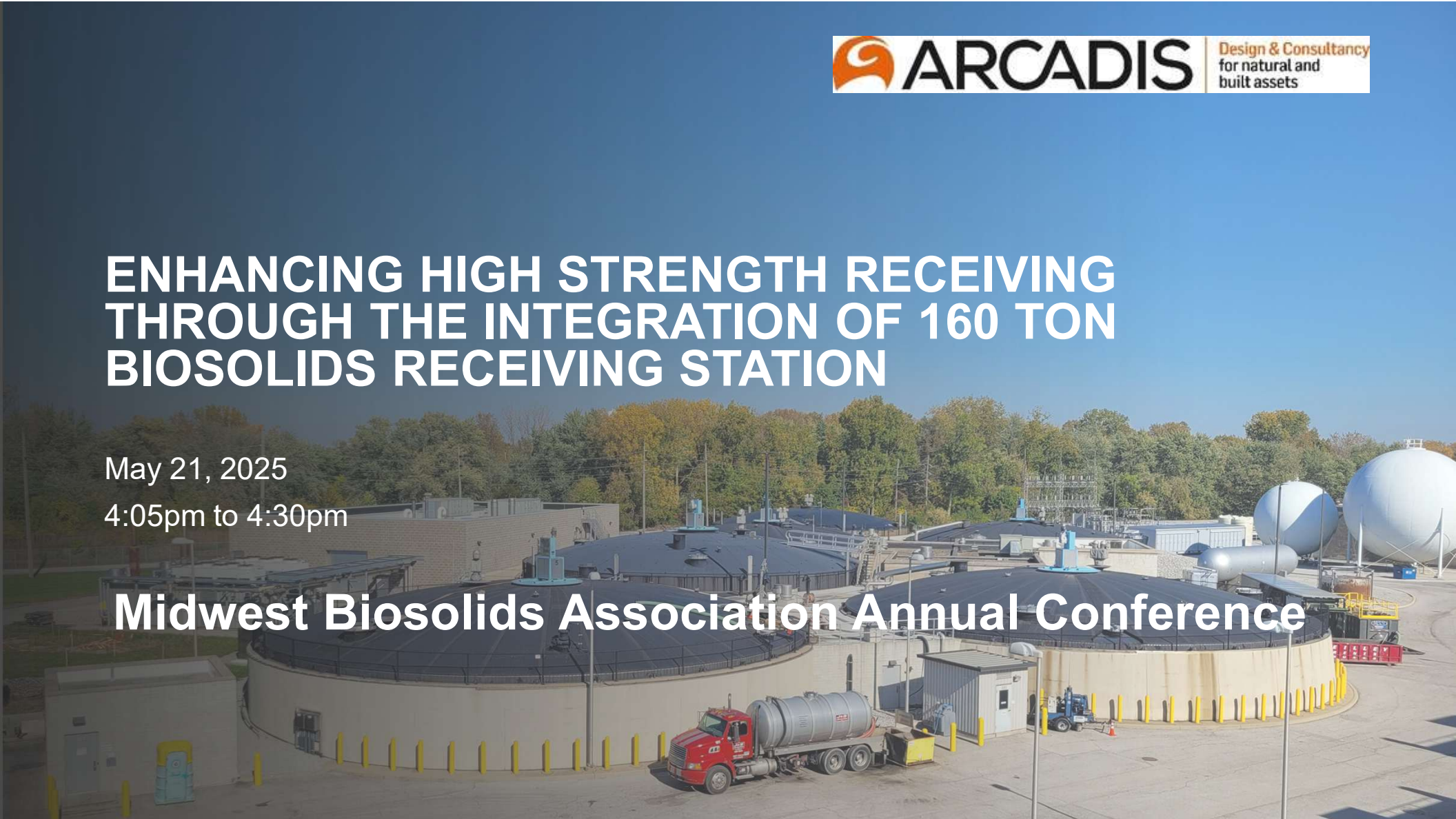


ENHANCING HIGH STRENGTH RECEIVING THROUGH THE INTEGRATION OF 160 TON BIOSOLIDS RECEIVING STATION

May 21, 2025

4:05pm to 4:30pm

Midwest Biosolids Association Annual Conference



Agenda

1 Project Goals

2 Project Scope and Objectives

3 Existing HSW System Review

4 New HSW System Overview

- Site Location
- Site Location

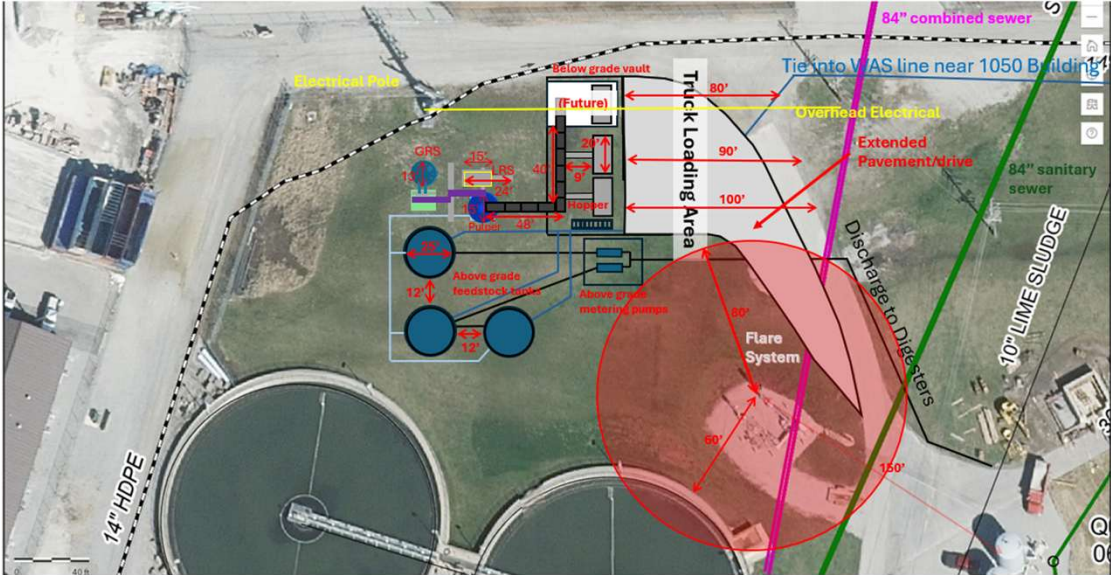
5 Proposed HSW System Technology Review

- Receiving Station/ Feedstock
- Storage
- Screening
- Mixing
- Grit Polishing
- Pumping
- Dilution
- Electrical and I&C

6 Early Decisions and Action Items



Project Goals



Project Goals

- Maximize the production of biogas in existing anaerobic digestion process.
- Reduce the solid waste/organic material dumped in Fort Wayne's landfills and supporting greater sustainability with landfill diversion and reduction to greenhouse gases.



