MECHANIC STREET PUMP STATION REPLACEMENT FEASIBILITY STUDY

CITY OF PORTSMOUTH, NH

Department of Public Works
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DRAFT

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AECOM

Table of Contents

1. Executive Summary 6
2. Introduction 9
2.1. Purpose 9
2.2. Scope of Work 9
2.3. Background 10
3. Existing Conditions 12
3.1. Pump Station Overview 12
3.2. Wet Well 13
3.3. Dry Well 14
3.4. Control Room 15
3.5. Heating and Ventilation 15
3.6. Electrical Service 16
3.7. Standby Generator 16
3.8. Site Conditions 17
4. Hydraulic Evaluation 18
4.1. Deer Street Pump Station 18
5. Flood Risk & Resiliency 19
5.1. Background 19
6. Permitting and Archaeology 20
6.1. Permitting 20
6.2. Archaeological 21
7. Pump Station Layouts 22
7.1. Existing Location Layout Options Evaluated 24
7.1.1. Option 1 - Retrofit Screen Building, New Control Building with Submersible Pump Station 25
7.1.1.1. Option 1A – Option 1 With Self Cleaning Wet Wells 25
7.1.1.2. Option 1B – Option 1 With Baffled Wet Wells 26
7.1.2. Option 2 - Retrofit Screen Building, New Control Building & Conventional Wet Wells / Dry Well 26
7.1.3. Option 3 - New Control Building with Integral Pump Station 27
7.1.3.1. Option 3A – Option 3 With Self Cleaning Wet Wells 27
7.1.3.2. Option 3B – Option 3 With Baffled Wet Wells 28
7.1.4. Option 4 – Submersible Pump Station and Separate Above Grade Control Building 28

7.1.4.1. Option 4A – Option 4 With Wet Wells and Dry Well 28
7.1.4.2. Option 4B – Option 4 With Self-Cleaning Wet Wells 29
7.1.4.3. Option 4C – Option 4 With Baffled Wet Wells 30
7.2. Relocation to Peirce Island 31
7.2.1. Horizontal Directional Drill 31
7.2.2. Microtunnel 32
7.2.3. Relocation to Peirce Island Conclusions 34
7.3. Alternate City Area Locations 34
7.3.1. Puddle Dock Restaurant 34
7.3.2. Memorial Bridge 35
7.3.3. Parrott Avenue 35
7.3.4. Alternate City Area Locations Conclusions 36
7.4. Preferred Options 36
7.4.1. Option 1B - Retrofit Screen Building, New Control Building with Submersible Pump Station and Baffled Wet Wells 36
7.4.2. Option 3A - New Control Building with Integral Pump Station with Self Cleaning Wet Wells 37
7.4.3. Option 4C - Submersible Pump Station and Separate Above Grade Control Building with Baffled Wet Wells 37
8. Cost Opinions 38
9. Conclusions 42
9.1. Relocation to Peirce Island 42
9.2. Alternate City Area Locations 43
9.3. Existing Site Location 43
9.4. Recommendations 45

List of Figures

Section Two – Background

2.3.1 Existing Pump Station Location.

Section Three – Existing Conditions

3.2.1 Bar Rack Screen.

3.2.2 Wet Well Influent Slide Gate.

3.3.1 Pump in Dry Well.

3.3.2 Pump in Dry Well.

3.6.1 Pump Station Pole Mounted Transformer.

3.7.1 Pump Station Standby Generator.

3.8.1 Pump Station Exterior Site View.

Section Seven - Pump Station Layouts

7.0.1 Typical Cross Sections of Self-Cleaning Trench Wet Well.

7.0.2 Typical Schematic Isometric View of a Rectangular Baffled Wet Well.

7.1.0 Option 1 **-** Conceptual Retrofit to screening and screening handling.

7.1.1.1 Option 1A - Retrofit Screen Building, New Control Building, Submersible Self-Cleaning Wet Wells.

7.1.1.2 Option 1B – Retrofit Screen Building, New Control Building and Submersible Baffled Wet Wells.

7.1.2 Option 2 - Retrofit Screen Building, New Pump Building with Conventional Wet Wells / Dry Well.

7.1.3.1 Option 3A – New Control Building with Integral Pump Station and Self-Cleaning Wet Wells.

7.1.3.2 Option 3B - New Control Building with Integral Pump Station and Baffled Wet Wells.

7.1.4.1 Option 4A - Submersible Pump Station and Separate Above Grade Control Building with Wet Well and Dry Well.

7.1.4.2 Option 4B – Submersible Pump Station and Separate Above Grade Control Building with Self Cleaning Wet Wells.

7.1.4.3 Option 4C - Submersible Pump Station and Separate Above Grade Control Building with Baffled Wet Wells.

7.2.1A Peirce Island Relocation Horizontal Directional Drilling.

7.2.1B Peirce Island Relocation Horizontal Directional Drilling.

7.2.2 Peirce Island Relocation Microtunnel Plan

7.2.3 Tunnel Boring Machine.

7.3.1 New Pump Station by Puddle Dock Restaurant.

7.3.2 New Pump Station by Memorial Bridge.

7.3.3 New Pump Station in Parrot Ave Parking Lot

Section Seven – Preferred Options Renderings

7.4.1.1A Site Plan Option 1B Retrofit.

7.4.1.1B Perspective View Option 1B Retrofit.

7.4.1.1C Perspective View Option 1B Retrofit.

7.4.1.1D Perspective View Option 1B Retrofit.

7.4.2.2A Site Plan Option 3A New Control & Integral Pump Station building.

7.4.2.2B Perspective View Option 3A New Control & Integral Pump Station building.

7.4.2.2C Perspective View Option 3A New Control & Integral Pump Station building

7.4.2.2D Perspective View Option 3A New Control & Integral Pump Station building

7.4.3.3A Site Plan Option 4C Submersible Pump Station & Control Building.

7.4.3.3B Perspective View Option 4C Submersible Pump Station & Control Building.

7.4.3.3C Perspective View Option 4C Submersible Pump Station & Control Building.

7.4.3.3D Perspective View Option 4C Submersible Pump Station & Control Building.

List of Tables

Table 8.1 AACE International Cost Estimating Classification System.

Table 8.2 Opinion of Probable Construction Cost and Opinion of Probable Project Cost for Mechanic St Pump Station Preferred Options.

Appendices

Appendix A Mechanic Street Pump Station Record Drawings.

Appendix B Deer Street Pump Station Hydraulics Evaluation Technical Memorandum.

Appendix C Mechanic Street Pump Station Flood Risk Assessment Technical Memorandum.

Appendix D Mechanic Street Pump Station Permitting Technical Memorandum.

1. Executive Summary

The existing Mechanic Street pump station is a critical asset to the City of Portsmouth wastewater infrastructure being the terminal pump station that conveys all flows (22 MGD) from the collection system to the Peirce Island Wastewater Treatment Facility (WWTF).

With the pump station's original construction in 1963 this station is over 60 years and now beyond its anticipated useful life. In recent years the pump station has suffered from numerous failures resulting in emergency repairs requiring a significant bypass pumping effort.

This evaluation reviewed a number of options for a new pump station at the existing site location including consideration of alternate locations and the existing Deer Sr pump station all of which are summarized below:

- **Deer Street Pump Station Hydraulic Evaluation** – This option looked at extending the Deer Street pump station forcemain to the WWTF. This included review of the existing pumps which would need to be replaced with larger pumps to accommodate the increased total dynamic head. In addition a jockey pump would also be required for low flows due to the replacement pumps limited turn down ratio. The replacement pumps and jockey pump in the small footprint with limited space would also impact the operation and maintenance.

  In conclusion due to the compact station footprint with limited available space for the larger replacement pumps including the addition of the jockey pump, this option was eliminated from further consideration

- **Alternate City Area Locations** – This option evaluated alternative locations within the City for a new pump station. A review of the collection system in conjunction with determining suitable locations for a new pump station resulted in three potential sites being identified. All three sites were public parking lots owned by the City near the Puddle Dock Restaurant, Memorial Bridge and Parrott Avenue. Construction of a new pump station at one of these locations would mean the loss of the parking lot as a public amenity in addition would also require significant modifications to the collection system resulting in extensive disruption during construction to the local community.

  These modifications would include the relocation of existing combined sewer overflow structures (CSO), new sewers and manholes, new forcemain and abandoning existing sewers and manholes. Also a pump station at the existing Mechanic Street location would still be utilized to pick up flows given this part of

the collection system is at the lowest elevation. Based on the above qualitative assessment this option was not considered further in this evaluation.

- **Relocation to Peirce Island** – This option evaluated the installation of a siphon below the river to convey wastewater to a new pump station located on Peirce Island. Construction of the siphon would use the horizontal directional drilling technique and was determined to be infeasible due to the existing geotechnical subsurface conditions and physical limitations of the HDD equipment.

  An alternative construction method was evaluated using a micro tunneling technique, in which the siphon pipes would be installed within a tunnel driven between two deep vertical shafts using a tunnel boring machine. This was determined to be technically feasible; however, it presents significant engineering and construction challenges with major disruption to the local community. The most notable challenges include site constraints with limited space for shaft construction on the City side, and construction of 25-30 foot diameter shafts extending 40-50 feet into bedrock. Due to these constraints and the magnitude of the estimated conceptual cost (adding $7M to $10M to overall construction costs), the micro tunneling option was not considered further.

- **Existing Site Location** – This option looked at the existing pump station site at 113 Mechanic Street including the building adjacent to the pump station site at 95 Mechanic Street and the adjacent Prescott Park Parcel of land. The existing pump station site has limited available space and is not adequate to accommodate a new pump station that meets current design and operation guidelines.

  The City owns the pump station site and the existing building at 95 Mechanic Street which is currently uninhabitable and could be demolished to provide additional space as well as improving the visual impact for residents. Also the Prescott Park Parcel of land next to the Prescott Memorial bridge would be utilized to locate the new pump station on the City side of the bridge.

  Four main options were evaluated, some with sub-options that included different wet well configurations (self-cleaning, baffled or conventional wet well / dry well). Of these options three were identified as preferred options:

  - Option 1B – Retrofit Screen, New Control Building with Submersible Pumps with Baffled Wet Wells. Project cost estimate $26M to $49M.
  - Option 3A - New Control Building with Integral Pump Station with Self-Cleaning Wet Wells. Project cost estimate $26M to $49M.
  - Option 4C - Submersible Pump Station & Separate Control Building with Baffled Wet Wells (or self-cleaning TBD). Project cost estimate $23M to $43M.

In discussions with the City it is recommended that Option 4C is pursued and the City move to the next stage to undertake preliminary engineering.

2. Introduction

2.1. Purpose

The Mechanic Street Pump Station is owned and operated by the City of Portsmouth. The existing station has exceeded its lifespan since its original construction in 1963 and has suffered critical failures in recent years. The purpose of the feasibility study is to determine and evaluate the available options that include modifications to the existing pump station, construction of a new pump station or a combination of both. The evaluation includes consideration of alternate locations, facility sizing, regulatory requirements, environmental impacts and local community benefits.

2.2. Scope of Work

The feasibility study includes the following key tasks to evaluate location, design, permitting, and other considerations for pump station improvements. The City will undertake a Public Outreach effort, but the results are not reported herein.

1. Site Identification and Land Use Considerations
    - Identify and evaluate available Parcels for potential pump station siting.
    - Assess potential land use restrictions, zoning implications, and compatibility with adjacent land uses.
2. Preliminary Equipment and Building Requirements
    - Determine equipment types and preliminary sizing.
    - Assess building space requirements to house mechanical, electrical, and control systems.
    - Identify power supply needs and generator capacity requirements.
3. Architectural and Site Layout Alternatives
    - Explore architectural design options for the new pump station building that consider aesthetics, operational needs, and contextual fit.
    - Develop conceptual site layout alternatives for each viable location.
4. Regulatory and Permitting Evaluation
    - Summarize key regulatory considerations related to siting, construction, and operation of the pump station.

- Identify applicable permits required at the local, state, and federal levels.

5. Cost Analysis and Funding Opportunities
    - Provide planning-level cost estimates for each alternative site and layout option.
    - Identify potential funding sources, including State Revolving Fund (SRF) programs, federal grants, or other financing mechanisms.
6. Stakeholder Coordination and Community Outreach
    - Outline a strategy for community engagement, including potential meetings or informational materials.
    - Identify opportunities for coordination with the Prescott Park Master Plan to ensure project compatibility with broader public space objectives.
7. Visualization and Conceptual Evaluation
    - Prepare pump station renderings or conceptual graphics for preferred layout alternatives to support decision-making and public communication.

2.3. Background

The City of Portsmouth owns and operates the Mechanic Street Pump Station, a critical facility within the City's wastewater collection system. The existing pump station is the terminal pump station that conveys all flows (22 MGD) from the collection system to the WWTF. The existing site is located in the south-end of the City's historic district at 113 Mechanic Street close to Prescott Park (refer to ***Figure 2.3.1*** below).

Originally constructed in 1963, the station has undergone several major upgrades to improve reliability and performance. These include a building renovation and pump replacement in 1991, a screenings removal system and submersible bypass pump upgrade in 2000, this also included upgrades to the pump station HVAC, and electrical and odor control system improvements in 2008.

The pump station upgrades transformed this station from an 7 MGD station in 1963 to 22 MGD station in the 1990 upgrade. This resulted in a station that was not consistent with typical design practices (e.g. wet well size).

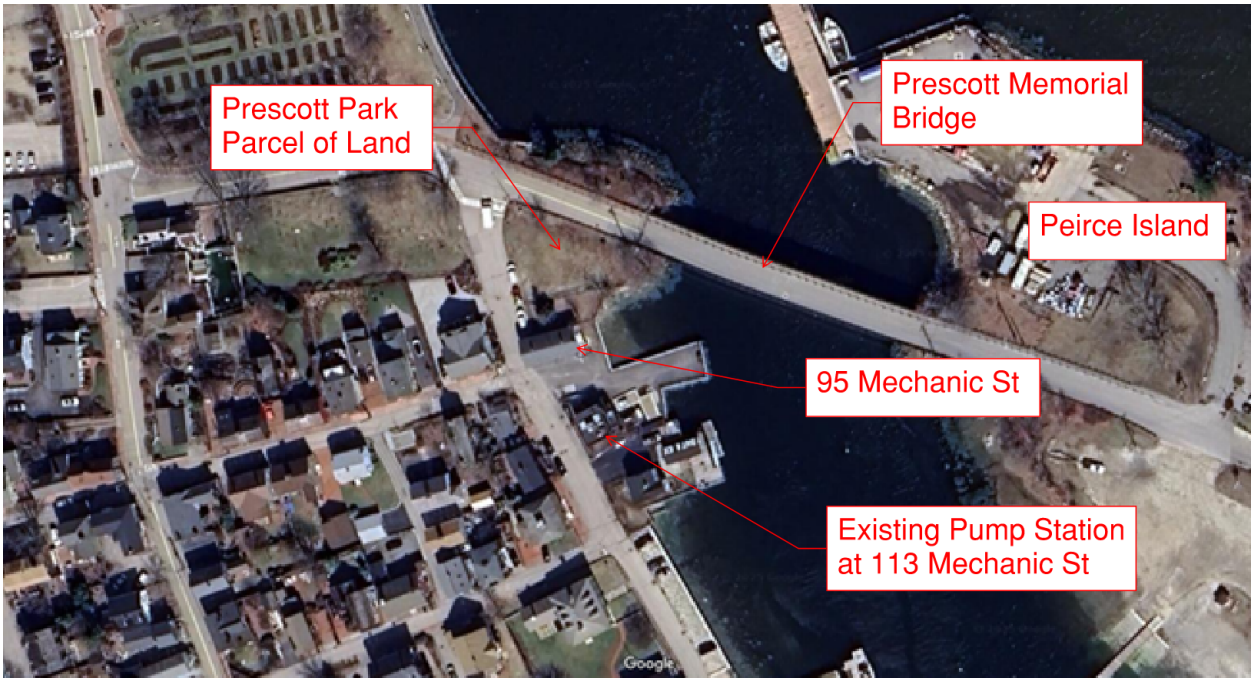


Figure 2.3.1: Existing Pump Station Location

The existing force main is a single 30-inch DI pipe from the pump station until just before the bridge where it splits into dual force mains that continue to the WWTF. The force main across the south side of the bridge has a 16-inch DI pipe that was replaced in 2016. On the north side of the bridge there is a 24-inch DI pipe that was slip lined with 20-inch fusible PVC in 2020. Immediately after the bridge the dual force mains transition to dual 24-inch HDPE pipe all the way to the WWTF and was upgraded in 2022.

In 2019, the City completed a Pump Station Master Plan Report, which assessed the condition and functionality of the existing equipment. The report concluded that many of the pump station's major components were either approaching or had reached the end of their anticipated useful lives, necessitating reinvestment to ensure continued reliable operation.

To address these findings, a Conceptual Design Report was prepared in 2021. The report outlined recommended improvements aimed at extending the service life of the facility through 2030. These improvements focused on replacement of high-priority equipment items within a defined capital budget of $2 million. The intention was to mitigate near-term risks and maintain operational continuity without undertaking a near term more costly full station replacement.

However, as project development progressed, the City experienced significant equipment failures, which prompted a reassessment of the original assumptions and design

approach. In response, the City conducted a risk management and design options charette to systematically evaluate failure modes and develop mitigation strategies. The analysis concluded that targeted equipment replacements alone would not sufficiently reduce risk or address core operational challenges, and that achieving the City's performance goals would require a broader project scope and increased investment.

3. Existing Conditions

The existing pump station (22 MGD) site is located at 113 Mechanic Street on the shoreline of the Piscataqua River. In addition to the City owning the pump station site they also own the building adjacent at 95 Mechanic St including the Prescott Park Parcel of land located between 95 Mechanic St and the Prescott Memorial Bridge. The existing pump station building has a small footprint and the overall site has limited available space.

3.1. Pump Station Overview

The existing pump station consists of a reinforced concrete structure below grade that includes the wet well and dry well with the building located over the top which has an exterior brick facade and interior CMU wall construction with a flat roof. The overall footprint of the building measures approximately 30 feet x 25 feet and is approximately 24 feet deep below finished grade elevation.

The building is partitioned into two areas the wet well and dry well with access to each area through double doors located to the rear of the building. The wet well has an upper screen room with vertical screen and wash press equipment. The lower screen room can be accessed via stairs leading down to the inlet channel and vertical screen with the wet well located below. The dry well includes the control room with the pump control panel and electrical switch gear. A set of stairs leads down to a mezzanine with a second set of stairs leading down to the pump room with the two dry pit submersible centrifugal pumps and motors. The pump room and mezzanine area also include the DI pipe, valves and flow meter. See ***Appendix A*** for the existing Mechanic St. Pump Station record drawings.

