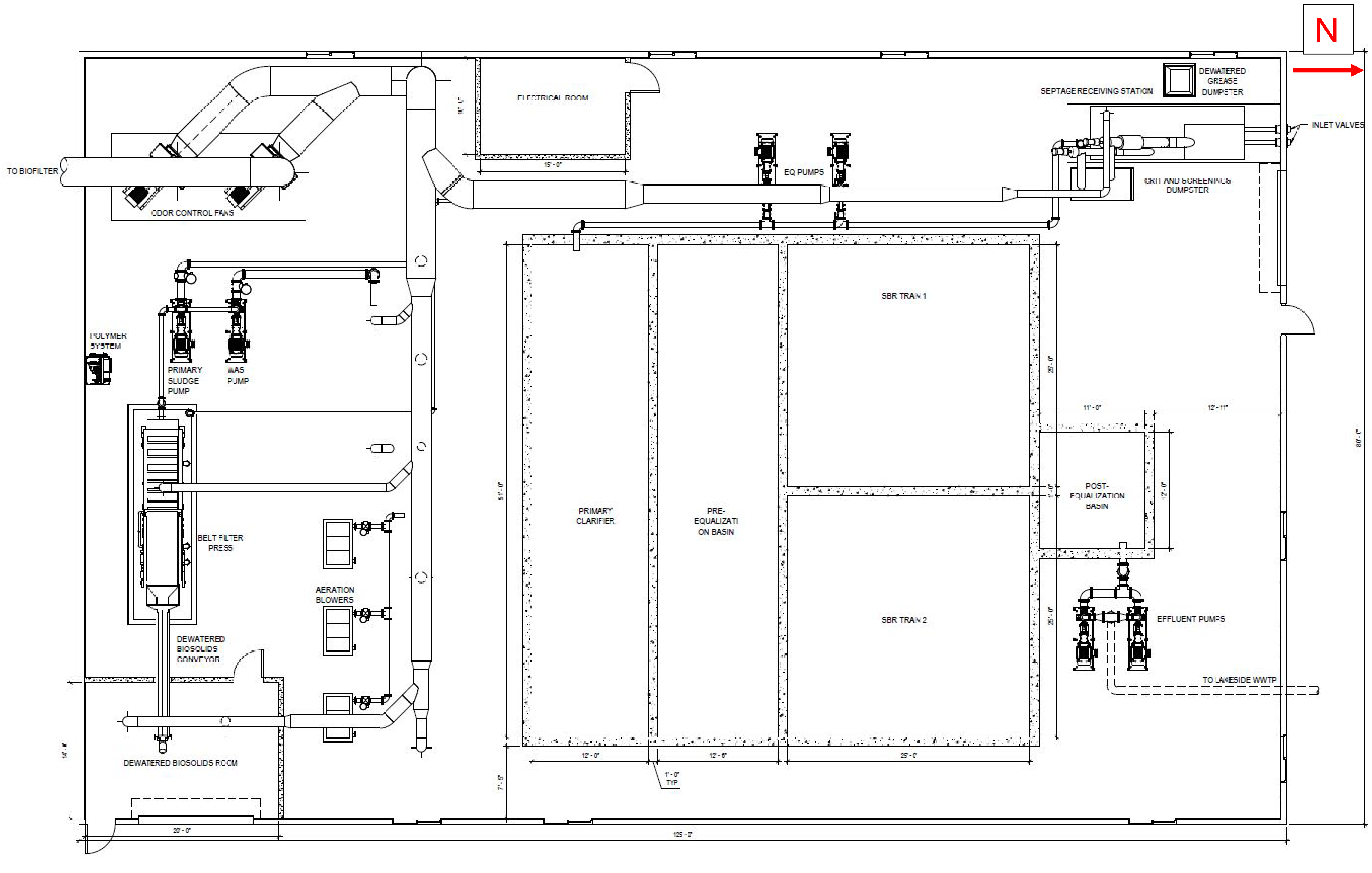

Figure 8. Preliminary Septage Operation Building Layout

5 Biosolids Composting Facility

Composting is the biological decomposition of organic material under aerobic conditions. The microorganisms involved fall into three major categories: bacteria, actinomycetes, and fungi. The process is a self-limited biological process. Available nutrients, temperature, aeration, moisture content, and pH play the most important roles in limiting the microbial population. The composting process produces heat as a result of the bacteriological metabolism. Initially, the heat generated by the mesophilic bacteria elevates temperatures to 50°C. As the mesophilic population decreases due to high temperature, the number of thermophilic bacteria increases and elevate the temperature to 60°C. If the environmental conditions, such as, air, water, and nutrients are appropriate, the microorganisms are self-limiting and the temperature stabilizes around 55°C.

The proposed biosolids composting process, aerated static piles (ASPs), is based on the recommended alternative in both the Kalispell Biosolids Management Plan and the Columbia Falls Wastewater Facility Plan. Since these two communities generate the majority of the biosolids that would be directed to a regional facility, the aerated static composting process remains the recommended option when biosolids from other sources and the septage treatment system are also added to the facility.

5.1 Aerated Static Pile Composting System Description

Aerated static piles consist of a grid of aeration or exhaust piping over which a mixture of dewatered sludge and bulking agent is placed. The bulking agent is usually woodchips or hog fuel, which are mixed with the dewatered solids by a mixer. Composting requires carbon to nitrogen ratios of at least 30:1 since microorganisms use approximately 30 parts of carbon for each part of nitrogen. Homogeneous mixtures of sludge and bulking agent usually provide a carbon to nitrogen ratio of about 30:1. Therefore, it is not normally necessary to add additional nutrients. Mixed material is composted for approximately 21 to 30 days and then cured for another 30 days. This requirement can increase to up to 6 months in the winter, depending upon temperature conditions. The purpose of the curing process is to provide enough time for the compost product to be fully stabilized prior to distribution. Air and moisture are the key process limiting conditions and are regulated to maintain the desirable moisture content level of 50 to 60 percent. The air is controlled by regulating air supply from the blowers, this also helps control the moisture. Moisture is introduced into the composting process through the two components, the biosolids and woody amendment. Different sources of biosolids will have different moisture contents depending on the method of dewatering used at that facility. However, each biosolids source should have a relatively consistent moisture content. The moisture content of the amendment will have a wider range. Some factors contributing to the amendment moisture include the material type, age of material, and recent weather. The composting and curing beds will be covered under a roof, this will protect the piles from the elements and help regulate moisture during the composting process.

For our design we are assuming moisture contents of 86% for the biosolids and 40% for the bulking material. We are also assuming a roughly 6:1 ratio of bulking material to biosolids by volume. A list of design parameters is shown in Table 17.

Typical ASP heights are about 7 to 8 feet. A layer of screened compost is placed as a base for the piles, and another layer on top of the pile for insulation. Disposable corrugated plastic drainage pipe is commonly used for air supply and each individual pile is recommended to have an individual blower for more effective aeration control. Screening of the cured compost is usually performed to reduce the quantity of cured compost and recover a portion of the bulking agent. For this design a 30% recycle rate has been assumed. Figure 9 shows a schematic of a typical aerated static pile system. Figure 10 shows an example aerated static pile facility in Coeur d'Alene, Idaho.

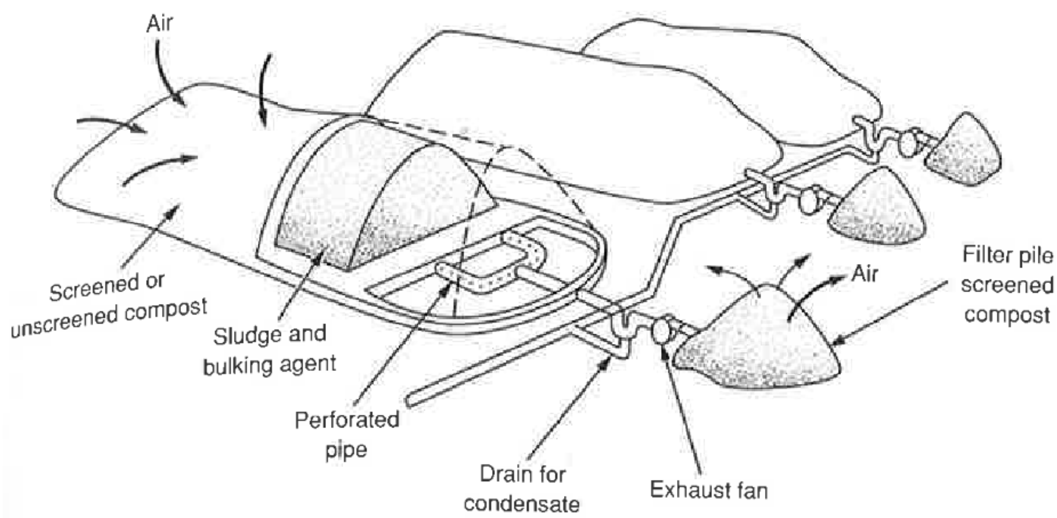

Figure 9. A Typical Aerated Static Pile System Schematic
(Source: Wastewater Engineering, Treatment, Disposal, and Reuse, Metcalf & Eddy, 3rd Ed.)

Figure 10. Example Aerated Static Pile – Coeur d'Alene, Idaho

An ASP composting facility typically includes the following components:

- Aerated static piles
- Cure piles
- Woodchipper, for mulching woody amendment
- Mixer, to mix dewatered solids with bulking agent
- Aeration blowers, to supply air or create negative pressure in the ASPs

- Screen, to separate compost from bulking agent
- Biofilter(s), for odor control
- Storage areas for new and recycled bulking agent
- Storage area for cured compost.

Table 17. List of Design Parameters

	Med/High Bulk Ratio and moderate bulk density	Units
Feedstock Description	**6**	**by Vol**
Technology	**Windrow**	
Incoming Green Waste = Bulking Agent	25,000	tons/yr
Incoming Biosolids (wet)	10,500	tons/yr
Processing Days per Year	312	days/yr
Tons per Day through mixer	114	tons/day
Tons per Year through mixer	35,568	tons/yr
Bulking Density (post grind)	650	lb/cu yd
Bulking C:N Ratio	50	
Bulking Moisture Content	40%	
Bulking post grind volume	76,923	cu yd
Biosolids Density	1,580	lb/cu yd
Biosolids C:N Ratio	7	
Biosolids Moisture Content	86%	
Biosolids Volume	**13,291**	**cu yd**
Biosolids Dry tons	**1470**	
Target C:N Ratio	30 to 45	
Target Moisture Content	55%	
Net Bulk Density at Arrival	350	lb/cu yd
Actual Bulk Density of mix post Grind	925	lb/cu yd
Net C:N Ratio	37	
Bulking Ratio by Volume (Woody/Biosolids)	**6**	**by Vol**
Bulk to Biosolids by weight (Woody/biosolids)	**2**	**by weight**
Net Moisture Content*	54%	
Water to Add Initially	118,848	gal/yr
Annual Volume Processed (at infeed)	**202,857**	**cu yd**
Annual Volume Processed (post grind/mixed)	**76,751**	**cu yd**

* Add water as needed to increase moisture content

5.2 Biosolids Composting Design

The facility design and associated costs assume enclosed or mostly enclosed structures that will house biosolids storage and aerated static piles during active composting to help mitigate odor concerns. Cure piles are assumed to be covered with an open-air building similar to Figure 11. The complete system would consist of 17 aerated static piles, 14 curing piles, a blower at each ASP and curing pile, one compost mixer, a biofilter, a skid steer loader, and one compost screen. The areas required for these processes are shown in Table 18. A preliminary equipment list is included in Section 9.2 and composting equipment proposals included in Appendix I. Finally, the composting system would include the collection of leachate from the aerated static and curing piles, the biofilter, and moisture trapped in the blower piping. The leachate will be conveyed to the Septage Operations Building for treatment in the SBR process. A process flow diagram of the proposed composting system is presented in Figure 12.

To compost the projected quantity of biosolids for the next 20 years, approximately 3.8 acres of land will be required.

Table 18. Process Area Sizes

Process Area	Area Required	Units
Grinding Area	8,550	sf
Compost Pads	45,900	sf
Bio Filter	2,049	sf
Compost Curing Pads	37,800	sf
Finished Compost Screening Area	7,500	sf
Storage Pad	72,996	sf
Total	**167,100**	**sf**
	3.84	**ac**

Figure 11. Hamilton, Montana Composting Facility

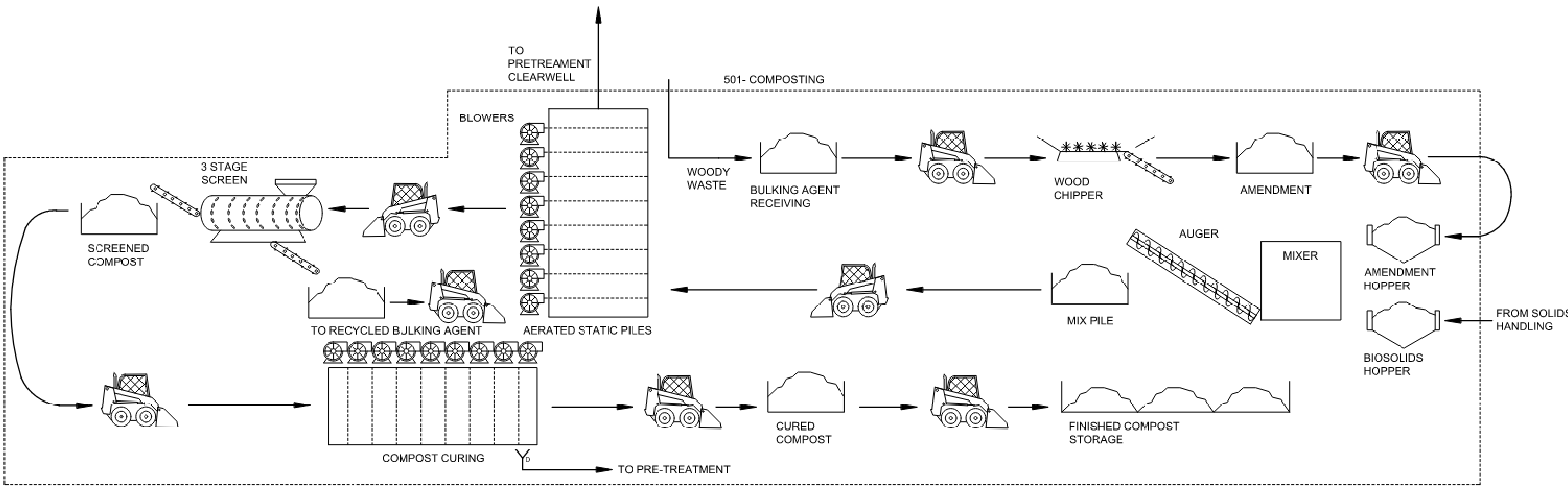

Figure 12. Composting Process Flow Diagram

5.3 Carbon Amendment Source

Another crucial item for the success of the project is identifying a high carbon amendment source for the composting process. One possible source is the local timber industry. Through the process of creating lumber and timber-based products, wood waste is generated – usually in the form of bark from the log's exterior. This wasted bark material is an excellent candidate for composting carbon amendment. FH Stoltze Land & Lumber (Stoltze), located in Columbia Falls, has been identified as a source for wasted bark and wood. Stoltze currently operates a classifier at their mill that separates soil, rock, and wood materials from their waste stream. The rock and soil are reused and/or sold by Stoltze, but the waste wood is incinerated in their biomass cogeneration system. The heat generated by this system is used to dry lumber, as well as to produce steam for electricity generation that is then fed into the local electrical distribution grid. Although Stoltze currently has a beneficial reuse for some of their wood waste, the quantity of wood waste being generated far exceeds the throughput capacity of their biomass cogeneration system. This excess wood waste quantity (mainly in the form of bark) could be a potential source of high carbon amendment. Initial discussions with a representative at Stoltze indicated that available wood waste exceeds the projected carbon amendment deficits for the facility.