Project Scope and Objectives



Project Scope and Objectives

High Strength Waste (HSW) Facility

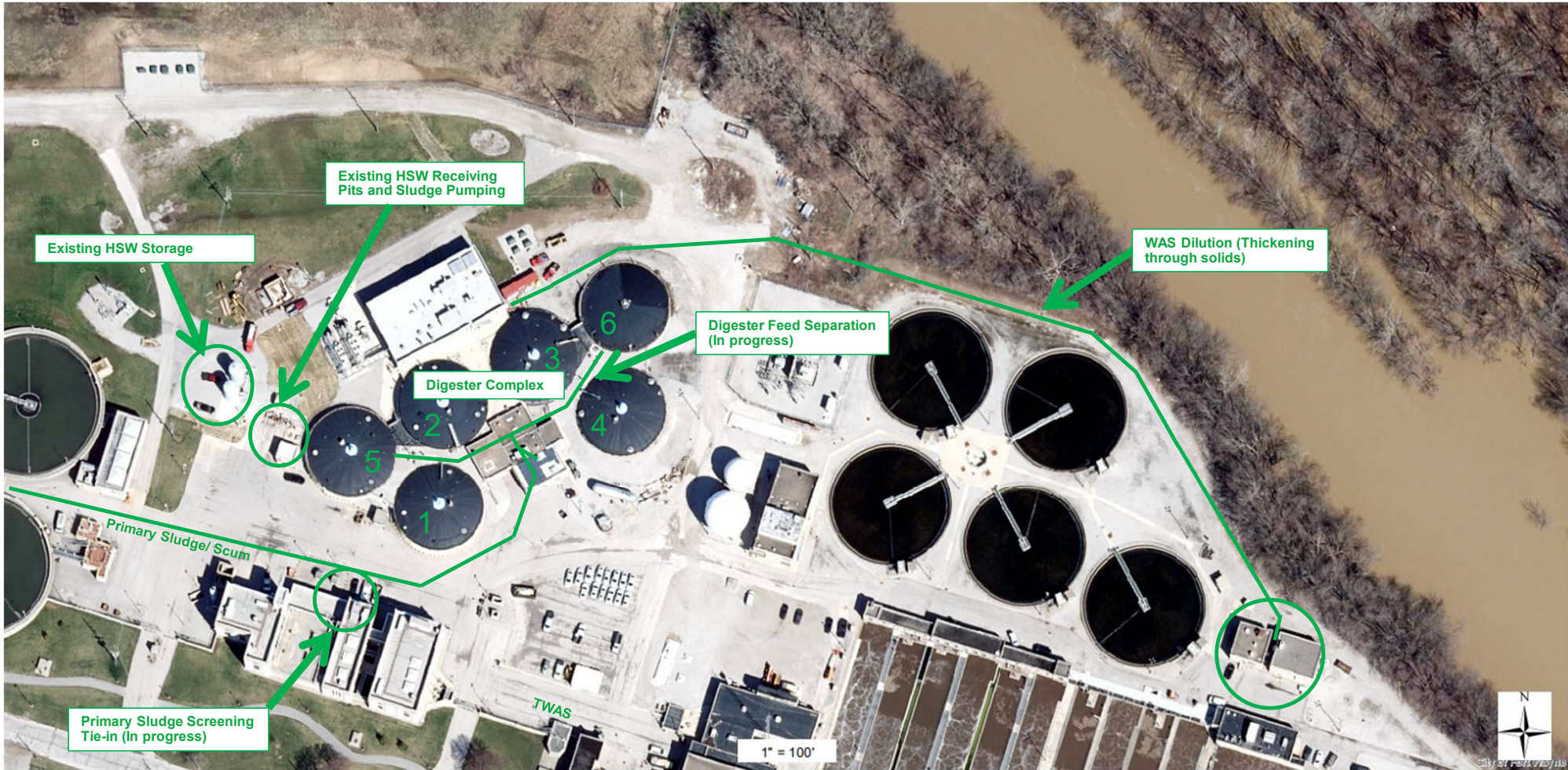
- New Expanded HSW Facility shall have the following components were evaluated based on the type of HSW received:
 - HSW Receiving (Tipping Floor and Hopper)
 - HSW Screening,
 - HSW Grit Polishing,
 - HSW Storage (~ 45,000 gallons)
 - Dilution and Mixing
 - HSW Pumping
 - HSW Conveyance, Tie-in, and Dilution Piping
- New High Strength Waste stream to be received at the WPCP:
 - HSW TS content between 15% - 25%
 - Possible sources of new waste stream include local industry, agricultural, lumber, food processing, and food wastes from residential, commercial, institutional, and industrial establishments.

HSW Facility Site Layout and Location

- Review of 2 possible site alternatives for the new HSW system:
 - Northwest corner of WPCP, north of the existing HSW facilities
 - South of the WPCP, southeast area of the visitor parking lot
- Receive 3 trucks at a time
- Above grade storage tanks

Existing HSW Receiving System





Existing HSW System

Existing HSW System

- Digesters currently receive primary sludge, TWAS, and HSW (3% total solids)
- 3% total solids HSW is unloaded at the existing receiving pits (capacity of 2 tanker trucks at the same time) and transferred to 3 storage tanks
- Existing HSW storage tanks continuously mix HSW via coarse air bubble mixing.
- HSW is pumped from storage tanks to digester at average flow of 25-50 gpm.
- Third party provides Fort Wayne digesters with the HSW.
- Primary sludge + primary scum and TWAS are pumped into a common header to feed to the digesters at 100 gpm and 50 gpm, respectively.



Existing HSW System

Existing HSW System

- The existing HSW system receives HSW at 3% total solids at receiving pits located directly west of Digester 5.
- The receiving pits provide the capacity for 2 tanker trucks to simultaneously unload HSW, which is conveyed through PVC piping into separate wet wells transferred into three above grade storage tanks with dry well chopper pumps
- 25k gpd capacity (existing)



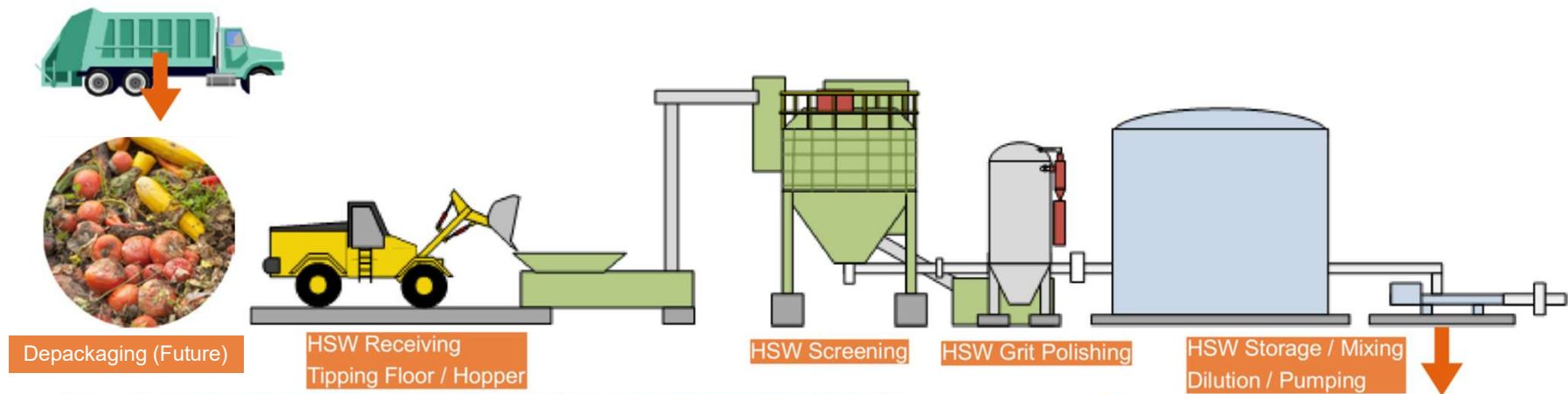
New Expanded HSW System Technology Evaluation



Project Features

- Site Traffic Pattern Analysis
- HSW characterization
- HSW receiving facility equipment
- Biosolids dilution and pumping
- Phasing
- Contaminant removal



