CRW ENGINEERING GROUP, LLC

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May 25, 2022

SEPTAGE DISPOSAL & TREATMENT FEASIBILITY STUDY

Feasibility Study

- Introduction
- Background
- Estimated Septage Volume Rates
- Septage Receiving Facility Siting
- Septage Receiving Facility Conceptual Design
- Palmer Wastewater Treatment Plant Evaluation
- Cost Estimates
- Conclusions and Recommendations

Introduction

- Evaluate the technical and relative economic feasibility of disposing of septage within the Matanuska-Susitna Borough (MSB) and treating the septage at the Palmer Wastewater Treatment Plant (PWWTP).
- High level review to determine whether to proceed to generation of a Preliminary Engineering Report (PER) and seek funding.
- Makes substantial use of previous MSB studies.

Background

- MSB has been evaluating the feasibility of collecting and treating septage within the confines of the Borough for several decades.
- Since 2007, MSB has reviewed the possibility of treating septage at the existing WWTPs operated by the City of Palmer and the City of Wasilla.
- And at new regional WWTP centrally located within the MSB “core area” between Palmer and Wasilla, including Central Landfill.

Background

- *Matanuska-Susitna Borough Septage Handling and Disposal Plan (April 2007)* prepared by HDR Alaska, Inc.
- *Matanuska-Susitna Borough Regional Wastewater and Septage Treatment Study (July 2010)* prepared by Hattenburg Dilly & Linnell, LLC, GV Jones & Associates, Inc., and HDR Alaska, Inc.
- *Preliminary Engineering Technical Memorandum – Update to the 2007 Septage Handling and Disposal Plan (February 2013)* prepared by HDR Alaska, Inc.
- *Septage and Leachate Treatment Facility Site Suitability and Engineering Analysis (June 2015)* prepared by CH2M Hill.
- *City of Palmer Wastewater Facility Plan 2016 Update (September 2016)* prepared by HDR Alaska, Inc.
- *Preliminary Engineering Report for Septage and Leachate Treatment Facility at Matanuska-Susitna Borough (January 2018)* prepared by Clark Engineering and HDL Engineering Consultants.

Background

- Since 2016, City of Palmer has had significant upgrades designed and constructed at its WWTP, in response to the need to meet new, more-stringent discharge permit requirements (ammonia).
- Phase 1 (2016-2018): Design and construction of new treatment process based on moving bed biological reactor (MBBR) technology.
- Phase 2 (2021-2022): Construction of secondary clarifiers and process flow vaults.
- Current Flowrates: 0.5 MGD average; 0.8 MGD peak day.