Another viable source for carbon amendment is the Montana Department of Natural Resource and Conservation (DNRC). Through sustainable logging and timber sales, the Greater Kalispell DNRC generates approximately 7,500-15,000 tons per year of waste "slash" or wasted woody debris from the timber harvesting process. Slash, mostly containing treetops and limbs, would be stockpiled near log landing operations at individual timber sales in the Flathead Valley. This material would then need to be hauled from various locations to the future composting facility. The dispersed nature of this amendment material could create an operational and planning challenge.

The Flathead Valley has a long legacy of responsible timber management. Partnering with the timber industry to create a beneficial product from organic waste components would further this legacy. Further discussions are required with potential wood waste providers to determine partnership structure, hauling costs, and other operational considerations.

6 Site Selection and Evaluation

A search for suitable parcels to construct the new County facility was conducted within Flathead County. This section describes those findings.

6.1 Site Description

Various properties were considered in the early stages of this project. Ultimately the selected property located at the southeast corner of Wiley Dike Road and Cedar Mill Road was recommended due to its location to various users of the facility and ability to discharge treated effluent to the nearby Lakeside County Water and Sewer District (LCWSD) wastewater treatment plant. The components of the site evaluation process included a geotechnical analysis, ALTA survey, existing Flathead County requirements, and an environmental review. As of the timing of the development of this report the property at southeast corner of Wiley Dike Road and Cedar Mill Road is before the County Commissioners for approval of purchase. An interlocal agreement with LCWSD has also been drafted and is before the County Commissioners for approval as well.

An aerial exhibit of the potential site is presented in Figure 13. The property information is as follows:

Current Owner: Mark Edward Dyer
Address: 305 Wiley Dike Road Kalispell, MT 59901
Assessor Number: 0969640

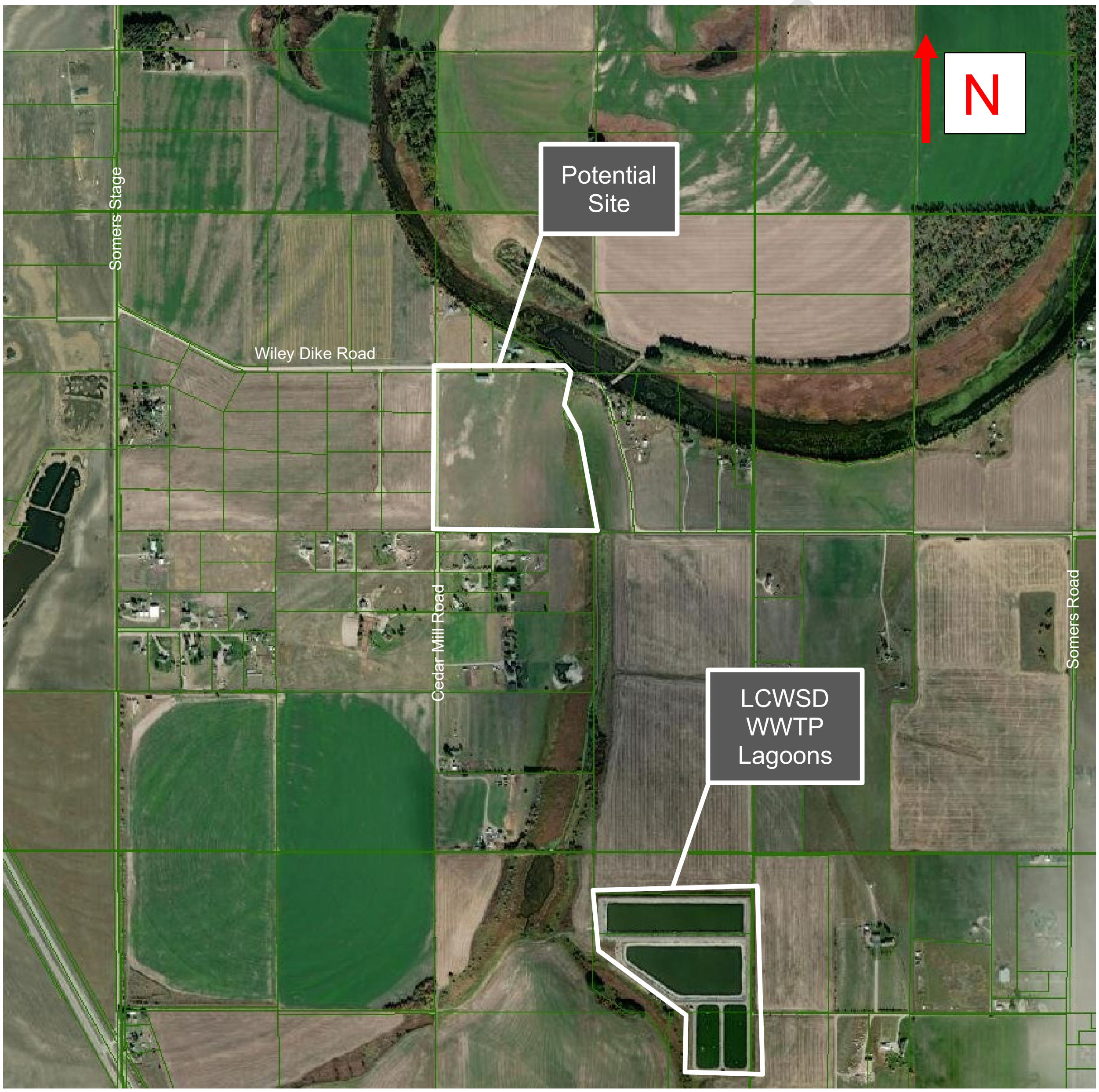

Figure 13. Potential Site Aerial

The parcel is in an area of the County that is not zoned. The existing use of the site is agricultural (cattle grazing land). There is one barn on the north side of the site adjacent to Wiley Dike Road that is proposed to be demolished and hauled offsite. The parcel is bordered on all sides by rural low density residential and agricultural land, all of which is also not zoned. In addition, properties owned by LCWSD used for effluent disposal are located immediately to the southeast and approximately 1,500 feet to the southwest. The LCWSD WWTP is located approximately 3,000 feet south of the property. There is an existing fence that borders the site.

6.2 Geotechnical Analysis

Alpine Geotech performed a geotechnical exploration consisting of three bore holes. The exploratory borings showed that there is between 6 to 12 inches of topsoil and organics over clay with some layering of silt. The boring logs and locations are included in Appendix J.

The geotechnical findings revealed that the structures proposed for this project can be constructed on this site. There was a concern that loose-packed, liquefiable sand would be encountered onsite like what was found at a nearby site. However, this soil type was not encountered in the exploratory borings.

Groundwater was encountered around 16 feet, indicating that groundwater monitoring and dewatering may be required for development and may also need to continue post construction depending on the final depth of structures. Although it is not required, Flathead County is considering installing a groundwater monitoring well for short- and long-term groundwater determinations.

Shallow foundations should be considered for all structures where possible, because zero-blow-count soil was encountered at about 15 feet and lower. In general, a significant structural section with geotextile fabric is anticipated for all pavement and structures. Foundation piles may be needed for deep structures that may be required for the septage treatment plant, depending on the final depth and loading. It should be noted that the City of Kalispell Wastewater Treatment Plant has similar structures at similar depths in similar soils.

A site mass grading is recommended to be performed once a site layout has been more clearly defined to give the soils time to settle before site construction begins.

If the County moves forward with purchase of this property, and the site layout is finalized, an additional geotechnical exploration is recommended to determine soil conditions at more specific locations to determine final recommendations for proper support of structures and pavement. The findings from that exploration will be incorporated into the final design phase of the project.

6.3 ALTA Survey

An American Land Title Association (ALTA) survey of the Dyer property was performed and is presented in Appendix K.

The Dyer property is the parcel described in Certificate of Survey No. 5607, Flathead County, Montana, in the South 1/2 of the Northeast 1/4 of Section 11, Township 27 North, Range 21 West, P.M.M.

The fenced portion of the property includes the majority of the actual property described in the Certificate of Survey 5607, excepting the west 40 feet of the property which is encumbered by a 40 foot private roadway easement benefitting the properties to the south of the property to access Wiley Dike Road, a portion of the Northeasterly corner of the property that is encumbered by the declared 60 foot County road, and a portion along the east line of the property that is encumbered by an irrigation ditch easement that runs along the east line where the fence was seemingly kept away from the majority of the ditch easement. There is an overhead powerline and utility poles running through the northeastern portion of the property that, as far as could be determined, does not have a publicly filed utility easement for encroachment.

All adjacent property corner monumentation found lie outside the existing fence line and do not appear to intrude on the subject property.

The recorded documentation for the ditch easement is presented in Appendix K.

6.4 Water Rights

Water & Environmental Technologies (WET) retrieved the water rights information for the subject property. This section summarizes their findings from their research.

Existing Water Rights

WET found no evidence of water rights associated with the subject property (geocode 07-3834-11-1-02-01-0000). The Department of Natural Resources and Conservation (DNRC) Water Rights Query System can be searched by geocode and property owner, neither of which produced results. WET reached out to DNRC to verify, and they also did not have record of any rights for the subject property.

Water rights typically transfer with the property upon the sale. However, if specified in the deed, water rights can be severed from the property. In the case where water rights have been severed from the land, the water right owner retains them, even after they sell the property. In that case, the owner will need a change authorization from the DNRC to use the water right elsewhere.

Since WET did not find any evidence of water rights associated with the property, there are no water rights being transferred with the purchase of the property.

Drainage/Irrigation Ditch

A drainage/irrigation ditch is located along the east boundary of the subject property. WET determined that there are no water rights associated with this ditch for the subject property.

6.5 Environmental

MEPA Checklist

A Montana Environmental Policy Act (MEPA) Checklist (Appendix L) was completed, and a search of available environmental records conducted by Environmental Data Resources, LLC (EDR) was acquired. The MEPA Checklist process is used to determine the environmental impacts of development on the subject property. Based on data collected and information provided, the development of this project was determined to have ‘no impact’ for most of the checklist items. For the few items with possible impacts, mitigation actions were proposed. The next sections describe the identified impacts and proposed mitigations.

Surrounding Air Quality

Implementation of the Proposed Action would result in minor and short-term increase of emissions from operation of construction equipment. There would be a temporary increase in diesel exhaust and carbon monoxide from equipment used during construction. Dust may be temporarily generated during construction of the Proposed Action. Best Management Practices (BMPs) would be followed during all phases of construction to minimize emissions and reduce dust. The construction impacts are anticipated to occur over a relatively short timeframe and have no long-term adverse effect on the local or regional air quality. A minimal area of disturbance is anticipated and, therefore, issues due to fugitive dust and/or airborne particulates are expected to be negligible and manageable via the use of BMPs during construction.

Handling and treatment of septage and biosolids will generate odors that must be contained and treated prior to discharge of air to the atmosphere. Handling and treatment facilities will be located in covered or enclosed facilities and forced ventilation will maintain buildings in a negative pressure condition and transmit air emissions to odor treatment facilities. In addition, setbacks from adjacent structures will be maintained and a vegetative buffer provided. Air emissions from treatment facilities will be continuous over the life of the facility. Air emissions will be contained, ventilated, and treated to reduce odor levels. The impact to adjacent properties is expected to be negligible and manageable.

Floodplains and Floodplain Management

Construction of the proposed project will require a floodplain development permit issued by Flathead County since the development extends into the 100-year floodplain boundary. The base flood elevation will be determined, and the facility will be constructed above that elevation. It is anticipated that detailed floodplain modeling will not be necessary to obtain a permit.

Agricultural Lands, Production, and Farmland Protection

Development of the proposed project site would impact land that is actively used for agricultural purposes. This impact through loss of productivity is considered negligible and discountable considering the relatively small parcel being affected and the significant available agricultural/grazing properties near the project and within Flathead County. No mitigation is proposed or necessary.

Vegetation and Wildlife Species and Habitats, Including Fish

Upland grasslands on the property will be converted to industrial uses, road and parking infrastructure, and various types of landscaping. Acreage of impact will depend on the final footprint of the proposed facility. The site is currently used for cattle grazing, so it is unusable as wildlife habitat. The proposed project would not change this, so no mitigation is proposed.

Visual Quality

Construction of the proposed project would permanently change the visual character of the property; however, the impacts to the overall visual character of the surrounding environment is anticipated to be minor. Identifying visual impacts as either beneficial or adverse is subjective, but for all intents and purposes the proposed project is described as having an adverse impact here because the visual character of the existing property would permanently change from that of an open field to a developed property.

Per the Flathead County Interactive Mapping Application, the proposed project is located in an area that is not currently zoned. When considering the development along US Highway 93 and the existing wastewater facility to the south of the project site, the resulting visual character of the project area post-construction would not be inconsistent with the surrounding environment. Treatment facilities are anticipated to be contained in structures designed with an agriculturally oriented architecture to give the facility a farm-like visual character to minimize impact to the surrounding area.