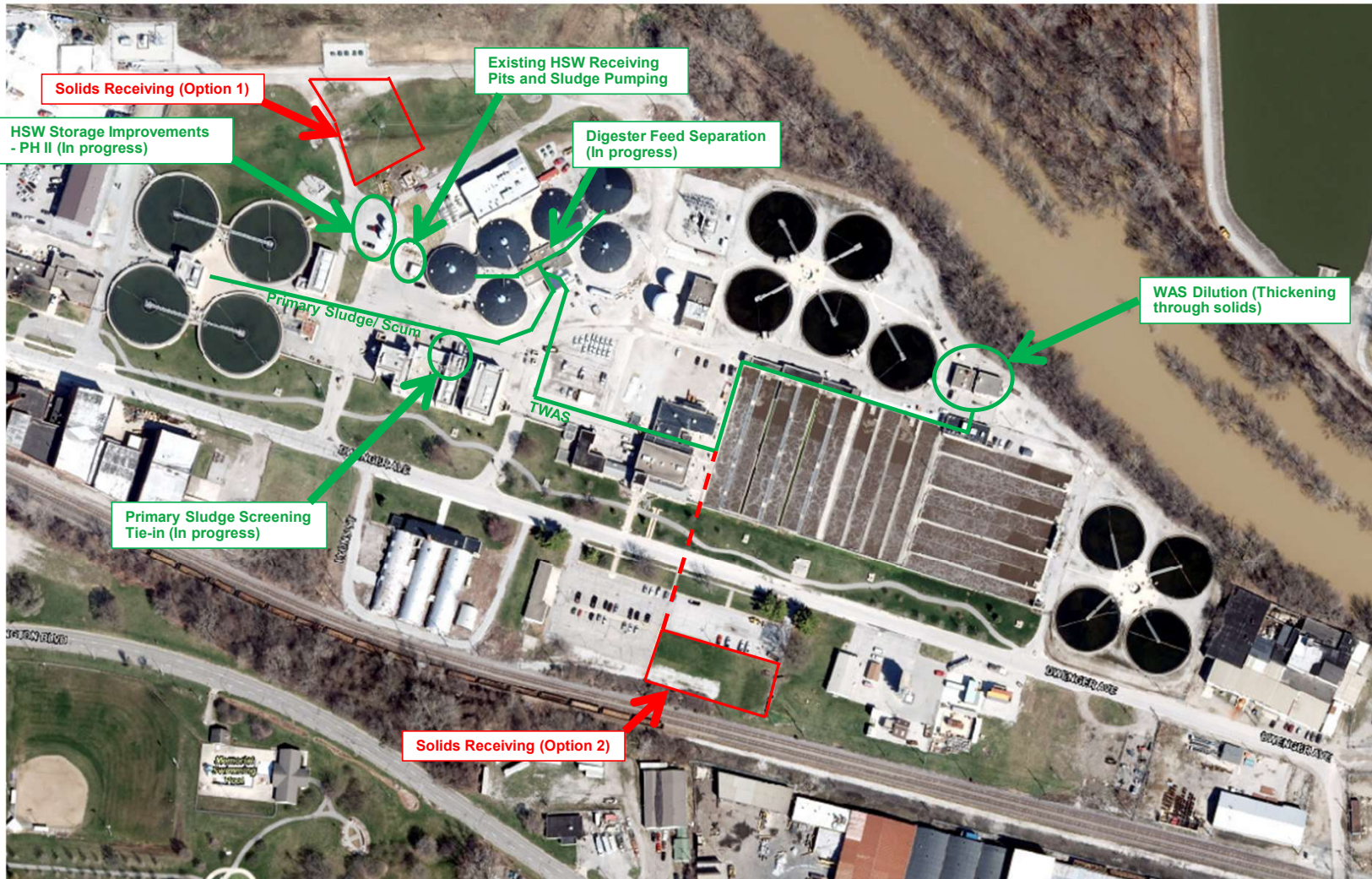


Objectives

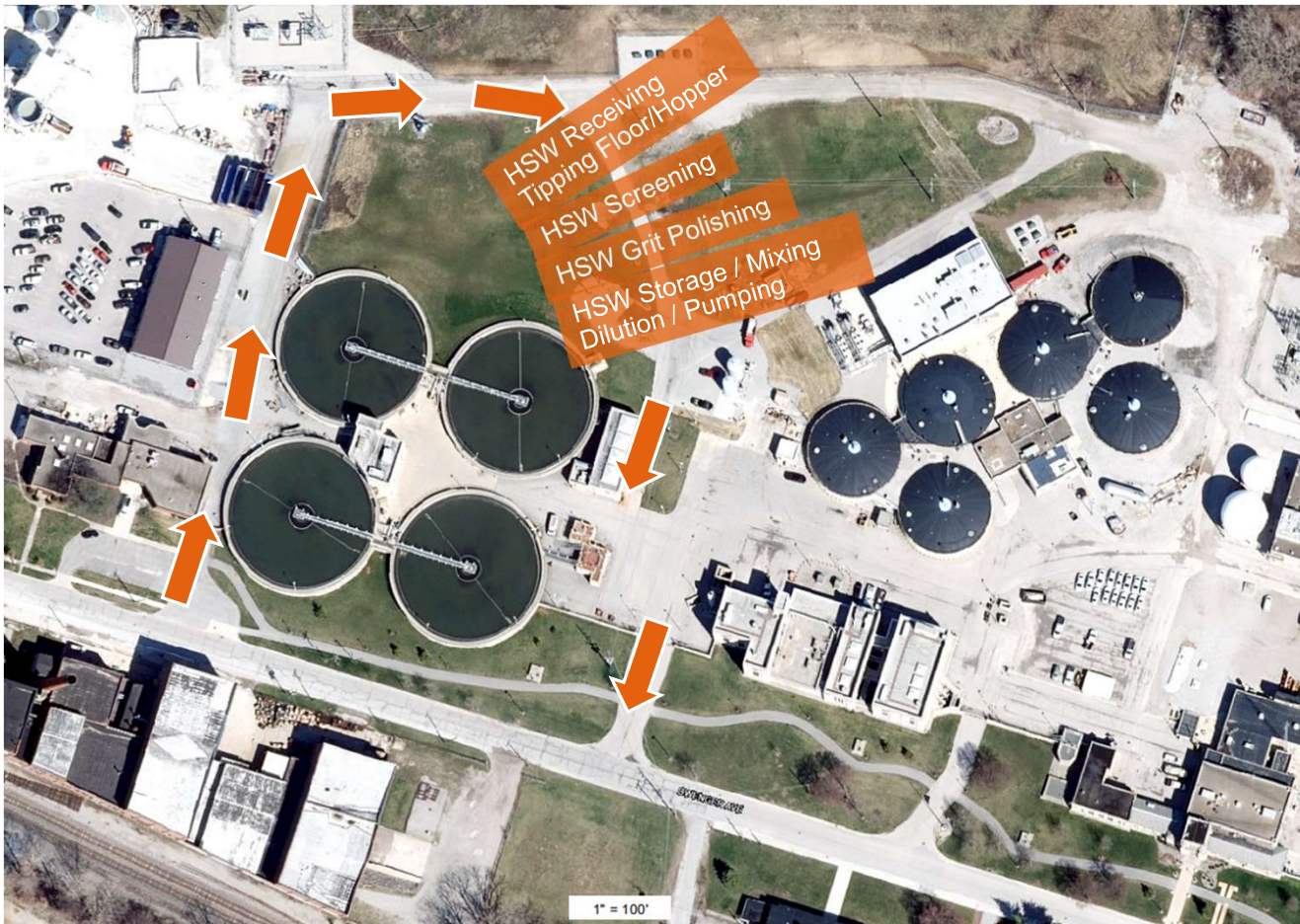
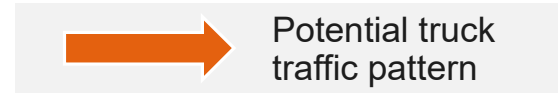
- Accept solid wastes and remove inorganic contaminants effectively.
- Remove packaging and potential digester contamination.
- Homogenize waste into digestible slurry.
- Maximize concentration of slurry while maintaining pumpability.
- Maintain effective odor control and keep slurry fresh.

To digestion

- Depackaging process (Future)
- Odor control (Future, if required)