The pump station site also includes a standby generator and activated carbon odor control system located to the rear of the building with HVAC equipment located on the roof of the building.

The pump station was originally designed as a triplex station and was converted to a duplex station with a separate bypass pump. The pump station is currently equipped with two 450 horsepower (HP) Davis-EMU dry pit submersible pumps, installed in 1991. Each pump is rated for peak capacity of 22 million gallons per day (MGD), or 15,300 gallons per minute (gpm). The pumps operate in a lead/standby configuration. Operation is

controlled via variable frequency drives (VFDs), with pump speed modulated in response to wet well level.

The station has experienced several pump failures in recent years that required emergency repair:

- Pump No. 1 developed a hole in the volute casing, requiring emergency installation of a temporary patch.
- Pump No. 2 suffered a motor failure that required rewinding, as well as a suction pipe failure that necessitated emergency coupling repairs in the dry well.
- The operators have reported issues with the pumps cavitating.
- The pump variable frequency drives (VFD) have also suffered from failures.
- Significant bypass pumping effort was required to allow operators to undertake the repairs to the existing pumps.
- Submersible bypass pump replaced in 2021.

3.2. Wet Well

Flow enters the lower level of the wet well via a 36-inch incoming sewer which discharges to a single open channel that is covered with steel plate flooring. Within this channel there is a hydraulically powered, vertical climber-style mechanical bar screen, (see ***Figure 3.2.1***) and a 36-inch motor-actuated influent slide gate (see ***Figure 3.2.2***).



Figure 3.2.1: View looking down at Mechanical Bar Screen



Figure 3.2.2: Wet Well Influent Slide Gate

After the screen flows discharge through rectangular openings to the wet wells located below. The wet well is partitioned into two chambers by a manual slide gate, which remains open and the City staff has reported this is inoperable. Access to the wet wells is limited and problematic for operators to maintain. The single open channel and screen are regularly overwhelmed and become submerged during high flows with bypass flows discharging unscreened.

In the upper level of the wet well side is the dual-stage wash press for cleaning and compacting screenings, which discharge into a plastic lined garbage container and disposed of by hand.

The wet well shows signs of age-related deterioration, including staining and localized concrete degradation on upper-level floors and walls. Overhead concrete beams also exhibit cracking and spalling.

There is a large submersible bypass pump located in an 8-feet diameter structure that is approximately 15-feet deep located immediately adjacent to the pump station building. The flow from this pump discharges via a 16-inch pipe that connects to the existing 30-inch forcemain. There is a below grade valve vault that measures 6-feet by 17-feet and includes a check valve, plug valve and electromagnetic flow meter. The submersible pump is 143 Hp and rated for a flow of 11.5 MGD (8,000 gpm) and installed as part of the 2000 Screenings Removal Upgrade project. It should also be noted that this single bypass pump is in operation more frequently that the two main dry well pumps.

3.3. Dry Well

The dry well contains the two main pumps, see ***Figure 3.3.1*** and ***Figure 3.3.2,*** with associated piping. The enclosed space in the pump room is cramped and inadequate to allow the City staff to properly perform operation and maintenance duties. For a pump to be removed for service or repair the pumps must be rigged in multiple stages to negotiate the mezzanine level and get the pump out of the building.

The pumps have poor turndown and are not adequate to deal with the range of low and high flows. In addition, the pumps, pipes and valves are beyond their anticipated useful life.



Figure 3.3.1: Pump in Drywell


Figure 3.3.2: Pump in Drywell

3.4. Control Room

The dry well includes the control room containing the electrical systems consisting of the automatic transfer switch (ATS), motor control center (MCC), pump control panel, SCADA equipment, and ventilation ducting that serve the pump station.

The control room is located directly above the dry well with access to the mezzanine and pump room below. It is not good that the electrical equipment is exposed to the lower open area which is a wet hazardous environment. Also, the pumps must be rigged through the control room to be removed for repair or service.

3.5. Heating and Ventilation

The wet well ventilation is provided by a roof-mounted, explosion-proof exhaust fan with weather hood with the exhaust air directed through an activated carbon odor control scrubber located on an elevated platform to the rear of the building. Heating to the interior of the building is provided by an explosion-proof electric unit heater.

The dry well ventilation is provided by a rooftop air handling unit and a ductless split system that provides gas heating, cooling, and ventilation. Air is exhausted from the dry well via a roof-mounted centrifugal upblast fan. The rooftop unit operates only during the day due to noise complaints from residents, leaving the dry well noncompliant with NFPA 820 ventilation requirements at night with City staff expressing concern with safety and adequate ventilation.

Most HVAC equipment was upgraded in 2000, with the ductless split and odor control system added in 2008. While equipment generally appears to be in good condition, its

roof-mounted configuration creates significant maintenance challenges. Safe access requires a complete electrical shutdown due to the proximity of pole-mounted transformers.

3.6. Electrical Service

Electrical service to the pump station is provided by three pole mounted transformers, (see ***Figure 3.6.1***) located directly adjacent to the roof. The proximity of the transformers creates safety issues when performing HVAC maintenance.

The pumps are powered by VFDs installed in 2008. Automatic transfer switches were replaced in 2016, however the remaining electrical infrastructure dates to the 1990 upgrade, now 35 years ago. Also, the VFD failures have been attributed to the exposure to the dry well gasses and poor ventilation.

The City of Portsmouth owns transformers with Eversource as the service provider. Any replacement will require a pad mounted transformer.



Figure 3.6.1: Pump Station Pole Mounted Transformers

3.7. Standby Generator

A standby diesel generator, (refer to ***Figure 3.7.1***) provides emergency power for the pump station. The Cummins 700 kW generator, installed in 1990, is fueled by an above ground diesel storage tank located next to the generator.



Figure 3.7.1: Pump Station Standby Generator

Although it remains functional, given the age of the generator at 35 years it's beyond its expected service life of approximately 25 years. The generator is subject to flooding at its base during certain high tide conditions.

3.8. Site Conditions

The Mechanic St. Pump Station (refer to ***Figure 3.8.1***) is located at 113 Mechanic St and is adjacent to the waterfront, on a back channel of the tidal Piscataqua River. The existing finished floor elevation is approximately 8.7 ft (NAVD 88), which is just above the FEMA flood Zone AE elevation of 8.0 ft (NAVD 88). The site has a history of flooding, and the existing grade surrounding the facility is approximately 7.24 ft (NAVD 88). The area is residential, with a private home to the south and a City-owned vacant house directly to the north.



Figure 3.8.1: Pump Station Exterior Site View

4. Hydraulic Evaluation

The Deer Street Pump Station is the second largest pump station in the City's collection system and discharges wastewater flows to the Mechanic St pump station. The purpose of the hydraulic evaluation is to determine if it's feasible for the Deer St pump station to pump directly to the WWTF.

The Deer St station was designed for a capacity of 12.7 MGD and is restricted to around 10.6 MGD to avoid overflows at its discharge point to the gravity collection system at Marcy Street during wet weather events.

The existing force main splits into two force mains just outside of the station and has parallel force mains that route along Ceres Street and Market Street. The Ceres Street force main leg continues to Bow Street across Daniel Street and State Street to its point of re-connection with the Market Street leg at the Daniel Street and Bow Street intersections. The Market Street leg of the force main routes along Bow Street to Penhallow Street to Daniel Street back to its reconnection with the Ceres Street force main leg at the Daniel Street and Bow Street intersections. The Market Street leg of the force main has air release valves structures on the main near the intersection of Market Street and Hanover Street and the intersection with Penhallow Street and Commercial Alley.

4.1. Deer Street Pump Station

The Mechanic Street Pump Station serves a combined collection system including 19 upstream stations. The Deer Street Pump Station, the second largest in the system, contributes approximately half of the influent flow to Mechanic Street. Originally constructed in 1963 with major upgrades completed in 2007, the Deer Street station currently operates with a triplex pump configuration designed for a peak flow of 12.7 MGD.

The hydraulic evaluation task focused on reducing capacity demands at Mechanic Street by removing the Deer Street Pump Station from its service area, providing the benefit of eliminating double pumping and lowering peak capacity requirements by roughly 50%.

A hydraulic evaluation was performed for extending the existing Deer St. Pump Station force main discharge to the Peirce Island Wastewater Treatment Facility (WWTF). Using system curves based on startup test data from 2007 and existing force main characteristics, the analysis determined the increased total dynamic head (TDH) due to extended piping. For detailed data, system curves, and pump performance evaluations, refer to the Deer Street Pump Station Hydraulics Evaluation Technical Memorandum in ***Appendix B***.

Retrofitting the existing Deer Street pumps to meet the increased head at peak flow conditions would require replacement of impellers, bearing frames, couplings, and motors. The upgraded motors would need to be 400 HP units operating at 1,150 RPM, doubling the size of the existing 200 HP motors.

Due to the significant increase in head, the pumps would not be capable of operating efficiently at the average flow rate. As a result a separate jockey pump would be needed to handle average flow conditions. Under this approach, two pumps would be retrofitted to operate in parallel to handle peak flows, while two jockey pumps would be installed to accommodate average flows. This arrangement would only provide redundancy for average flow conditions. Installing four pumps (two jockey and two retrofit) presents a significant challenge due to the existing station compact footprint.

According to Grundfos the estimated costs to retrofit each existing pump and replace each motor would be approximately $350,000. This estimate does not include additional costs for power modifications, engineering or construction

In conclusion due to the compact station footprint with limited available space for the larger replacement pumps including the addition of the jockey pumps, this option was eliminated from further consideration.

5. Flood Risk & Resiliency

For any modifications to the existing Mechanic Street Pump Station or construction of new pump station will need to be protected against flooding in accordance with current design standards, regulatory and City zoning ordinances. An assessment to ascertain the flood risk and determine appropriate elevation for finished floor elevations and equipment to be protected against flooding. This assessment will consider historical flooding, tidal, storm surge, sea level rise, and FEMA flood maps.

5.1. Background

Several project alternatives are located at or near the existing pump station, adjacent to the waterfront along a back channel of the tidal Piscataqua River. A technical memorandum, *Mechanic St. Pump Station Flood Risk Assessment* in ***Appendix C***, was prepared to determine the appropriate flood hazard elevation for the new pump station. The assessment evaluated design flood elevations in accordance with the City of Portsmouth Zoning Ordinance and the New Hampshire Department of Environmental Services (NHDES) Design Guidelines (Env-Wq 700). A climate-informed science approach, as outlined in Env-Wq 700, was applied. Historical flood events in the project area were also considered to support a comprehensive understanding of flood risk.

Based on following the NHDES requirements for this project, the following design flood elevations were determined:

- For new or retrofitted structures located within the footprint of the existing Mechanic St. Pump Station and 95 Mechanic St., a design flood elevation of 12.9 ft should be used.
- For new structures located adjacent to the bridge abutment, a design flood elevation of 12.9 ft should be used or higher as needed to suit existing site elevations and proposed building finished floor elevations.
- For other features on the site that are designed for a shorter design life (<50 years), such as a fully enclosed standalone generator, an elevation lower than 12.9 ft may be considered and be evaluated during future design.

6. Permitting and Archaeology

For any modifications to the existing Mechanic Street Pump Station or construction of new pump station will need to identify any federal, state or local permits that will be required. In addition a sensitivity survey to understand the local area for any historic or archaeological significance will also be required.

6.1. Permitting

A Permitting Technical Memorandum, included in ***Appendix D***, was prepared to identify local, state, and federal permitting and regulatory requirements for feasible project alternatives evaluated.

The following permits were identified as being needed for construction of a new pump station:

- Certificate of Approval (COA) – City of Portsmouth Historic District.
- Major Impact Wetlands Permit – NHDES.
  - Compensatory Wetlands Mitigation will likely be required.
- Army Corps of Engineers Approval – May be required for wetlands impacts.
- Wetlands Standard Dredge and Fill Application – NHDES.
- Shoreland Permit by Notification – NHDES (under SWQPA).
- Temporary Discharge Permit – NHDES (for dewatering).
- Environmental Review – Required for CWSRF funding.
- Conditional Use Permit – City of Portsmouth Construction Committee.
- Planning – City of Portsmouth Planning & Sustainability

6.2. Archaeological

A Phase IA Archaeological Sensitivity Assessment was completed by Independent Archaeological Consulting (IAC) on January 30, 2025, covering two main survey areas: (1) proposed alternative work on Peirce Island and (2) proposed work within the footprint of the existing pump station, the Prescott Park Parcel, 95 Mechanic Street, and surrounding roadways.

The assessment concluded that while portions of the project fall within modern roadways, the historical realignment and varying widths of Portsmouth's streets suggest there is the potential for intact archaeological resources beneath existing pavement. The assessment delineated the entire project area as sensitive for post-contact archaeological resources.

IAC Recommendations**:**

- Given the limited availability of testable areas—due to pavement and hardscape cover, IAC recommended a Phase IB intensive archaeological investigation in accessible grassy areas, particularly at the boat launch and the Prescott Park Parcel.
- For areas where Phase IB testing is not feasible (e.g., beneath roadways and sidewalks), archaeological monitoring during construction is recommended for all subsurface excavations.

IAC proposed the following monitoring scope of work:

- Prior to construction, the archaeologist will conduct a briefing with the contractor, site superintendent, and field personnel to review expected archaeological features and response protocols in the event of a discovery.
- If an archaeological feature is encountered, all soil disturbing activity in the immediate vicinity of the resource will cease, and the archaeologists will expeditiously assess the identity, integrity and significance of the find.
- Archaeological recordation will consist of photography, mapping (using Trimble 7X® handheld data collector with sub-meter accuracy, and if necessary, hand-drawn sketch maps).
- If artifacts are present, the archaeologist will obtain a reasonable sample to aid in the identification and dating of the feature.
- In the event the installations fall within previously excavated utility trenches, the archaeologist will make periodic site inspections to verify the work is within previously disturbed soils.

These measures are intended to comply with preservation standards while minimizing disruption to the construction schedule.

7. Pump Station Layouts

Numerous potential options and layouts were considered and iterated upon through a series of workshop style meetings with the City. Included among these were options that re-used the existing pump station to the extent possible, options that positioned a new pump station on the existing site as well as the adjacent Prescott Park Parcel, options that relocated the pump station to Peirce Island, and options that relocated the pump station to alternate City locations. In evaluating these options there are site constraints that need to be considered, this includes flooding and available space to build a new pump station. This section provides a summary of the alternatives considered and identifies three preferred alternatives for further consideration and evaluation.

In addition to where the pump station was located and whether it would re-use portions of the existing Mechanic St. Pump Station, three different types of wet wells were considered. These included a traditional wet well with adjacent dry well housing the pumps, a self-cleaning trench style wet well with either submersible pumps or vertical solids handling pumps, and a baffled wet well with submersible pumps. Each of these wet well approaches meets current Hydraulic Institute standards. All options also include provisions for pump protection such as screens or grinders and dual wet wells to facilitate maintenance.

Traditional Wet Wells

A traditional wet well with adjacent dry well housing the pumps will generally have the largest footprint of all the options under consideration and is expected to require regular cleaning by the City's maintenance staff, similar to many of the City's existing pump stations. This type of arrangement typically experiences solids deposition, scum build-up and has a greater potential for induced vortices at the pump inlets. The air space in the wet well will need to be ventilated to an odor control unit.

Self-Cleaning Wet Wells

Self-cleaning trench wet wells were originally developed in the 1950s and 1960s and started to become more commonplace in the 1990s. A typical schematic section of a self-cleaning trench wet well is shown in ***Figure 7.0.1*** below. These pump stations are more compact than a traditional wet well-dry well station and consist of a deep, relatively narrow trench with a steep transition from the influent sewer to the wet well. During operation, this layout minimizes vortices and entrained air and provides good inlet conditions for the pumps. The trench wet wells are designed for cleaning with the periodic operation of the pumping equipment using a sequential procedure that does not require isolating the station or a wet well and interrupting the station operation. Periodically, the wet well can be put through a cleaning cycle during which the water level is drawn down, inducing a

hydraulic jump on the steep section. The velocities around the pumps during the cleaning cycle re-entrains settled solids and mixes in floating debris and scum. This mixture is then pumped out of the well by the cleaning pump which is set slightly lower than the other pumps.

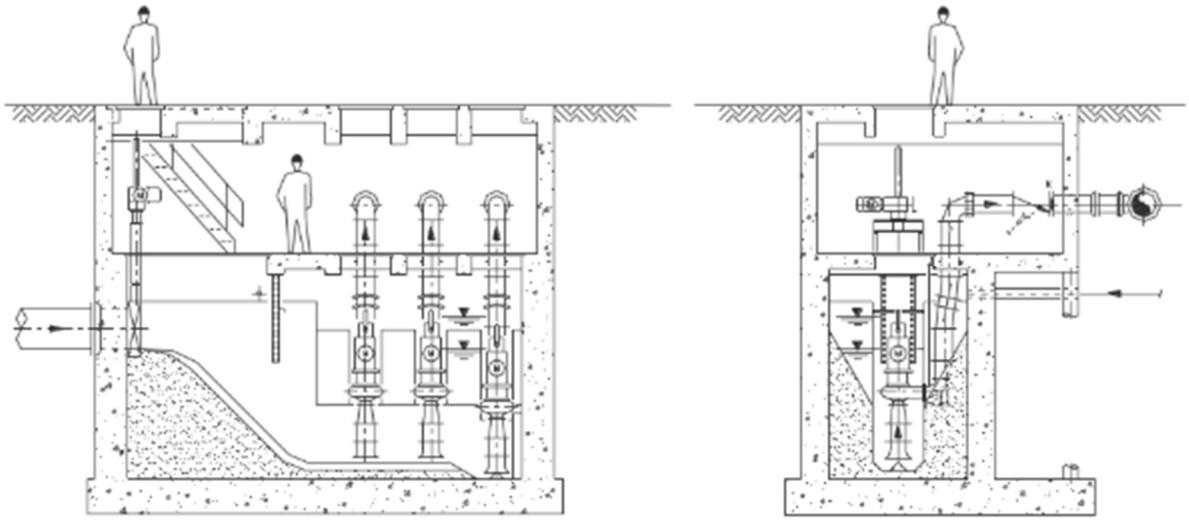


Figure 7.0.1: Typical Cross Sections of Self-Cleaning Trench Wet Well

Rectangular Baffled Wet Wells

Rectangular baffled wet wells with submersible pumps were also considered in this evaluation. This style of wet well places submersible pumps in the wet well and a number of baffles are introduced to the wet well to promote better inlet conditions for the pumps. A typical schematic isometric view of a rectangular baffled wet well is shown in ***Figure 7.0.2*** below. This style of wet well is smaller than a traditional wet well-dry well configuration. It has a similar area to that of a self-cleaning trench wet well, although it has a slightly different geometry. Rectangular baffled wet wells have proven to work well in normal pumping operation. Removal of solids from baffled wet wells is possible to prevent the continued buildup of solids by operating a pump or pumps to lower the level in the wet well to a level just before the pumps lose prime. Settled and floating solids are mostly removed by the solids handling pumps but not as positively as the trench wet well. Scum is removed by the surface vortices that form beside a pump when submersion of the intake is greatly reduced but again not as positively as the trench design. Vortices are small and removal of floating solids can be substantially improved by supplemental features, such as induced turbulence or liquid sprays that remove surface scum to the active pump. This cleaning procedure momentarily subjects the pumps to vibration, dry running, and other severe conditions and most importantly requires isolation of a wet well. Adding a pre-rotation system is an option to the baffled wet well design that allows the

system to be somewhat self-cleaning using a similar operating scheme as the self-cleaning trench wet well. This option is newer to the marketplace makes the station somewhat deeper, requires the use of submersible solids handling screw impeller pumps, and requires isolation of a wet well.