Nuisances

The proposed project could potentially result in new nuisance in the form of lights, odor, and noise (see below for more information on noise). Facility operation would cease by nighttime and adverse impacts from lights or glare is not anticipated. The facility design will include covered, enclosed, or mostly enclosed structures that will house septage receiving and treatment and biosolids storage and aerated static piles and air emissions will be collected and treated to help mitigate odor concerns. In addition, a buffer between treatment facilities and adjacent structures will be maintained. The facility, to the extent practicable, is planned to be designed with features to help mitigate potential nuisances resulting from the proposed facility.

Minor disruption of local residents due to construction noise, fumes, dust, etc., is unavoidable. Such effects will be mitigated wherever possible by BMPs and control measures, such as following established noise ordinances and minimizing emissions and fugitive dust during construction. Such nuisances will be temporary in duration and will cease once construction is completed. Odor generation from treatment facilities will be mitigated by placing the processes in covered, enclosed, or mostly enclosed structures and providing forced ventilation and odor treatment.

Noise

The long-term operation of the proposed project is anticipated to incrementally increase noise in the immediate project area. Operation of the facility would result in vehicles such as septage trucks, porta potty haulers, WWTP biosolids haulers, suppliers, users, and customers traveling to and from the site, predominantly during normal work hours. Daily operation of the facility would result in new noise from equipment operation. Noise from facility operation will be mitigated by containing equipment within buildings and providing a berm and vegetative barrier around the site.

A temporary increase in noise is anticipated during construction due to operation of construction equipment. An increase in noise level at the construction site would be short-term and minor.

EDR Report Summary

On November 17, 2022, Environmental Date Resources, LLC (EDR) performed a review of environmental databases to identify records, which could be used to evaluate the presence or likely presence of contaminated media on the subject and/or adjoining properties. The following environmental database listings were provided by EDR as documented in their report, which is presented in Attachment B of the MEPA Checklist in Appendix L. None of the other 105 environmental databases returned any records of environmental impact.

SPILLS Database

The Montana Department of Environmental Quality (MDEQ) maintains a SPILLS database which is used to document reported spills or hazardous material releases. According to the MDEQ SPILLS database, in April 2008 the following comment was provided by an anonymous complainant:

> *Car washes in the Kalispell area are being pumped by an unknown septic pumper that the complainant does not believe is a licensed pumper. The car washes in question are Best Wash, Super Wash, and Tri City Car Wash. Tri City Car Wash contacted the complainant*

regarding a bid to dispose of the dried sand; however, they did not hire him. Complainant believes the sand is being illegally disposed by an unlicensed pumper or the property owner themselves. Best Wash and Super Wash stopped using the complainant and are possibly using an unlicensed pumper.

Review of information provided in the EDR report states that this incident has been closed due to lack of information. The incident address listed in the SPILLS database is “Throughout Flathead County” with no street name, property address, or geospatial coordinates. Based on the complainant's description, lack of specific incident location, absence of additional records for the subject property, and closed incident status, it is unlikely that disposal of the dried sand occurred on the subject property; therefore, this listing does not indicate the presence or likely presence of contaminated media on the subject property.

Orphan Summary

EDR provided an Orphan Summary for unmappable database listings located within the search radius. The Orphan Summary identified one unmappable listing in the SPILLS database; however, the Orphan Summary only identifies the site name as “Flathead County Stolen Vehicle In” and the site address as “South Fork of the Flathead Riv”.

Due to the lack of information for this Orphan site, identification as a stolen vehicle, and presumed distance from the subject property of over 0.5 miles; this database record is unlikely to have resulted in the presence or likely presence of contaminated media at the subject property.

6.6 County Requirements

This section details the various County requirements to be met should any private or public entity develop the property.

Floodplain

There is a wetland and irrigation ditch with irrigation easement on the east side of the parcel. The location of the 100-year and 500-year floodplains are based on Flathead County mapping tools and Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Number 30029C2280J, which is presented in Attachment C of the MEPA Checklist in Appendix L. The approximate location of the floodplain boundaries can also be seen on the ALTA survey in Appendix K and the site plan in Figure 21. The extent of the 100-year flood boundary is shown as “Flood Zone A”, and the extent of the 500-year floodplain is shown as “Flood Zone X” on the FIRM.

As indicated on the FIRM, zones A and X do not have an associated base flood elevation (BFE). However, due to the site’s proximity to the Wiley Slough, it could be estimated that its BFE is 2,904 feet. A meeting with the Flathead County Floodplain Administrator to discuss floodplain permitting indicated that the County does not require permitting or review if development occurs outside of the 100-year flood boundary (Zone A). However, the proposed development will occur within Zone A, so a floodplain permit must be applied for in accordance with County code and issued by the County.

Setbacks

The subject property and surrounding area do not have assigned County zoning, which means that there are no restrictions regarding what can be constructed on the subject property or where the construction could occur (e.g., setbacks) on the property.

Roadway

The local roads are gravel in the area and additional traffic, especially heavy trucks, could result in damage to the road during certain times of the year. Septic trucks are not exempt from road weight limits. However, septic haulers can apply for an overweight permit, at the cost of $500, with the County, which the Road Department has the authority to grant depending on the road condition and outside temperatures. Road weight limit is enforced by the Montana Department of Transportation (MDOT) Motor Carrier Services. Wiley Dike Road is proposed to be paved from Somers Stage to Somers Road to mitigate loading and traffic concerns and dust. It is recommended that a traffic impact study be performed during design and suggested routes, chosen for minimizing impact, are developed for septic haulers.

County Review

Part of the facility lies within the 100-year floodplain boundary, so a Floodplain Development Permit will be required from the County. A County review during the permitting process will be required.

6.7 Cultural

A file search request was sent to the Montana State Historical Preservation Office (SHPO) for the subject property. SHPO replied that there is a low likelihood that cultural properties will be impacted by the facility and that a recommendation for a cultural resource inventory is unwarranted at this time. A copy of the email response is in Attachment F of the MEPA Checklist in Appendix L.

7 Additional Design Features

This section summarizes key design features of the facility including odor control, water supply, the office building, stormwater retention, site security and aesthetics, offsite improvements, and electrical design.

7.1 Odor Control

The facility will have numerous sources of odor, this section will summarize odor sources and design elements to reduce odors from traveling offsite.

Summary and Ranking of Odor and Corrosion Sources

In addition to identifying odor and corrosion sources, a general ranking was performed to prioritize where attention should be focused to reduce odor emissions, enhance operator safety, comfort and address known corrosion impacts due to foul air emissions from the treatment processes. The ranking system combines odor and corrosion intensity, volume, frequency and ancillary impacts such as worker safety and comfort. Table 19 lists the odor and corrosion sources identified at the facility. An index of the ranking system nomenclature used in the table is listed below:

1. Odor Intensity (L - low or barely discernible; M - moderate; H - high, intense, or offensive)
2. Foul Air Volume (L - low, less than 200 cfm; M - moderate, 200- 500 cfm, H - high, greater than 500 cfm)

3. Frequency of Odor Generation (C - continuous; ID - intermittent daily; IW - intermittent weekly; IS - intermittent seasonal; R - rare occurrence)
4. Other Impacts Related to Odor Source (C - significant corrosion of structures, equipment, or electrical facilities; S - worker safety and comfort impacted due to poor indoor air quality or inadequate ventilation; E - explosion risk due to venting of flammable gas)
5. Overall Ranking of Odor Source (N - no odor control needed, L - lower priority, M - moderate priority, H - higher priority)

Table 19. Summary of Odor Sources on Site

Odor Source	Intensity	Volume	Frequency	Other Impact	Overall Rank
Septage Receiving	H	L	ID	C/S/E	H
EQ Basins	H	H	C	C/S/E	H
Primary Clarifier	H	M	C	C/S/E	H
SBR	M	H	ID	C/S	M
Belt Filter Press	H	M	ID	C/S	M
Solids Room	H	H	C	C/S	H
Bulking Agent Receiving	L	H	C	-	L
Aerated Static Piles	M	H	C	S	M
Mixer/Mix Pile	M	H	IW	-	L
Screening Area	L	H	C	-	L
Compost Curing	L	H	C	-	L

Characteristics of Wastewater Odor Sources

Gases commonly referred to as sewer gas usually include hydrogen sulfide (H2S), ammonia, carbon dioxide, and methane. Of these, only H2S and ammonia are odorous. Often sewer gas includes highly odorous compounds such as mercaptans, organic sulfides, and amines such as indole and skatole. Depending on the types of chemicals present in non-domestic discharges, other odorous compounds may include organic acids, aldehydes and ketones.

Table 20 lists some of the odorous compounds typically found in wastewater. Most of these substances are gaseous under normal atmospheric conditions or have a significant volatility. Although H2S is considered to be the most prevalent odorous compound in wastewater, it should not be presumed that an odor problem is exclusively caused by H2S. Reduced sulfur compounds, such as mercaptans and organic sulfides, can be significant odor sources even at low concentrations.

Table 20. Typical Odorous Compounds Found in Wastewater

Odorous Compound	Chemical Formula	Odor Characteristic
Amines	$CH_3NH_2(CH_3)H$	Fishy
Ammonia	NH_3	Ammoniacal
Diamines	$NH_2(CH_2)_4NH_2$, $NH_2(CH_2)_5NH_2$	Decayed Fish
Hydrogen Sulfide	H_2S	Rotten Eggs
Mercaptans (methyl and ethyl)	CH_3SH, $CH_3(CH_2)SH$	Decayed Cabbage
Mercaptans (butyl and crotyl)	$(CH_3)_3CSH$, $CH_3(CH_2)_3SH$	Skunk
Organic Sulfides	$(CH_3)_2S$, $(C_6H_5)_2S$	Rotten Cabbage
Skatole	C_9H_9N	Fecal Matter

Septage expected on site will come from porta potty's and septic tanks, all of which will have a range of odor characteristics. Additional septage sampling could be completed to obtain more data on the levels of sulfate, total sulfides, BOD, NH3, and phosphorous. This would only provide a snapshot in time of a single sample that may not represent the range that will be present on site. Air sampling for odors is often an option to help narrow design criteria, but there is not an existing facility that solely receives septage from the area that could be sampled without background odors. Due to the variability of septage as an odor generating source, conservative odor concentrations that are typically found in WWTP headworks areas will be used as the basis of design for this project, see Table 21.

Table 21. Expected Foul Air Characteristics

Parameter	Units	Average Situation	Peak Warm Weather Situation
H_2S concentration range	ppm	2 to 10	5 to 40
Organic sulfur compounds	ppm	sub ppm to very low ppm	Low ppm range, generally <5
Ammonia	ppm	<1	<40
Total odor level [a]	Odor units	2,000 to 10,000	5,000 to 30,000
Relative humidity [b]	%	~100	~100
Particulates [c]	--	grease material	grease material

a. This estimate assumes that most of the odorant is defined by the H_2S component.

b. Supersaturated foul air will condense under covers and within the foul air duct.
c. Grease particulates will adhere to tank/channel walls, covers and foul air duct. Filters recommended.

Surrounding Land Uses

The project site is located approximately 1 mile east of Highway 93 outside of an industrial park area and adjacent to rural homes. Currently there is a mix of agricultural land and rural homes directly across Wiley Dike Road and Cedar Mill Road approximately 500 feet away. The nearby residences are the nearest receptors of any odors that may travel offsite.

Odor Control Design and Performance Criteria

MDEQ regulates and permits facilities with potential to emit regulated pollutants above defined thresholds as follows:

- Any source emitting more than 5 ton/year of lead (Pb) or 25 tons per year (tpy) of any other pollutant; OR
- An incinerator of any kind
- A source that has the Potential To Emit (PTE) > 100 tpy of any criteria pollutant, which include sulfur dioxide, oxides of nitrogen, volatile organic compounds, particulate matter 2.5, particulate matter 10, and carbon monoxide
- PTE > 10 tpy of any individual hazardous air pollutant (HAP) or
- PTE > 25 tpy of combined HAPs
- When required by other applicable regulations, for example, New Source Performance Standards (NSPS) or Maximum Achievable Control Technology (MACT).

The County facility does not have the potential to exceed any of the thresholds listed. Additionally, Flathead County Environmental Health Department has an Air Quality and Ventilation program. To date no known regulations or permits are required for the odor control system at this facility.

The National Fire Prevention Association (NFPA) 820 provides guidelines for safety issues in wastewater treatment facilities, including atmospheric considerations. In addition to any regulatory standards or guidelines, the consideration of worker safety within the facilities is important.

Ventilation rates are typically governed by the following criteria:

- Worker safety and comfort.
- National fire Protection Association (NFPA) standards for fire protection in wastewater applications NFPA-820.
- American Conference of Governmental Industrial Hygienists Industrial Ventilation Manual.
- Ventilation rates required to effectively capture odorous air emissions from industrial guidance manuals and field experience.
- Ventilation rates required to prevent buildup of highly corrosive conditions that will result in unwanted degradation of equipment and infrastructure.

Development of the foul air volumes should be based on the following assumptions/criteria:

- Ventilation systems shall be designed to pull air from odorous spaces from the odor generation source. Foul air will not be pulled across clean air areas. Ventilation systems will be designed to pull air across rooms, sweeping clean air across operations space, to provide for an operator friendly working environment.
- Foul air will be collected at the odor sources using low-level covers and other isolation measures to limit the amount of air to be handled. Covers will be considered at the SBR, belt filter press, and other tanks.
- For areas susceptible to grease aerosols, cleanable/washable filters will be provided.
- The tankage air flows will be sufficient to maintain the space below the covers in a negative static condition.
- A push-pull (or pull-push) ventilation system will be used (as needed) in which the odor source areas are exhausted by local fans which discharge to the foul air collection system. Foul air is then forced through the treatment system by large, centralized blowers. The push-pull arrangement ensures positive ventilation for source areas, provides greater reliability in the event of a system fan outage, and facilitates future expansion.
- Duct design will be fiberglass-reinforced plastic (FRP) duct for all above grade applications. These applications will include surfacing veil and insulation will be considered for exterior portions of duct.
- Duct design will be high-density polyethylene (HDPE) for all below grade applications. Smooth diameter, SDR-11 minimum will be used for all biofilter applications and corrugated will be considered for larger diameters. HDPE applications will be designed to meet all applicable codes, standards and manufacturer's recommendations.

Table 22 provides other general design criteria for estimating foul air collection/ventilation rates. If the major odor and corrosion sources are effectively contained and ventilated, the foul air quantities listed in Table 22 below would be exhausted and directed to foul air treatment.