Site Location Alternative 1



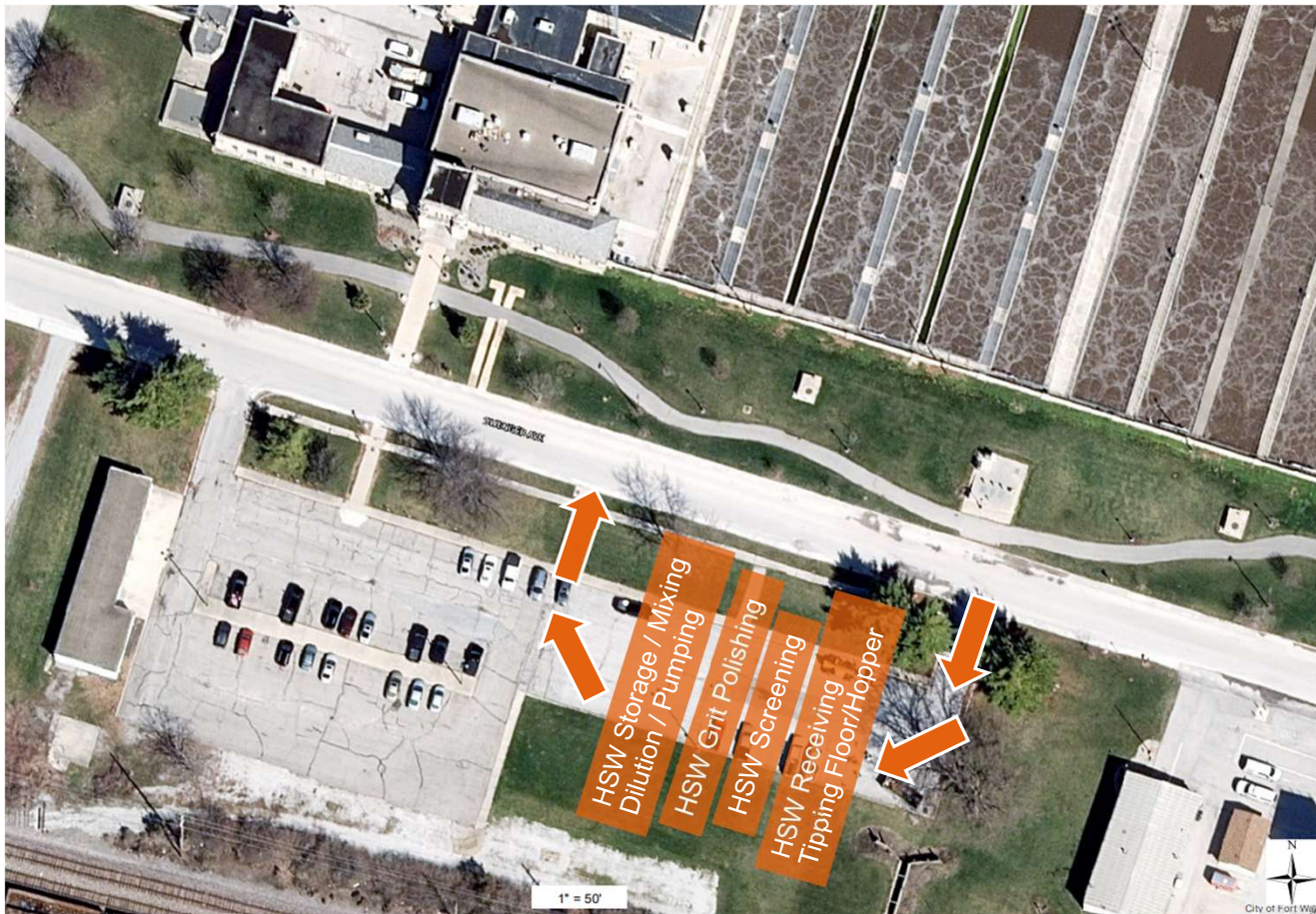
Site Pros:

- Circular driving
- Security / gate access
- Close to WAS forcemain (potential dilution)
- Close to electrical infrastructure
- Close to existing HSW facilities

Site Cons:

- Poor soils
- Underground infrastructure (2) 84" & (1) 30"
- Overhead utility lines
- Near surface drainage
- Coordination with plant staff
- Using available space on plant site

Site Location Alternative 2



Potential truck traffic pattern

Site Pros:

- Circular driving
- Less utility conflicts

Site Cons:

- Poor soils
- No security / gate access
- Far from electrical infrastructure
- Far from current HSW facilities
- No easy source for dilution
- Longer distance to pump
- Challenging routing of forcemain

HSW Site Location Recommendation

Site Location Alternative 1



Space available for trucks to pull through



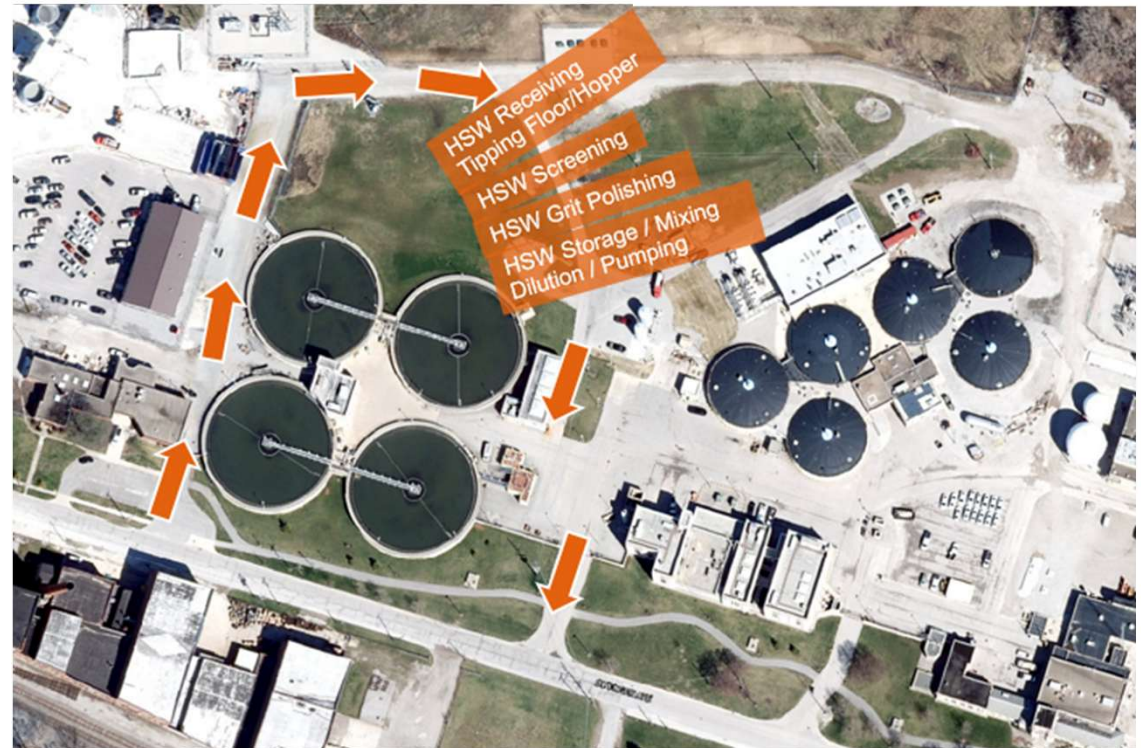
Existing security gate access



Closer to WAS forcemain (potential dilution)



Closer to electrical infrastructure and existing HSW infrastructure



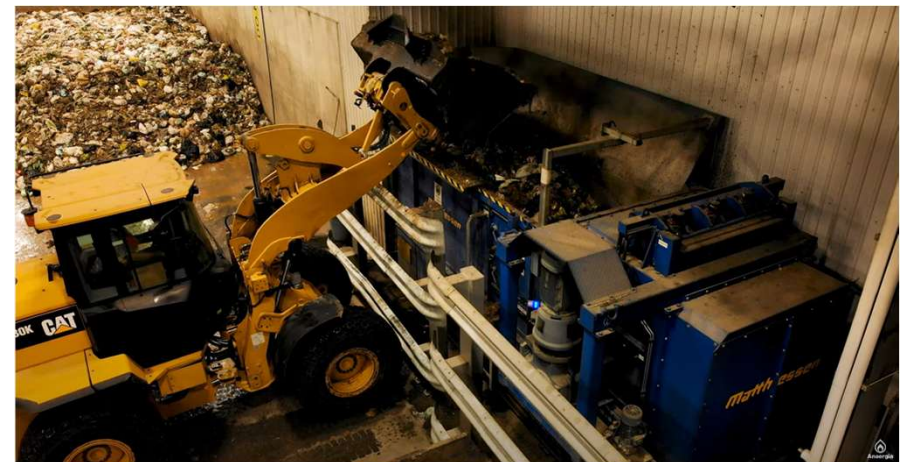
HSW Receiving Station Feedstock

HSW Feedstock Overview

- HSW Feedstock Types and Quantities (daily deliveries of):
 - 100 tons of biosolids (22-25% TS)
 - 60 tons of DAF (18-24% TS)
 - 40 tons of foodwaste (30% TS)
- HSW Feedstock Properties:
 - Biosolids (pH range of 4-8):
 - 150,000 mg/L COD concentration
 - Low contamination level
 - DAF Sludge (pH range of 4-8):
 - 200,000 mg/L COD concentration
 - Low contamination level
 - Foodwaste (pH range of 4-8):
 - 250,000 mg/L COD concentration
 - Up to a contamination level of 5% is expected



HSW Receiving Station

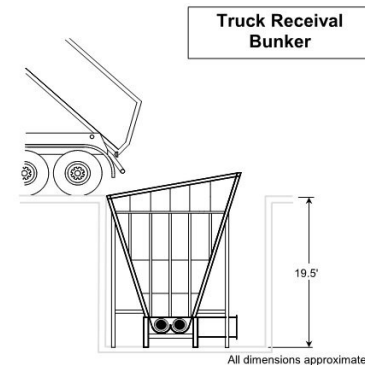
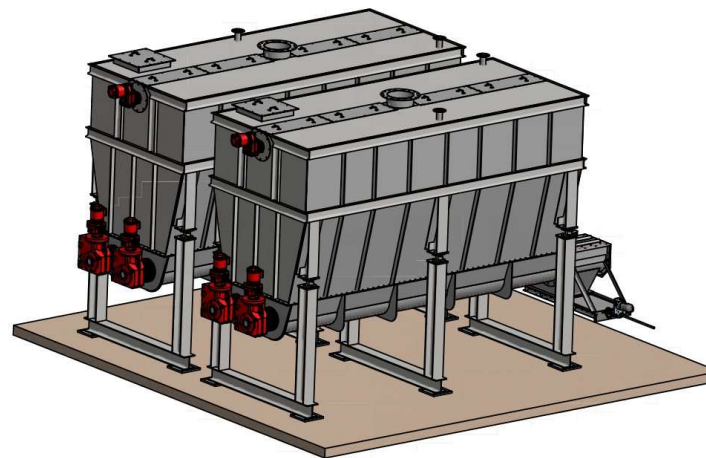


The HSW receiving station (tipping floor / hopper) is where high strength wastes are unloaded and transferred to a hopper. The proposed HSW receiving station will be sized to contain three unloading bays and ample room for front-end loaders or truck directly to transfer into a hopper and for the collection of debris from a future depackaging system that will need to be hauled off for off-site disposal or recycling.

