

Pumping and Filtration Techniques

TRIECA 2012

A stylized map of Canada in shades of blue, serving as a background for the company name and tagline.

Aquatech

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Aquatech specializes in the supply of *pumps, complete pumping systems, dewatering solutions and associated equipment*, for construction, mining, oil & gas and industrial applications.



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Topics of Discussion

- Dewatering & Pumping Methods/Types
- Permitting & BMP's
- Filtration & Treatment Methods
- Monitoring & Compliance



What is Dewatering?

...the removal of water from solid material or soil by wet classification, centrifugation, filtration, or similar solid-liquid separation processes.

Removing or draining water from an aquifer, riverbed, excavation, caisson or mine by pumping. This is often done during the site development phase of a major construction project due to a high water table. Usually involves the use of "dewatering" pumps.

Common Types of Dewatering

- Positive Dewatering (Deep Wells, Wellpoints, Eductors)
- Passive Dewatering (Sump Pumping)
 - Trench excavation
 - Shaft construction
 - Pond dewatering
- Creek / Stream Bypass



Vacuum Eductor Systems



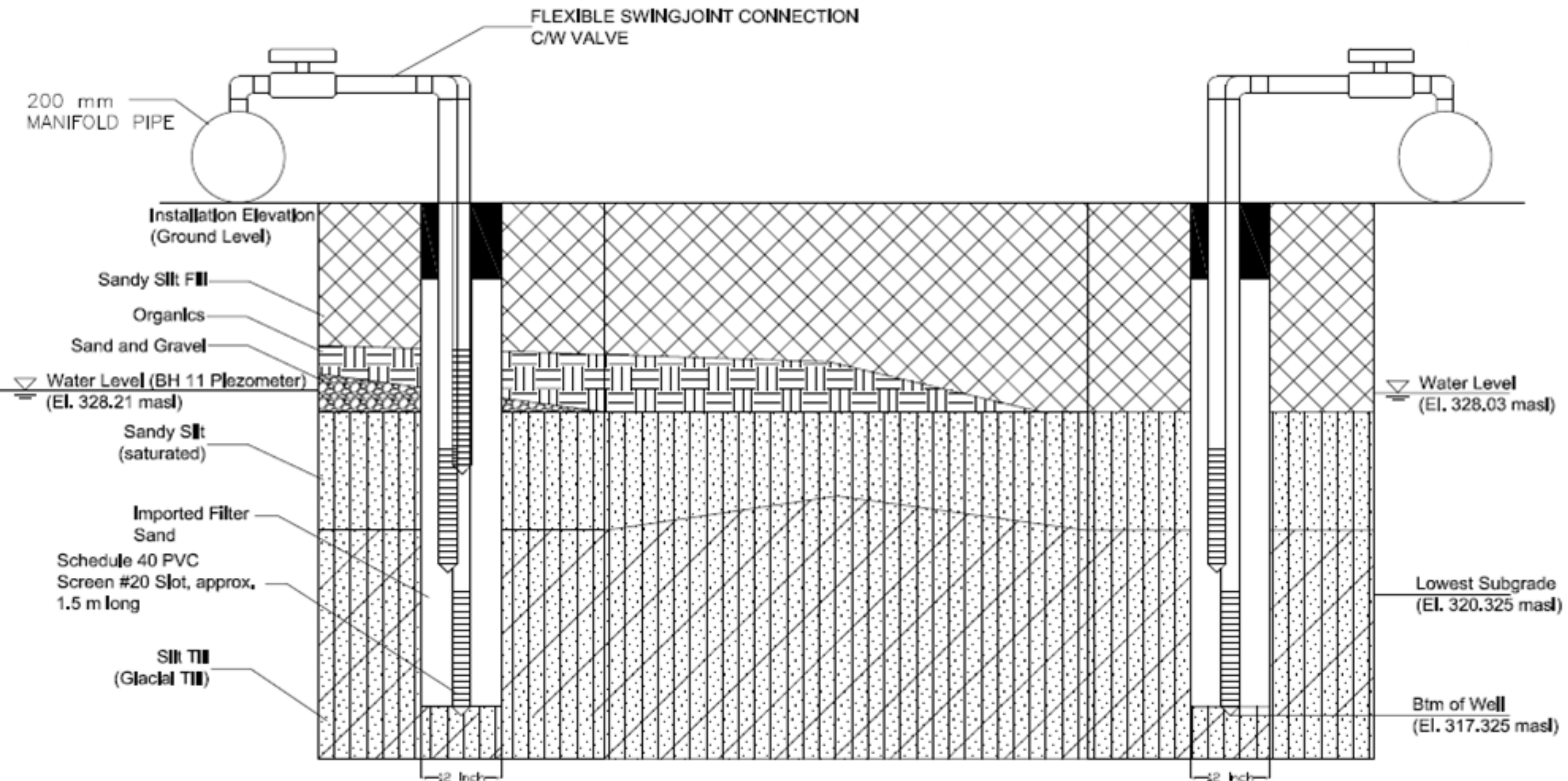
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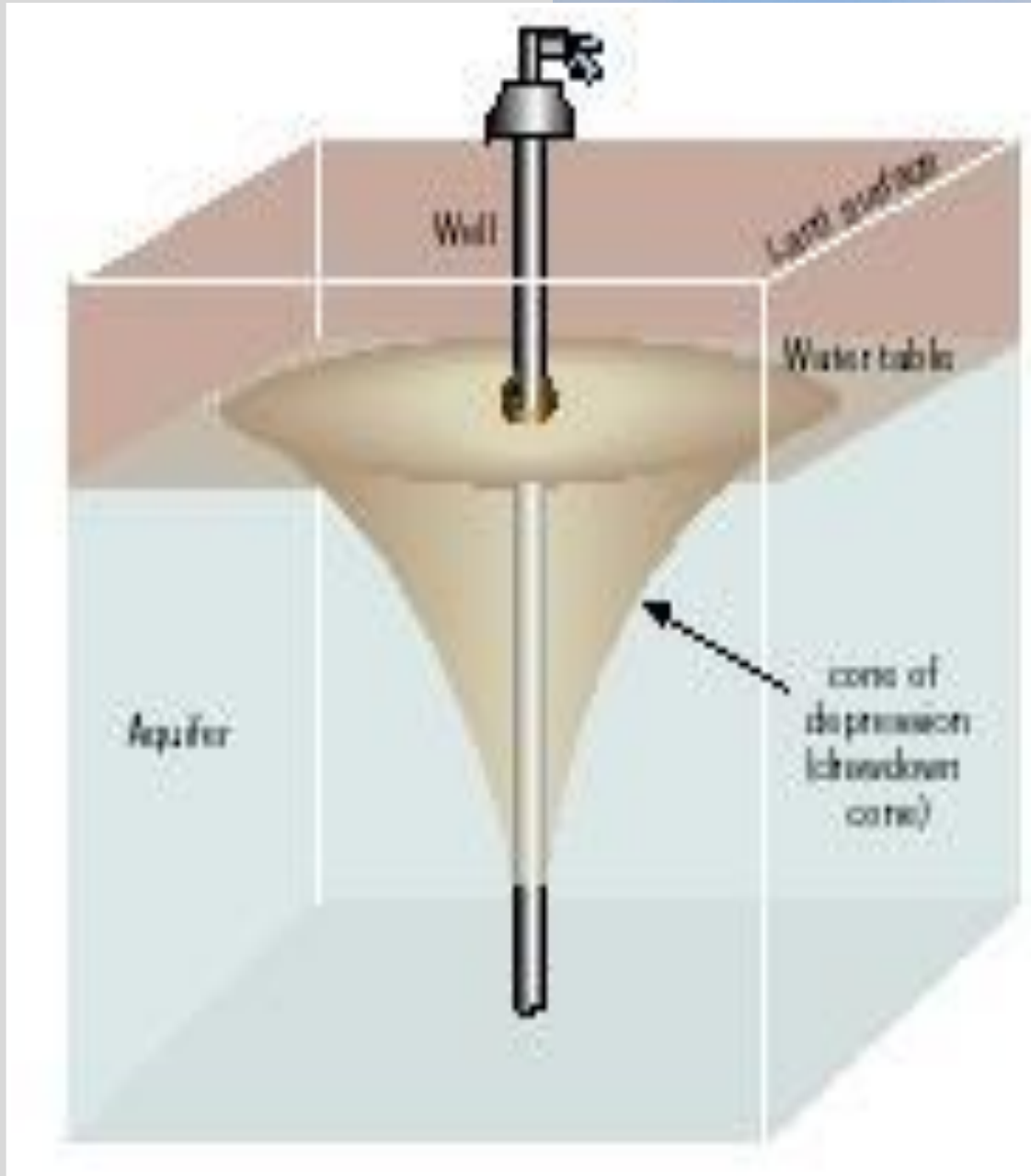
Vacuum Wellpoint System



Dual Sided / Multi-level Vacuum Wellpoint System



Dual Sided / Multi-level Vacuum Wellpoint System



Deep (Gravity) Wells

Passive Dewatering – Sump Pumping

- Low Head < 1.5 metres (overburden)
- Dense soil conditions
- Moderate permeability
- Little fine grained soil
- In conjunction with cut-off method (sheet piles, caissons)
- Utilized in mine/shaft dewatering (bedrock) no head limitations with proper staging
- **Disadvantage – water quality**



Passive Dewatering – Sump Pumping

Pump Selection

- Flow - Must be given to establish **line size**.
- Total Lift (Static Discharge Lift plus Static Suction Lift) - gravity resistance determines **pump strength**. (High Head)
- Distance - Determines if **line size should be increased** to reduce friction loss.
- **Environmental Considerations**
- **Impacts** on Site (ie. Space, noise, etc.)