Table 22. Foul Air Collection/Ventilation Design Criteria

Area/Source	Rate
Occupied areas, such as rooms with open conveyors or truck loading bays for loading screenings and grit	6 to 12 air changes per hour
Covered basins not occupied	2 to 4 air changes per hour, depending upon openings needed.
Sweep velocities along channels being ventilated	50 feet per minute minimum
Capture face velocities at makeup air openings or at access hatches (including cracks)	100 to 200 feet per minute
Tightly closed conveyance or materials handling systems (e.g., Overflow Covers)	10 to 40 cubic feet per minute minimum per unit
Air from process air source such as aerated grit channels	10 percent higher than inlet air volume and supply air
Areas requiring reduction of adjacent area classifications per NFPA-820	12 air changes per hour minimum

Table 23 presents estimated air volumes for the various odor sources based upon the above design criteria and were calculated assuming:

- Point source control of odors used at covered facilities and enclosed equipment to the greatest extent possible to minimize air collection volumes;
- Placing all covered areas in a slight negative static condition to ensure foul air is not allowed to escape to atmosphere, and regular maintenance openings ventilated with a minimum face velocity during open conditions;
- Providing minimum room air exchanges to meet requirements of NFPA 820 and the NEC for wastewater treatment facilities.

Table 23. Estimated Foul Air Volumes for Treatment

Process Area/Odor Source	Estimated Foul Air Volume (CFM)
Septage Receiving	200
EQ Basins	1,400
Primary Clarifier	200
SBR	6,600
Effluent Wet Well	500
Belt Filter Press	200
Solids Room	1,200
Septage Treatment Volume	**10,300**
Aerated Static Compost Piles	6,700
Compost Static Piles Volume	**6,700**

HDR recommends separating the odor control into two separate systems to eliminate excessive underground duct and the need for any over road duct crossings.

Treatment Technologies

There are a number of technologies available for the treatment of foul air. The three basic mechanisms of foul air treatment include adsorption and oxidation using packed bed chemical scrubbers or mist scrubbers, adsorption with materials such as activated carbon or potassium permanganate, and liquid-based or bulk media-based biological treatment. The following presents the full range of technologies:

- Combustion Systems
- Ozonation Systems
- Carbon Adsorbers
- Biological Systems
    - Biofilters
    - Bioscrubbers
    - Biotrickling Filters
- Wet Chemical Scrubbing
- Photo Ionization Systems
- Process Aeration Supply

The following systems were eliminated with an explanation for why they were eliminated also included:

- Combustion - high O&M costs for fuel.
- Ozonation - mixed results, mostly poor, and would require an ozone destruct system.
- Carbon Adsorbers – high O&M costs due to media replacement.
- Bioscrubbers – high O&M costs and nutrient addition.
- Biotrickling Filters – high capital and O&M costs.
- Wet Chemical Scrubbing – high O&M costs and additional equipment for chemical addition.
- Photo Ionization Systems – high O&M costs on the boarder of applications capacity of (10,000 cfm)
- Process Aeration Supply – no secondary activated sludge process on site.

The preferred technology for this application is a biofilter as they are well suited for H2S loadings of 5 to 10 ppm average and peaks up to 50 ppm. Additionally, the O&M costs are low relative to other technologies primarily due to less frequent media change outs and no chemical addition.

Biofilter Design

This section contains many design decisions including structure type, media type, sizing/layout, and watering/moisture control systems. Each item will be discussed further in this section.

Biofilter Structure Type

Biofilters need to be contained in some fashion to maintain a stable bed of media. This can be accomplished by using a concrete stub wall and creating a rectangular structure to house the media. Similarly, a rectangular earthen berm can be created to house the media. Finally, the media can be mounded with minimal excavation for drainage piping. The alternatives have been listed from most expensive to least expensive.

Biofilter Media Types

The two main types of biofiltration media are organic and inorganic media. Organic biofilters consist of a bark and compost-type material to house the biology which treats the foul air. Inorganic media consists of rock and/or sand-like material, see the subsections below for further discussion.

Organic Media

These types of biofilters can be very cost effective for places that are not space-limited and have a good source of wood product and compost source available. Organic media for biofilters is sometimes difficult to acquire in areas where forest products manufacturing is limited. Because of the continuous contact with hydrogen sulfide and high humidity, organic media will decompose/degrade over time. Organic media generally has a useful life in the range of 3-5 years, with media replacement required when excessive bed compaction occurs. This periodic media replacement is subject to escalations for a variety of reasons, similar to the elevated building materials market we see currently. The spent media is generally directed to the landfill. Other municipalities in the region have also beneficially used spent organic media as daily cover or surface restoration at their landfills.

The exact type of wood product used in the biofilter media can vary and will ultimately be determined by the local materials available. Softwoods are generally less desirable as they tend to have a shorter bed life than hardwoods. Wood from pines, Douglas fir, and hemlock are preferred. Expected static pressure loss across the media bed is typically 1 to 2 inches per foot of media depth. Costs for organic media generally range from $40–$50 per cubic yard, depending on the vendor and material makeup. Standard organic-based media needs to be replaced (typically at a minimum) approximately every 5 years. Some installations may last longer (5–8 years), depending on operating conditions and climate, but a 5-year life is a reasonable expectation. Cost of disposal of the media needs to be considered also. If the media has a higher moisture content, additional disposal costs (weight) will be required unless the media is allowed to dry onsite. An irrigation or duct mist system is required with an organic media biofilter, as moisture for biological growth is always necessary. The City of Kalispell WWTP staff has operational and maintenance experience with organic media biofilters.

Inorganic Media

Inorganic media is composed of an engineered blend of materials and soils with an enhanced microbial population. The media would likely be guaranteed for up to 10 years but would likely last 20+ years without requiring replacement. Generally, media is replaced when a build-up of elemental sulfur impedes the flow of air (fan pressure increases). For the purposes of any cost comparison, it should be assumed that the inorganic media will be replaced at the 10-year mark. Inorganic media suppliers are typically responsible for quality control and training, and the inorganic filter media would require minimal maintenance, with periodic removal of weeds as needed similar to an organic biofilter. An irrigation or duct mist system is still required for an inorganic media biofilter, as with an organic biofilter, to provide moisture required for biological growth.

Costs for an inorganic media biofilter will range from $80–$100 per cubic yard of filter media. This cost generally includes delivery charges. Due to the higher head required for the denser soil media, additional blower horsepower will be necessary. The media installation labor cost will likely be comparable to that of installing organic-based biofilter media but will also require the added costs associated with installation of higher horsepower blowers. The end-of-life transportation and labor costs for the engineered media will likely be similar to that of the organic-based media but will occur less frequently.

Bohn media falls under the inorganic media category but is separate from typical engineered inorganic medias as the pressure drop across Bohn media is higher and the surface loading rate must remain lower than those achievable by engineered medias. Bohn’s primary advantages include higher ammonia removal rates and typically longer media life.

Media Selection

As mentioned previously, there will be two biofilter systems onsite. One system for the Septage Operations Building and a second system for the aerated static piles. Odors generated from the Septage Operations Building will be significantly higher and span a greater range over time, while the aerated static piles will have low levels of odors and be more consistent over time. These distinctly different sources lead to the option for two different media types. The basis of design will be the use of an inorganic media for the septage biofilter and an organic media for the compost static pile biofilter.

Moisture Control

Moisture control is an important factor in maintaining the biofilter media and ensuring odor removal performance. Media that is too wet can become too dense and compact, resulting in reduced media porosity and high back-pressures on the air delivery system. This has a tendency to reduce airflow and create inactive areas in the biofilter. Conversely, if the incoming airstream is not constantly humidified, airflow in the biofilter tends to dry out the media. If moisture is not properly controlled these undesirable conditions can occur rapidly. To properly optimize moisture within the biofilter, media pre-humidification and surface irrigation will be provided. A pre-wetting system (Figure 14) consisting of atomization nozzles installed within the foul air mainline ducts immediately upstream from the biofilter is recommended. The pre-wetting atomizing nozzles require easy access and protection from cold weather. In addition to moisture control, temperature and pH control are also important controlling parameters for effective odor treatment within the biofilter. Because the majority of the foul air sources identified for collection and treatment are from heated structures or are exposed to warmer waste streams, additional heating of the foul airstream to the biofilter is not deemed necessary. In addition, experience from other similar plant sites has proven that pH adjustment beyond that which occurs with conventional moisture control and leachate collection will not be required.

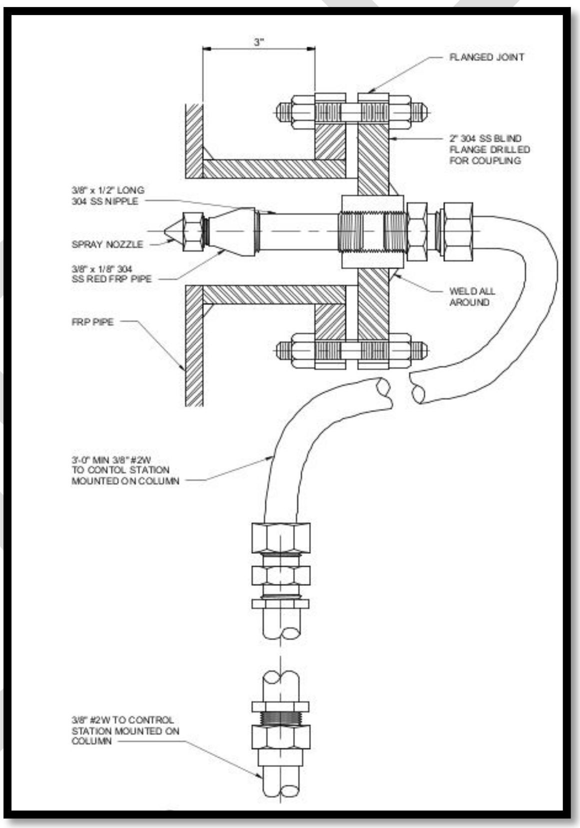

Figure 14. Typical Spray Nozzles

Water for surface irrigation of the biofilter bed will be a typical home sprinkler system requiring 40 PSI water supply. A Rainbird or similar system will require 120V power for control of solenoid valves and associated irrigation zones.

Septage Building Biofilter

As previously mentioned, an inorganic biofilter will be the treatment technology used at the Septage Operations Building. Two fans, one duty and one stand-by, will be located within the building to collect foul air from the sources identified within the building and directing the foul air to the biofilter on the south side of the building. Condensate will drain at the fans into equipment drains inside the building.

The recommended biofilter design layout is to provide multiple treatment beds or sections to enable a portion of the treatment bed to be removed from service for maintenance while still operating the biofilter treatment process. This allows treatment to occur on a continuous basis to avoid complete bypassing of the foul air stream while maintenance activities are occurring. The multi-cell biofilter will consist of biofilter media contained within concrete walls; foul air distribution manifolds and laterals with cleanouts; pre-wetting and irrigation systems to control media moisture content; and a leachate collection/drainage system with sampling access ports. Figure 15 presents a graphic of a typical biofilter bed arrangement. Table 24 provides recommended sizing criteria for the inorganic biofilter facilities.

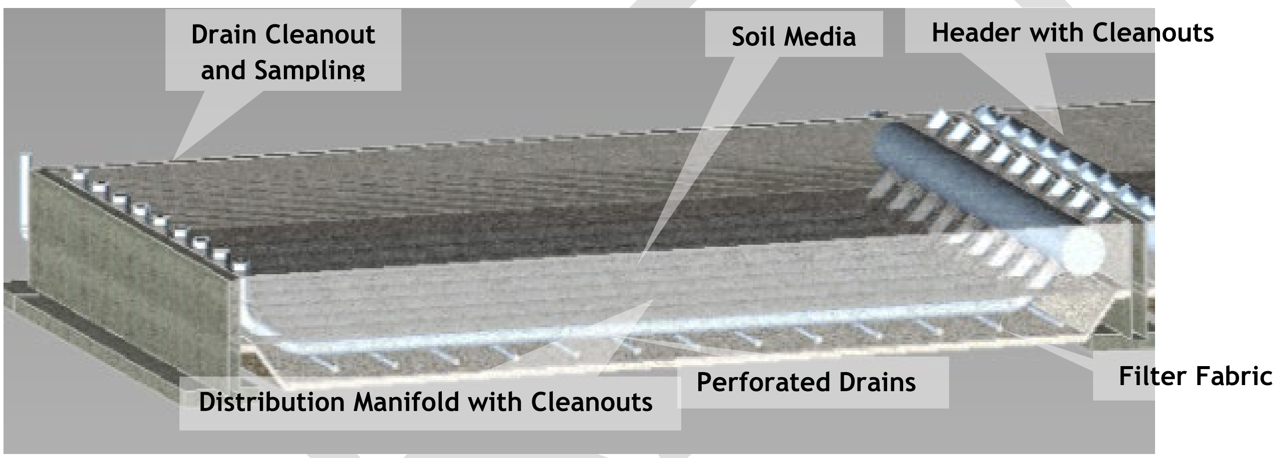

Figure 15. Biofilter Bed Arrangement Details

Table 24. Typical Inorganic Biofilter Bed Sizing Criteria

Process Parameter	Unit	Recommended Range	Design
Empty Bed Residence Time	min	0.5 – 1.5	1.4
Bed Surface Loading	cfm/ft^2	1 - 15	2.8
Bed Media Depth	ft	3.0 – 5.0	4.0
Media Pressure Drop	In w.c./ft of media	0.5 – 2.0	2.0
Foul Air Inlet Velocity	ft/s	30 - 80	46
Hydrogen Sulfide Removal Efficiency	%	98% removal with max input of 100 ppmv	

Using the sizing criteria in Table 24 the biofilter will be sized at 60 ft x 60 ft. The bed surface loading rate has been held low to allow for Bohn media to remain an option into detailed design. Other inorganic medias can handle higher surface loading rates and may allow for a reduction in biofilter area. Bohn typically sees a higher media pressure drop and has been used for the basis of design. For preliminary design the redundant feed fans will be 40 HP each and installed on VFDs to allow for flexibility in capacity over the design period.

Compost Static Piles Biofilter

Thirty-one, 325 cfm blowers and ancillary piping would be installed to aerate the static piles and curing piles, one per pile. The blowers will draw air from the static piles and push it through a central biofilter. The biofilter will also have two auxiliary blowers. Condensate from the blowers would drain into the leachate collection system within the sludge drying beds.

A biofilter would be installed south of the composting pads. Table 25 details the biofilter sizing requirements. The biofilter would be approximately 24 ft x 90 ft and would be filled with approximately 4 feet of finished compost material. The biofilter would be lined and leachate would drain to the SBR treatment system.