HSW Receiving Station

HSW Feedstock Details

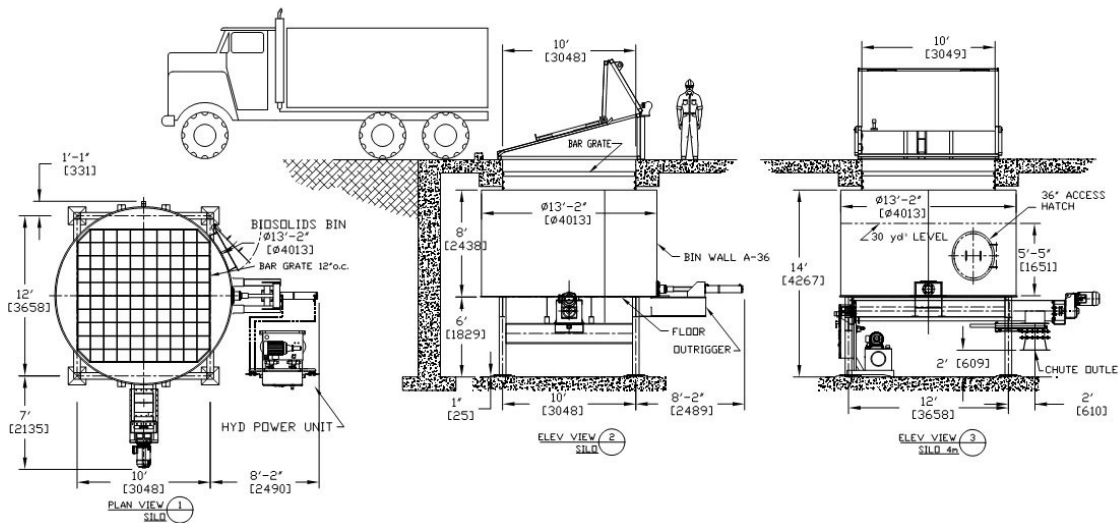
- Biosolids from other plants in the area
 - Undigested and dewatered biosolids material
 - 100 tons of biosolids (15-25% TS) per day



HSW Receiving Station

HSW Feedstock Details

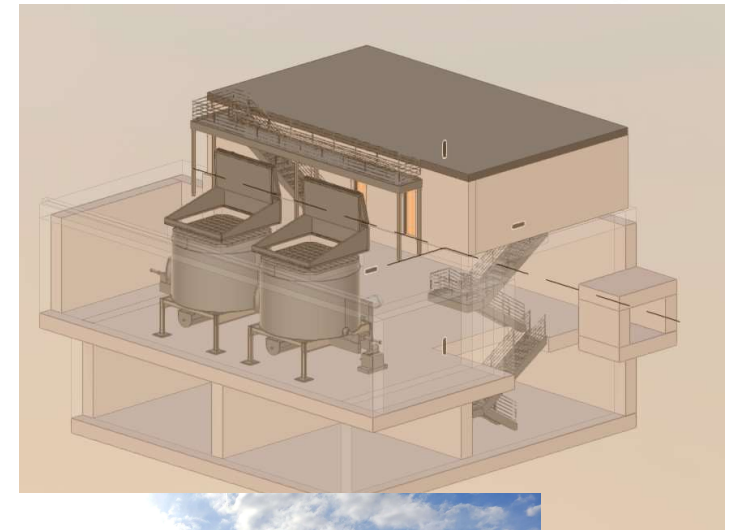
- Dewatered DAF Sludge
 - Sources of DAF are multiple food manufacturers including dairy producing and chicken/meat processing facilities
 - 60 tons of dewatered DAF (15-25% TS)



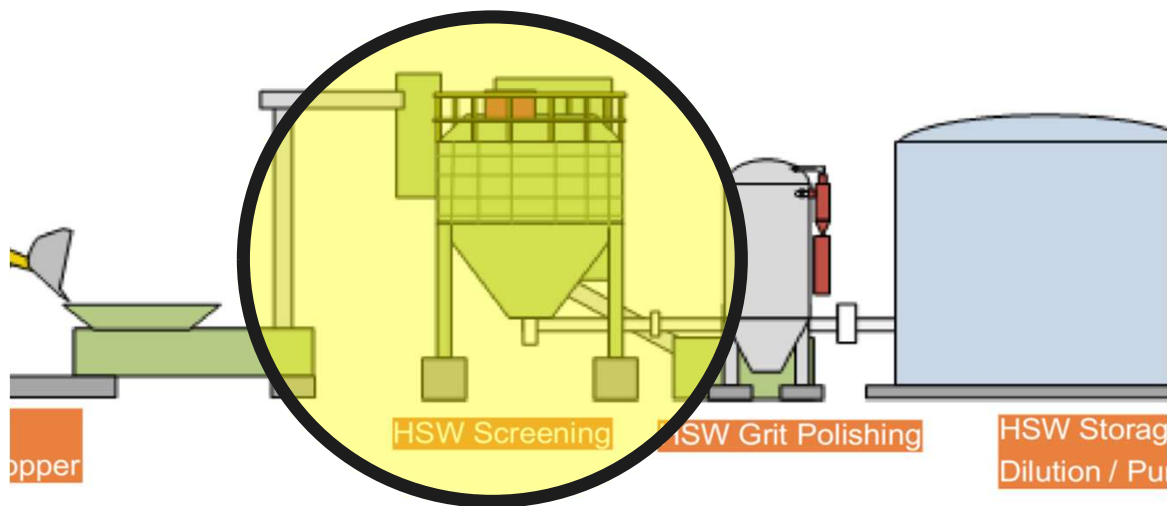
HSW Receiving Station

HSW Receiving Station Design Considerations – Below Grade Vault with removable panels

- Minimize inorganic contamination via traps or slotted screens at the unloading bays (3 truck capacity) based on tipping floor and hopper style setup.
- Designated unloading bays for segregation of high and low-contamination wastes.
- Solid waste may need to be transferred to depackaging system (Phase II), where rejected debris is collected in roll-off containers for off-site disposal or recycling
- Potentially utilize heat tracing in storage tanks and piping to prevent the received HSW from sticking and stratifying.
- External electric resistance heat trace tape installed on piping, storage, and quarantine tanks to reduce accumulation of solids on the interior surface.



HSW Screening



The HSW screening process is where contaminants are removed from the incoming HSW stream and will be largely dependent on the level of remaining contamination, size, and hardness of material required to be removed. Successful implementation of screening requires an understanding of the future depackaging system and polishing system downstream.