High volume – Low head – Long Discharge

Discharge location on other
side of hill



High volume – High head – Long Discharge



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Shaft Dewatering – High head – Long Discharge



Creek Bypass

Best Management Practices (BMPs)

Environmentally responsible setups:



← Silt Bags

Larger dual walled →
fuel tanks





Fish
Baskets

River Bypass - Hydroelectric

Floating Suction Assemblies

- Optimal management practice
- Minimizes sediment being pumped
- Higher turbidity levels require more complicated systems (ie: Enviro-Tanks, flocculent treatment)



Are the Required Permits in Place...

Permit to Take Water (PTTW)

- Hydrogeological Report (Q, Ro)
- Impact Assessment (sensitive features, wells, discharge...)
- Monitoring Plan ↔ Mitigation Plan

Discharge Permits & Authorization

- Local Municipality – Discharge to municipal sewer
- Conservation Authority – Discharge to the natural environment
- Section 53, C of A, MNR, DFO...

Most Common Problem in Dewatering/Pumping



Most Common Problem in Dewatering/Pumping



Common Contaminants

- Sediment (TSS, turbidity)
- VOC's, hydrocarbons, plume migration
- Metals – Iron, zinc, manganese...
- PH (concrete work)

Common Sources

- Trench Sump Pumping
- Tunneling Process Water
- Positive Dewatering
- Remediation (pump + treat)

Filtration / Treatment Equipment & Methods

- Carbon and Clay Filters (Pressurized Vessels)
- 5K to 18K Size Enviro-Tanks
- Sand Media Filters
- Oil-Water Separators
- Flocculation Separation
- Gravity Bag Filters
- Micron Canister Filters



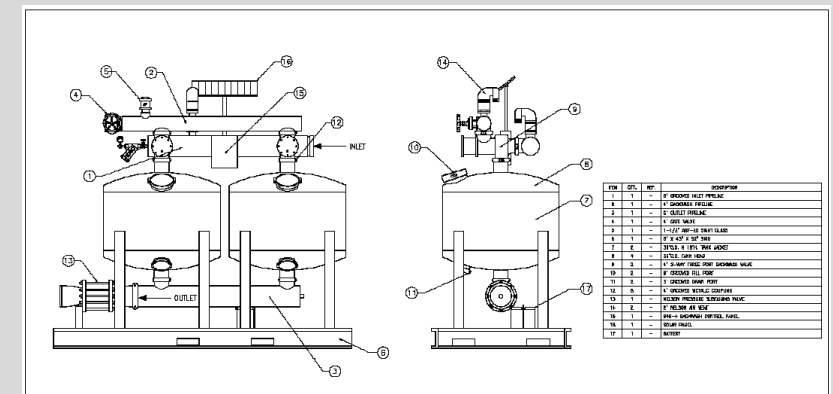
Enviro-Tanks

- Internal weirs separate water and waste (over and under weirs).
- Removes waste, solids (gravel, sand silt) some visible oil grease and hydrocarbons, and some metals (removed with sedi



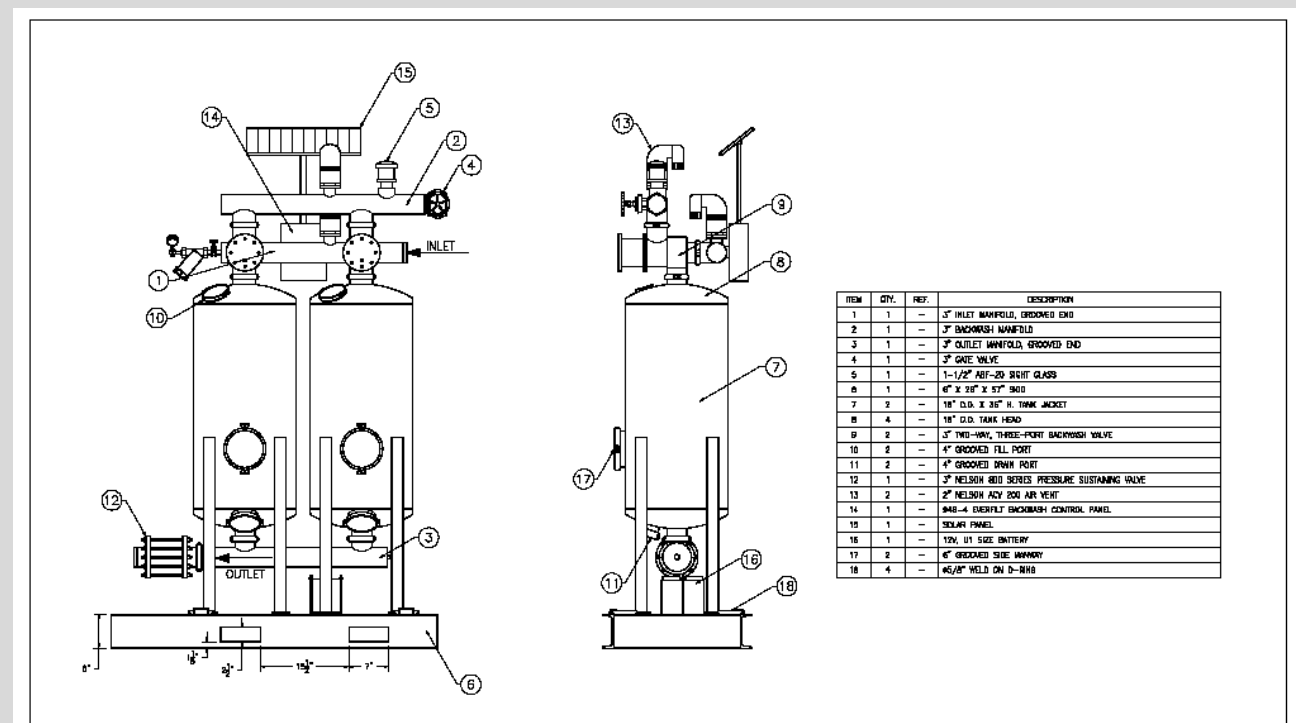
Sand Media Filters, Clay & Carbon Media Filters