Table 25. Biofilter Sizing

Parameter	Value
Average Volume on Compost Pad	8,411 yd^3
Wet Tons of Compost on Compost Pad	1,473 tons
Dry Tons of Compost	683 tons
Flow rate through compost	8 cfm/dry ton
Total Flow rate from Compost	6,704 cfm
Biofilter size factor	4 ft^3/min/ ft^2 of filter

Parameter	Value
Biofilter size calc	2,514 ft^2

7.2 Water Supply Well

The facility will require water for both potable and non-potable use. Since the area is rural and there are no public water systems in the vicinity of the site, drilling a well is the only feasible option for meeting the water demands of the facility. The proposed location of well is in the southwest corner of the property, approximately 150 feet from the west property line and 250 feet north of the south property line. The well drilling requirements are described in Section 3.5 of this report. The assumed yield from the well is 35 gpm.

Water System Demands

The potable water needs are anticipated to be relatively small. The office building will need to have potable water for employee-only use. Potable water use would include water for sinks, toilets, showers, and drinking facilities. The public will not be able to use the potable water for drinking.

The Septage Operations Building could have an exterior frost-free hydrant or hose bibb located inside of the building for wash down purposes. A frost-free hydrant could also be located near the compost facilities. Two frost-free hydrants are assumed for water demand calculation purposes. The septage receiving station and belt filter press also require water connections for operation. Table 26 presents the proposed fixtures and their associated water demands.

Table 26. Water Fixture Demands

Fixture Description	Quantity	Flow Rate (gpm)	Total Flow Rate (gpm)
Kitchen Sink	1	2.2	2.2
Fridge/Freezer	1	0.5	0.5
Drinking Fountain	1	0.5	0.5
Bathroom Sink	1	1.5	1.5
Janitor Sink	1	2.2	2.2
Shower	2	2	4
Yard Hydrants	2	17.5	35
Septage Receiving Station	2	25	50
Belt Filter Press	1	35	35

Fixture Description	Quantity	Flow Rate (gpm)	Total Flow Rate (gpm)
Eye Wash Stations	2	0.4	0.8
Eye/Face Wash Stations	1	3	3
Drench Showers	1	20	20
		Total demand of worker facilities:	10.9
		Total demand for equipment/site facilities:	120
		Total demand for emergency wash facilities:	23.8

The water demands for “worker facilities”, such as sinks, showers, and bathrooms, are significantly lower than the anticipated yield of the well. However, once the other facility demands are added, the water flow requirement almost reaches 100 gpm. This situation is common for water systems and is mitigated by adding storage volume, typically in the form of a hydropneumatic tank (pressure tank) or a storage tank and pump system. These systems allow the well to keep up with the water demand and reduce the number of pump starts and run time. Table 27 shows the estimated daily volumes that can be used to determine the number and size of storage facilities.

Table 27. Water Volume Summary

Fixture Description	Total Flow Rate (gpm)	Estimated Daily Run Time (min)	Volume (gal)	Location
Yard Hydrant	17.5	60	1050	Septage Treatment Building
Septage Receiving Stations	50	180	9000	Septage Treatment Building
Belt Filter Press	35	180	6300	Septage Treatment Building
Eye Wash Stations	0.8	15	12	Septage Treatment Building
Eye/Face Wash Stations	3	15	45	Septage Treatment Building
Drench Showers	20	15	300	Septage Treatment Building
Yard Hydrant	17.5	60	1050	Near Composting Structures
		Daily Volume for Septage Operations Building =	16,707	gal
		Daily Volume for Composting Structures =	1050	gal
		Total =	17,757	gal

Pressure tanks are typically sized to be four times the drawdown gallons. Based on these numbers, almost 75,000 gallons of pressure tank storage would be required for the Septage Operations Building and the yard hydrant near the compost facilities. The pressure tank option for the Septage Operations Building is impractical economically due to cost and footprint. Pressure tanks are also typically required to be stored in a temperature-controlled building, which would require the building to be large enough to house the large tank(s). A 120-gallon pressure tank is proposed for the office building.

HDR recommends the use of underground storage tank(s) with a pumping system for the Septage Operations Building. The benefits of this option include saving building space by burying the tanks, reducing the volume of the tank(s) since they do not have to be sized to four times the drawdown capacity, and reducing cost. Two 15,000-gallon underground storage tanks are proposed with two 20-hp pumps, one on duty and one on standby. These pumps are proposed to be housed in the Septage Operations Building.

Two 15,000-gallon underground fire protection water storage tanks are proposed onsite for fire protection water supply. These tanks are proposed to be hydraulically connected so the two tanks in effect serve as a 30,000-gallon tank. Each tank is proposed to have a suction standpipe with a fire department connection so that the fire department can draft out of one or both tanks at once to replenish their water supplies while fighting a fire. Coordination with the Somers Lakeside Fire Department will be done for Design, Installation/Placement, Hardware (suction fittings, tank fill, vents, etc.), and Fire Department Standard Operating Procedures, to ensure optimal performance of the underground water storage tanks.

Water Supply Well Implementation

The typical fees associated with applying for beneficial water use to the DNRC and drilling and testing a production well include approximately $25,000 in consulting fees, approximately $10,000 to $15,000 in pump contracting and aquifer testing fees to complete the requisite pump testing.

The Huntsman well (GWIC 80936) is located near the project site and is constructed with six-inch casing to a total depth of 280 feet. It produces (yields) 30 gpm. The Huntsman well is anticipated to be similar in size and capacity required for the County facility well. Current drilling costs are estimated to be approximately $60-$65 per lineal foot depth for drilling. A 35-gpm submersible pump, installed with motor and controls are estimated to cost around $30,000.

7.3 Facility Office

The facility office building serves multiple purposes including providing a place for the public to pay fees or ask questions and providing workspaces for employees. A preliminary floor plan of the office building is presented in Figure 16.

The office building is proposed to include the following:

- Reception area
- Two Offices
- Kitchen
- Unisex Bathroom
- Mechanical/Electrical Room

- Janitor's Closet
- Work Room
- Women's Shower and Locker Room
- Men's Shower and Locker Room
- Maintenance Garage

7.4 Stormwater Management

The existing site is primarily vacant pasture and undeveloped besides a barn on the north side. Construction of the facility will introduce a large amount of impervious area to the site in the form of buildings and pavement, which will have an impact on the volume of stormwater runoff. The stormwater management system will mitigate these effects and ensure that runoff is properly treated, retained or detained, and discharged.

Stormwater runoff generated on pavement typically requires treatment since the water may mix with dirt, fluids from vehicles, or similar substances. Runoff from paved areas is proposed to be collected by a system of catch basins and piping and conveyed to an oil-water separator system before it enters the stormwater facility. Runoff generated on roofs typically does not need to be treated unless it mixes with stormwater generated on paved surfaces. Roof runoff will be collected by gutters and downspouts and either directly discharged, detained, or retained.

Preliminary Stormwater Facility Sizing

The proposed stormwater facility will be designed to treat the first half-inch of runoff on pavement surfaces. The facility will also be designed to store enough volume to ensure the post-development runoff is less than or equal to the pre-development runoff. The volumes were calculated at 24 hours using the rational method, assuming a 100-year design storm frequency, and intensity values for the Kalispell area from the Montana Department of Transportation (MDT) Hydraulics Manual. Table 28 lists the preliminarily calculated stormwater facility parameters based on the conceptual site layout.

Table 28. Preliminary Pond Sizing

Parameter	Value
Calculated Pre-Development Stormwater Volume	39,728 cu ft
Calculated Post-Development Stormwater Volume	62,944 cu ft
Required Stormwater Facility Volume (Post – Pre)	23,216 cu ft
Required Stormwater Treatment Volume (First ½")	3,816 cu ft

Preliminary Stormwater Facility Location

The existing site is relatively flat and generally slopes to the east toward an irrigation ditch. There is a depression that is located in the northeast part of the site. The proposed location for the stormwater facility is in that depression. The proposed location provides a hydraulic advantage since it allows stormwater piping to have steeper than minimum slopes, increasing flow capacity and conveyance efficiency. The location also provides an aesthetic advantage since it is anticipated to require minimal disturbance or excavation to accommodate the required volumes.

7.5 Site Security and Aesthetics

This section summarizes proposed measures to provide both security and aesthetics for the facility. Chain link fence is proposed to be installed along the perimeter of the site as can be seen on the site plan (Figure 21).

Access gates are proposed to control ingress and egress. The facility's access strategy is unique since the goal is to allow septic haulers access to the septage receiving station, while public access is limited. A badge system could be used where each septic hauler is issued a badge with their information that they can use for access. The gate that controls public access would only be open during business hours.

A berm is proposed along the north, west, and south sides of the facility to provide a sight and sound barrier for the adjacent properties. A berm is not proposed on the east side since that side will be a fill slope, and the berm would need to be unreasonably tall to provide visual barrier to the east. Additionally, the adjacent property to the east is vacant, so visual and audible impacts are anticipated to be minimal. The berm is proposed to be approximately five feet tall and could be covered in select forms of landscaping.

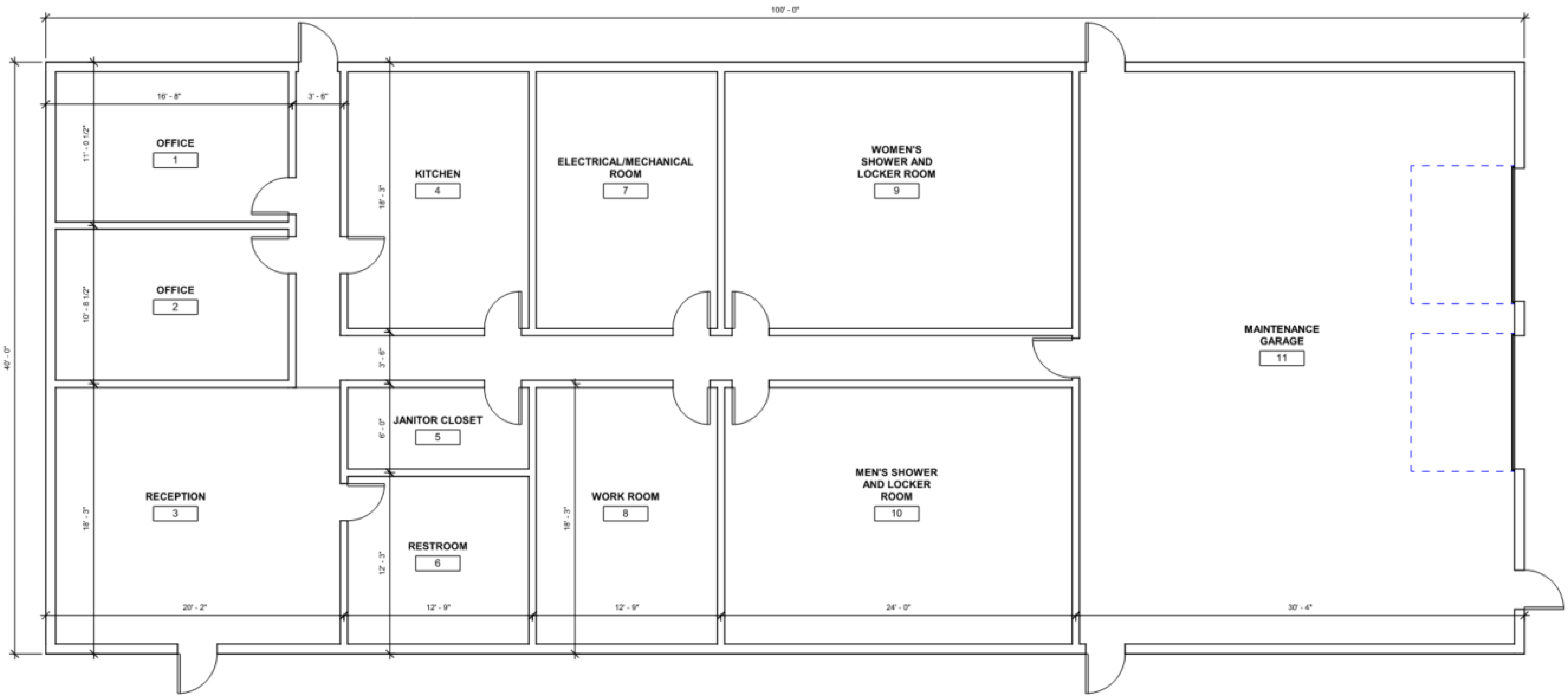

Figure 16. Preliminary Office Building Floor Plan

7.6 Offsite Improvements

This section summarizes the proposed offsite improvements necessary for operation of the facility.

Wiley Dike Road Improvements

Wiley Dike Road is a county road that extends from Somers Stage Road to Somers Road. The existing road is gravel and is approximately 20-24 feet wide depending on location. The road is primarily used for access to properties and residences in the area. An increased amount of traffic throughout the year, especially heavy truck traffic, could cause damage to the existing road and increase dust creation, depending on weather conditions at the time. Paving Wiley Dike Road from Somers Stage Road to Somers Road would mitigate these issues and provide an improved road surface for residents in the area. The road will be designed to meet applicable standards for a county road including structural section and width. The intent is to pave over the existing road, make no changes to the existing road alignment, and limit the amount of disturbance. Areas that are disturbed are proposed to be replaced in kind to equal or better condition.

Lakeside County Water and Sewer District

The effluent from the septage treatment operation is proposed to be conveyed to the Lakeside County Water and Sewer District (LCWSD) wastewater treatment plant located southeast of the property on Larkin Lane for further treatment. The effluent would be pumped via a new force main. The alignment of the force main would leave the site, then generally follow the alignment of Wiley Dike Road, and extends through LCWSD's property (Figure 17). The force main could likely follow Wiley Dike Road (County right-of-way) to the east and then south until reaching the LCWSD WWTP. Wiley Dike Road is a County Road with a 60-foot right-of-way. County right-of-way is used for roads and public utilities, and discussion with the County indicated that there is no problem with the force main being in the Wiley Dike Road right-of-way. The County does not anticipate this road ever growing to the point where the right-of-way would need to expand. However, as a safety measure, they did suggest placing buildings 20 feet from the property line. The Septage Treatment building is the closest building to the right-of-way and is over 50 feet away from the property line. The force main is proposed to run across vacant Lakeside property (in a proposed easement) and tie into their existing facility. Discussions will continue with LCWSD to determine an acceptable alignment and terminus for the force main and its associated easement.