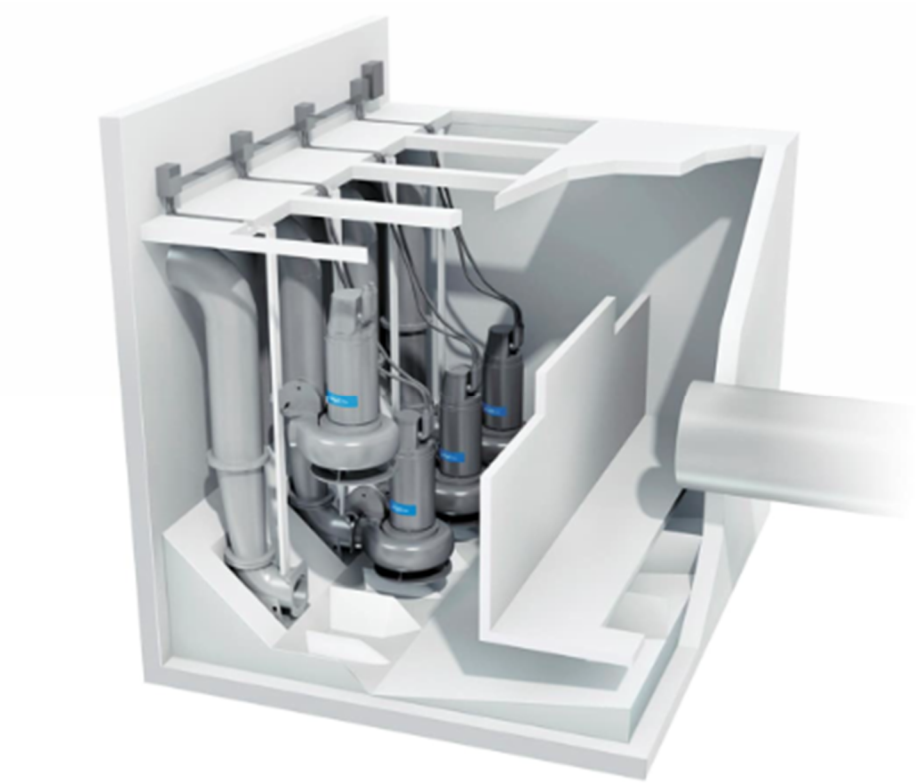


Figure 7.0.2: Typical Schematic Isometric View of a Rectangular Baffled Wet Well

7.1. Existing Location Layout Options Evaluated

This section presents four different layout options; two options that re-use the existing pump station infrastructure to the extent possible and two options that utilize the existing pump station site and the adjacent Prescott Park Parcel to construct a new pump station. Options 1 and 2 described below present concepts that re-use the existing pump station foundation to the extent possible and construct additional infrastructure to provide for the remainder of the City's project needs. Options 3 and 4 described below present options that will result in the demolition of the existing 60-year-old pump station and construction of new infrastructure. Options 1, 3, and 4 have several sub-options depending on the style of wet well. Each of these options are briefly described below and evaluated qualitatively.

7.1.1. Option 1 - Retrofit Screen Building, New Control Building with Submersible Pump Station

Option 1 considers repurposing the existing Mechanic Street Pump Station as a dedicated screenings building see ***Figure 7.1.0***, to be used in conjunction with a new submersible pump station, wet well and separate control building. The existing facility would house a two-channel screen room with 4-foot-wide concrete channels. The reconfigured building would include two floors, with the lower level designed to be fully submersible and accommodate the screen room, channels, and sluice gates.

Screenings would be captured using two near-vertical mechanical bar rack screens with 1-inch bar spacing. The screenings would be conveyed from the basement to the first floor and discharged via a washer compactor into a roll-off dumpster. Skylights would be incorporated into the roof design to allow for future screen removal.

The incoming sewer would be modified to allow for an equal flow split into the two screening channels, while the outgoing sewer would be divided into two flows for redundancy, discharging into a newly constructed wet well. A new, separate building would house electrical equipment and controls.

A preliminary structural assessment indicated that the existing interior walls are load-bearing and necessary to support the exterior walls. As a result, additional structural modifications would be required to support the reuse of the existing structure.

7.1.1.1. Option 1A – Option 1 With Self Cleaning Wet Wells

Option 1A includes a dual self-cleaning trench wet well with submersible pumps. Screened influent would be conveyed to an influent splitter box, which would distribute flow evenly into two gravity mains discharging into the dual wet wells. The trench wet wells would be designed so that the top of the structures would be approximately flush with the surrounding grade to minimize the visual impact to the public. Access to the wet well would be water-tight hatches mounted at grade. An associated above-grade control building housing electrical equipment and a standby generator would be located close adjacent.

See ***Figure 7.1.1.1*** for the conceptual site plan of Option 1A. The dual self-cleaning trench wet well would be located at the existing 95 Mechanic St. site and would require the demolition of the building at 95 Mechanic St. A separate control building housing electrical equipment and generator would be located adjacent on the south side of the Prescott Park Parcel and would be elevated above the design flood elevation. The transformer would be located on the Prescott Park Parcel adjacent to the bridge abutment.

Based on the results of the workshops with City staff, this option was not advanced for further development and evaluation because it does not offer any notable advantages over Option 1B. In fact, it has a slightly larger footprint than Option 1B and will be more challenging to fit within the existing available land.

7.1.1.2. Option 1B – Option 1 With Baffled Wet Wells

Option 1B incorporates a pump station with two baffled wet wells with submersible solids handling pumps. The dual baffled wet wells would be designed so that the top of the structures would be approximately flush with the surrounding grade to minimize the visual impact to the public. Screened influent would flow to the submersible dual baffled wet well via two gravity mains to ensure split flow. A separate Control Building would house an electrical room, mechanical room, and generator room. The finished floor of the Control Building would be elevated above the design flood elevation.

See ***Figure 7.1.1.2*** for the conceptual site plan of Option 1B. The dual baffled wet well and Control Building would be located on the Prescott Park Parcel. The transformer would be located on the Prescott Park Parcel adjacent to the bridge abutment.

Based on the results of the workshops with City staff, this option was combined with Option 1A above. Both Option 1A and 1B provide similar advantages and disadvantages, and the dimensions of the wet well between the two options are very similar. A final decision as to wet well type will be determined in a subsequent phase of the project should this option be selected. Refer to ***Section 7.4*** below for additional discussion of this option.

7.1.2. Option 2 - Retrofit Screen Building, New Control Building & Conventional Wet Wells / Dry Well

Option 2 includes converting the existing Mechanic Street Pump Station into a dedicated screenings facility, with construction of a new control building and a conventional wet well/dry well pump station. The wet well and dry well would be constructed as separate structures to isolate critical pumps and equipment from flooding. The new pump station would be built with its finished floor above the design flood elevation, resulting in a taller structure compared to the existing facility.

As shown in the preliminary conceptual site layout ***Figure 7.1.2***, the new pump station building would be located entirely within the 95 Mechanic Street Parcel, avoiding any permanent structures within the Prescott Park Parcel. The conceptual layout also shows that the new building footprint would extend to the edge of the roadway, leaving limited space for construction staging and long-term operations.

Based on the results of the workshops with City staff, this option was not advanced for further development and evaluation because of the limited footprint of the existing 95 Mechanic Street building and available land. The new pump station footprint will be more challenging to fit within this available space and extends into the road.

7.1.3. Option 3 - New Control Building with Integral Pump Station

Option 3 has several sub-options depending on the style of wet well. These alternatives are all sited on the Prescott Park Parcel adjacent to the existing Mechanic St. Pump Station but, in some cases, also extend into the existing Parcel. None incorporate re-use of the existing pump station building. The primary benefit for considering these options is that they allow for the design of a pump station that meets current design best practices. They will simplify construction sequencing by minimizing the need for temporary pumping systems, and all include a building that encloses the major pump station equipment for ease of maintenance.

7.1.3.1. Option 3A – Option 3 With Self Cleaning Wet Wells

Option 3A incorporates a single, above-grade building to house a screening or grinder facility for pump protection, a pump station utilizing two self-cleaning trench wet wells with vertical solids handling pumps, an electrical room, mechanical room, and generator room. The foundation for the building will be quite deep to allow for gravity flow into the pump station. The finished floor of this building would be elevated to Elevation 13 to provide protection of the equipment for the future flood elevation. The building would be situated in the Prescott Park Parcel adjacent to the existing pump station and the main entrance would be Peirce Island Road. Because the ground slopes down from the bridge to Mechanic St. several feet, the building will appear quite tall when viewed from Mechanic St. An exterior odor control process will be required to ventilate the building.

See ***Figure 7.1.3.1,*** which includes the preliminary conceptual site plan discussed at workshops with the City showing approximate sizes and locations for the major components associated with this option. As noted above, all these components with the exception of the transformer and odor control unit would be housed in a single, above-grade structure.

Based on the results of the workshops with City staff, this option was advanced for further development and evaluation. Although this option will result in a relatively large, above-grade structure that fills nearly the entire available Parcel, it avoids submersible equipment and provides an enclosed, heated space for operations and maintenance. Eliminating submersible equipment will allow for majority of O&M tasks to take place without having to open hatches or lift equipment out of service. Refer to ***Section 7.4*** below for additional discussion of this option.

7.1.3.2. Option 3B – Option 3 With Baffled Wet Wells

Option 3B incorporates a single, above-grade building to house a screening or grinder facility for pump protection, a pump station utilizing two baffled wet wells with submersible solids handling pumps, an electrical room, mechanical room, and generator room. The foundation for the building will be quite deep to allow for gravity flow into the pump station. The finished floor of this building would be elevated to Elevation 13 to provide protection of the equipment for the design flood elevation. The building would be situated in the Prescott Park Parcel adjacent to the existing pump station and the main entrance would be from Peirce Island Road. Because the ground slopes down from the bridge to Mechanic St. several feet, the building will appear quite tall when viewed from Mechanic St. An exterior odor control process will be required to ventilate the building.

See ***Figure 7.1.3.2***, which includes the preliminary conceptual site plan discussed at workshops with the City showing approximate sizes and locations for the major components associated with this option. As noted above, all these components with the exception of the transformer and odor control unit would be housed in a single, above-grade structure.

Based on the results of the workshops with City staff, this option was not advanced for further development and evaluation because it does not offer any notable advantages over Option 3A. In fact, it has a slightly larger footprint than Option 3A and will be more challenging to fit within the existing available land. Additionally, this option has submersible pumps which the City's O&M staff would like to avoid if possible.

7.1.4. Option 4 – Submersible Pump Station and Separate Above Grade Control Building

Option 4 has several sub-options depending on the style of wet well. These alternatives are all sited on the Prescott Park Parcel adjacent to the existing Mechanic St. Pump Station and extend into the existing Parcel. None incorporate re-use of the existing pump station building. The primary benefits for considering these options is that they allow for the design of a pump station the meets current design best practices. They will simplify construction sequencing by minimizing the need for temporary pumping systems, and all include a submersible pump station that will minimize the size of the new above ground infrastructure.

7.1.4.1. Option 4A – Option 4 With Wet Wells and Dry Well

Option 4A includes a traditional dual wet well with adjacent dry well housing dry-pit submersible pumps. The pumps would be protected using submersible grinders housed

in a separate structure. The grinder facility and wet well/dry well pump station would be designed so that the tops of both structures are more or less flush with the surrounding grade to minimize the visual impact to the public. Access to these structures would be through water-tight hatches mounted at grade. An associated above-grade structure housing electrical equipment and a standby generator would be located close by.

This option would be located on the existing Mechanic St. Pump Station Parcel as well as the adjacent Prescott Park Parcel next to the bridge. It would require the demolition of 95 Mechanic St. but could be constructed without prior demolition of the existing pump station simplifying construction sequencing.

See ***Figure 7.1.4.1***, which includes the preliminary conceptual site plan discussed at workshops with the City showing approximate sizes and locations for the major components associated with this option. As noted above, the grinder facility and wet well/dry well would be flush with grade and a Control Building housing electrical equipment and a standby generator would be located close by. As shown the wet well/dry well layout is not as compact as the self-cleaning trench wet well or baffled well discussed in Options 4B and 4C and extends into the roadway.

Based on the results of the workshops with City staff, this option was not advanced for further development and evaluation. It was not advanced because it does not offer any notable advantages over Options 4B or 4C and is too large to fit on the site.

7.1.4.2. Option 4B – Option 4 With Self-Cleaning Wet Wells

Option 4B includes a dual self- cleaning trench wet well with submersible pumps. The pumps would be protected using submersible grinders housed in a separate structure. The grinder facility and trench wet well would be designed so that the tops of both structures are more or less flush with the surrounding grade to minimize the visual impact to the public. Access to these structures would be through water-tight hatches mounted at grade. An associated above-grade structure housing electrical equipment and a standby generator would be located close by.

This option would be located on the existing Mechanic St. Pump Station Parcel as well as the adjacent Prescott Park Parcel next to the bridge. It would require the demolition of 95 Mechanic St. but could be constructed without prior demolition of the existing pump station.

See ***Figure 7.1.4.2***, which includes the preliminary conceptual site plan discussed at workshops with the City showing approximate sizes and locations for the major components associated with this option. As noted above, the grinder facility and self-cleaning trench wet well would be flush with grade with submersible equipment and water-

tight hatches. A Control Building housing electrical equipment and a standby generator would be located close by. The finished floor of the Control Building would be elevated above the design flood elevation. The Control Building and grinder facility and self-cleaning trench wet well would be separated vertically by a retaining wall.

Based on the results of the workshops with City staff, this option was advanced for further development and evaluation. This option minimizes the area of new above grade structures and their associated visual impact by burying the grinder facility and pump station. Refer to ***Section 7.4*** below for additional discussion of this option.

7.1.4.3. Option 4C – Option 4 With Baffled Wet Wells

Option 4C includes a dual baffled wet well with submersible pumps. The pumps would be protected using submersible grinders housed in a separate structure. The grinder facility and baffled wet well would be designed so that the tops of both structures are more or less flush with the surrounding grade to minimize the visual impact to the public. Access to these structures would be through water-tight hatches mounted at grade. An associated above-grade structure housing electrical equipment and a standby generator would be located close by.

This option would be located on the existing Mechanic St. Pump Station Parcel as well as the adjacent Prescott Park Parcel next to the bridge. It would require the demolition of 95 Mechanic St. but could be constructed without prior demolition of the existing pump station.

See ***Figure 7.1.4.3***, which includes the preliminary conceptual site plan discussed at workshops with the City showing approximate sizes and locations for the major components associated with this option. As noted above, the grinder facility and baffled wet well would be flush with grade with submersible equipment and water-tight hatches. A Control Building housing electrical equipment and a standby generator would be located close by. The finished floor of the Control Building would be elevated above the design flood elevation. The Control Building and grinder facility and baffled wet well would be separated vertically by a retaining wall.

Based on the results of the workshops with City staff, this option was combined with Option 4B above. Both Option 4B and 4C provide similar advantages and disadvantages, and the dimensions of the wet well between the two options are very similar. A final decision as to wet well type will be determined in a subsequent phase of the project should this option be selected.

7.2. Relocation to Peirce Island

Relocating the existing Mechanic Street Pump Station across the river to Peirce Island was evaluated as an alternative to constructing a new station at the current site. This relocation would allow the new facility to be sited at a higher elevation and alleviate some of the physical and operational constraints associated with the existing location. Additionally, moving the station would open opportunities for repurposing the existing site, potentially supporting goals outlined in the proposed Prescott Park Master Plan.

In determining the relocation to Peirce Island and conveyance of the wastewater below the river it is important to understand the existing geological subsurface conditions. This information was compiled from several sources. Historical boring data from the Peirce Island Bridge project ("Contract Plans for Peirce Island Bridge and Approaches," dated January 9, 1958, by Clifford Broker Associates) was used to approximate the riverbed profile. While these borings were not taken along with the exact alignment of the proposed siphons, they were assumed to be representative of the general subsurface conditions. Additional boring data from the "95 Mechanic Seawall and Wharf Replacement" (Tighe & Bond, 2021) and the "Sewage Treatment Plant Pumping Stations and Appurtenant Work" (Metcalf & Eddy Engineers, 1963) provided further insight into conditions near the existing pump station.

Two alternatives for conveying wastewater to a new station on Peirce Island were considered:

- Option 7.2.1 Installation of inverted siphons via directional drilling
- Option 7.2.2 Installation of inverted siphon via micro tunneling

7.2.1. Horizontal Directional Drill

This option evaluated using inverted siphons installed beneath the Piscataqua River to convey wastewater to the new pump station located on Peirce Island. The siphon pipes would be installed using the horizontal directional drilling (HDD) construction techniques.