Phase 1 Construction

- MBBR primarily targeting:
  - Ammonia-N removal
  - BOD removal

- 1.0 MGD average daily capacity
- 1.5 MGD peak daily capacity

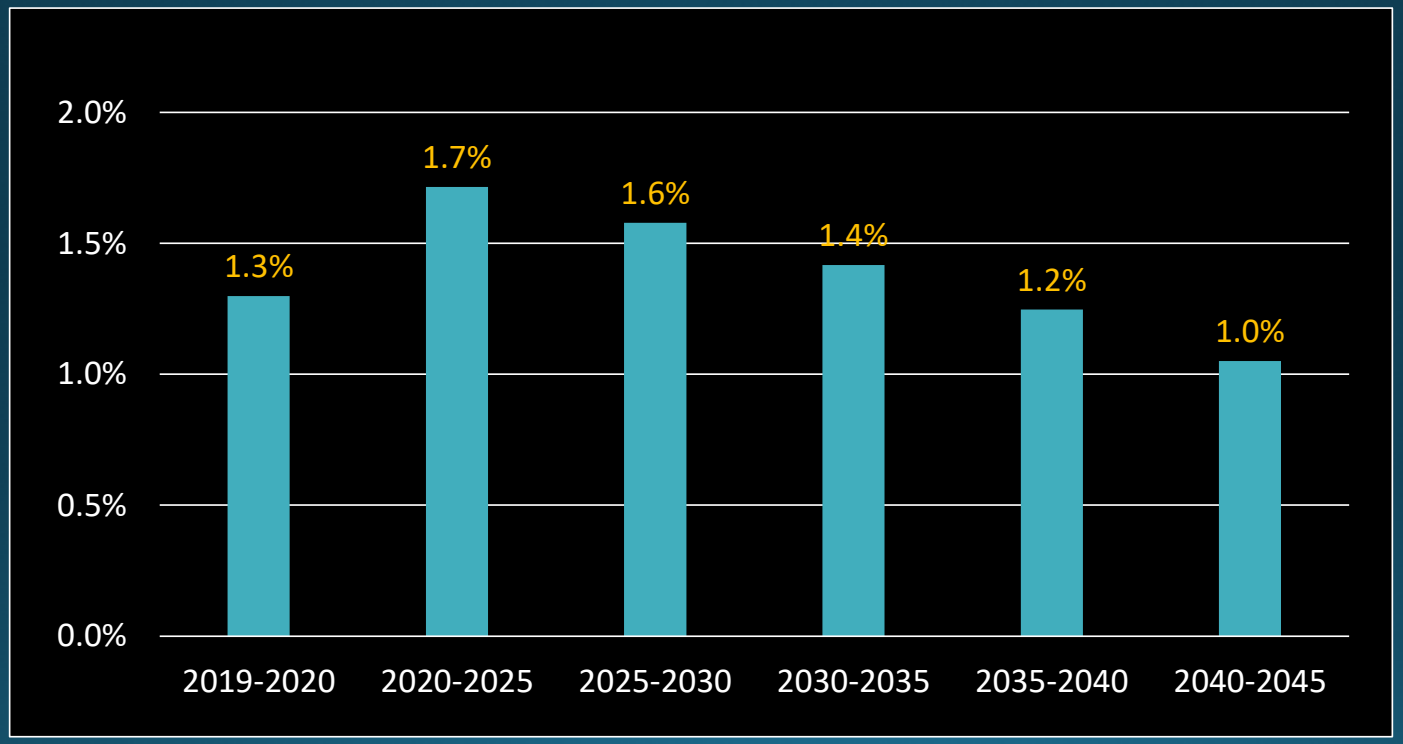
Phase 2 Construction

- Secondary Clarifiers:
  - TSS removal
  - Bypassing existing lagoons for improved ammonia discharges.
  - Waste Activated Sludge (WAS) pumping.

Estimated Septage Volumes

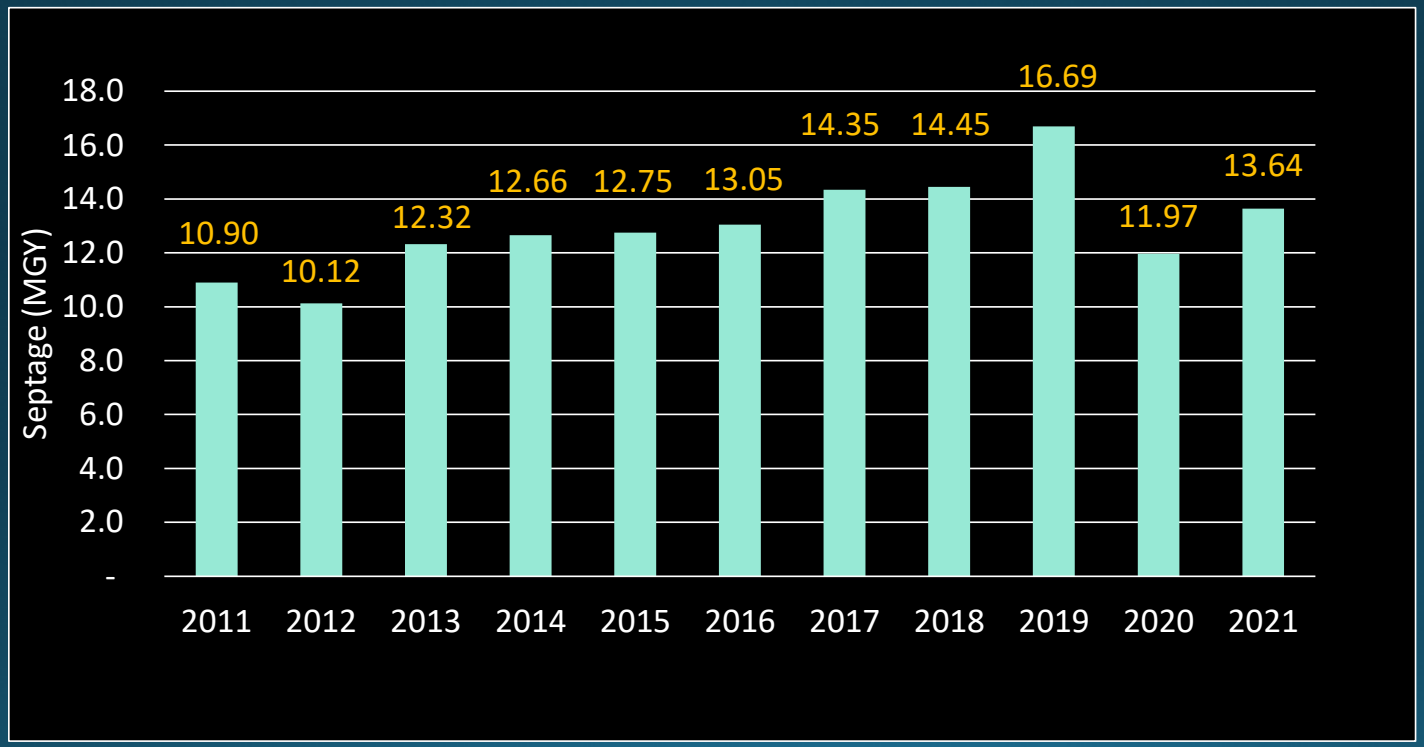
- For this study, future population growth is considered to generally relate to the growth in septage hauling volumes.
- In general, projected growth rates for the MSB are anticipated to steadily decrease in the next few decades.
- From 2019 to 2045, the average annual population growth rate in the MSB is estimated to be about 1.7%.
- Reference: *Alaska Population Projections: 2019 to 2045,* ADOL&WD (2020).