There has been limited discussion with LCWSD about the possibility of the County facility receiving sludge from the LCWSD WWTP for solids handling. If this alternative is approved, then a sludge line could be installed in the same trench and parallel to the effluent force main. The LCWSD sludge would serve as another source of biosolids at the County facility. Discussions will continue with LCWSD staff in order to obtain more information about the potential sludge line and associated design/construction implications.

Figure 17. Preliminary Force Main Route

7.7 Existing Electrical Infrastructure

Nearly all distribution power within the Flathead Valley is operated and maintained by Flathead Electric Cooperative, including the area north of Flathead Lake and east of Highway 93. An existing overhead, three-phase power line parallels the east side of Highway 93 near the junction of Highway 93 and Highway 82 to Somers Stage Road. The overhead line then parallels Somers Stage Road and a three-phase tap then parallels the south side of Wiley Dike Road and adjacent to the project site (Figure 18).

The three-phase line along Somers Road appears to be a large conductor, while the line along Wiley Dike Road is slightly smaller. Flathead Electric Cooperative was contacted for this study and given preliminary electrical loads required for this facility. They indicated that existing power infrastructure would be able to serve the County facility.

Figure 18. Power Line along Wiley Dike Road. Courtesy Bing Maps

8 Preliminary Market Analysis and Business Plan

A preliminary market analysis and business plan provides an estimate and projection of both revenue and expenses for the proposed Flathead County Septage Treatment and Biosolids Composting Facility based on the data collected during preliminary design. The information in this section was derived from data from other wastewater treatment plants and composting facilities in the region, conversations with current and former operators and administrators of these facilities, and conversations with compost suppliers and consumers. This preliminary market analysis and business plan will be updated as the data and facility design are refined.

8.1 Compost Market Analysis

The compost market analysis is impacted by two factors: the availability of biosolids to create compost and the demand for compost, both of which serve as a source of income.

Biosolids Availability

Biosolids are a byproduct of wastewater treatment and are an integral part of the proposed composting process for this project. The availability of biosolids affects the quantity of compost that can be created. Although biosolids will be created from the septage treatment plant, it is anticipated that biosolids will also be received from the Kalispell and Columbia Falls Wastewater Treatment Plants. The quantity of biosolids delivered for composting will depend on several factors including disposal cost and the availability of other disposal options for the two municipalities. The total available biosolids quantity was estimated in Section 0.

The market for this facility serving as a disposal option for biosolids is initially dependent heavily on the cost of disposal, but the lack of available disposal options in the future may drive more biosolids to this facility.

According to the City of Kalispell, if the cost of biosolids disposal at the new County facility is less than the Flathead County Landfill, then they will bring the biosolids that are currently landfilled to the new facility. That would result in approximately 1,430 wet tons of biosolids being available immediately for composting upon facility start up. In addition, since the capacity of the Glacier Gold Facility is limited, it is anticipated that all biosolids from Kalispell above the 600 dry ton threshold could also come to the new Flathead County facility in the future.

According to the City of Columbia Falls, if the County facility is as affordable as the landfill, they will also bring all their biosolids to the new facility immediately. As mentioned in Section 1.2, it is not anticipated that the City of Whitefish will contribute biosolids to the County facility.

Compost Market – Bulk Sales

The largest producer of compost in the valley, Glacier Gold, was understandably unwilling to share detailed information regarding compost sales. However, in discussions with landscapers, other compost retailers, and the City of Missoula composting facility, there appears to be a significant market for compost in Flathead County and around northwestern Montana (e.g., Lake, Sanders, Lincoln, and Glacier Counties). The market generally includes sales to the general public (20%), nurseries (13%), other composting facilities that include a bagging operation (35%), land reclamation (20%), and farmers for specialty crops, landscapers, construction companies, golf courses and municipalities (12%). This market breakdown is based on the current sales from the City of Missoula composting facility.

According to the City of Missoula, they sell compost throughout the region and as far away as Bozeman. A fairly large percentage of Missoula's total sales are to other compost companies who bag the compost and sell it under their brand name, meaning that competing compost producers may also serve as customers for the new facility.

Mountain West Products owns Glacier Gold and its two closest operations are in Olney, Montana and Superior, Montana. The closest facility, Olney, is located approximately 31 miles north of Kalispell. An internet search of compost suppliers in the Flathead Valley indicates that the only other bulk supplier of compost is Creston Topsoil, but it appears that their business is centered around topsoil and products other than compost. There are also other smaller companies that sell compost in the valley including Dirt Rich in Columbia Falls, which sells organic compost.

The City of Missoula sells approximately 26,000 cubic yards of bulk compost per year at $26 per cubic yard. Bulk compost sales at smaller facilities in the valley reach nearly $80 per cubic yard.

8.2 Septage and Porta Potty Waste Market Analysis

Since land application of septage is still legal, it is difficult to estimate exactly how much residential septage will be taken to the facility upon startup given that many of the pumpers may still have a very cost effective and viable form of disposal. Like biosolids, the use of the new facility will be heavily impacted by the cost of disposal and the future availability of land for pumpers to use for septage disposal.

The local wastewater treatment plants in the region do not accept septage. Columbia Falls has historically accepted porta potty waste and they charge around $0.07 per gallon for disposal. Based on data collection from septic pumpers, the average cost for land application of septage is $0.06 per gallon. This value may not be accurate if actual septage volumes are under-reported, nor does it appear to account for other costs such as the requirement to screen the septage prior to disposal, the effort to clean the trash out of fields if the septage is not screened, etc.

An important factor to consider is the pumper's loss of potential revenue due to the volatility associated with the land application of waste. Pumpers are not supposed to land apply if the ground is muddy from rain or if it is frozen, meaning that land application of septage likely does not (or should not) occur in the wet spring months or during the winter.

After review of the data and numerous conversations with various septage pumpers, the following conclusions have been reached regarding the market for this facility:

- Land application is still legal, and as a result, serves as a major competitor for this facility.
- Since tipping fees will be applied on a volumetric basis, any increase in cost to the pumpers is the same, meaning the facility does not provide a competitive advantage to those who use the facility.
- The tipping fees for this facility will likely be greater than the cost of land application. However, the facility offers the following major advantages:
  - The facility allows for septage disposal during times when septage should not be land applied. Year-round pumping results in the potential for greater annual revenue.
  - If over-application is indeed occurring, the new facility provides the pumpers with the opportunity to bring their current land application sites into compliance with DEQ requirements.
  - The new facility eliminates the risk of losing an existing land application site.
  - The new facility prevents the need to screen septage in the field prior to disposal or the need to remove trash from the field if screening does not occur.

- The new facility will provide an environmentally conscious method of porta potty and septage waste disposal. The waste will be treated and beneficially reused, reducing the risk of surface and groundwater contamination and land pollution.

8.3 Business Plan

The business plan is based on an income and expense model developed using assumptions developed from the market analysis as well as estimates of expenses based on information provided by existing, similar facilities. The model assumptions and model results/conclusions are discussed in detail below.

Facility Organization

This business plan envisions the Septage Treatment and Biosolids Composting Facility will be owned by Flathead County and operated by a separate entity, such as a formed district, a private entity, or a public entity. The operation is anticipated to be incorporated into an Enterprise Fund, where the expenses and revenue have a separate account structure and the fund is expected to be revenue neutral, i.e., the income is expected to offset the expenditures. However, this may not be the case depending on what entity operates the facility, and the stakeholders should consider whichever option would result in dependable operation and affordable, reliable rates.

Facility Expenses

The business plan model includes a preliminary budget of operating expenses to help determine the economic viability of the proposed facilities. The expenses were developed based on data from other similar facilities in the area. There are many unknown factors in the operation, therefore the projected budget was prepared to reflect a conservative scenario. The costs presented in this budget do not include costs associated with purchase of the property or construction of the required improvements. The next sections describe the assumptions of costs that make up a budget to support the proposed operation.

Personnel

Personnel requirements for operating the facility were projected using the Northeast Guide for Estimating Staffing at Publicly and Privately Owned Wastewater Treatment Plants assuming the facility is operated utilizing one shift per day, five days per week. Weekend staffing may be required for accepting woody waste and monitoring facility operations.

Additional staff time was allotted for composting operation duties not anticipated in the model, such as receipt of woody wastes diverted from the landfill and compost sales. Staff time was also allocated for managing septage haulers through a program designed to ensure septic haulers are insured, maintain their equipment properly to prevent spills, and discharge only septage to the facility. Together, the staffing requirements are estimated at 2 full-time employees at facility startup and 3 full-time employees (FTEs) as septage flows to and/or compost sales from the facility increase. One half-time employee (HTE) was added for administrative work. The budget was developed using 3 FTE operators at $27/hour average wages and 1 HTE administrative worker at $18/hour. A benefits package was assumed to add 63% to the wage costs.

Supplies

The supplies budget includes chemicals required for the treatment processes, fuel for equipment, operating supplies such as amendment (woody waste) used as a carbon source for composting, office supplies, and equipment parts and supplies.

The volume of amendment to be purchased is based on several factors. Each dry ton of biosolids to be composted requires approximately 6.2 tons of amendment. Sources of amendment include woody waste diverted from the landfill, purchased amendment, and material that is screened from the finished compost (recycle). In this business plan, a 40% recycle rate was assumed, but anecdotal information suggests that the rate may be higher. The model assumes 3,000 tons of woody waste will be diverted from the landfill and available to use in the composting process. Because there is not an established market for large quantities of woody waste, local sources for waste wood products should be explored to get a better sense of local cost for the needed woody waste material.

The fuel budget was developed using a list of equipment generated during preliminary design efforts. Fuel powered equipment includes a front-end loader, a skid steer loader, an auger, and screening equipment. Average operating hours, assumed engine horsepower, and an average fuel cost of $3.50 per gallon were all considered during the development of these costs.

The chemical budget was developed to address alkalinity addition, backup chemical phosphorus removal, and polymer for solids dewatering. In addition, a nominal amount of cost was added for office supplies and maintenance supplies.

Services

This line item includes costs associated with operator training, certification and licensure, utilities (electric, natural gas, phone, sanitation), professional services, and miscellaneous repair and maintenance.

Electric utility costs were generated using the current Flathead Cooperative schedule XCS01-1 Extra Large General Service rate issued April 26, 2023. Based on an equipment list developed during preliminary design, peak and average kilowatt consumption rates were developed.

A fee for effluent discharge is based on communications with Lakeside County Water & Sewer District. A fee quote of $10,030 per month for 60,000 gallons per day of discharge was provided. These costs would be prorated based on the growth estimates in the model.

Administrative Overhead

This line item includes using outside services for administrative functions such as human resource services, payroll, information technology services, accounting, audits, and general business expenses. The budget item is equal to 18% of the total of the above budget items.

Maintenance Fees

This budget item is meant to recover costs from other departments within the facility owner's organization that might be used to support the proposed facility. These costs include services from outside entities such as general street maintenance (snow plowing, etc.) and skilled maintenance personnel such as electricians and plumbers, Supervisory Control and Data Acquisition (SCADA) maintenance, etc.

Equipment Replacement

This budget item is meant to contribute to a replacement fund based on the cost of the equipment and the expected life of that equipment. Preliminary design of the facilities provided a list of equipment needed for the facility. Estimated purchase costs for major equipment were divided by an assumed life expectancy and the resulting value increased by assumed inflation to generate an annual equipment replacement budget. Equipment includes septage receiving equipment, septage treatment equipment, effluent pumping equipment, wheel loader, skid steer loader other compost equipment (auger, woodchipper, mixing and screening equipment), and compost blowers. The schedule is based on a 3% equipment cost escalation with constant annual set-aside. Once the facility is operational and specific equipment and their costs are known, it is recommended that the schedule be reassessed using anticipated replacement costs for equipment and that funding goals be established on that basis.

Contingency

A 20% contingency was added to the total of the above budget to reflect uncertainty in the budget development and the facility details.

Based on these assumptions, an overall budget was created for the first twenty years of facility operations. The budget model takes into consideration both fixed costs and costs that are variable based on the amount of septage received and the amount of compost produced. Examples of variable costs include chemicals, compost amendment, power, fuel, and the cost of discharge of effluent to LCWSD. A three percent inflation rate was also included.

Fund Balance Targets

The cash flow model includes an operational cash balance target and an equipment replacement fund target.

It is common for utilities to set a minimum cash balance equal to a number of days of operational expenses depending on their business cycle and other policy considerations to make sure there is sufficient cash to handle the ebb and flow of expenses and revenue. A 30-day fund balance would be a minimum recommended for an operation where revenue is fairly steady and most expenses are paid monthly. For this model, a 45-day fund balance was chosen to be conservative.

A fund balance target is also established for the equipment replacement fund described above. Where sufficient cash is not available to fully provide the annual contribution to this fund, as is the case in the early years of operation, only the available cash left over after meeting the operations cash balance goal is transferred to the equipment replacement fund. When the equipment replacement fund is meets its target balance, any additional funds remaining accumulate in the operations cash balance.

The budget, which is presented in an Enterprise Fund format consistent with public facility operations, is included at the end of this Business Plan.

Model Assumptions and Inputs

The business plan model includes several key assumptions and inputs that were developed based on the information gleaned from the market analysis and other sources of information previously discussed. The model assumptions are included in Figure 19.