- Sand 20 to 50 NTU
- Carbon <10 NTU
- Hydrocarbons, VOC's
- Metals



Canister / Bag Filters

- <10 Micron size , 10 NTU.
- TSS treatment, water polishing.
- Final step in filtration series.
- Pre-filtration for granular activated carbon or clay.



Filtering Capabilities

Enviro-Tank (Weir Tank)

Gravity Bag Filter

Sand Media
Particulate Filter

Pressurized Bag Filter

Cartridge Filter

2 mm
(2,000 microns)

0.05 mm
(50 microns)

0.002 mm
(2 microns)

← Gravel Sand Silt Clay →

Particle Size and Type

Notes: mm - millimeters

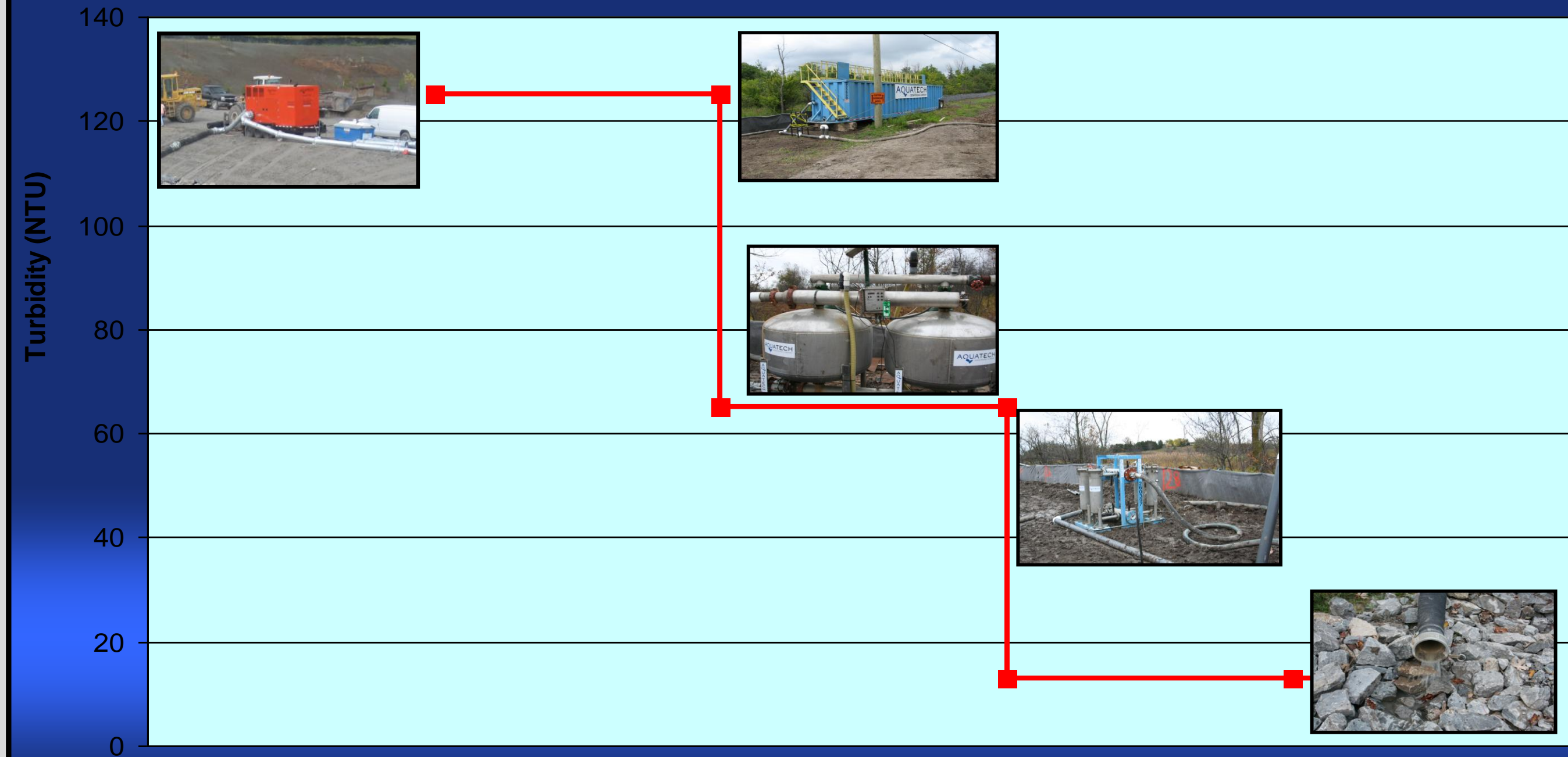
SOIL TEXTURAL
GROUP

PARTICLE SIZE
Microns

Inches

Gravel	>2,000	> .08
Very Coarse Sand	1,000 - 2,000	.04 - .08
Coarse Sand	500 - 1,000	.02 - .04
Medium Sand	250 - 500	.01 - .02
Fine Sand	100 - 250	.004 - .01
Very Fine Sand	50 - 100	.002 - .004
Silt	2 - 50	.00008 - .002
Clay	<2	<.00008

Filtering Equipment Treating Turbid Groundwater



Polymers and Flocculation

- Removal of contaminants via coagulation and flocculation.



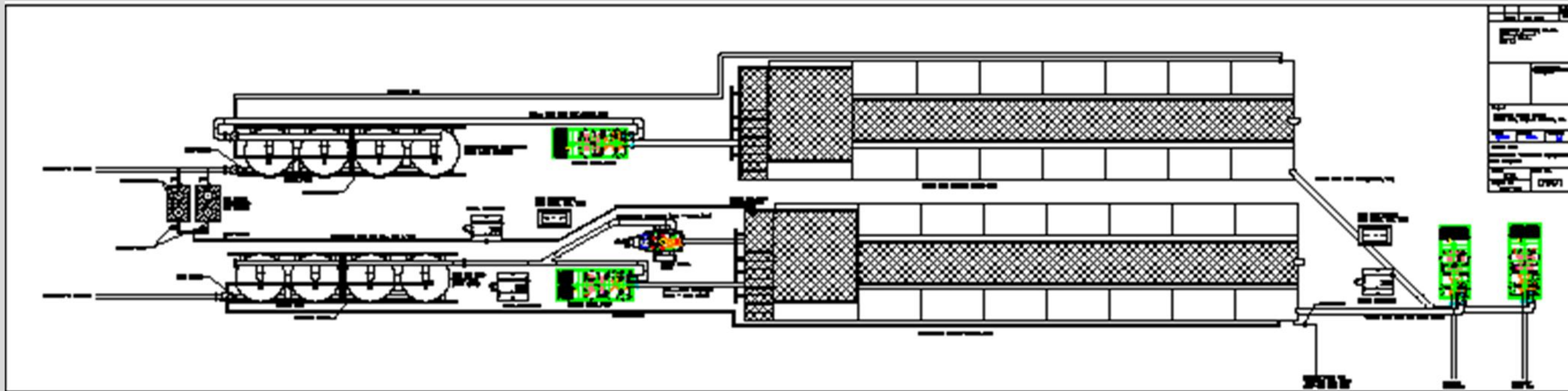
Stormwater Flow Turbidity Treatment (2100 USGPM)



Stormwater Bypass and Filtration System



Stormwater Flow Turbidity Treatment





Clean
Discharge!