Estimated Septage Volumes



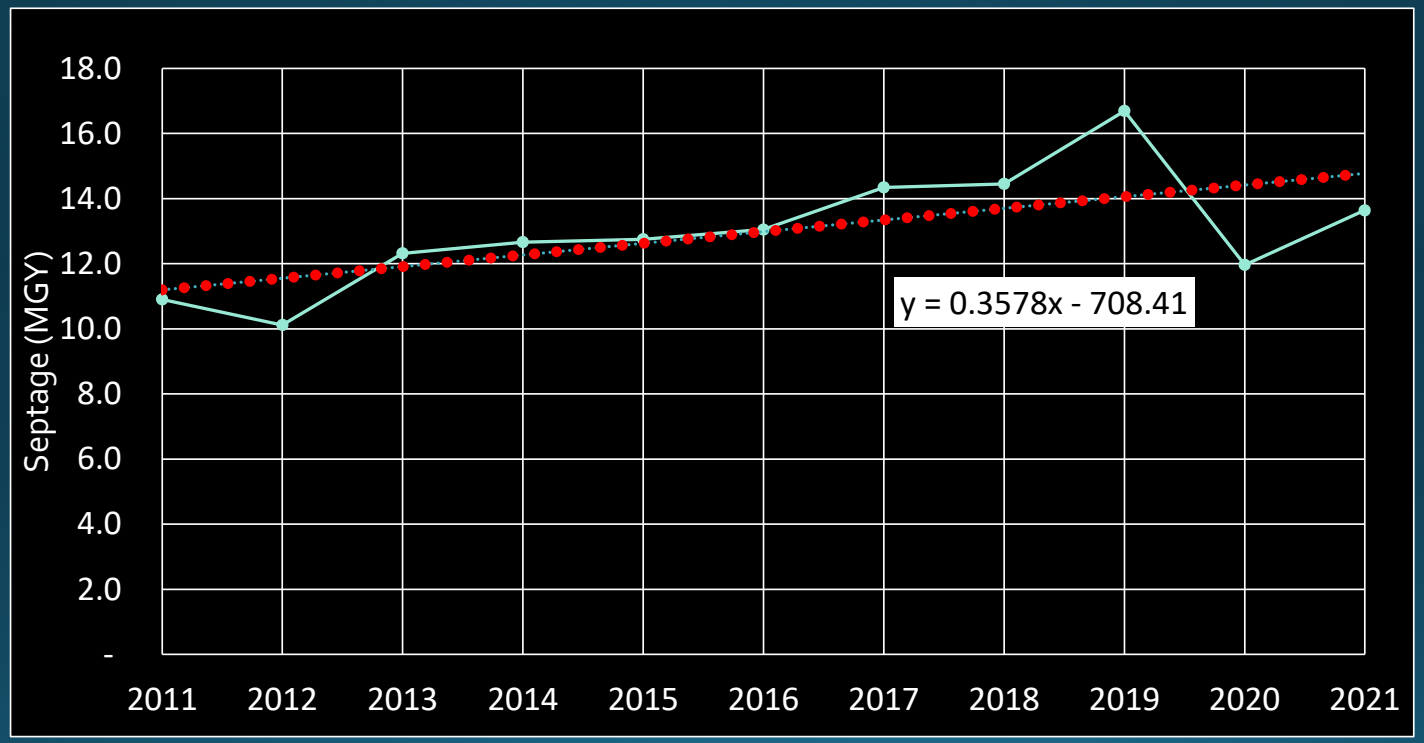
2019 to 2045 Projected MSB Population Growth Rates