Comments on the model assumptions are summarized as follows:

- The biosolids available for composting is based on data provided by the cities of Kalispell and Columbia Falls. The availability of these biosolids to be brought to the new facility is based on the current disposal strategies of these municipalities.
- It is assumed that at a minimum, the quantity of biosolids currently landfilled by Kalispell and Columbia Falls will be diverted to the new facility in Year 1. It is then assumed that the facility will see a significant increase in biosolids delivery between Years 2 and 4, predominately from the City of Kalispell as the new facility offers significant advantages over other options due to travel distances.
- It is assumed that 100 percent of the compost will be sold. There is a high level of confidence in this assumption based on the market analysis and given the fact that the compost supply is located right within Flathead County.
- Septage delivered to the facility will be about 2.6 million gallons in Year 1 comprised of porta potty waste and a limited amount of septage from pumpers that currently do not have land for disposal. The quantity of septage is assumed to increase to 6.5 million gallons per year by the end of Year 10 and 10 million gallons per year by the end of Year 20.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Composting																				
Available Biosolids - annual wet tons (increased by growth rate)	7,207	7,320	7,430	7,540	7,650	7,760	7,880	8,000	8,120	8,240	8,360	8,490	8,620	8,750	8,880	9,010	9,150	9,290	9,430	9,570
Available Biosolids - annual dry tons at 14% solids	1,009	1,025	1,040	1,056	1,071	1,086	1,103	1,120	1,137	1,154	1,170	1,189	1,207	1,225	1,243	1,261	1,281	1,301	1,320	1,340
% of available biosolids delivered	45%	60%	75%	90%	90%	90%	90%	90%	90%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Biosolids delivered to site (dry tons)	454	615	780	950	964	978	993	1,008	1,023	1,038	1,170	1,189	1,207	1,225	1,243	1,261	1,281	1,301	1,320	1,340
Biosolids generated from Septage Treatment (dry tons)	140	160	190	220	250	270	280	310	340	370	400	440	470	500	540	550	560	570	570	580
Compost amendment requried (6.2:1 ratio with 40% coming from recycle)	2,210	2,880	3,610	4,350	4,520	4,640	4,740	4,900	5,070	5,240	5,840	6,060	6,240	6,420	6,630	6,740	6,850	6,960	7,030	7,140
Woody waste diverted from landfill (tons) (increase by growth rate)	3,000	3,050	3,100	3,150	3,200	3,250	3,300	3,350	3,400	3,450	3,500	3,550	3,600	3,650	3,700	3,760	3,820	3,880	3,940	4,000
Amendment needed to purchase (tons)	-	-	510	1,200	1,320	1,390	1,440	1,550	1,670	1,790	2,340	2,510	2,640	2,770	2,930	2,980	3,030	3,080	3,090	3,140
Finished Compost Available - (cu. yds) (13 cu. yds. per ton of input biosolids)	7,722	10,075	12,610	15,210	15,782	16,224	16,549	17,134	17,719	18,304	20,410	21,177	21,801	22,425	23,179	23,543	23,933	24,323	24,570	24,960
% of Compost sold	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Volume of compost sold (cu.yd)	7,722	10,075	12,610	15,210	15,782	16,224	16,549	17,134	17,719	18,304	20,410	21,177	21,801	22,425	23,179	23,543	23,933	24,323	24,570	24,960
Septage Treatment																				
Septage Treatment design volume - increased by growth rate (MG per year)	7.50	7.61	7.72	7.84	7.96	8.08	8.20	8.32	8.44	8.57	8.70	8.83	8.96	9.09	9.23	9.37	9.51	9.65	9.79	9.94
Septage Treatment design volume - increased by growth rate (gal/d)	30,000	30,440	30,880	31,360	31,840	32,320	32,800	33,280	33,760	34,280	34,800	35,320	35,840	36,360	36,920	37,480	38,040	38,600	39,160	39,760
% of design value delivered to site	30%	35%	40%	45%	50%	55%	55%	60%	65%	70%	75%	80%	85%	90%	95%	95%	95%	95%	95%	95%
Septage to be treated (MG per year)	2.25	2.66	3.09	3.53	3.98	4.44	4.51	4.99	5.49	6.00	6.53	7.06	7.62	8.18	8.77	8.90	9.03	9.17	9.30	9.44
Septage to be treated (gal/d)	9,000	10,640	12,360	14,120	15,920	17,760	18,040	19,960	21,960	24,000	26,120	28,240	30,480	32,720	35,080	35,600	36,120	36,680	37,200	37,760
Biosolids generated (61.7 tons/MG)	140	160	190	220	250	270	280	310	340	370	400	440	470	500	540	550	560	570	570	580
Porta Potty Waste																				
Porta Potty Design Volume - increased by growth rate (MG per year)	0.4	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59
Porta Potty Treatment design volume - increased by growth rate (gal/d)	1,600	1,640	1,680	1,720	1,760	1,800	1,840	1,880	1,920	1,960	2,000	2,040	2,080	2,120	2,160	2,200	2,240	2,280	2,320	2,360
% of design value delivered to site	85%	90%	95%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Porta Potty to be treated (MG per year)	0.34	0.37	0.40	0.41	0.44	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59
Porta Potty to be treated (gal/d)	1,360	1,476	1,596	1,634	1,760	1,800	1,840	1,880	1,920	1,960	2,000	2,040	2,080	2,120	2,160	2,200	2,240	2,280	2,320	2,360
Biosolids generated (61.7 tons/MG)	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30	30	30	40	40	40
Septage + Porta Potty Average Design Volume - increased by growth rate (gal/d)	10,360	12,116	13,956	15,754	17,680	19,560	19,880	21,840	23,880	25,960	28,120	30,280	32,560	34,840	37,240	37,800	38,360	38,960	39,520	40,120
Septage + Porta Potty Summer Design Volume - increased by growth rate (gal/d)	15,540	18,174	20,934	23,631	26,520	29,340	29,820	32,760	35,820	38,940	42,180	45,420	48,840	52,260	55,860	56,700	57,540	58,440	59,280	60,180
Summer Septage (gal/d)	13,500	15,960	18,540	21,180	23,880	26,640	27,060	29,940	32,940	36,000	39,180	42,360	45,720	49,080	52,620	53,400	54,180	55,020	55,800	56,640
Summer Porta Potty (gal/d)	2,040	2,214	2,394	2,451	2,640	2,700	2,760	2,820	2,880	2,940	3,000	3,060	3,120	3,180	3,240	3,300	3,360	3,420	3,480	3,540

Figure 19. Business Plan Model Assumptions

Business Plan Model Results and Conclusions

The business plan model is presented as cash flow taking into consideration income and expenses over a twenty-year period. The accumulation of cash, or cash carryover, is cash that can be used for reinvestment into the facility, profit, etc. Any deficit in cash carryover would be addressed in the facilities operating budget. In addition to the assumptions above, the business plan model has four basic inputs used to estimate revenue. These inputs include:

Woody Waste Tipping Fee ($/ton) – The fee for accepting woody waste used in the composting process.

Biosolids Tipping Fee ($/dry ton) – The fee for accepting biosolids from the local municipalities.

Septage Tipping Fee ($/1,000 gal) – The fee for accepting septage from pumpers.

Compost Sales ($/cu. yd.) – The rate at which bulk compost will be sold.

The model also takes into consideration a small annual increase in fees (1.75%), a 3% annual inflation rate and a growth factor of 1.5%.

Though the model is dynamic and can be used to predict numerous potential scenarios, only the scenario described in the previous sections is represented in this report. This scenario is based on reasonable inputs that are consistent with the information gleaned from the business plan.

These inputs assume the woody waste tipping fee ($31.05 per ton) and biosolids tipping fee ($222 per dry ton or $31.05 per wet ton) are the same as that currently being charged by the landfill. As a result, it is reasonably assumed that woody waste and biosolids will be diverted to this facility rather than the landfill. The model scenario presented also assumes a tipping fee for septage and porta potty waste of $0.13 per gallon, or $130 per thousand gallons. Though this is obviously greater than a land application option or slightly greater than what the municipalities are charging for receiving porta potty waste, the cost is not deemed unreasonable given the fact that pumpers can pump year-round resulting in greater income and given that the facility significantly reduces the risk to the pumpers. Finally, the model assumes that bulk compost is sold at a cost of $33 per cubic yard. The twenty-year cash flow is presented in Figure 20.

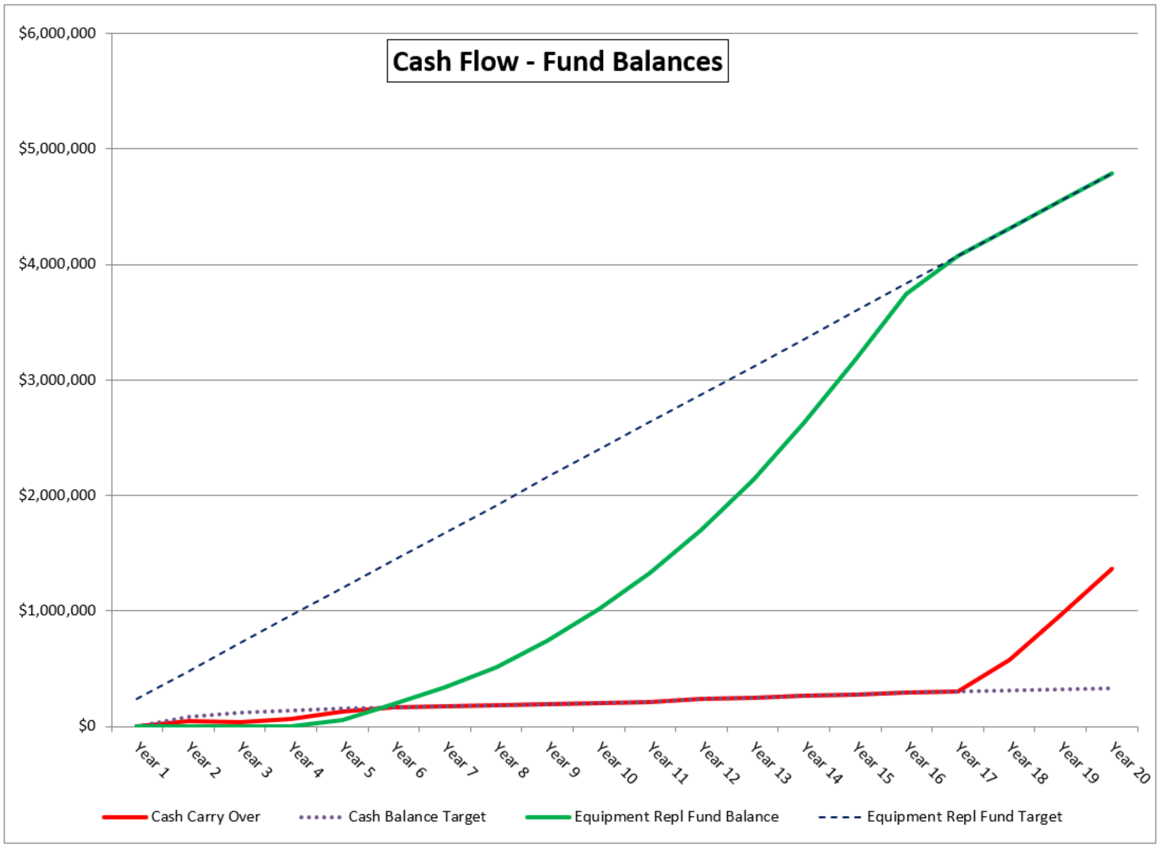

Figure 20. Cash Flow Chart

As described above, the facility is not able to meet cash balance targets for the first several years of operation. This is because fixed costs are a much larger percentage of total costs since septage flows and compost production are low at facility start up. As flows and compost sales increase, income increases and fixed costs become smaller as a percent of total costs, resulting in more cash that can be carried over year after year.

Conclusions of this business plan based on information derived from the model as well as other considerations are as follows:

- The model predicts annual cash surpluses for all years of operation except Year 2. This is due to assumptions about staffing. The model anticipates an increase in staffing as additional septage and biosolids are delivered to the facility. The timing of hiring the additional staff can mitigate the impacts to the projected cash flow.
- The sooner both the septage treatment plant and compost facility approach full capacity, the faster cash carry over will grow.
- Consideration should be given to having the construction contractor provide ‘contract operations’ of the facility built into the construction bid to assist with the transition to the ultimate operator of the facility. Alternatively, the County could develop a request for qualifications separate from the construction contract for facility operation services.

9 Preliminary Design Information

9.1 Site Layout

A preliminary site plan layout for the proposed facilities is presented in Figure 21. The proposed site ingress/egress is off Wiley Dike Road. The east access point is the main site access point. The west access is exclusively for haulers delivering septage and porta potty waste to the receiving station. The office and parking area is located on the north side of the site near the Septage Operations Building. The access road splits so traffic can pass or bypass the weigh scales as required to access the facility. The composting operations were placed to meet the setbacks specified in ARM 17.50.1703. Figure 22 and Figure 23 show concept 3D renderings of the facility.

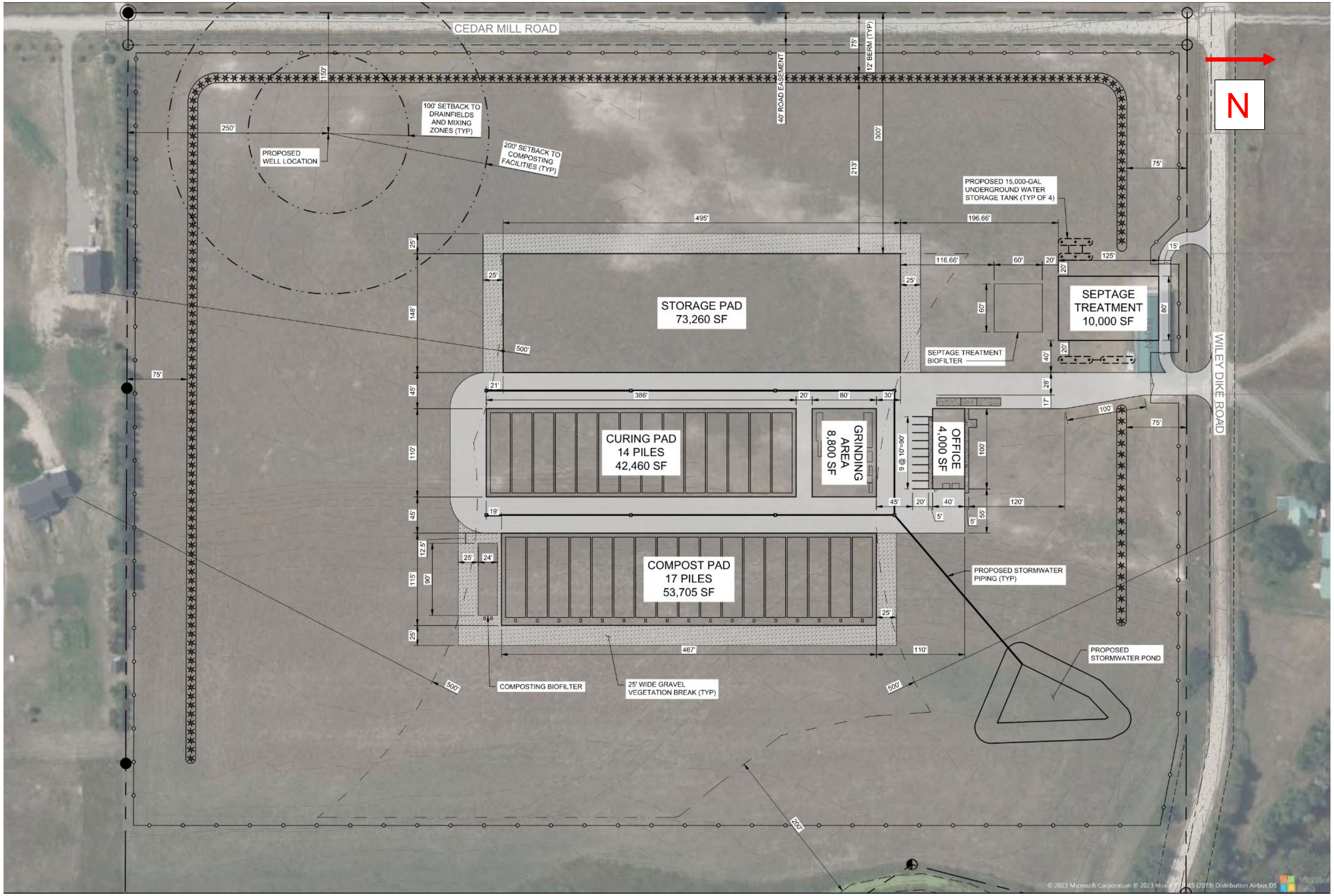

Figure 21. Preliminary Site Plan Layout

Figure 22. 3D Site Rendering Concept Looking Southeast

Figure 23. 3D Site Rendering Concept Looking Southwest

9.2 Equipment List

A preliminary equipment list is presented in Table 29.