Using the geological information mentioned above, a preliminary profile, refer to ***Figure 7.2.1A***, was developed to assess feasibility. The preferred alignment begins in the Prescott Parcel of land and terminates on Peirce Island, avoiding conflicts with the existing seawall. Underwood Engineers discussed project details with three directional drilling contractors, DBU Construction (NH), Henniker Directional Drilling (NH) and Hemlock Directional Boring (CT). Based on these input the following preliminary design criteria was established:

- Siphon size: Two pipes roughly 18-inch diameter and 30-inch diameter.
- Siphon material: HDPE

- Drill length: roughly 510 feet
- Rod length: 18 feet
- Alignment assumptions: maximum entry/exit slope of 20%; max deflection per rod of 10% in soil and 3% in rock
- Drill entry from Peirce Island side
- HDD bend radius: 3,600 ft

The preferred alignment shows drilling through both the soft overburden material and bedrock. A concern with this preferred alignment was the bedrock is most likely to be weathered, which is looser, less dense material and therefore drilling through would increase the risk of unintentional release of drilling fluid ("frac-out") during drilling.

A further detailed analysis of subsurface conditions using available data was conducted to assess the type and characteristics of bedrock in the project area. According to regional geologic mapping, the area is underlain by the Kittery Formation, which primarily consists of "feldspathic and calcareous metagraywacke," a metamorphosed sandstone known for being hard and abrasive. From previous borings undertaken in this area, it had been documented as heavily fractured shale, but based on the regional geology, these may have been misclassified. Directionally drilling through the heavily fractured shale presents a challenge, as poor rock quality indicates vertical rock fissures that would increase risk of frac-outs.

From the geological subsurface conditions mentioned above and to mitigate this risk, it is recommended the directional drill pipe be installed at least 20 feet below the highest rock elevation along the alignment. This would increase the horizontal drill length to approximately 1,200 feet, double that of the preferred alignment. As shown in ***Figure 7.2.1B***, this extended alignment would place the HDD entry / exit pits in the Puddle Dock Restaurant parking lot. This introduces several challenges:

- The need for a large staging area for equipment
- The existing collection system in the Mechanic Street / Macy Street area would not be able to be redirected by gravity to the Puddle Dock parking area (highlighted in yellow in ***Figure 7.2.1B***).
- The gravity sewer in the Mechanic Street / Macy Street area would require a separate local pump station to convey flows.

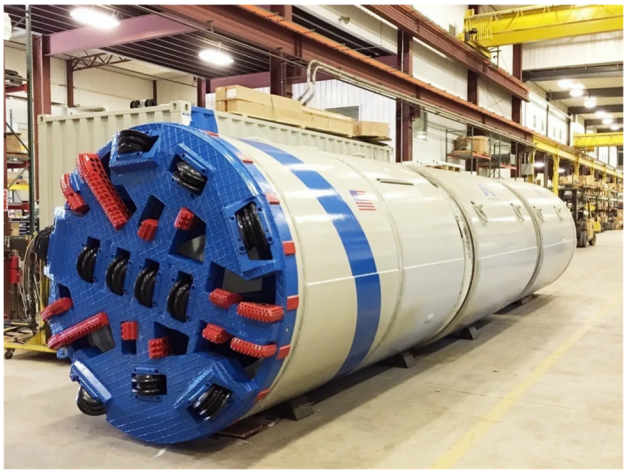
7.2.2. Microtunnel

A second construction technique that was considered for the piping to convey flow to a new pump station on Peirce Island via an inverted siphon was the construction of a Microtunnel, see ***Figure 7.2.2*** for a conceptual site plan. A Microtunnel is a trenchless construction method most often employed in urban settings for utilities. Microtunnel

construction employs tunnel boring machines (TBMs) that are remotely piloted, an example of which is shown in ***Figure 7.2.3.*** Two shafts are needed on either side of the tunnel to launch and receive the TBM. Although this method is technically feasible for this project, it introduces significant engineering and construction challenges.

In this case, the Microtunnel considered would be roughly 8' diameter with a steel casing pipe. Inside the steel casing pipe would be three HDPE carrier pipes that would convey raw wastewater from Mechanic Street to the new pump station. The annular space between the carrier pipes would grouted after installation.

After construction, the launch shaft and receiving shaft would be converted to the inlet and outlet shafts of the siphon. Based on our experience with these types of projects, the shafts would be roughly 25 to 30' in diameter and would need to extend into bedrock on either side. Based on the existing boring information available, the shaft on the City side of the siphon would be roughly 50' deep and the shaft on the Peirce Island side of the siphon would be approximately 40' deep so that the top of the steel casing pipe would be positioned approximately 10' below the top of bedrock. While feasible, the Microtunnel presents significant engineering and construction challenges due to the physical site constraints and limited working space, particularly on the City side and the depth of the shafts extending into bedrock.



Source: https://constrofacilitator.com/what-is-microtunneling-what-type-of-equipments-are-used-for-it/
Figure 7.2.3: Tunnel Boring Machine

As shown in ***Figure 7.2.2*** conceptual site plan, the outlet shaft of the siphon and new pump station would be positioned in the Peirce Island Boat Launch but could be designed to include some community amenities such as a public restroom and attendant's office.

7.2.3. Relocation to Peirce Island Conclusions

For the HDD option, when considering the geotechnical subsurface conditions and the constraints on the existing sewer system including the substantial construction, operational, and serviceability challenges, the HDD option was eliminated as it was deemed qualitatively infeasible.

The Microtunnel option is technically feasible, however the estimated cost of the tunnel and tunnel shafts alone is roughly $7 to $10 million. Based on this order of magnitude cost, this option was eliminated from further consideration.

7.3. Alternate City Area Locations

Relocating the pump station to an area within the existing collection system was evaluated. The goal was to determine the feasibility of constructing a new pump station at an alternate location within the existing collection system in the City. Using City tax maps and collection system maps, potential sites were identified and conceptually evaluated based on hydraulic considerations and system impact.

The three sites identified and evaluated for the new pump station located on the nearby parking lots were:

- Puddle Dock Restaurant
- Memorial Bridge
- Parrott Avenue

7.3.1. Puddle Dock Restaurant

This option considered and identified a parking lot near the Puddle Dock restaurant as a potential area to locate a new pump station Refer to ***Figure 7.3.1.*** This location would capture the wastewater flows from the Deer Street pump station and most of the Mechanic Street sewer collection system with an estimated capacity required for the new pump station roughly 21 MGD. A new forcemain would be required to connect into the existing forcemain to Peirce Island WWTF.

The existing Marcy Street pump station forcemain would need to be extended to discharge to this new pump station sewer system via the gravity sewers in Pleasant Street, which would need to be upsized to cater for the increased flows.

With the modifications described above a smaller pump station at the existing Mechanic Street pump station location with a capacity of 1 MGD would still be required to capture flows that could not be redirected by gravity.

7.3.2. Memorial Bridge

This option considered and identified a parking lot located close to the right abutment of the Memorial Bridge as a potential area for the new pump station Refer to ***Figure 7.3.2.*** Like the Puddle Dock restaurant option this would require capturing the wastewater flows from the Deer Street pump station and most of the Mechanic Street sewer system with an estimated capacity required for the new pump station roughly 21 MGD. This would also require modification of the existing sewer system to redirect the main sewer collection system in addition to new forcemain to connect into the existing forcemain to Peirce Island WWTF.

The existing Marcy Street pump station forcemain would need to be extended to discharge to this new pump station sewer system via the gravity sewers in Pleasant Street, which would need to be upsized to cater for the increased flows.

With the modifications described above a smaller pump station at the existing Mechanic Street pump station with a capacity of 1 MGD would still be required to capture flows that could not be redirected by gravity.

7.3.3. Parrott Avenue

This option considered and identified a parking lot located at the right abutment of the Memorial Bridge as a potential area for the new pump station Refer to ***Figure 7.3.3.*** This location would require a new pump station with a capacity of roughly 20 MGD to capture the wastewater flow from the existing sewer collection system. In addition, a new forcemain that runs parallel to the existing sewer through Strawbery Banke and Prescott Park and connecting to the existing forcemain on the Peirce Island bridge would be required.

The existing sewer collection system at this location would require assessment and modification for reduction in wastewater flows and be able to maintain self-cleansing velocities in the gravity sewer pipes. Also a new sewer would be required to convey wastewater flows from Pleasant Street to the existing Mechanic Street pump station location.

As with the Puddle Dock Restaurant and Parrott Avenue options, the Deer Street forcemain would need to be extended and the Macy Street pump station forcemain would need to be extended via the Pleasant Street gravity sewer system as well as upsizing the sewers for the increased flows.

With the modifications described above a smaller pump station at the existing Mechanic Street pump station with a capacity of 2 MGD would still be required to capture flows that could not be redirected by gravity.

7.3.4. Alternate City Area Locations Conclusions

All three evaluated alternatives would require significant modifications to the existing collection system, including the installation of new force mains and reconfiguration of gravity sewers. With a pump station at the proposed new location, each option would still require a reduced capacity pump station at the existing Mechanic Street location to serve a small, isolated portion of the system.

Based on the preliminary qualitative assessment, none of the alternatives appear to offer a feasible solution and these options were eliminated from further consideration.

7.4. Preferred Options

Based on the qualitative evaluation above, three preferred options were selected as preferred options to be advanced and considered further. Schematic plan views and preliminary conceptual renderings for each of these three options are presented below. Costs for these three options are presented in Section 8.

7.4.1. Option 1B - Retrofit Screen Building, New Control Building with Submersible Pump Station and Baffled Wet Wells

Option 1B incorporates a pump station with two baffled wet wells with submersible solids handling pumps. The dual baffled wet wells would be designed so that the top of the structures would be approximately flush with the surrounding grade to minimize the visual impact to the public. Screened influent would flow to the submersible dual baffled wet well via two gravity mains to provide split flow. A separate Control Building would house an electrical room, mechanical room, and generator room. The finished floor of the Control Building would be elevated above the design flood elevation.

Option 1B using dual baffled wet wells and the Control Building would be located on the Prescott Park Parcel. The transformer would be located on the Prescott Park Parcel adjacent to the bridge abutment.

Refer to ***Figure 7.4.1.1A*** for the site plan and ***Figures 7.4.1.1B, 7.4.1.1C and 7.4.1.1D*** for the perspective view and conceptual renderings of this option presented in the figures section seven preferred options.

7.4.2. Option 3A - New Control Building with Integral Pump Station with Self Cleaning Wet Wells

As noted above, Option 3A incorporates a single, above-grade building to house a screening or grinder facility for pump protection, a pump station utilizing two self-cleaning trench wet wells with vertical solids handling pumps, an electrical room, mechanical room, and generator room. The finished floor of this building would be elevated to Elevation 13 to provide protection of the equipment to the future flood elevation. An exterior odor control process will be required to ventilate the building as well as an exterior fuel storage tank to store fuel for the standby generator. The building would be situated in the Prescott Park Parcel adjacent to the existing pump station and the main entrance would be from Peirce Island Road. It could be constructed without prior demolition of the existing pump station.

This option results in a relatively large, above-grade structure that fills nearly the entire available Parcel. However, it eliminates submersible equipment and provides an enclosed, heated space for operations and maintenance. Eliminating submersible equipment will allow for the majority of O&M tasks to take place without having to open hatches or lift equipment out for service.

Refer to ***Figure 7.4.2.2A*** for the site plan and ***Figures 7.4.2.2B, 7.4.2.2C and 7.4.2.2D*** for the perspective view and conceptual renderings of this option presented in the figures section seven preferred options.

7.4.3. Option 4C - Submersible Pump Station and Separate Above Grade Control Building with Baffled Wet Wells

As noted above, Option 4C includes a dual baffled wet wells with submersible pumps. The pumps would be protected using submersible grinders housed in a separate structure. The grinder facility and baffled wet well would be designed so that the tops of both structures are more or less flush with the surrounding grade to minimize the visual impact to the public. Access to these structures would be through water-tight hatches mounted at grade. An associated above-grade Control Building housing electrical equipment and a standby generator would be located close by. The finished floor of the Control Building would be elevated above the design flood elevation. The Control Building and grinder facility and self-cleaning trench wet well would be separated vertically by a retaining wall.

This option would be located on the existing Mechanic St. Pump Station Parcel as well as the adjacent Prescott Park Parcel next to the bridge. It would require the demolition of 95 Mechanic St. but could be constructed without prior demolition of the existing pump station.

This option minimizes the area of new above grade structures and their associated visual impact by burying the grinder facility and pump station.

Option 4B using a self-cleaning trench style wet well would be very similar to this option in appearance, operations and maintenance, cost, and performance. As the project advances, further consideration should be given as to the relative advantages and disadvantages of a baffled wet well versus a self-cleaning trench wet well should this option be selected.

Refer to ***Figure 7.4.3.3A*** for the site plan and ***Figures 7.4.3.3B, 7.4.3.3C and 7.4.3.3D*** for the perspective view and conceptual renderings of this option presented in the figures section seven preferred options.

8. Cost Opinions

Class 5 Engineer's Opinion of Probable Construction Costs (EOPCC) were developed for the proposed options for the Mechanic St. Pump Station in accordance with the Association for the Advancement of Cost Estimating International (AACE). Refer to ***Table 8.1*** below for the AACE Cost Estimating classification system. A Class 5 EOPCC is a concept screening level estimate and, accordingly, has an expected accuracy range of -20% to +50%.

Costs were based on conceptual layout drawings and budgetary process and pumping equipment quotes from vendors and recent similar projects. The opinions of probable cost include preliminary estimates for site work, yard piping, demolition, sheeting, dewatering, cast in place concrete, architectural details, process piping, HVAC, plumbing, fire protection, electrical, and instrumentation based on the conceptual layout drawings. The estimated costs reflect an allowance of 15 percent for Contractor overhead and profit, 12 percent for General Conditions, 1 percent for permits, 0.85% for risk insurance, and 1.25% for bonding. Recognizing that the level of design definition is conceptual at this stage, an allowance for final design elements of 30 percent of the total construction cost was also included. Inclusion of this item in the opinion of cost reflects the fact that at the concept level, all the items and construction costs needed in the project have not yet been defined. The allowance for final design elements is not a contingency. Costs have also been escalated to the estimated mid-point of construction of June 30, 2030 at 3.85% percent per year. An additional 40 percent allowance for design and construction phase engineering services, permitting, and contingency was also included.

The Engineers Opinion of Probable Construction Cost (EOPCC) for each option is a concept screening level cost and has been developed based on assumptions and may not represent the final cost for the project once designed. The final cost could be higher

or lower depending on what decisions are made during the design phase, how the final facilities are constructed, and when the final facilities are constructed.

The costs presented are limited to the conditions existing at issuance and is not a guarantee of the actual price or cost. Uncertain market conditions such as but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this EOPCC.

Table 8.1
AACE International Cost Estimating Classification System

	Primary Characteristic	***Secondary Characteristic***		
Estimate Class	***Level of Project Definition*** *Expressed as % of complete definition*	***End Usage*** *Typical purpose of estimate*	***Methodology*** *Typical estimating method*	***Expected Accuracy Range*** *Typical variation in low and high ranges [a]*
Class 5	*0% to 2%*	*Concept Screening*	*Capacity Factored Models Judgement or Analogy*	*L: -20% to -50% H: +30% to +100%*
Class 4	*1% to 15%*	*Study or Feasibility*	*Equipment Factored or Parametric Models*	*L: -15% to -30% H: +20% to +50%*
Class 3	*10% to 40%*	*Budget Authorization or Control*	*Semi-Detailed Unit Costs with Assembly Level Line Items*	*L: -10% to -20% H: +10% to +30%*
Class 2	*30% to 70%*	*Control or Bid/Tender*	*Detailed Unit Cost with Forced Detailed Take-off*	*L: -5% to -15% H: +5% to +20%*
Class 1	*50% to 100%*	*Check Estimate or Bid/Tender*	*Detailed Unit Cost with Detailed Take-off*	*L: -3% to -10% H: +3% to +15%*

Notes
[a] The state of process technology and availability of applicable reference cost data affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.

Table 8.2 below displays the concept level opinion of probable construction cost and the opinion of probable project cost, with high and low range costs (based on Class 5 estimates) for each of the three selected alternatives. Based on the opinions of probable cost below, Option 4C has the lowest capital cost of the feasible alternatives.

The annual operations and maintenance (O&M) costs for each option were considered qualitatively. The O&M costs are expected to be similar because each option has essentially the same equipment in slightly different physical arrangements. The largest component of O&M costs for the option considered will be power and the largest component of the power cost will be the pumps and odor control fan. The grinders or screens, lighting, and other electrical loads will be a fraction of the power usage associated with the pumps and odor control fan. However, Options 1B and 3A will have slightly higher power usage than Option 4C because these two alternatives have larger building volumes, requiring greater ventilation volumes and imposing additional heating loads.

Table 8.2
Opinion of Probable Construction Cost and Opinion of Probable Project Cost for Mechanic St Pump Station Preferred Options

Description		*Low Range (-20%)*	*Estimated Cost*	*High Range (+50%)*
Option 1B – Retrofit Screen Building, New Control Building with Submersible Baffled Wet Wells	Construction Cost[1]	$18,730,000	$23,410,000	$35,120,000
	Project Cost[2]	$26,230,000	$32,780,000	$49,170,000
Option 3A – New Control Building with Integral Pump Station with Self-Cleaning Wet Wells	Construction Cost[1]	$18,560,000	$23,190,000	$34,790,000
	Project Cost[2]	$25,990,000	$32,470,000	$48,710,000
Option 4C – Submersible Pump Station and Separate Above Grade Control Building with Baffled Wet Wells	Construction Cost[1]	$16,390,000	$20,480,000	$30,720,000
	Project Cost[2]	$22,950,000	$28,680,000	$43,010,000

Notes
[1]Construction Costs include General Conditions, Contractor Overhead and Profit (30%) and Allow for Final Design Elements (30%)
[2]Project Costs Include Engineering, Permitting and Contingency (40%)

At this conceptual design level, the electrical loads due to the larger ventilation volumes are assumed to be overshadowed by the electrical load of the pumps, so from an O&M cost standpoint each of the alternatives is considered equal. Labor and equipment replacement costs will be similar between alternatives and none of the alternatives are

expected to have significant chemical usage. Therefore, O&M costs are not expected to differ significantly between the alternatives to the point where the life cycle O&M costs will change the analysis.

9. Conclusions

The existing Mechanic Street pump station is a critical asset to the City of Portsmouth wastewater infrastructure being the terminal pump station that conveys all flows (22 MGD) from the collection system to the Peirce Island wastewater treatment facility.