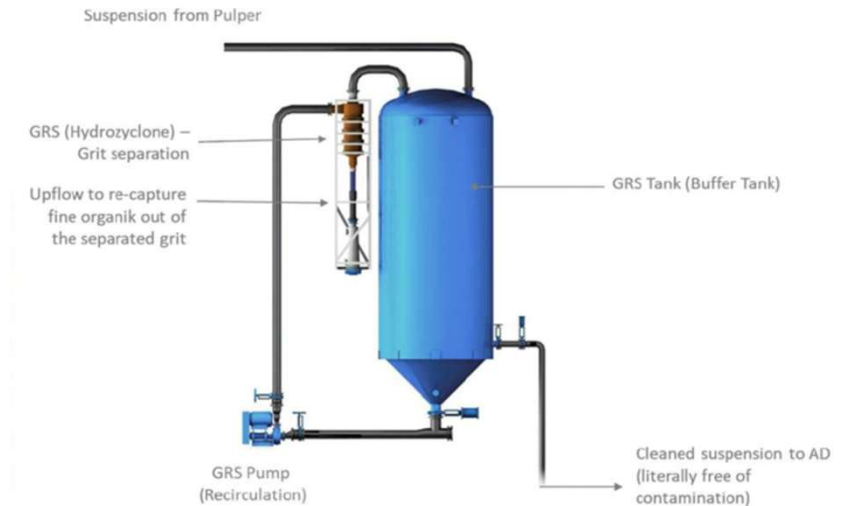
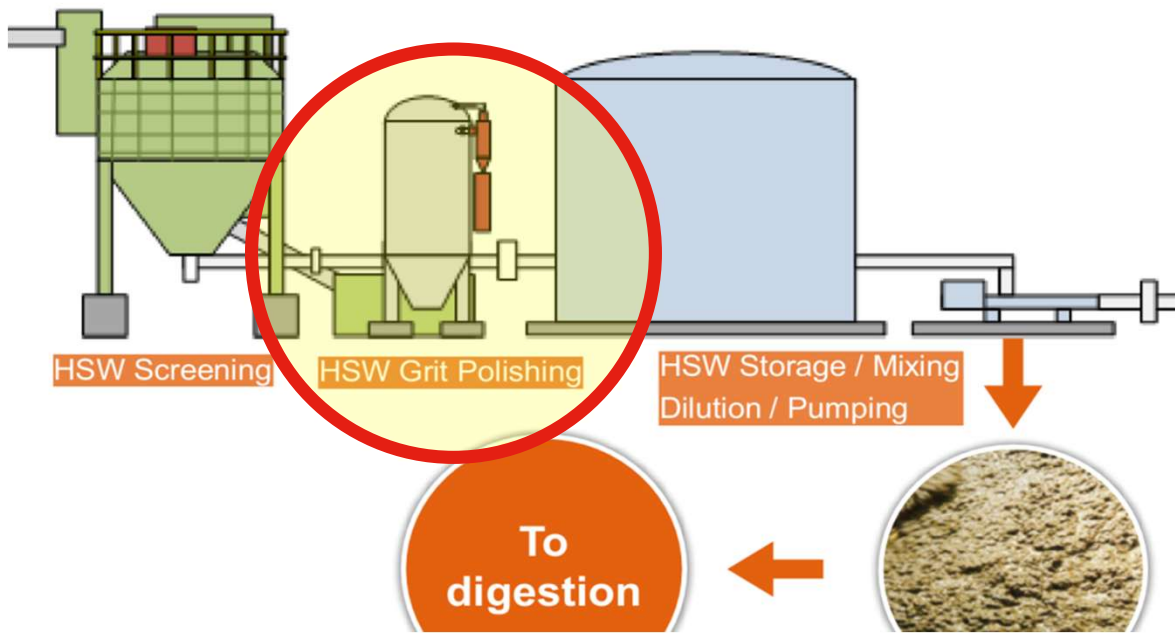
HSW Screening

HSW Screening Design Considerations

- Will be determined by the details and information made available from third party hauler about the HSW characteristics.
- “Clean” streams will need to assess and evaluate remaining contamination, size, and hardness of material to be removed.
- Screening technologies include the following:
 - For Heavy fraction (waste pulper)
 - For Light fraction i.e. shredded plastics (screw press)



HSW Grit Polishing



The HSW grit polishing process seeks to remove smaller inorganic debris such as impurities/grit/sharps and shredded plastic that will damage equipment downstream if left unaddressed. Removal of such debris is typically achieved with a hydrocyclone, grit collection, and cleaning system.

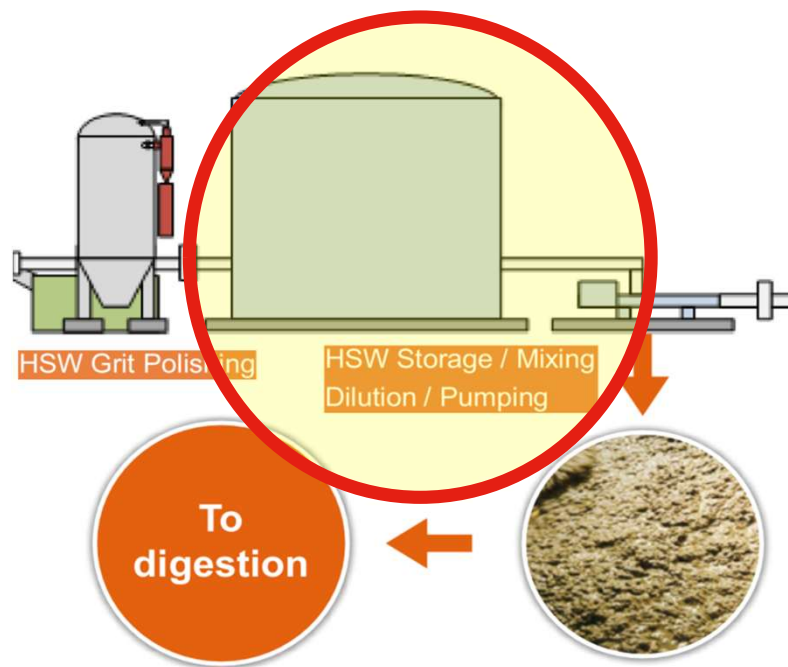
HSW Grit Polishing

HSW Grit Polishing Design Considerations

- Will be determined by the details and information made available from third party hauler about the HSW characteristics – Phase II
- “Clean” streams will need to assess and evaluate remaining contamination, size, and hardness of material to be removed.
- The polishing process is intended to remove impurities/grit/sharps and lighter contamination such as shredded plastics.
- Grit and debris removal technologies include the following:
 - For Grit/sharps (hydrocyclone)



HSW Dilution



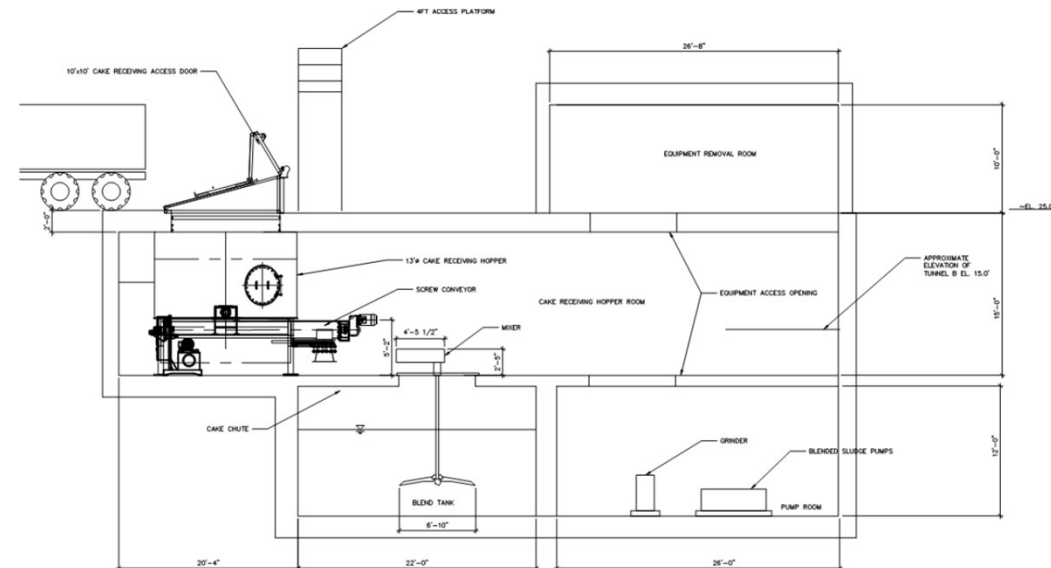
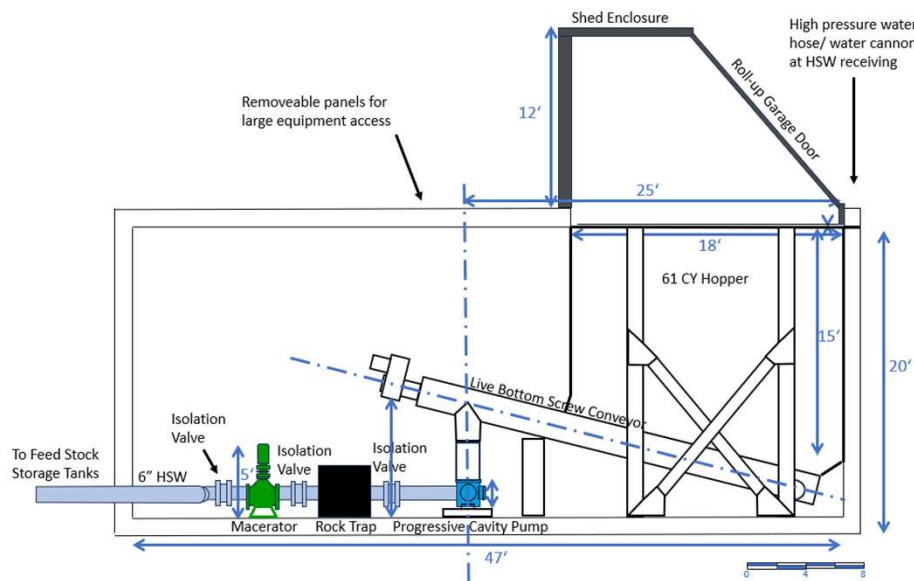
The HSW dilution process typically mixes or blends the incoming HSW stream with an existing plant stream such as waste activated sludge (WAS), primary sludge, primary scum, plant water, or other HSW lower in total solids content to achieve a homogenous mixture suitable for pumping to the digesters.