Estimated Septage Volumes



2011 to 2021 MSB Septage Volumes

Estimated Septage Volumes



2011 to 2021 MSB Septage Volumes

Estimated Septage Volumes

2022 Septage Volume	15.2 MG/year
Facility Life	30 years
Funding Acquisition, Design and Construction Timeframe	5 years
Total Growth Period	35 years
35-year MSB Avg Yearly Growth Rate	2.4%
2057 Septage Volume	34.8 MG/year

Future MSB Septage Volume Criteria

Estimated Septage Volumes

	Current Estimate (2021)	2007 - 2013 Estimates	2010 Estimate	2018 Estimate
Future Average Annual Septage Volume (MG/year)	34.8	38.1	44.8	16.4 to 36.4
Future Year	2057	2030	2048	2025
Average Annual Growth Rate	2.4%	4.0%	2.8%	6%
Estimated Peak Daily Volume (gallons per day)	217,500	238,165	200,000	243,282

Septage Flow Comparison

Septage Receiving Facility Siting

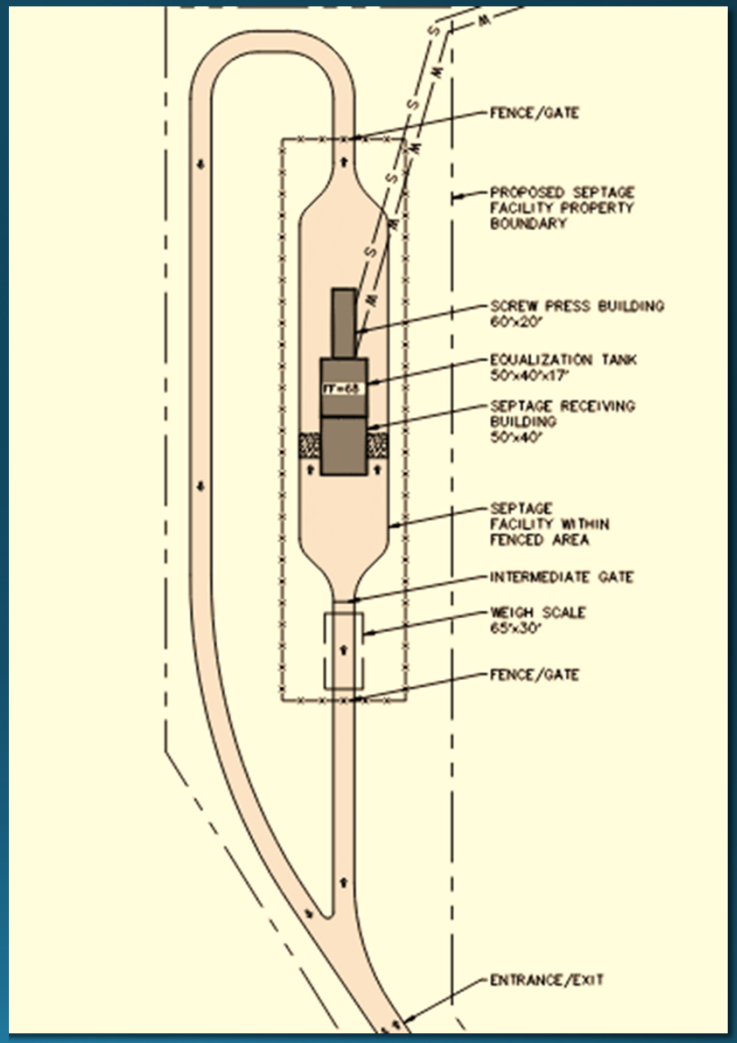
- Proximity to sewer utility
- Accessibility to major roadways
- Cost of land
- Public vs. private property
- Proximity to PWWTP
- Site topography
- Proximity to water utility
- Proximity to residential areas
- Zoning

Septage Receiving Facility Siting

- Focus on Granite Pit location.
- Easy future access to Glenn Hwy.
- Closest to Parks Hwy Interchange.
- Proximity to existing water, sewer, power and NG lines.
- Industrial area.

Septage Receiving Facility Conceptual Design

- Accessibility off-of/on-to highway.
- Simple flow through the facility with dual discharge stations.
- Allow for truck queuing and alternate exiting.
- Use of automated gates.
- Use of scale for septage weight measurement.
- Screening from highway.
- Linear layout of building/treatment facilities.