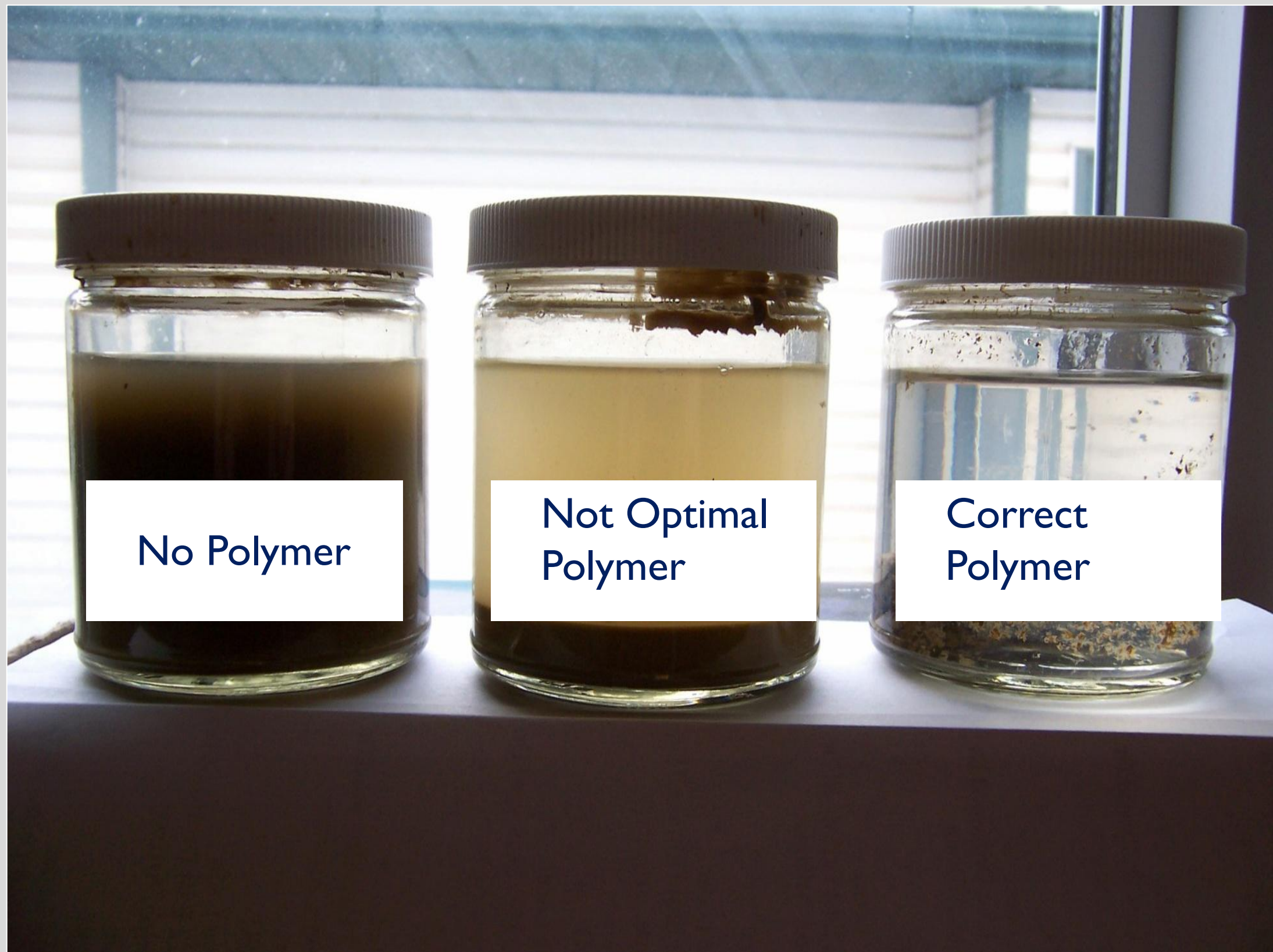


	Sample from Ditch (NTU)	Sample after Enviro-Tank (NTU)	Sample after Sand Media Filtration (NTU)
Test Sample 1 (initial set-up—w/out flocculent, w/micron filtration bags)	321	80	57.8
Test Sample 2 (w/flocculent)	115	41	6.54
Test Sample 3 (w/flocculent)	376	24.97	4.87