HSW Dilution

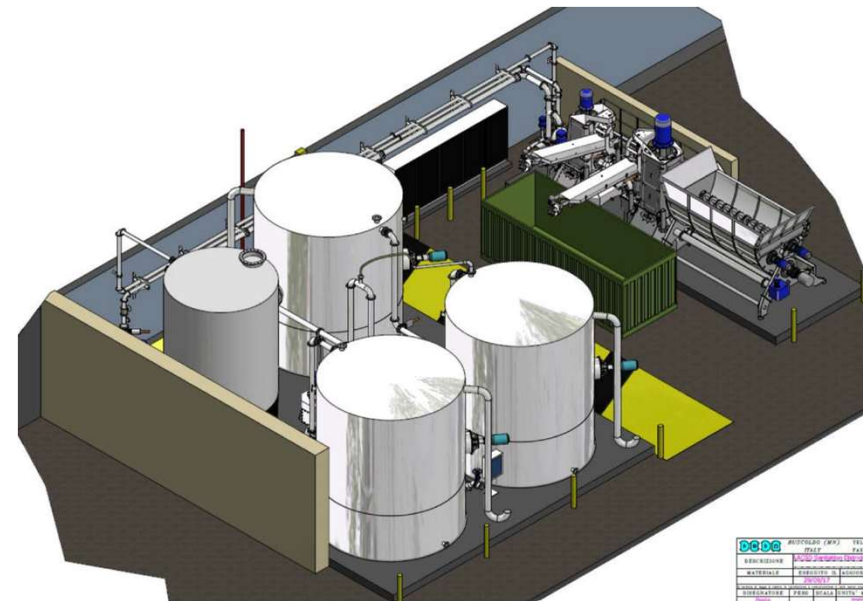
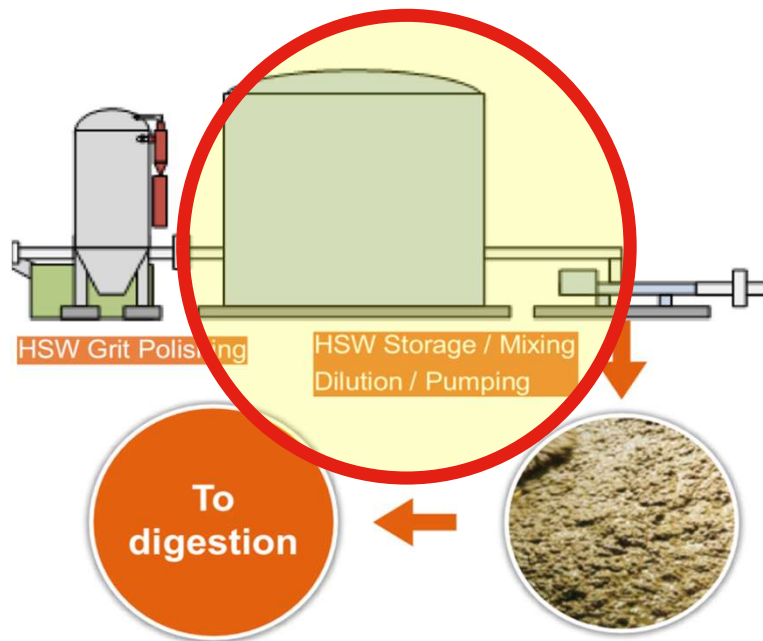


HSW Dilution Design Considerations – Dilution at Hopper

- Evaluation of different existing plant streams for dilution including WAS, primary sludge, primary scum, plant water, and other HSW.
- High BOD loading and low TSS dilution stream is preferable to maximize the biogas potential after dilution.
- Dilution stream temperature is preferred to be relatively around the same temperature as the HSW media to avoid the need for additional heating costs.



HSW Storage



DATE	2025/05/21	PROJECT	WATER TREATMENT PLANT
DESIGNER	ARCADIS	CLIENT	WATER & SEWERAGE BOARD
DRAWN BY	ARCADIS	SCALE	AS SHOWN
CHECKED BY	ARCADIS	STATUS	FOR APPROVAL
APPROVED BY	ARCADIS	DATE	2025/05/21

The HSW storage component of the system is utilized to provide sufficient storage capacity for the screened and polished new HSW stream and acts as a buffer for regulating HSW feed addition to the digester to maximize biogas production.

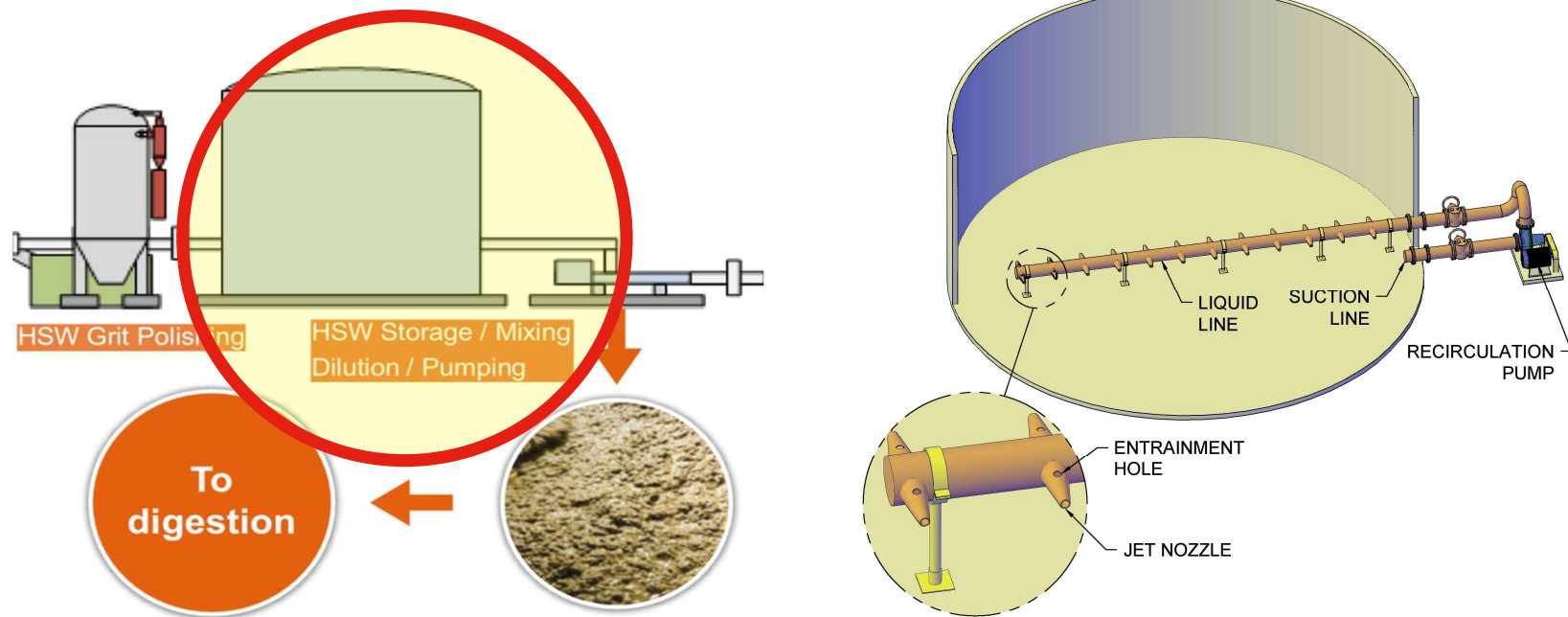
HSW Storage

HSW Storage Design Considerations – Above Grade Tanks

- 3 mixed feedstock tanks with combined volume of 100,000 gallons for storage of combined organic feedstock for 1.5 days of storage at peak receiving capacity
- Variable volume storage tanks will provide hydraulic and load equalization upstream of digesters and able to accommodate sporadic deliveries.
- Design coordination for timing with the storage of HSW and control in the amount of HSW conveyed to the digesters is critical for maximizing biogas production.