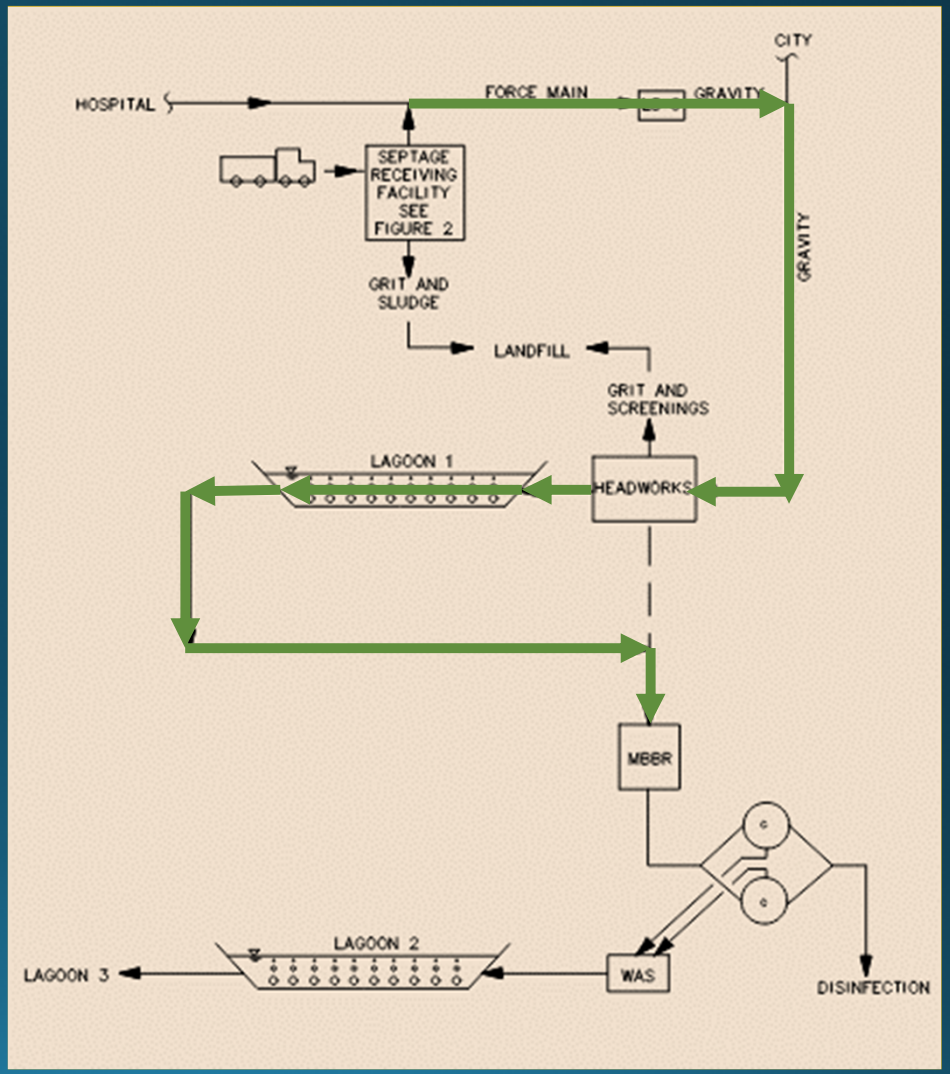
Septage Characteristics

- Highly variable characteristics.
- Very high levels of all typical constituents (BOD, TSS, TKN, Ammonia, FOG, etc.).
- Strong Odors.
- Typically requires pre-treatment before discharging into a domestic WWTP.

Septage Treatment
Conceptual Design

Objectives:

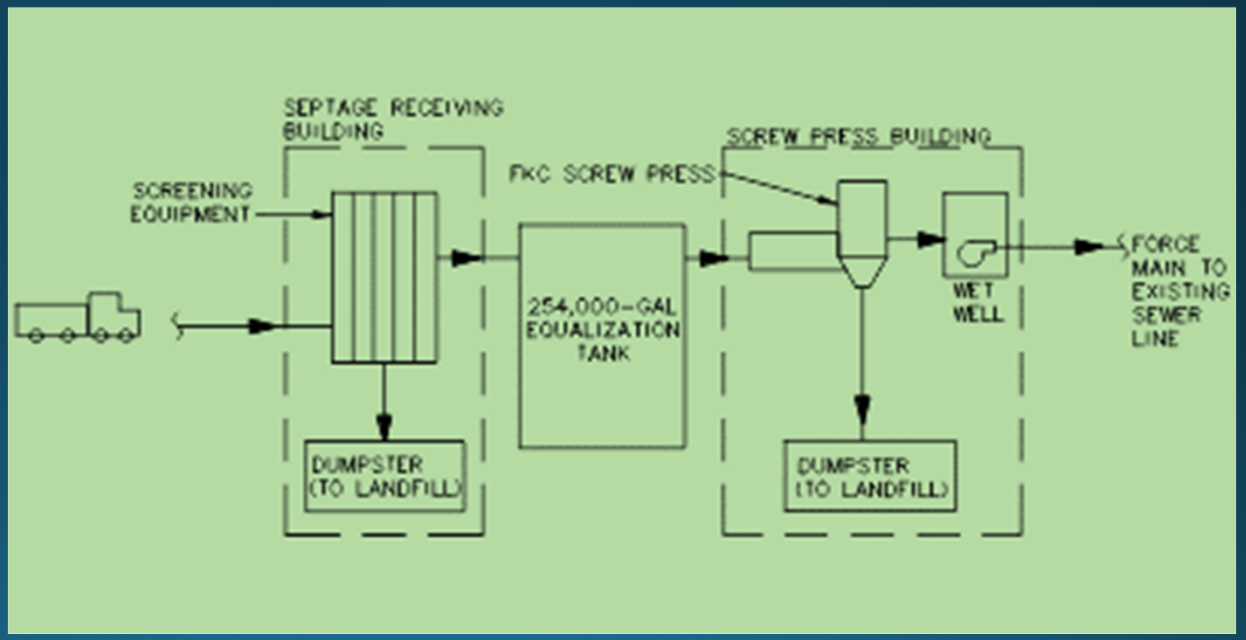
- Significant reduction of TSS and BOD at receiving station.
- “Dilution” of primary-treated septage in Palmer WW collection system.
- Significant reduction of BOD and Ammonia at PWWTP Lagoon #1.
- Mixed septage/wastewater characteristics treatable by MBBR process.



Septage Receiving Facility Conceptual Design

Process Objectives:

- Screening of larger solids.
- Odor Control
- Equalization of septage in-flows.
- Dewatering of suspended solids.
- Disposal of dewatered solids.
- “Dilution” of primary-treated septage in Palmer WW collection system.



Estimated Septage Loadings

Constituent	Units	FLOW RATE		
		Average Annual = 1.0 MGD	Max Month = 1.2 MGD	Peak Day = 1.5 MGD
BOD	mg/L	224	282	380
	lb/day	1868	2818	4754
TSS	mg/L	244	310	395
	lb/day	2035	3102	4754
TKN	mg/L	38	48	65
	lb/day	318	479	808
Ammonia-N	mg/L	26	32	43
	lb/day	213	321	541