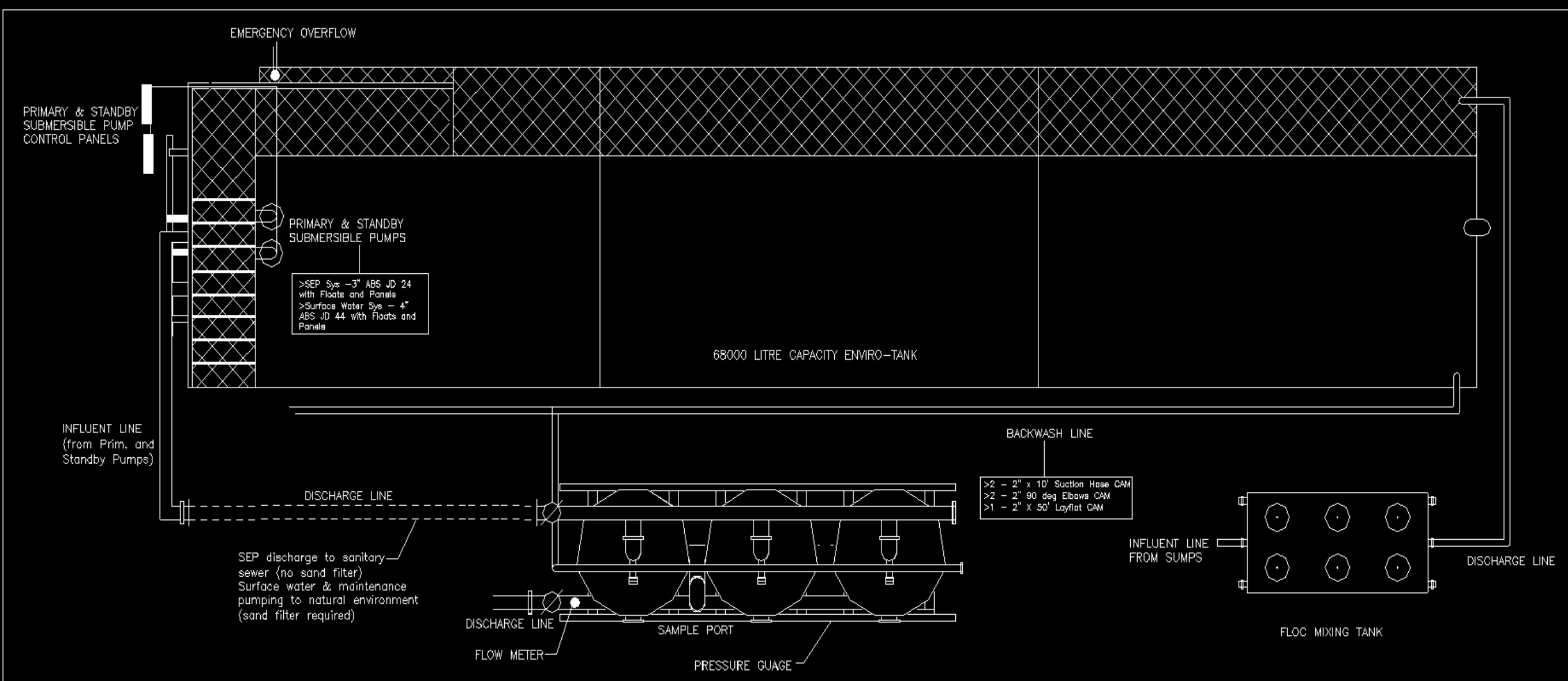




No Polymer

Not Optimal
Polymer

Correct
Polymer



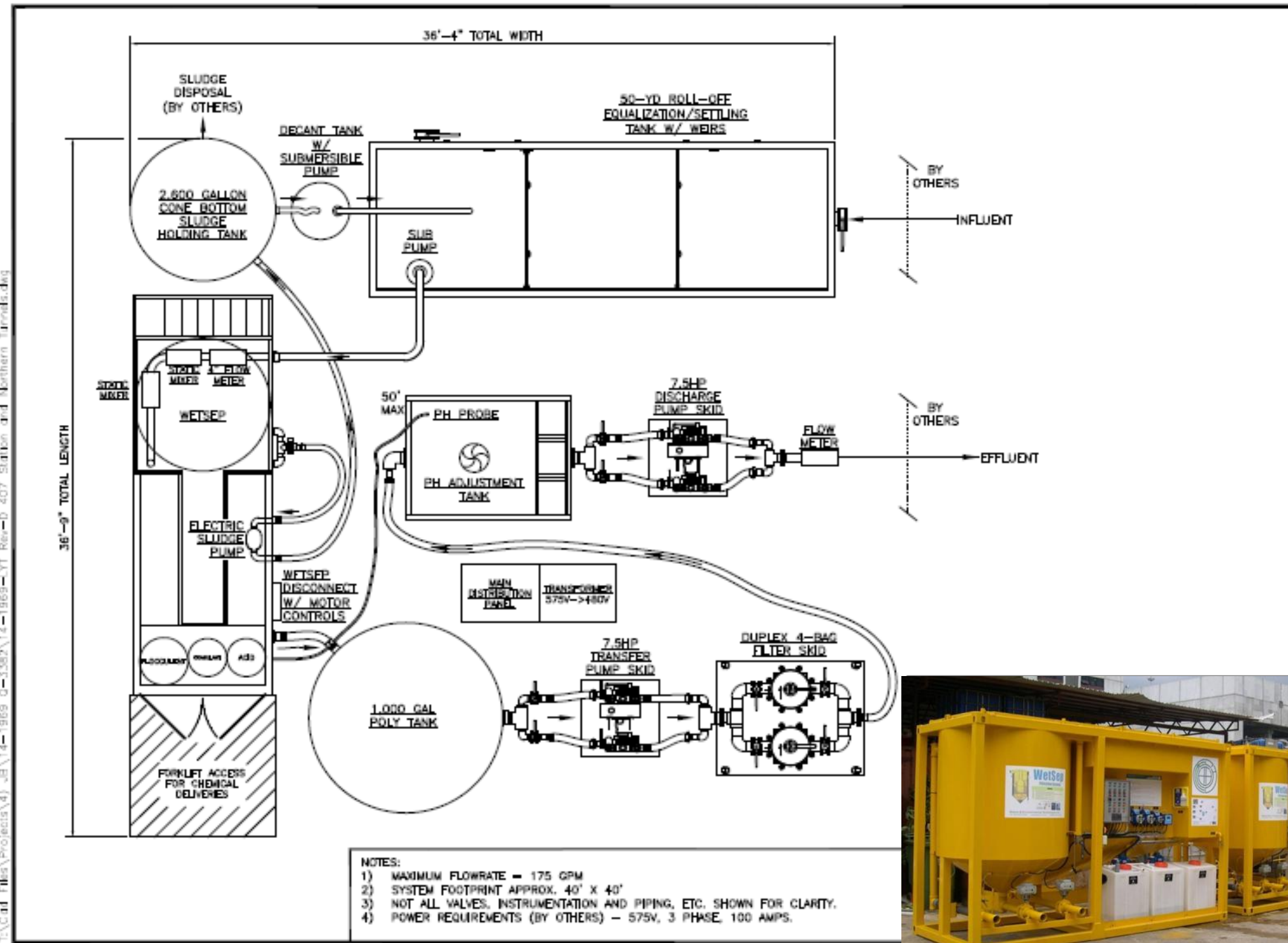


AQUASEP Filter

- Mixing and separation of suspended solids
- Removal of contaminants via coagulation and flocculation
- PH Adjustment
- Accommodate various means of filter media and absorbents