This pump station is over 60 years old since its original construction in 1963 and beyond its expected useful life. In recent years the pump station has suffered from a number of failures and given the size of the pumps (450Hp) presents a considerable challenge for the operators to repair and maintain, with some emergency repairs requiring a significant bypass pumping effort. These repairs not only have a financial impact but also affect the local community adjacent to the station. Also if the existing building is to be re-used there is potential for the presence of hazardous building materials (e.g. PVB, lead and asbestos).

Any reuse of the existing building

This evaluation reviewed a number of options for a new pump station at the existing location including consideration of alternate locations with a summary of each option shown below:

- Relocation to Peirce Island.
- Alternate City Area Location.
- Existing Site Location.

9.1. Relocation to Peirce Island

The evaluation included the option of relocating the pump station to Peirce Island directly across the river by the boat launch from its current location. Both the existing pump station and 95 Mechanic Street buildings would be demolished such that it would open up the wharf water front area from the existing pump station location to the Prescott Memorial Bridge. This would dramatically improve the visual outlook for the local residents that live on that part of Mechanic Street and open up the area that could be landscaped to provide additional amenities to the local residents and visitors. In addition at the relocated position on the island the new pump station building could also include a boat keepers office and public bathrooms.

To convey wastewater flow to the island would require the construction of a siphon with two or three pipes installed below the river bed using horizontal directional drilling (HDD) construction technique. This option was evaluated and determined not to be feasible due to the existing geological sub-surface conditions, the site physical limitations and capabilities of the directional drilling equipment.

As an alternative to HDD method the micro tunneling technique was considered. This would use a tunnel boring machine to allow installation of a large steel casing to carry the siphon pipes. This would also require the installation of large diameter entry and exit shafts on either side of the river to a depth of approximately 40 to 50 feet below ground elevation. While this option is technically feasible it was not considered further due to the magnitude of cost ($7M- $10M).

9.2. Alternate City Area Locations

For this option there were three areas identified and evaluated to relocate the new pump station in the parking lots near to the Puddle Dock Restaurant, Memorial Bridge and Parrott Avenue. All locations would require significant modifications to the existing collection system including changes to the gravity sewer and provision of new force mains.

All three evaluated alternative locations Puddle Dock Restaurant, Memorial Bridge and Parrott Avenue would require significant modifications to the existing collection system, including the installation of new force mains and reconfiguration of existing gravity sewers. For all three options a smaller pump station at the existing Mechanic Street pump station location would still be required to serve a small, isolated portion of the local collection system.

9.3. Existing Site Location

The existing pump station building has a compact footprint and is too small to be re-used or rehabbed into a new pump station. The overall site location has very limited available space making any improvements or upgrades challenging. The City owns the building at 95 Mechanic Street next to the existing pump station. This building is currently uninhabitable and could be demolished to provide additional space as well as improving the view for the residents. Also the Prescott Park Parcel of land next to the Prescott Memorial bridge could be required to locate the new pump station building.

In addition to the physical constraints the pump station will need to be protected against future flooding which was determined to be elevation 13.0 feet. This is approximately 5.0 feet above the existing finished grade elevation.

This evaluation considered a number of options that included a combination of retrofit the existing pump station and construction of a new pump station. Of the options considered there were four main options and with some of those there were sub-options for different configurations of wet well that included self-cleaning, baffled, or conventional wet well / dry well. The options considered and evaluated are listed below:

- Option 1 – Retrofit Screen, New Control Building with Submersible Pumps.
  - Option 1A – With Self Cleaning Wet Wells.
  - Option 1B – With Baffled Wet Wells.
- Option 2 – Retrofit Screen Building, New Control Building & Wet Well / Dry Well.
- Option 3 – New Control Building with Integral Pump Station.
  - Option 3A – With Self Cleaning Wet Wells
  - Option 3B – With Baffled Wet Wells
- Option 4 – Submersible Pump Station & Separate Control Building.
  - Option 4A – With Wet Wells and Dry Well
  - Option 4B – With Self Cleaning Wet Wells
  - Option 4C – With Baffled Wet Wells

Further evaluation of these options resulted in identifying three preferred options below:

- Option 1B – Retrofit Screen, New Control Building with Submersible Pumps with Baffled Wet Wells
- Option 3A - New Control Building with Integral Pump Station with Self-Cleaning Wet Wells
- Option 4C - Submersible Pump Station & Separate Control Building with Baffled Wet Wells

For Option 1B the existing pump station building would be retrofitted with screening equipment. A new control building for electrical equipment and standby generator. Submersible pumps would be located in a separate wet well structure below grade elevation.

Also for Option 1B the proposed submersible pumps require opening of hatches and use of lifting equipment for maintenance or repair. Retrofit of the existing building would require extensive structural and building modifications. Construction of this option would require temporary bypass pumping.

For Option 3A the new control building would include the electrical equipment, standby generator, screening or grinders, wet well and dry well with pumps. This results in a relatively large above grade building structure that fills nearly the entire available Prescott Park Parcel of land. However this option eliminates the submersible equipment and provides an enclosed, heated space for operations and maintenance. It could be constructed without prior demolition of the existing pump station.

For Option 4C the new control building would include the electrical equipment and standby generator. The pumps and grinders would be submersible type and located in separate wet well structure below grade elevation. These style of pumps and grinders

require opening of hatches and use of lifting equipment for maintenance or repair. It could be constructed without prior demolition of the existing pump station.

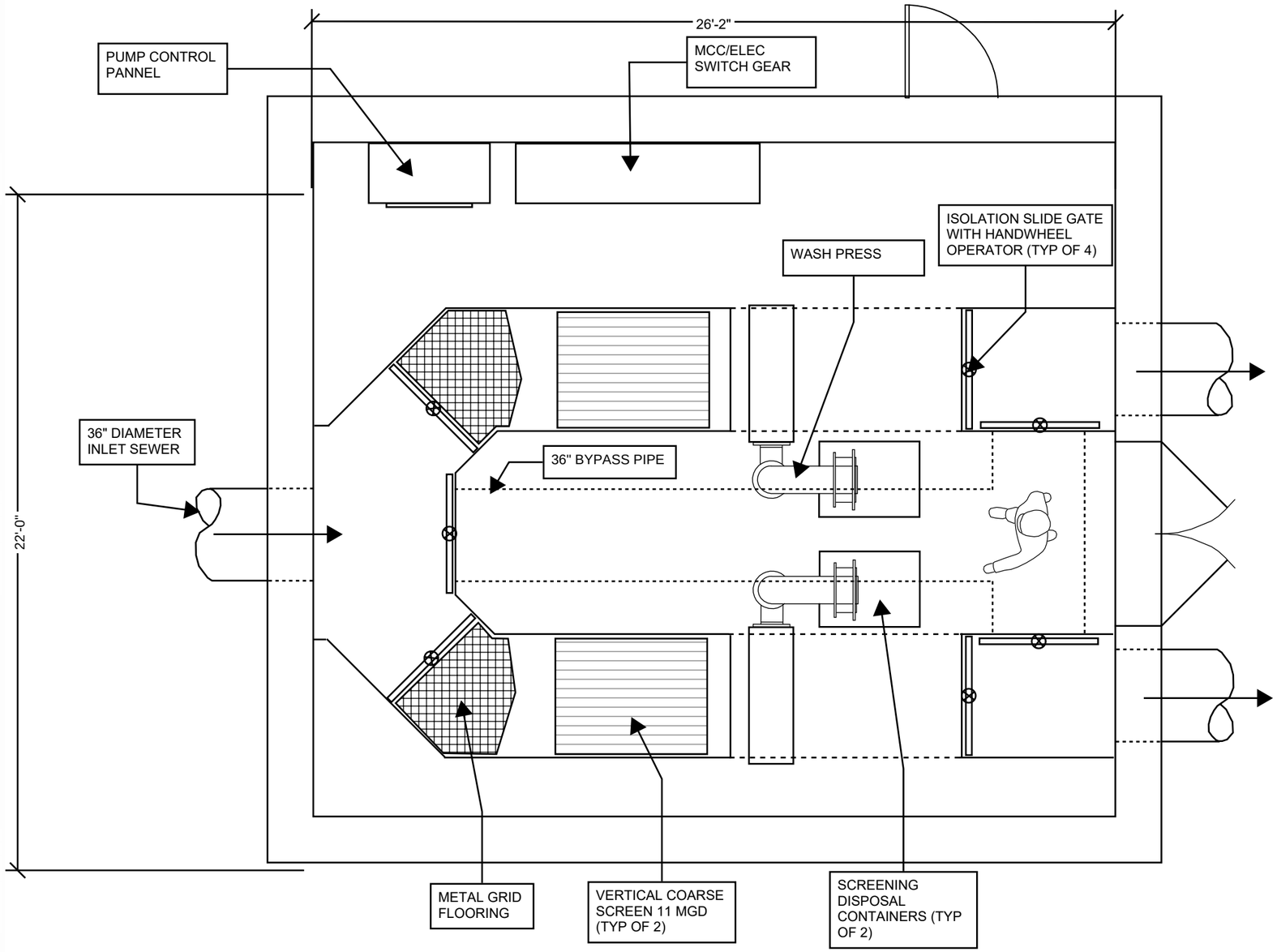
An EOPCC was prepared for the above mentioned options at the existing pump station location and shown below:

	Construction Cost	Project Cost
○ Option 1B – Retrofit Screen, New Control Building with Submersible Pumps and Baffled Wet Wells	$18,730,000 to $35,120,000	$26,230,000 to $49,170,000
○ Option 3A - New Control Building with Integral Pump Station with Self-Cleaning Wet Wells	$18,560,000 to $34,790,000	$25,990,000 to $48,710,000
○ Option 4C - Submersible Pump Station & Separate Control Building with Baffled Wet Wells	$16,390,000 to $30,720,000	$22,950,000 to $43,010,000

9.4. Recommendations

The existing Mechanic Street Pump Station is a critical asset to the City of Portsmouth that is beyond its useful life and needs to be replaced with a new pump station that meets current design standards. In discussions with the City it is recommended that Option 4C is pursued and the City move to the next stage to undertake preliminary engineering.

FIGURES
SECTION SEVEN
PUMP STATION LAYOUTS



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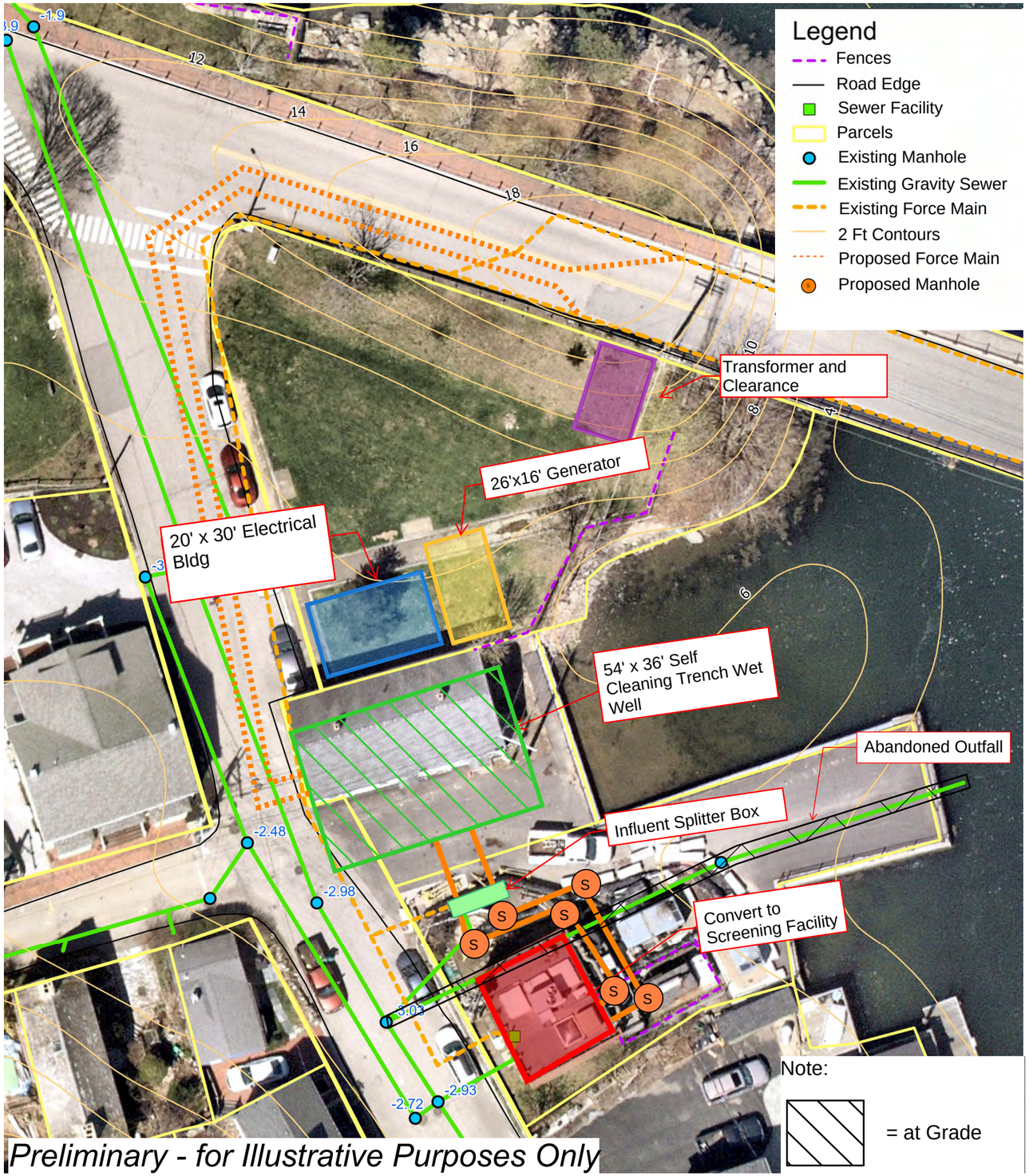
Conceptual Retrofit to Screening & Screenings Handling

SHEET NUMBER

7.1.0



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Option 1A – Retrofit Screen Building, New Control Building with Submersible Self-Cleaning Wet Wells

SHEET NUMBER

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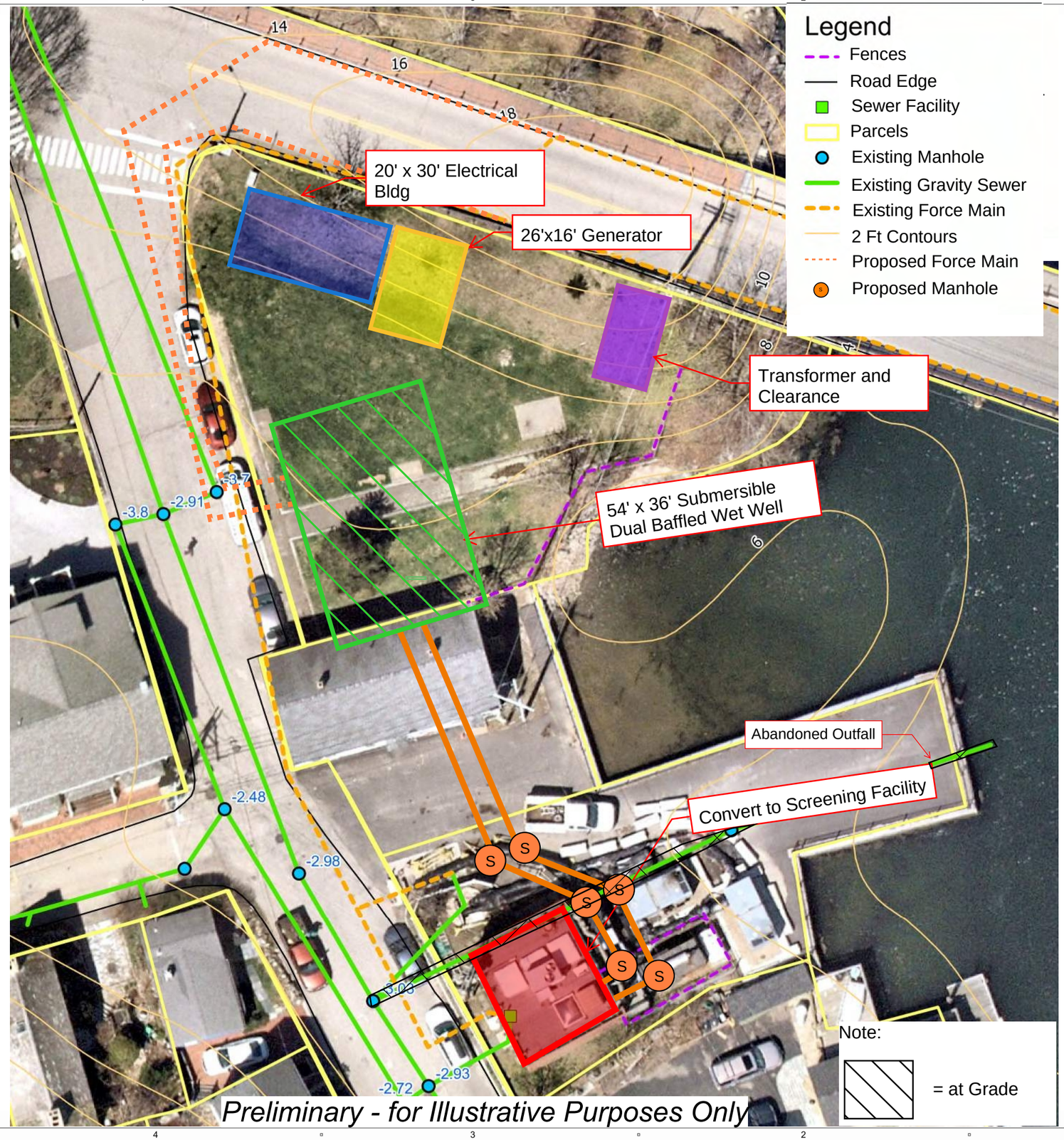

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Option 1B – Retrofit Screen Building, New Control Building with Submersible Baffled Wet Wells