MBBR System Design Flow Rates and Loadings

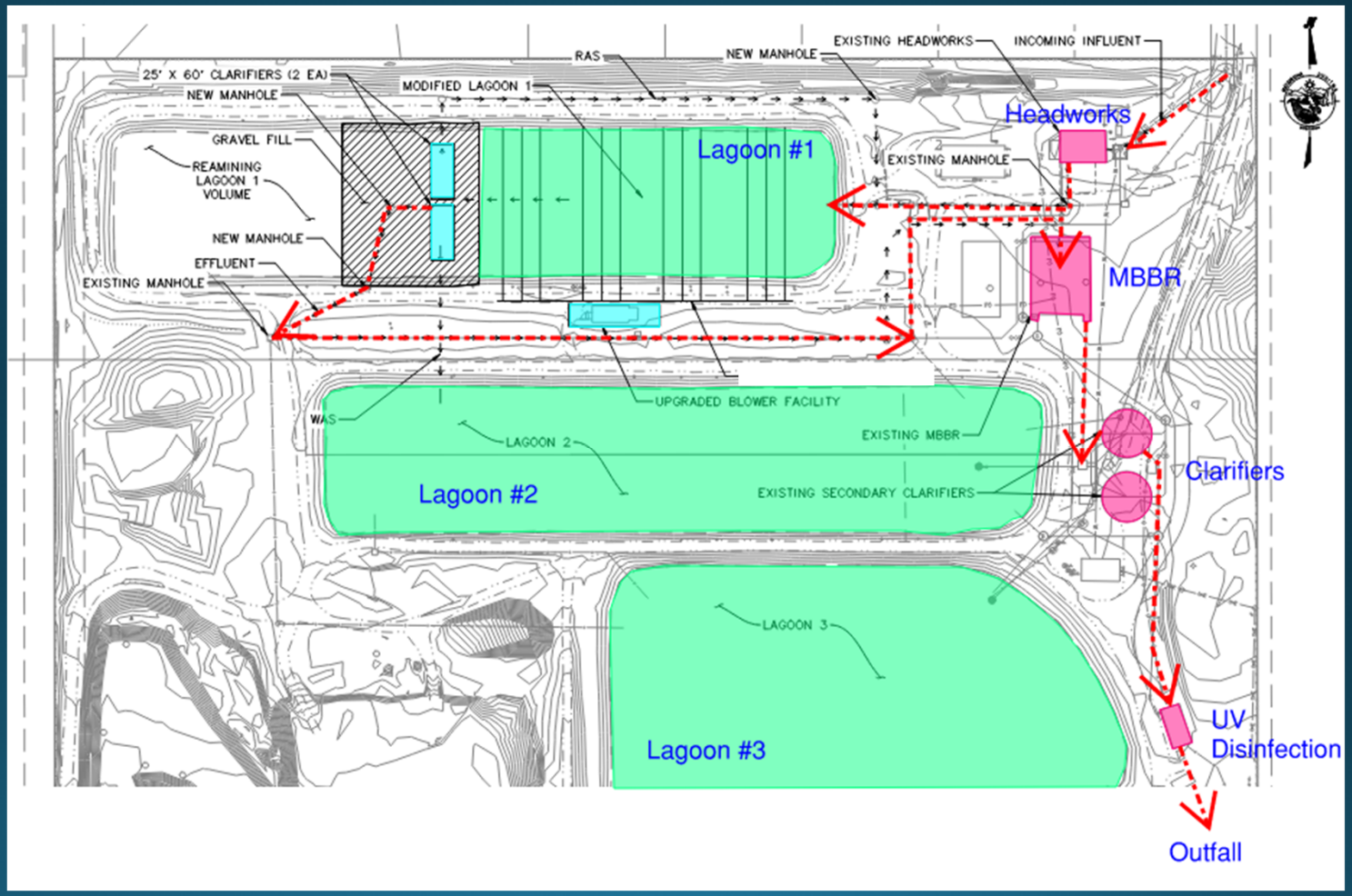
Estimated Septage Loadings

Combined Loading	Units	Average Daily Flow Rate	Peak Day Flow Rate	"Low Day" Flow Rate
Summer Flow	GPD	1,217,500	1,717,500	867,500
Winter Flow	GPD	1,072,500	1,572,500	722,500
BOD	mg/L	334	438	567
	lb/day	3,392	6,278	4,099
TSS	mg/L	328	435	549
	lb/day	3,330	6,236	3,971
TKN	mg/L	66	81	109
	lb/day	672	1,162	792
Ammonia-N	mg/L	39	51	66
	lb/day	396	724	476
Alkalinity	mg/L	320	285	369

Estimated Combined Septage and City WW Loading Rates

PWWTP Modifications

- *Biolac* Aeration System
- Blower Upgrades
- Clarifiers
- Activated Sludge Treatment



Capital Cost Estimate

Item	Subtotal
Construction	$ 12,425,621
City Administration (2%)	$ 248,512
Design (10%)	$ 1,242,562
Construction Management (12%)	$ 1,491,074
Project Contingency (20%)	$ 2,485,124
Inflation (5 years @ 2.5%)	$ 1,632,829
Project Total (2027 Dollars)	**$ 19,525,723**