Table 29. Preliminary Equipment List

Facility	Description	Quantity	Total hp
Septage Operations Facility	Septage Receiving Station	1	
	EQ Pumps	2	
	EQ Tanks	1	
	Primary Clarifier	1	
	Septage Treatment System – SBR Trains	2	
	Aeration Blowers	TBD	
	Effluent Pumps	2	
	Dewatering System – Belt Filter Press	1	
	Primary Sludge Pump	1	
	Waste Activated Sludge (WAS) Pump	1	
	Polymer System	1	
	Dewatered Biosolids Conveyor	1	
	Odor Control Fans	2	
Composting Facility	Blowers	33	
	Skid-Steer Loader	1	
	Front-End Loader	1	
	Woodchipper	1	
	Hopper	2	
	Grinder/Chopper	1	
	Mixer	1	
	Auger	1	

Facility	Description	Quantity	Total hp
	3-Stage Screen	1	
Site	Water Supply Well	1	

9.3 Preliminary Sheet and Specification Lists

A preliminary sheet list and preliminary specification list are presented in Appendix M and Appendix N, respectively.

10 Project Costs

10.1 Capital Costs

For estimating capital construction costs, cost data was derived from suppliers of materials and equipment whenever possible and in some cases consultation with local contractors. In addition, cost data was obtained from past projects with similar design aspects with an adjustment applied to the assumed 2025 midpoint of construction. Project capital costs include allowances for contractor mobilization, bonding, profit and technical design and construction administration services. In addition, a 20% construction contingency is included. The total estimated project cost is approximately $36,520,000. A breakdown of costs is shown in Table 30. Project costs should be updated as more is decided with design features of the facility.

Actual construction costs may differ from the estimates presented depending on a variety of factors such as the final project scope and market conditions at the time of project bidding. The level of design in this Basis of Design Report is considered schematic design, which corresponds to a typical Class 3 estimate (Figure 24). An estimate of this type is normally expected to be within –20% to +30% percent of the actual construction cost. The final cost of the projects will depend on actual labor and materials costs, actual site conditions, productivity, competitive market conditions, bid dates, seasonal fluctuations, final project scope, final project schedule, and other variables. As a result, the final project costs will vary from the estimate presented in this report. The range of accuracy for a Class 3 cost estimate is broad, but these are typical levels of accuracy at this stage of design. It is important to communicate this level of accuracy to policymakers and decision-makers.

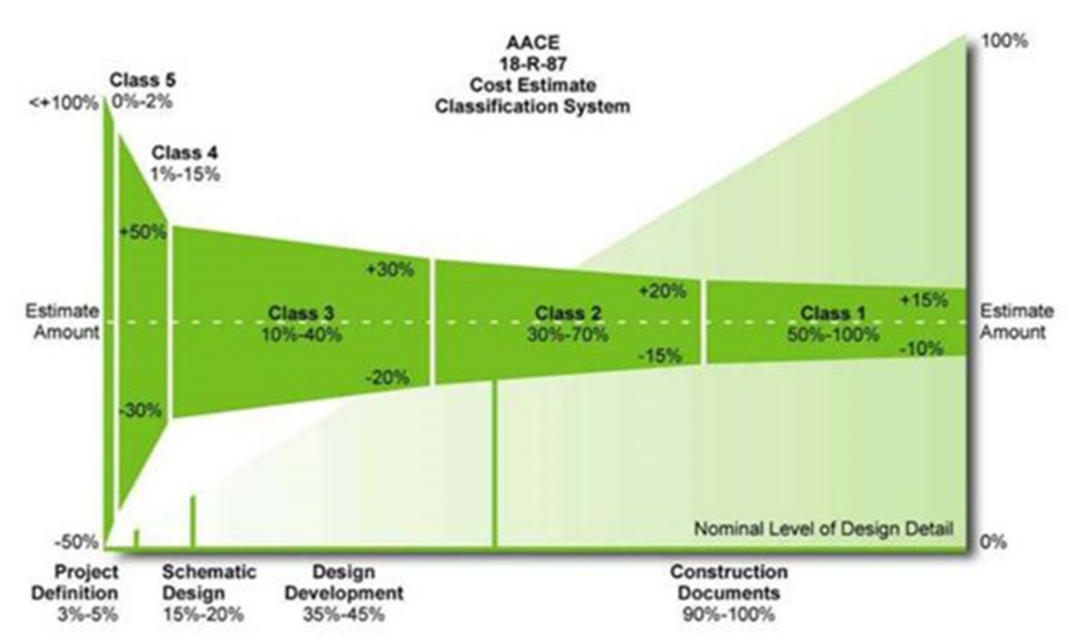

Figure 24. AACE Cost Estimate Classification System

Table 30. Opinion of Probable Construction Costs – Class 3 Cost Estimate

Flathead County Septage Treatment and Biosolids Composting Facility
Preliminary Design
Date : 10/6/2023

CLASS 3 OPINION OF PROBABLE CONSTRUCTION COST

Item	Number	Units	Cost / Unit	Subtotal
Division 02 — Existing Conditions				
Existing Barn Demolition	1	LS	$25,000.00	$25,000.00
Division 03 — Concrete				
Septage Operations Building Pad	185	CY	$550.00	$101,859.80
Office Building Pad	74	CY	$550.00	$40,743.92
Grinding Building Pad	163	CY	$550.00	$89,636.62
Compost Building Pad	995	CY	$550.00	$547,038.05
Compost Curing Building Pad	786	CY	$550.00	$432,496.71
Storage Building Pad	1,357	CY	$550.00	$746,224.89
SBR Tanks	160	CY	$700.00	$112,000.00
EQ Tanks	70	CY	$700.00	$49,000.00
Clarifier	110	CY	$700.00	$77,000.00
Non-Structural Concrete (Sidewalk, etc)	40	CY	$425.00	$17,000.00
Concrete/Eco Blocks	3,300	EA	$215.00	$709,500.00
Division 12 — Furnishings				
Office Building Furnishings	1	LS	$50,000.00	$50,000.00
Division 13 — Special Construction				
Septage Operations Building	10,000	SF	$85.00	$850,000.00
Grinding Building	8,800	SF	$50.00	$440,000.00
Compost Building	53,705	SF	$50.00	$2,685,250.00
Compost Curing Building	42,460	SF	$50.00	$2,123,000.00
Storage Building	73,260	SF	$50.00	$3,663,000.00
Office Building	4,000	SF	$75.00	$300,000.00
Division 22 — Plumbing				
Office Building Plumbing	1	LS	$75,000.00	$75,000.00
Division 23 — Heating Ventilating and Air Conditioning				
Septage Operations Building HVAC	1	LS	$200,000.00	$200,000.00
Office Building HVAC	1	LS	$50,000.00	$50,000.00
Division 26 — Electrical				
Electrical	1	LS	$1,617,251.20	$1,617,251.20
I&C	1	LS	$1,617,251.20	$1,617,251.20
Division 28 — Electronic Safety and Security				
Gas & Fire Detection and Alarm	1	LS	$60,000.00	$60,000.00
Site Security	1	LS	$40,000.00	$40,000.00
Division 31 — Earthwork				
Clearing and Grubbing	415,422	SF	$0.21	$88,277.18
Site Excavation	63,262	CY	$8.50	$537,730.54
Wiley Dike Road Excavation	2,667	CY	$21.25	$56,666.67
Site Aggregate Base	5,970	CY	$12.75	$76,117.50
Wiley Dike Road Aggregate Base	2,667	CY	$42.50	$113,333.33
Site Aggregate Subbase	11,860	CY	$8.50	$100,810.00
Stormwater Pond	1	LS	$25,000.00	$25,000.00
Division 32 — Exterior Improvements				
Site Asphalt	1,566	TON	$47.00	$73,602.00
Wiley Dike Road Asphalt	3,915	TON	$47.00	$184,005.00
Site Striping	200	LF	$3.00	$600.00
Wiley Dike Road Striping	9,000	LF	$3.00	$27,000.00
Fence	4,555	LF	$9.00	$40,995.00
Gates	3	EA	$8,500.00	$25,500.00
Trees	220	EA	$130.00	$28,600.00
Landscaping	30,000	SF	$1.00	$30,000.00
Irrigation	1	LS	$8,500.00	$8,500.00
Division 33 — Utilities				
Domestic Water Well	1	LS	$50,000.00	$50,000.00
Water Storage Tank - 15,000 gallon tank	2	EA	$70,000.00	$140,000.00
Catch Basin	8	EA	$3,000.00	$24,000.00
12" PVC Stormwater Piping	1,420	LF	$45.00	$63,900.00
Division 40 — Process Interconnections				
3" DIP EQ Piping	100	LF	$30.00	$3,000.00
3" DIP WAS Piping	75	LF	$30.00	$2,250.00
3" DIP Primary Sludge Piping	40	LF	$30.00	$1,200.00
4" DIP Force Main to Lakeside WWTP	5,800	LF	$40.00	$232,000.00
3" DIP Potable Water	1,100	LF	$30.00	$33,000.00
2" DIP Potable Water	1,750	LF	$22.00	$38,500.00
2" Air Piping for ASPs	3,100	LF	$15.00	$46,500.00
Division 41 — Material Processing and Handling Equipment				
Screw Conveyors	30	LF	$2,300.00	$69,000.00
Division 43 — Process Gas and Liquid Handling, Purification and Storage Equipment				
EQ Pumps	2	EA	$7,500.00	$15,000.00

Effluent Pumps	2	EA	$12,500.00	$25,000.00
WAS Pump	1	EA	$45,000.00	$45,000.00
Primary Sludge Pump	1	EA	$45,000.00	$45,000.00
ASP Blowers	33	EA	$4,250.00	$140,250.00
Water Pumps (from storage tank to Septage Bldg)	2	EA	$50,000.00	$100,000.00
Division 46 — Water and Wastewater Equipment				
Septage Receiving Station	1	EA	$707,700.00	$707,700.00
SBR System (equipment only, includes Primary Clarifier)	1	LS	$1,086,778.00	$1,086,778.00
Belt Filter Press	1	EA	$554,400.00	$554,400.00
Emulsion Polymer Unit	1	EA	$55,000.00	$55,000.00
Septage Building Biofilter - Inorganic Media	1	EA	$800,000.00	$800,000.00
Aerated Static Pile Biofilter - Organic Media	1	EA	$25,000.00	$25,000.00
Subtotal				**$22,437,468**
Mobilization/Demobilization, 3%				$673,124
Field Overhead, 5%				$1,121,873
Insurance & Bonds, 1.5%				$336,562
Montana Contractor Tax, 1%				$224,375
Contractors Profit, 10%				$2,243,747
Contingency, 20%				$4,487,494
Land Acquisition, Fixed				$1,518,000
LCWSD Connection Fee, Fixed				$1,833,705
Caterpillar 950M	1	EA	$365,000.00	$365,000
Caterpillar 272D3	1	EA	$83,000.00	$83,000
8-foot Auger	1	EA	$25,000.00	$25,000
Woodchipper	1	EA	$50,000.00	$50,000
SSI Model 600 Mixer (ECS 575 cubic feet)	1	EA	$150,000.00	$150,000
Pickup Truck	1	EA	$50,000.00	$50,000
Rotochopper MC266 Wheeled Grinder/Chopper	1	EA	$568,973.70	$568,974
Rotochopper 175MT Trommel	1	EA	$351,330.00	$351,330
			-20%	**$29,216,000**
Class 3 Cost Estimate Range (-20%, +30%)				**$36,520,000**
			+30%	**$47,476,000**

11 Recommendations & Next Steps

The next steps listed below are recommended to move the project forward into detailed design.

- Perform additional septage sampling to better characterize water quality & solids constituents and odors
- Identify reliable carbon amendment source(s)
- Conduct a traffic impact study for the facility
- Begin the process to get a well drilled as soon as the water supply requirements are solidified and the purchase of the property is complete. WET recommended designing, bidding, drilling a well as soon as the property is purchased. Most drilling contractors have a backlog of six months or more and lead times on materials can exceed eight weeks.
- Get a Geotechnical professional contracted to perform a more detailed geotechnical evaluation of the site.
- Concrete ecology blocks, or eco blocks, are proposed for the walls that separate the composting and curing piles. Eco blocks are made when concrete plants have extra concrete that they cannot use, so they pour the eco blocks to minimize concrete waste and maximize profit. For that reason, they are not typically a product that is mass produced and have been identified as a product with significant lead time. The facility will require a large amount of eco blocks, so HDR recommends ordering the eco blocks early and staging the blocks onsite.
- Continue public outreach and engagement about the project, specifically educating the public regarding the compost process and compost product.
- Identify permits that take the most time and begin the application and/or process for those permits.
- Consider pursuing the required permitting to mass grade the facility site in preparation for construction once the facility design in completed. This could run parallel to facility design, would expedite the project completion date, and would give the soil more time to consolidate and settle.
- Obtain additional survey boundary, monumentation, and topographical information:
  - Along the length of Wiley Dike Road that is proposed to be paved. This should encompass the entire right-of-way-width and include all existing utility information.
  - Along the alignment of the force main on LCWSD’s property. This should include the entire proposed easement width (to be determined).