HSW Mixing

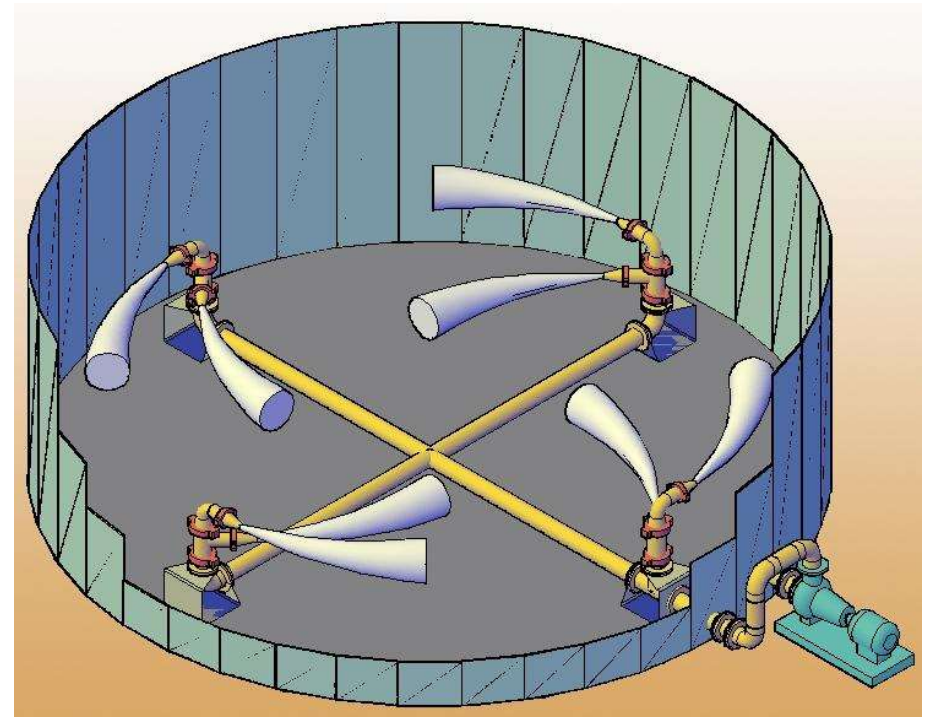


The HSW mixing process occurs within the storage tank where adequate mixing is performed to prevent separation and maintain a homogenous HSW feedstock by constantly incorporating floating material blankets and solids off tank floors and walls.

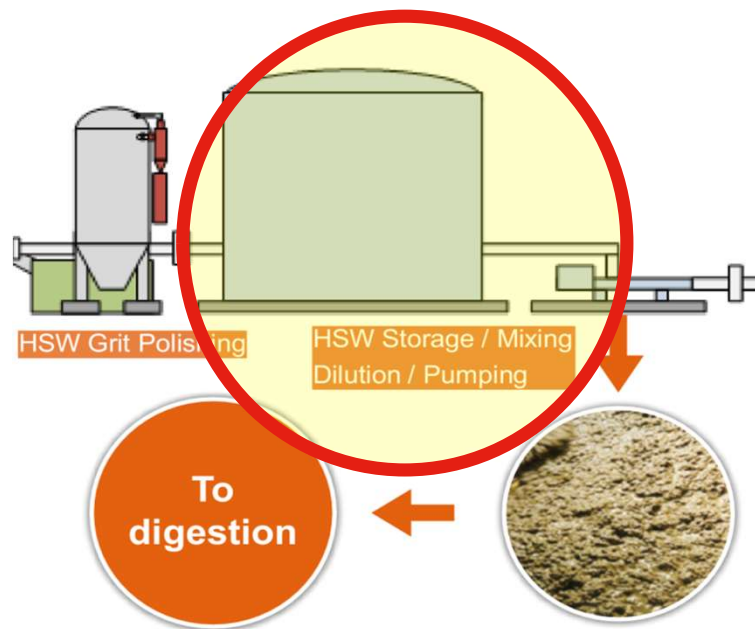
HSW Mixing

HSW Mixing Design Considerations

- Evaluation of different mixing technologies was evaluated including internal paddle mixers, external pump recycling mixing with jet nozzles and air bubble mixing.
- Mixing system with internal nozzles and dedicated external pump were selected for easy access and maintenance without interruption to operations.



HSW Pumping

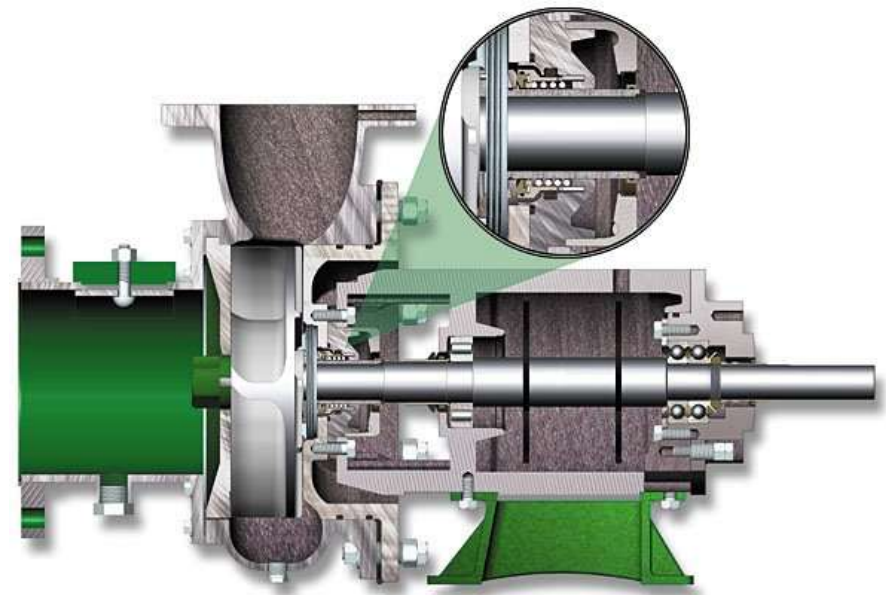


The HSW pumping process moves the high solids HSW stream from the storage tank to the digesters. Heavy duty reliable pumps sized to handle highly abrasive and viscous flow without clogging are critical for smooth operation in this part of the system.

HSW Pumping

HSW Pumping Design Considerations

- Evaluation of pumping technologies considered the HSW content to be pumped
 - Greasy wastes are notorious for clogging
 - Wastes with heavy meat contents will result in highly viscous and abrasive flow that can easily wear down pumps
 - Vegetable wastes particularly high in starchy content will have thick slurry-like flow with fibrous materials from seeds, skin, and pulp that will cause clogging
- Pump technologies are progressive cavity type pumps
- The HSW flow is expected to be fed into the existing primary sludge line downstream of the sludge screening tie-in by the Headworks facility.



Lessons Learned



Key Takeaways



Strict specifications for the HSW material getting delivered allowed the system to be right sized and cost effective for Phase I to receive 160 tons of biosolids.



Placing the HSW system below grade - this went against traditional design thinking to want all equipment within a brick and mortar building. This vault approach allowed a more compact footprint, and significantly reduced costs for both the ancillary equipment and the avoided building costs.

By thinking outside the traditional design mindset, however, it is possible to deliver a highly efficient and effective HSW receiving system that upgrades core infrastructure while also providing positive economics.



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