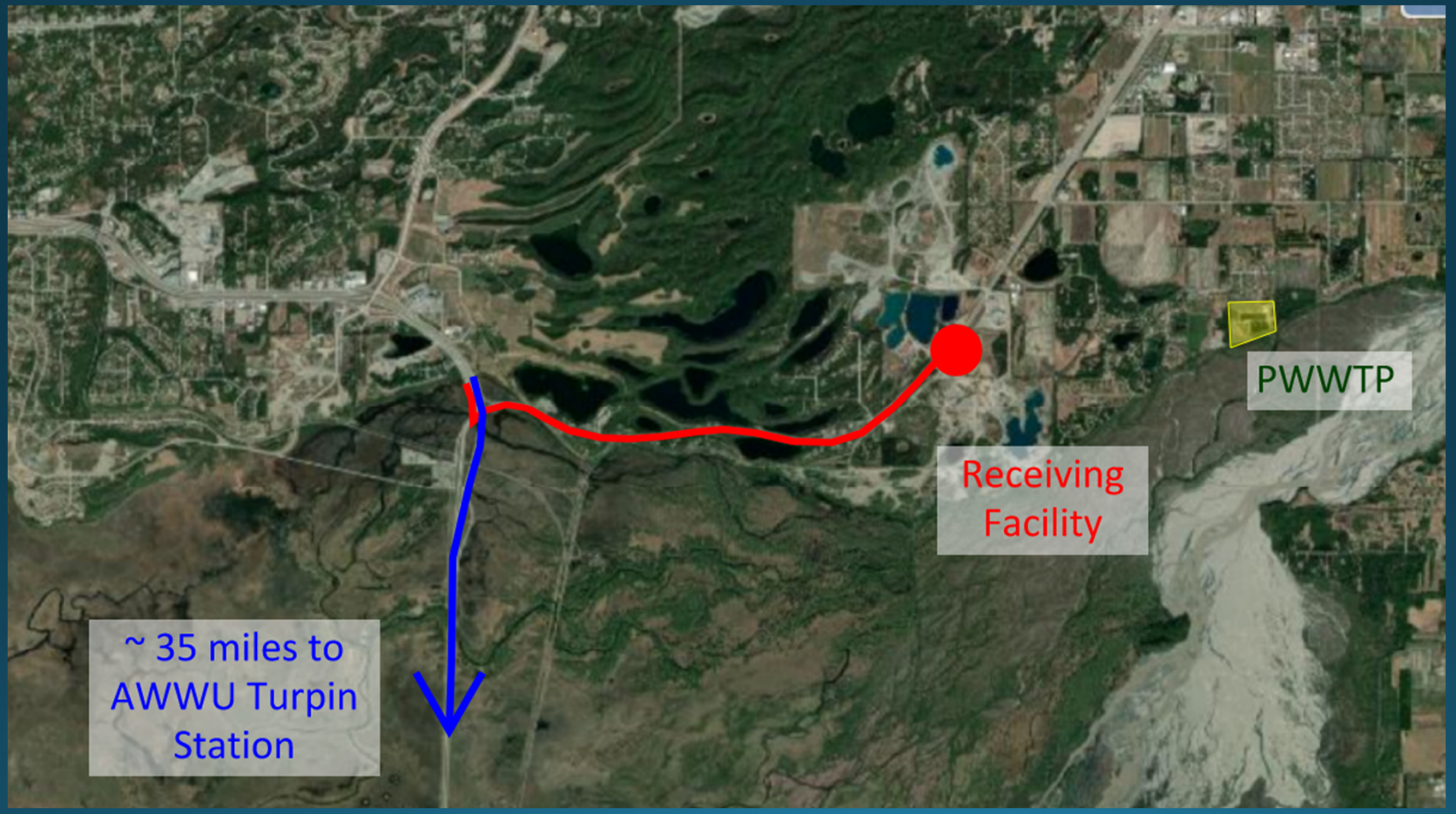
Annual O&M Cost Estimate

Item	Subtotal
Septage Receiving Facility O&M	
Labor - Operation	$ 41,055
Labor - Maintenance	$ 6,480
Power	$ 90,182
Heating	$ 40,393
Miscellaneous Supplies	$ 4,425
Miscellaneous Services and Equipment	$ 23,553
Major Equipment Amortization	$ 69,833
Receiving Facility Subtotal	$ 275,920
Palmer WWTP O&M	
Labor - Operation	$ 4,489
Labor - Maintenance	$ 23,401
Power	$ 188,262
Heating	$ 9,730
Miscellaneous Supplies	$ 17,824
Miscellaneous Services and Equipment	$ 39,794
Major Equipment Amortization	$ 40,000
WWTP Subtotal	$ 323,499
Subtotal Annual O&M Costs	$ 599,419
Contingency (10%)	$ 59,942
5 Years Inflation @ 2.5%	$86,645
O&M Total (2027 Dollars)	$ 746,006

Estimated Tipping Fees & Total Trip Costs

	Tipping Fee per 1,000 gal	Total Tipping Fee	Total Hauling Expenses	Total Trip Cost
Year 2027 MSB	$ 78.04	$ 234.11	$ 26.10	**$ 260.21**
Year 2057 MSB	$ 38.38	$ 115.13	$ 26.10	$ 141.23
Flat-Rate MSB	$ 58.21	$ 174.62	$ 26.10	$ 200.72
Year 2027 AWWU	$ 30.21	$ 90.63	$ 182.67	**$ 273.30**

Estimated Tipping Fees & Total Trip Costs



Conclusions

- Pre-treatment followed by intermediate treatment process is needed to produce combined septage and wastewater characteristics that are readily treatable by the existing processes at the PWWTP.
- Pre-treatment and intermediate activated sludge treatment process appears to be technically feasible in producing wastewater that can be subsequently treated by the PWWTP.
- Receiving facility site located south of Palmer near the Glenn Highway is considered the preferred location.
- Hauler trip costs to proposed receiving station would appear to be less than the cost of hauling and disposing of septage at AWWU's Turpin St. receiving station in Anchorage.
- Septage receiving and treatment facility revenues could be expected to match or exceed operational and financing costs from the beginning of its operations.

Recommendations

- Seek concurrence with the City of Palmer and approval from the Borough Assembly in pursuing further planning of the septage receiving and treatment improvements considered in this study.
- With City concurrence and Borough Assembly approval, proceed with the development of a PER for USDA grant/load funding or similar design analysis document to evaluate project alternatives in further detail, and generate estimated costs for funding acquisition.