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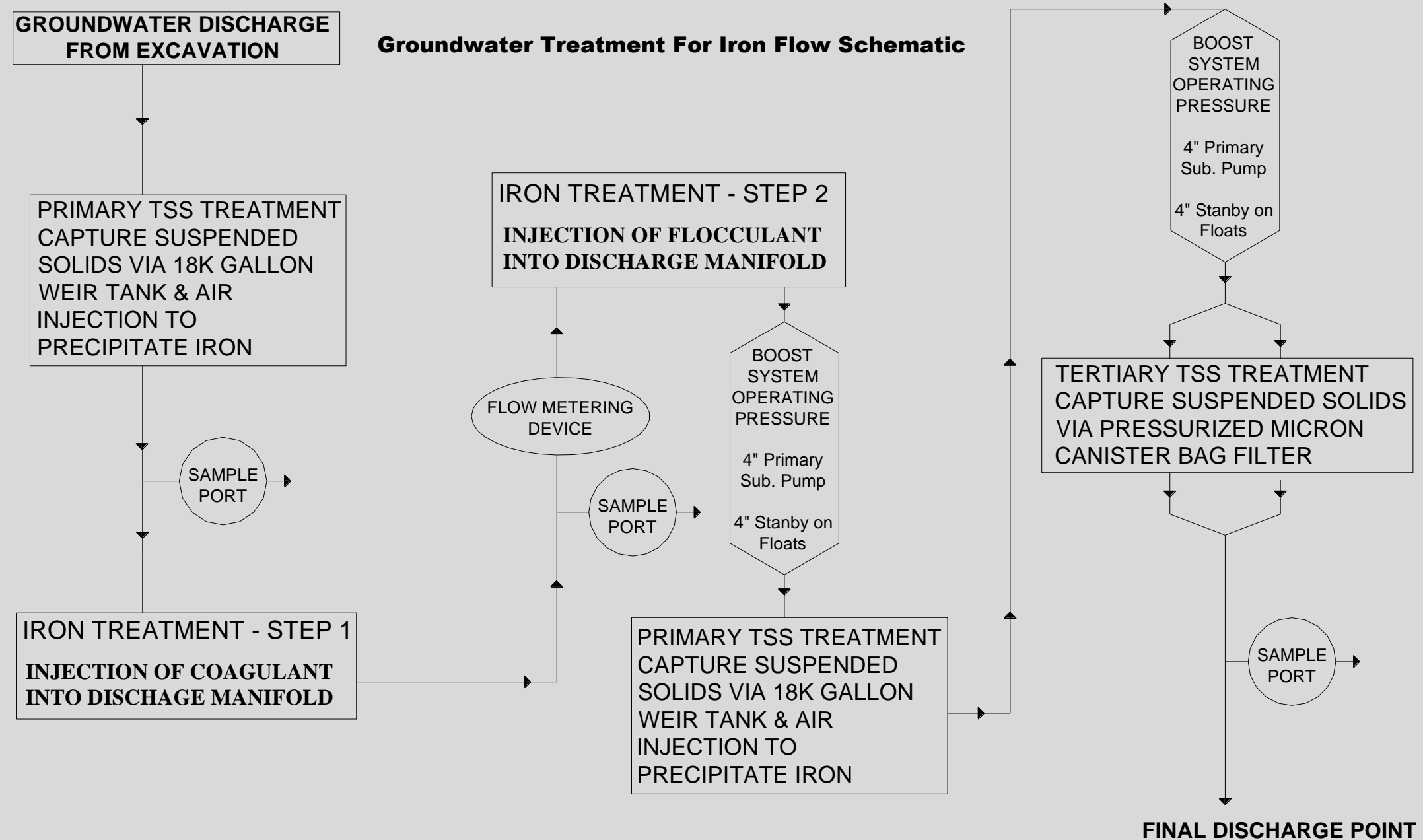
Metal Removal

Pressure Vessels

- Carbon media
- Clay media
- Green sand media



Iron Treatment



Pump and Treat

- Oil water separator
- Micron filters
- Carbon vessels



Monitoring Requirements

Permit to Take Water (PTTW)

- Zone of Influence Wells
- Environmental Monitoring – sensitive features

Discharge Monitoring

- Flow Rate
- Water Quality
- Site vs. Laboratory Sampling

THANK YOU...QUESTIONS?

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