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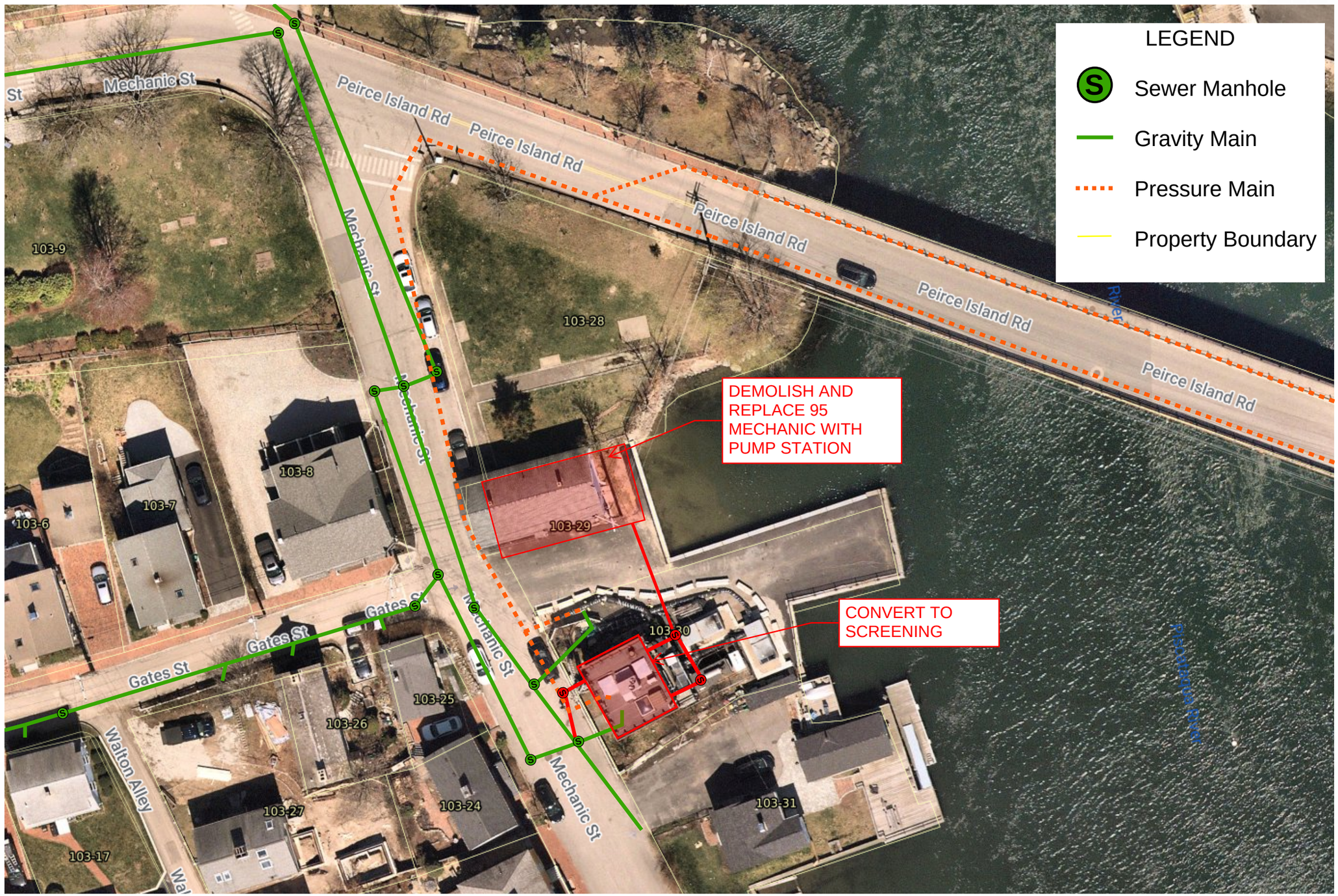

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Option 2 – Retrofit Screen Building, New Pump Building with Conventional Wet Wells / Dry Well

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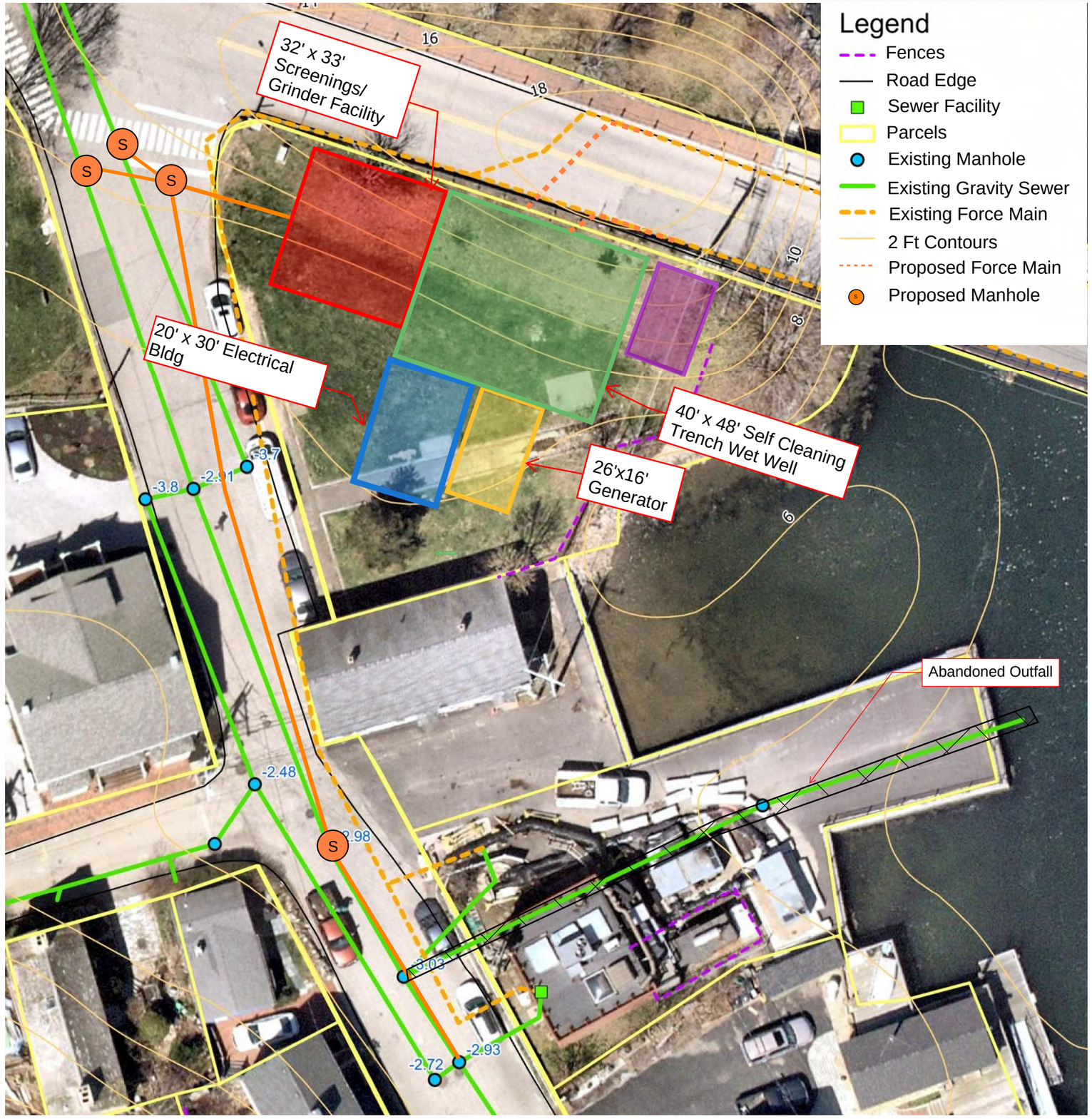

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Option 3A - New Control Building with Integral Pump Station – Self Cleaning Wet Wells

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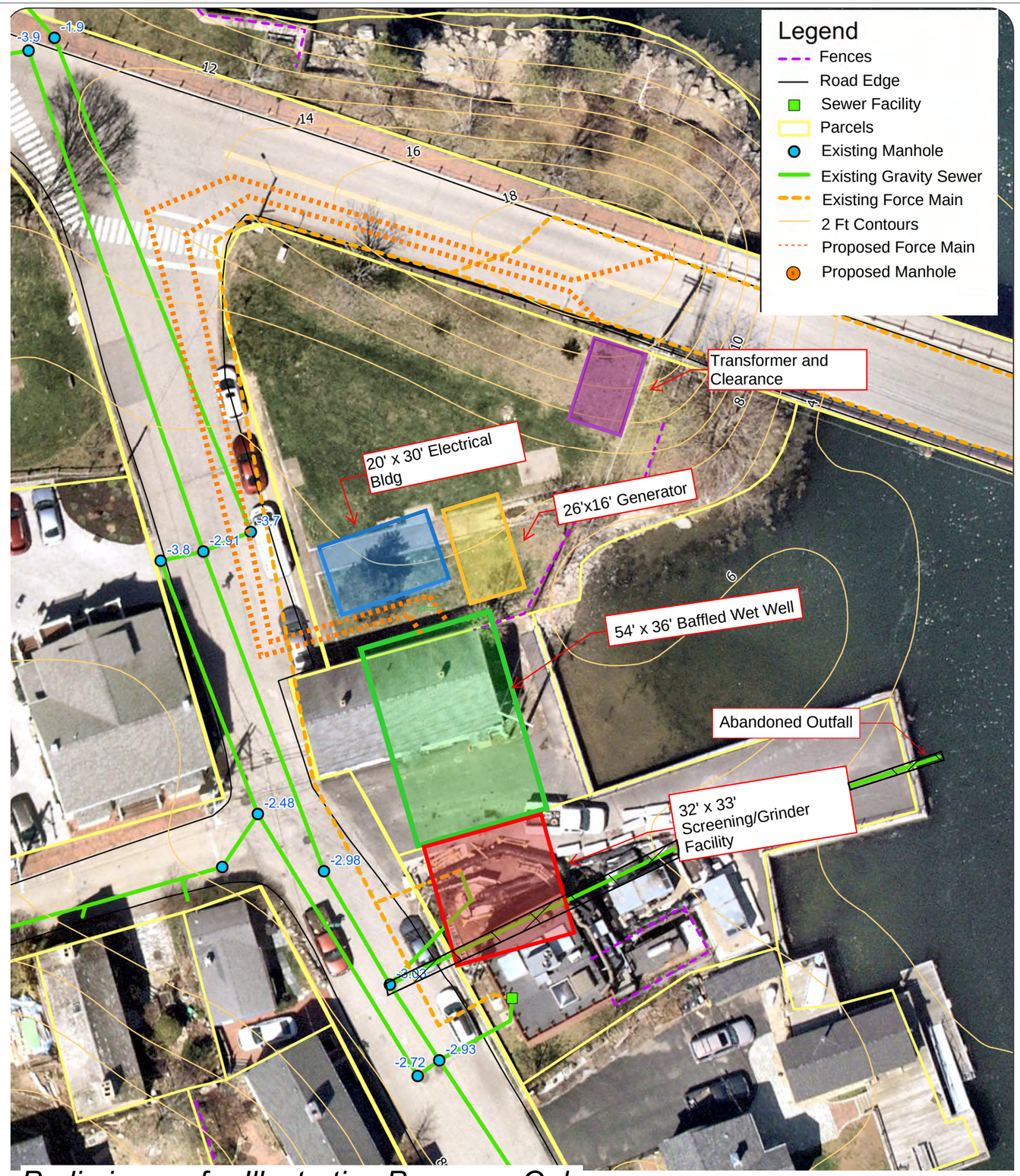

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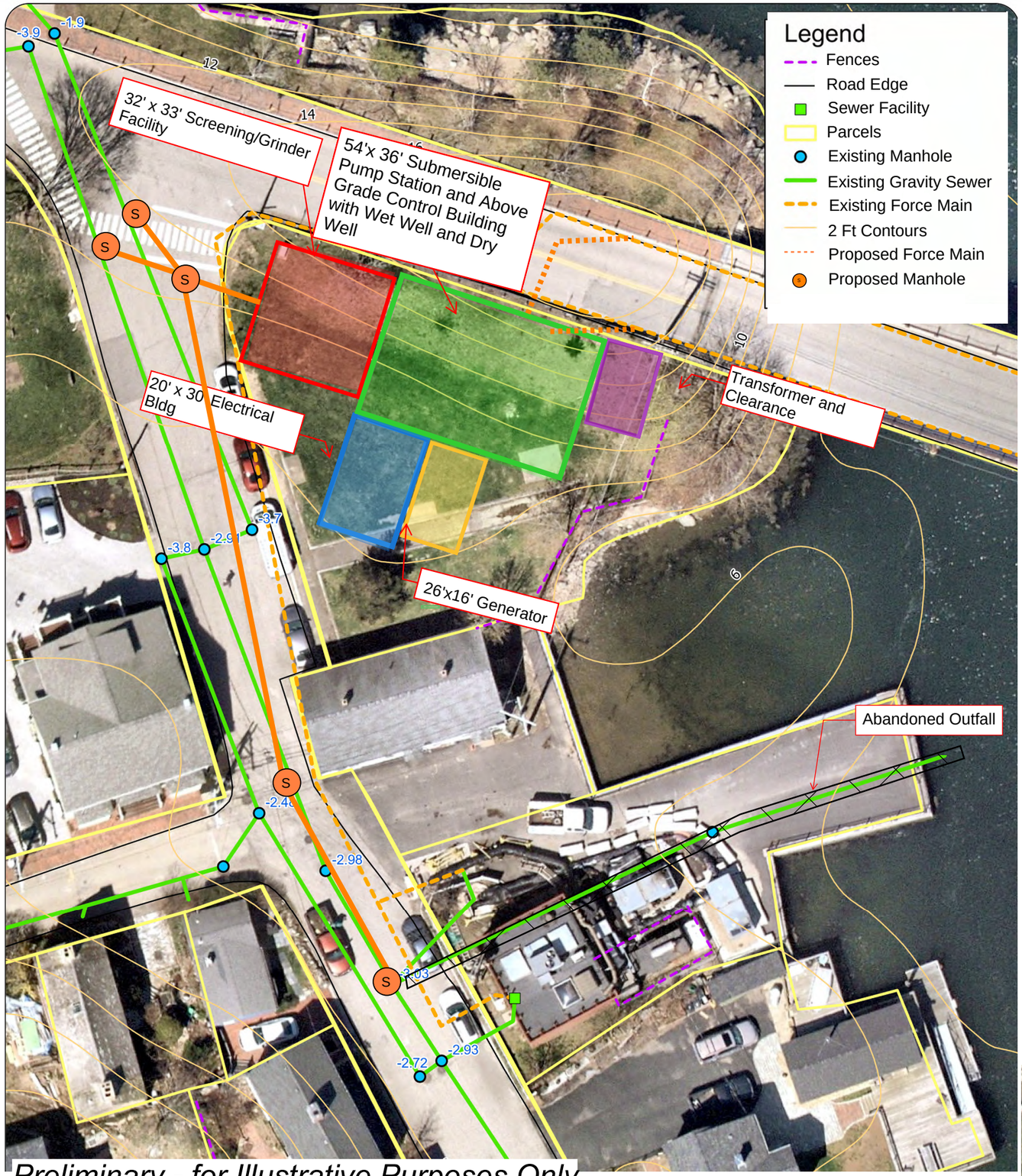
SHEET TITLE

Option 3B - New Control Building with Integral Pump Station – Baffled Wet Wells

SHEET NUMBER

7.1.3.2



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Scale:	1" = 30'-0"

DISCIPLINE

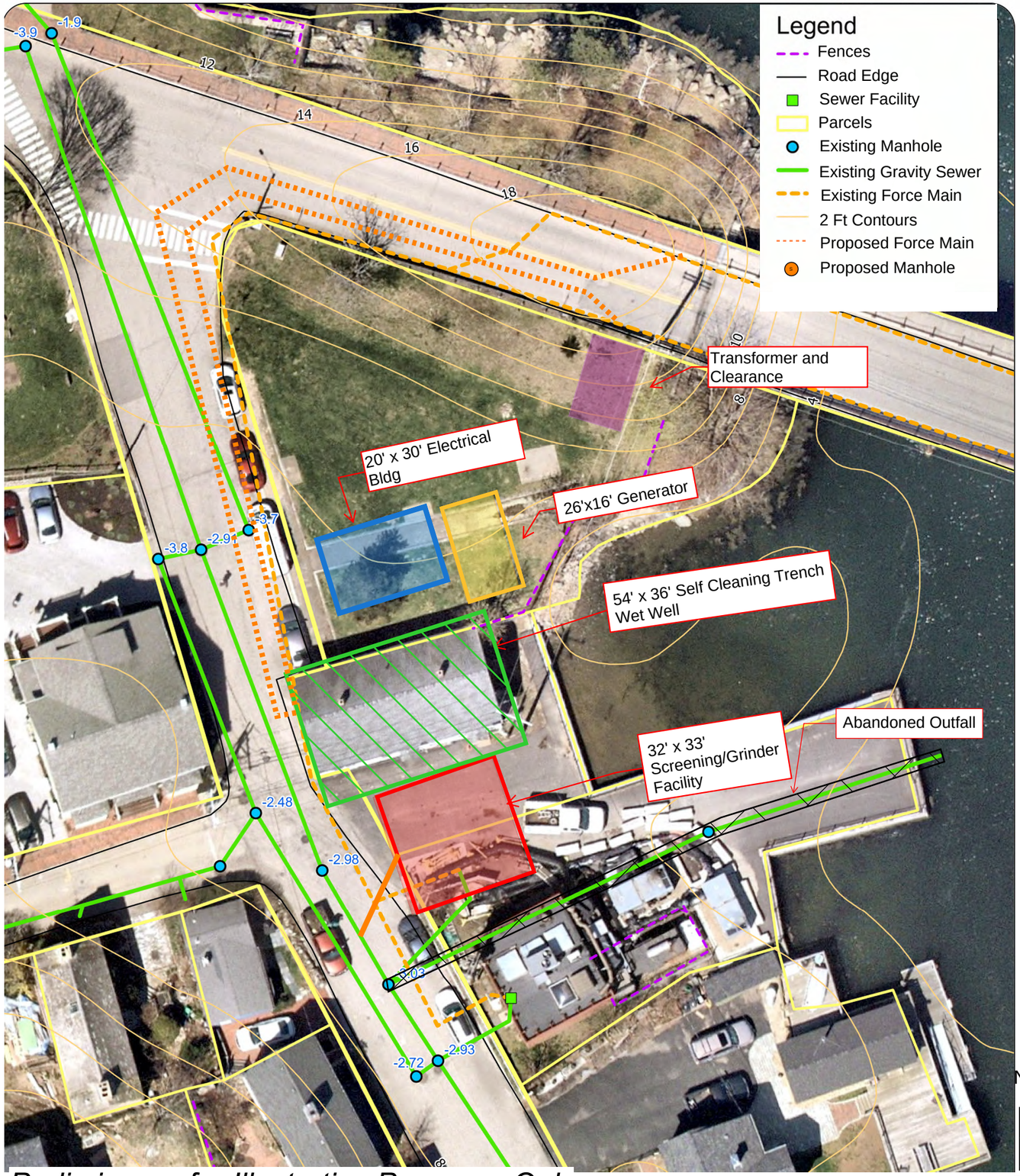
CIVIL

SHEET TITLE

Option 4A - Submersible Pump Station and Separate Above Grade Control Building – Wet Well and Dry Well

SHEET NUMBER

7.1.4.1



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SCALE: 1" = 30' - 0"

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Note:

= at Grade

PATH/FILENAME: Autodesk Docs://Chelmsford MA Proposals - Revit 2023/04191990 - Mech St PS - Model Storm Trench V2 - Arch - Option 3.rvt
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DISCIPLINE

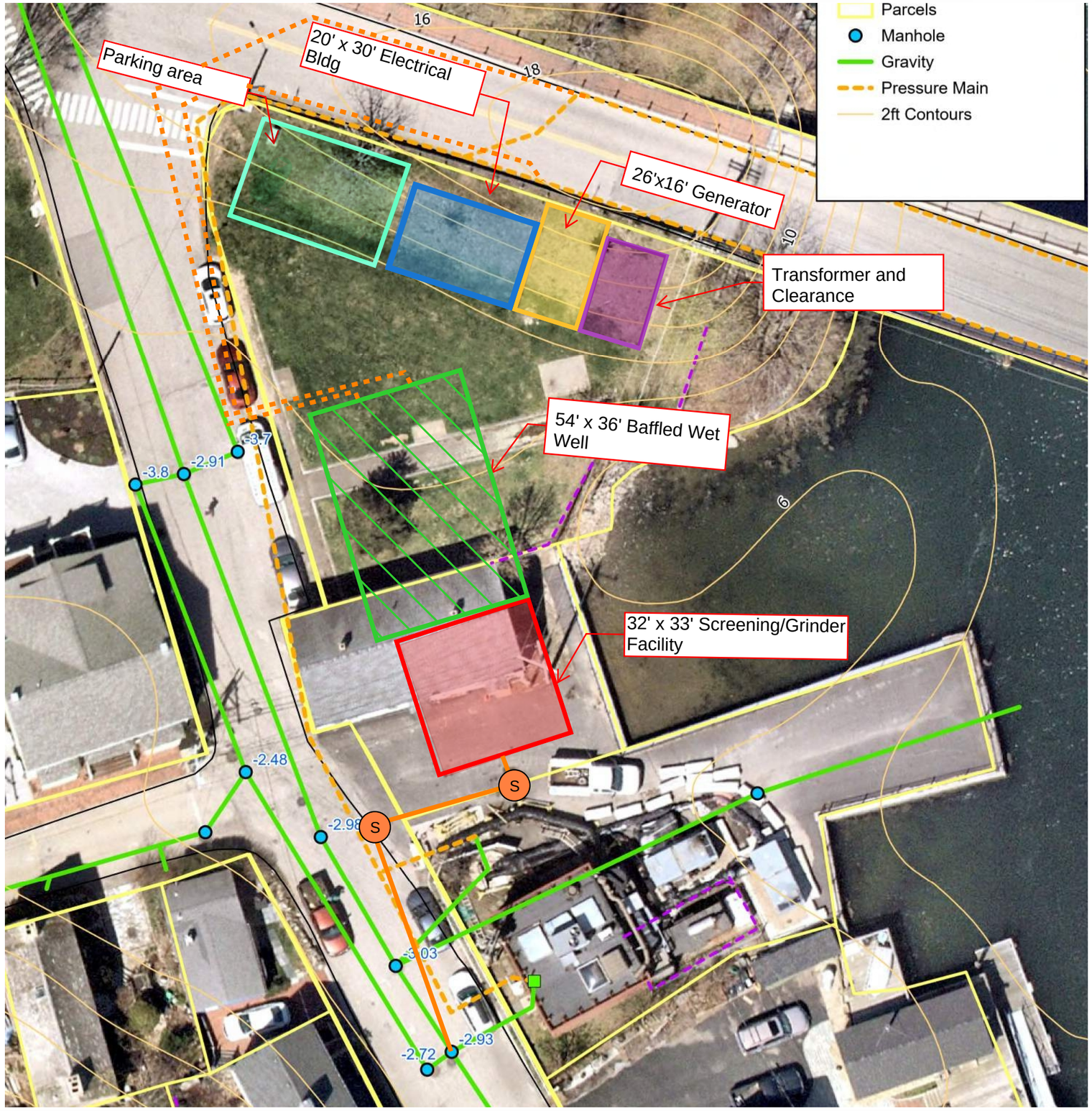
CIVIL

SHEET TITLE

Option 4B – Submersible Pump Station and Separate Above Grade Control Building with Self Cleaning Wet Wells.

SHEET NUMBER

7.1.4.2



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DISCIPLINE

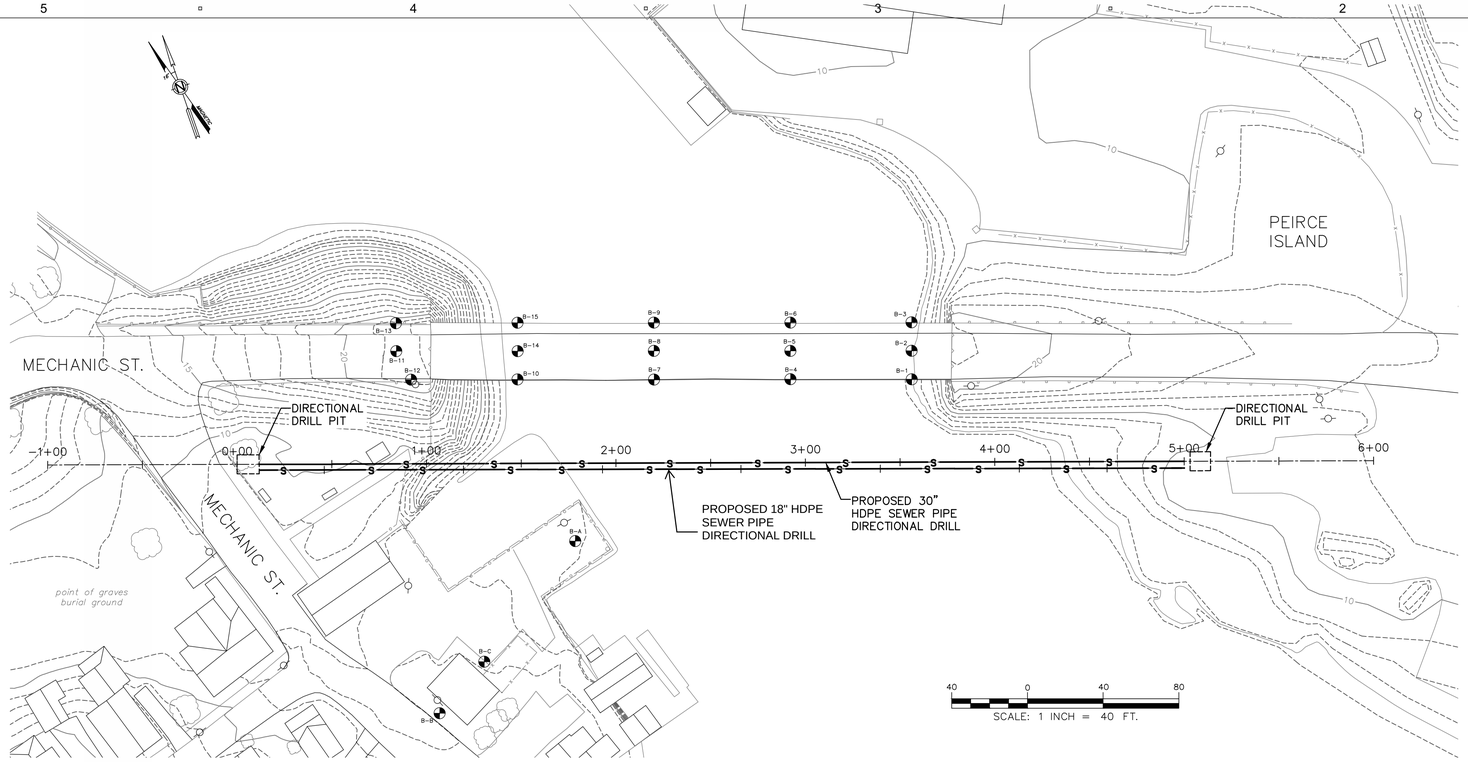
CIVIL

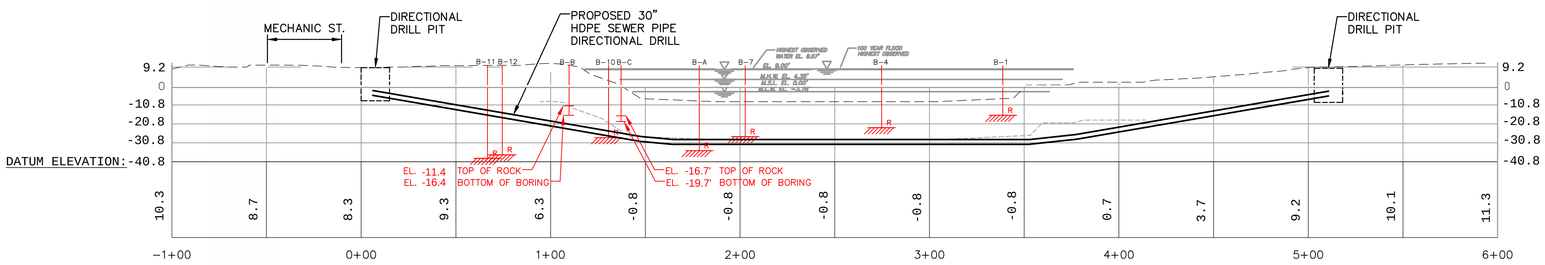
SHEET TITLE

Option 4C - Submersible Pump Station and Separate Above Grade Control Building – Baffled Wet Wells

SHEET NUMBER

7.1.4.3





NOTES:

1. SITE FEATURES AND TOPOGRAPHY FROM "PEIRCE ISLAND BRIDGE FORCE MAIN REPLACEMENT" DATED AUGUST 6, 1997 BY UNDERWOOD ENGINEERS, INC.
2. SEAWALL AND WHARF FEATURES FROM "95 MECHANIC STREET SEAWALL AND WHARF REPLACEMENT" DATED MARCH 24, 2021 BY TIGHE & BOND
3. TEST BORINGS B1 TO B13 ON PEIRCE ISLAND ROAD ARE APPROXIMATE AND BASED ON "CONTRACT PLANS FOR PEIRCE ISLAND BRIDGE & APPROACHES" DATED JANUARY 9, 1958 BY CLIFFORD BROKER ASSOCIATES.
4. TEST BORING B−A FROM "95 MECHANIC STREET SEAWALL AND WHARF REPLACEMENT" DATED MARCH 24, 2021 BY TIGHE & BOND. BORING PREPARED BY WATERFRONT ENGINEERS, LLC., PERFORMED MAY 14, 2009.
5. TEST BORINGS B−B AND B−C FROM "SEWAGE TREATMENT PLANT PUMPING STATIONS AND APPURTENANT WORK BY MEDCALF AND EDDY ENGINEERS", DATED MARCH 1963. BORINGS PREFORMED OCTOBER 1962.
6. VERTICAL DATUM IS BASED ON DATUM NAVD 1988. ELEVATIONS CONVERTED FROM RECORD INFORMATION (NVGD 1929 TO NAVD 1988.

PATH/FILENAME: Autodesk Docs://Chelmsford MA Proposals - Revit 2023/04191990 - Mech St PS - Model 5_Sym Trench_V2_Arch Option 3.rvt
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DISCIPLINE

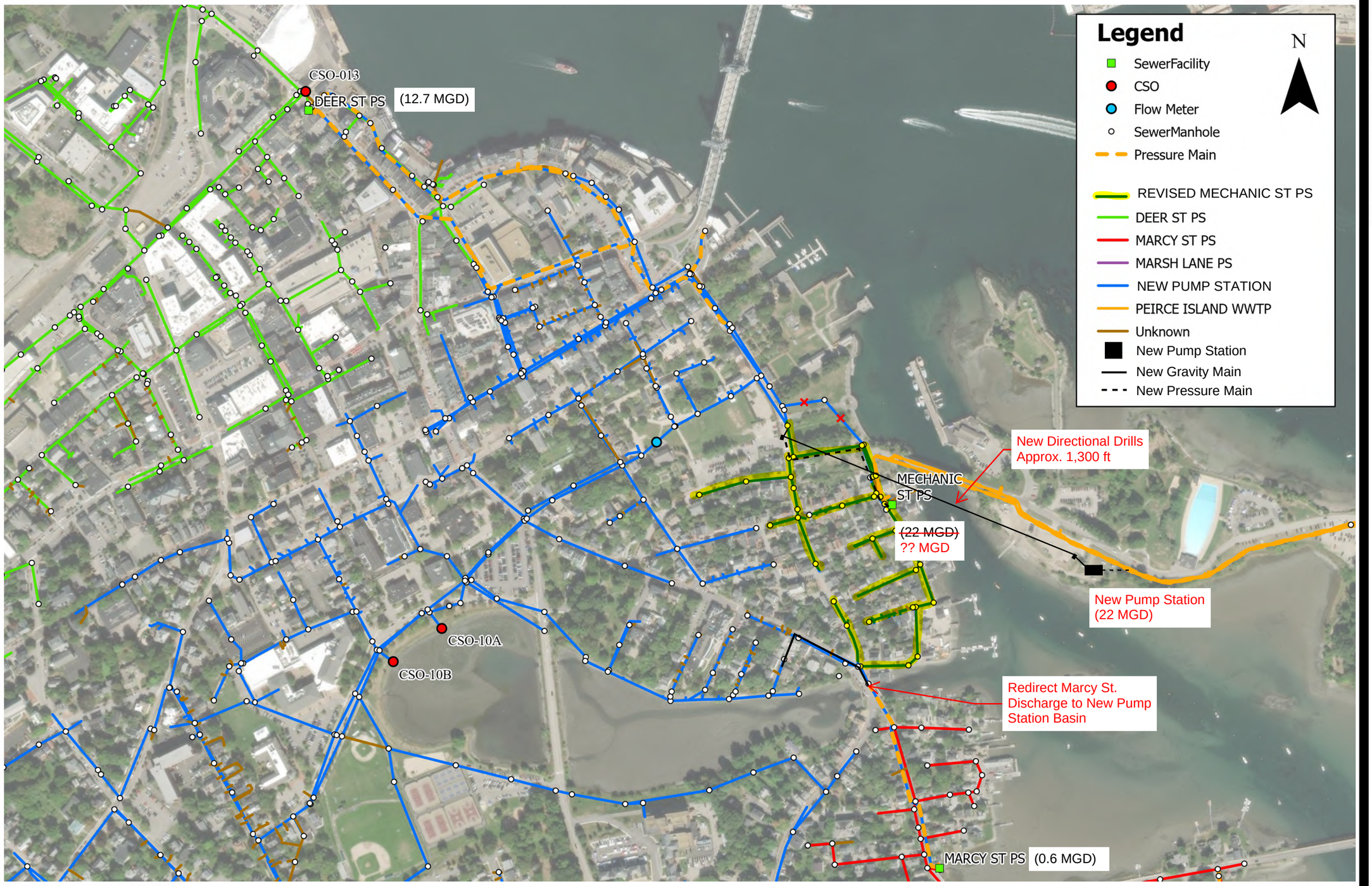
CIVIL

SHEET TITLE

Peirce Island Relocation
Directional Drilling

SHEET NUMBER

7.2.1A



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DISCIPLINE

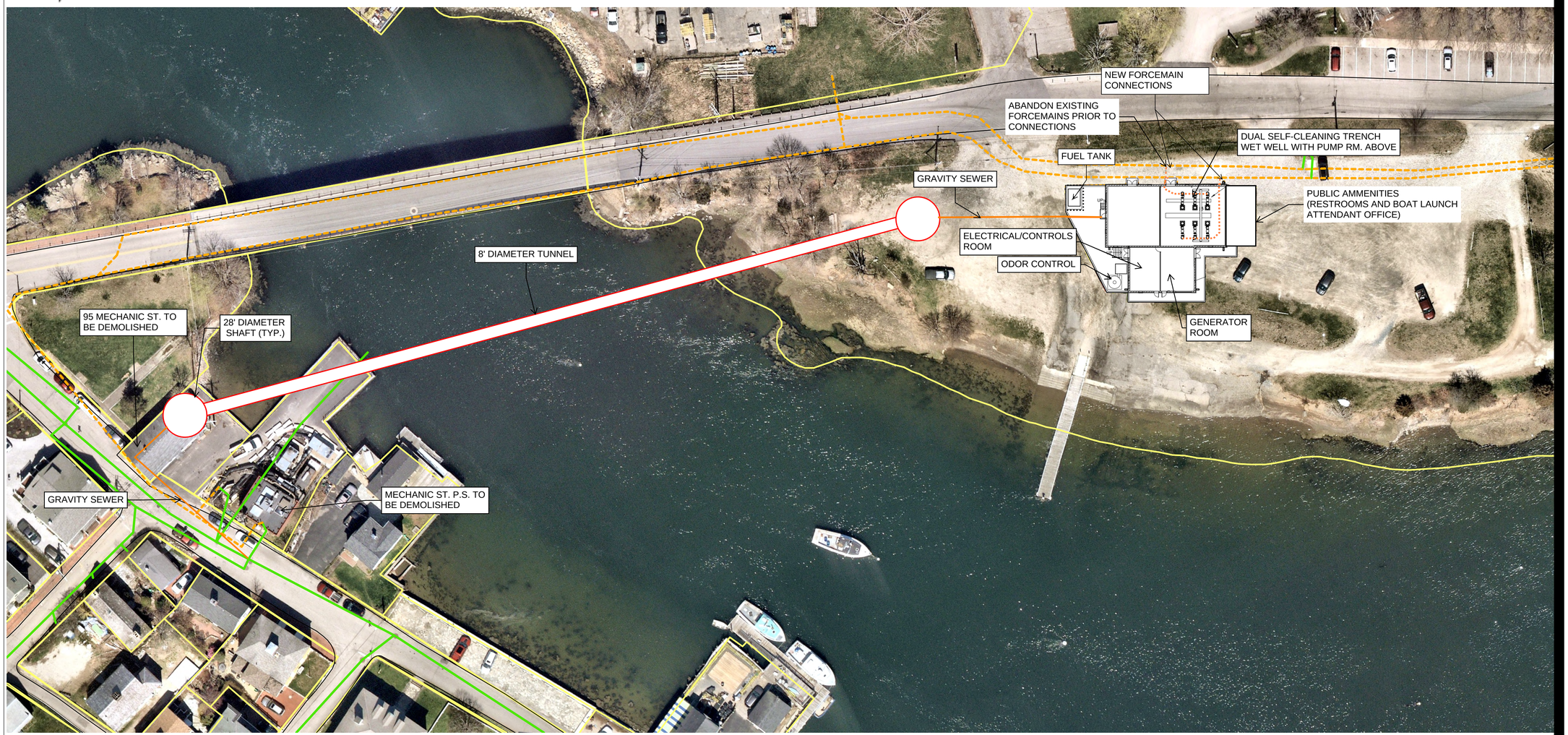
CIVIL

SHEET TITLE

Peirce Island Relocation Directional Drilling

SHEET NUMBER

7.2.1B



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1 SITE PLAN
Scale: 1" = 35' - 0"

PATH/FILENAME: Autodesk Docs://Chelmsford MA Proposals - Revit 2023/04191990 - Mech St PS - Model Submit Baffle WW_Arch - Option 1.rvt
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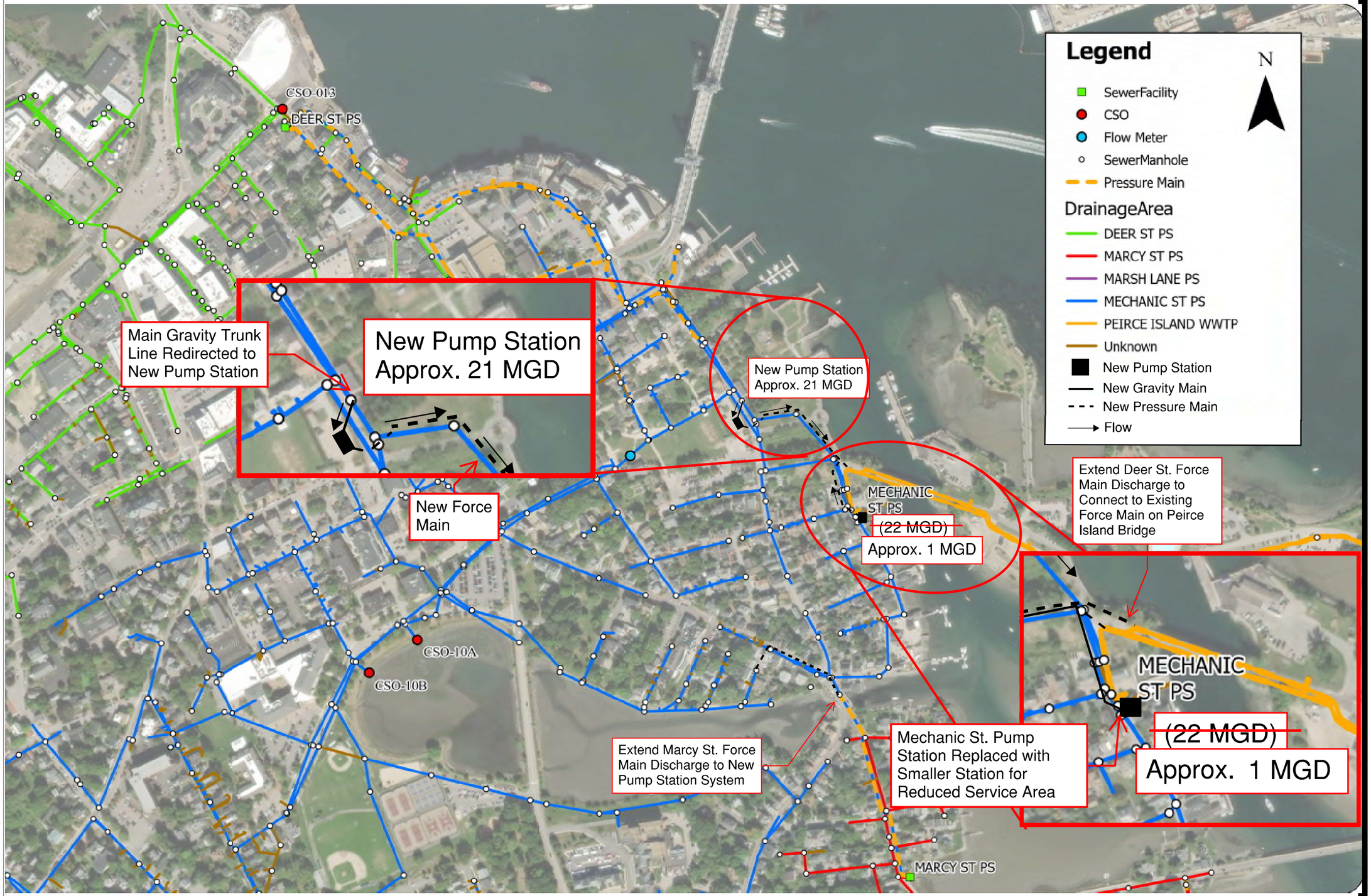
DISCIPLINE

CIVIL

SHEET TITLE

Peirce Island Micro-tunneling Plan

7.2.2



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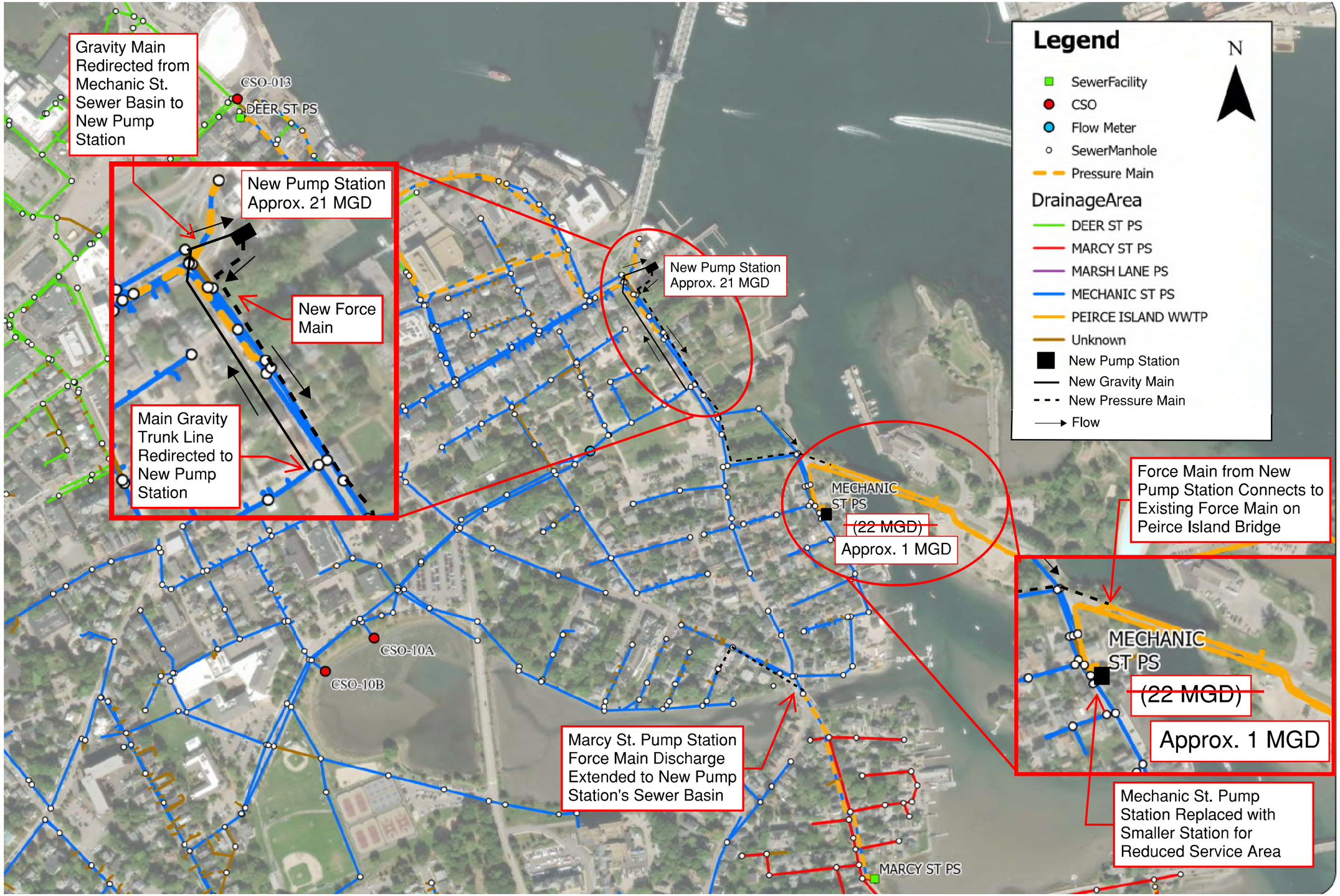
CIVIL

SHEET TITLE

New Pump Station by Puddle Dock Restaurant

SHEET NUMBER

7.3.1



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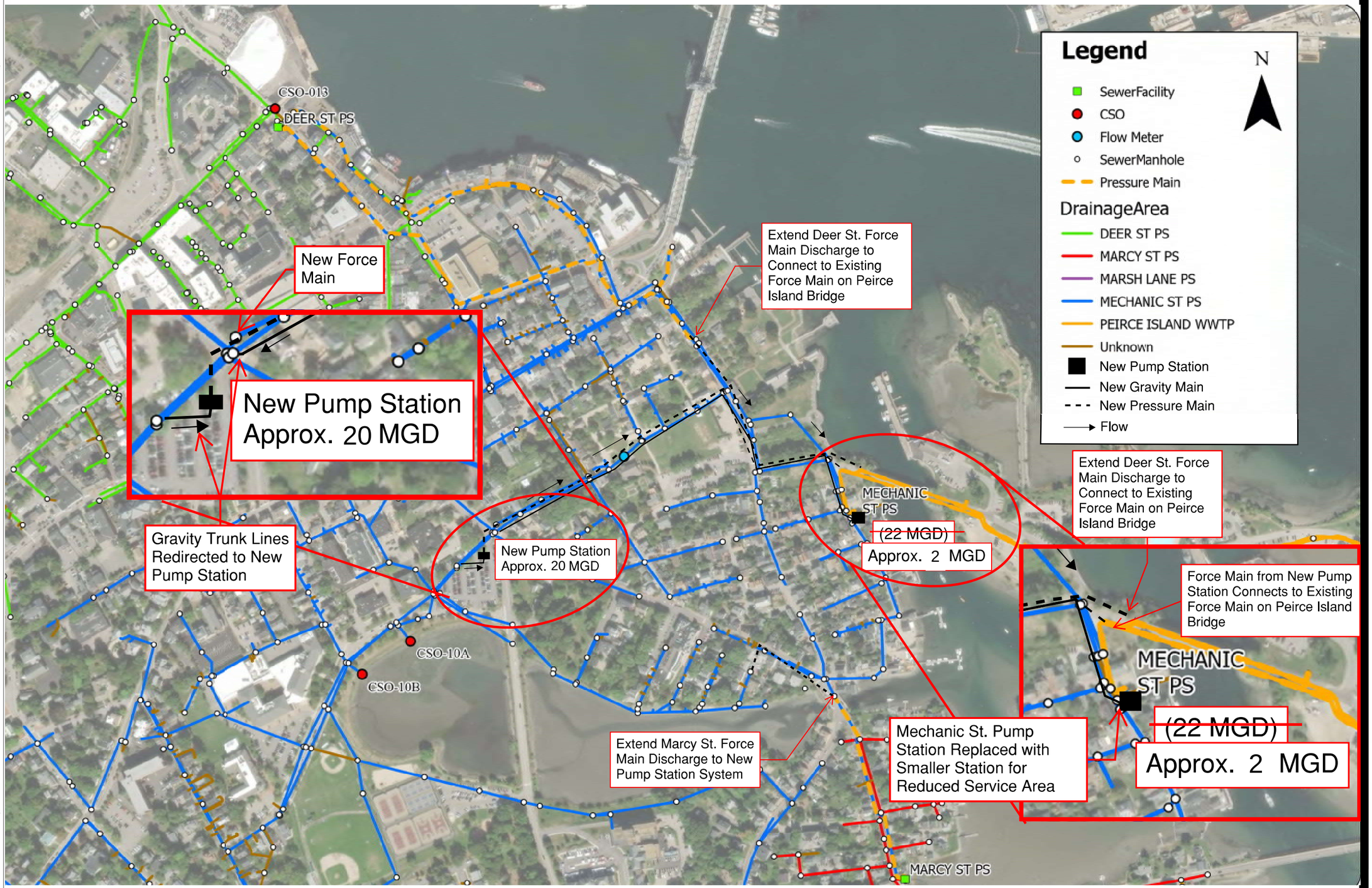
SHEET TITLE

New Pump Station by Memorial Bridge

SHEET NUMBER

7.3.2



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PLOT DATE: 5/19/2025 11:34:43 PM

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SHEET TITLE

New Pump Station in Parrot Ave Parking Lot

SHEET NUMBER

7.3.3

FIGURES

SECTION SEVEN

PREFERRED OPTIONS RENDERINGS



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Legend

- Fences
- Road Edge
- Sewer Facility
- Parcels
- Existing Manhole
- Existing Gravity Sewer
- Existing Force Main
- 2 Ft Contours
- Proposed Force Main
- Proposed Manhole
- Buried Electric

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CIVIL

SHEET TITLE

Site Plan Option 1B – Retrofit Screen Building, New Control Building with Submersible Baffled Wet Wells

7.4.1.1A

PATH/FILENAME: Autodesk Docs://Chelmsford MA Proposals - Revit 2023/04191990 - Mech St PS - Model Sloped Baffle WW with Option 1.rvt
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SHEET TITLE

Perspective View Option 1B – Retrofit Screen Building, New Control Building with Submersible Baffled Wet Wells

7.4.1.1B

PATH/FILENAME: Autodesk Docs://Chelmsford MA Proposals - Revit 2023/04191990 - Mech St PS - Model Submersible Baffle WW_Arch - Option 1.rvt
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Perspective View Option 1B – Retrofit Screen Building, New Control Building with Submersible Baffled Wet Wells

7.4.1.1C

PATH/FILENAME: Autodesk Docs://Chelmsford MA Proposals - Revit 2023/04191990 - Mech St PS - Model - Option Baffle WW Area - Option 1.rvt
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Scale:	**NOT TO SCALE**

DISCIPLINE

CIVIL

SHEET TITLE

Perspective View Option 1B – Retrofit Screen Building, New Control Building with Submersible Baffled Wet Wells

7.4.1.1D



Legend

- Fences
- Road Edge
- Sewer Facility
- Parcels
- Existing Manhole
- Existing Gravity Sewer
- Existing Force Main
- 2 Ft Contours
- Proposed Force Main
- Proposed Manhole
- Buried Electric

Preliminary - for Illustrative Purposes Only

1 SITE PLAN
Scale: 1" = 20'-0"

PATH/FILENAME: Autodesk Docs://Chelmsford MA Proposals - Revit 2023/04191990 - Mech St PS - Model V01_Pumps_Arch_Option 2.rvt
LAST UPDATE: 7/14/2025 12:33:20 PM
PLOT DATE: 7/14/2025 12:33:20 PM

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PUMP STATION

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NEW HAMPSHIRE

DEPARTMENT OF PUBLIC WORKS
680 Peverly Hill Road
Portsmouth, NH 03801
603-427-1530 tel 603-427-1539 fax
http://www.portsmouthnh.gov/publicworks

CONSULTANT

UNDERWOOD ENGINEERS
25 VAUGHN MALL
PORTSMOUTH, NH 03801
PHONE: (603) 436-6192
www.UnderwoodEngineers.com

AECOM TECHNICAL SERVICES, INC.
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CHELMSFORD, MA 01824
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www.aecom.com

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Dept Check:	**KC**
Proj Check:	**EM**
Date:	**JULY 2025**
Scale:	**1" = 20'-0"**

DISCIPLINE

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SHEET TITLE

Site Plan Option 3A - New Control Building with Integral Pump Station – Self Cleaning Wet Wells

7.4.2.2A



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Dept Check:	**KC**
Proj Check:	**EM**
Date:	**JULY 2025**
Scale:	**NOT TO SCALE**

DISCIPLINE

CIVIL

SHEET TITLE

Perspective View Option 3A - New Control Building with Integral Pump Station – Self Cleaning Wet Wells

7.4.2.2B

PATH/FILENAME: Autodesk Docs://Chelmsford MA Proposals - Revit 2023/04191990 - Mech St PS - Model_V2_Perspective_Option 2.rvt
LAST UPDATE: 7/14/2025 12:33:21 PM
PLOT DATE: 7/14/2025 12:33:21 PM



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PATH/FILENAME: Autodesk Docs://Chelmsford MA Proposals - Revit 2023/04191990 - Meeh St PS - Model AVT Plots_v23_ch_Option 2.rvt
LAST UPDATE: 7/14/2025 12:33:21 PM
PLOT DATE: 7/14/2025 12:33:21 PM

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Drawn By:	**MP**
Dept Check:	**KC**
Proj Check:	**EM**
Date:	**JULY 2025**
Scale:	**NOT TO SCALE**

DISCIPLINE

CIVIL

SHEET TITLE

Perspective View Option 3A - New Control Building with Integral Pump Station – Self Cleaning Wet Wells

7.4.2.2C



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PATHFILENAME: Autodesk Docs://Chelmsford MA Proposals - Revit 2023/04191990 - Mech St PS - Model
LAST UPDATE: 7/14/2025 12:33:22 PM
PLOT DATE: 7/14/2025 12:33:22 PM

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Date:	**JULY 2025**
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DISCIPLINE

CIVIL

SHEET TITLE

Perspective View Option 3A - New Control Building with Integral Pump Station – Self Cleaning Wet Wells

7.4.2.2D



Preliminary - for Illustrative Purposes Only

Legend

- Fences
- Road Edge
- Sewer Facility
- Parcels
- Existing Manhole
- Existing Gravity Sewer
- Existing Force Main
- 2 Ft Contours
- Proposed Force Main
- Proposed Manhole
- Buried Electric

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Date:	**JULY 2025**
Scale:	**1" = 20'-0"**

DISCIPLINE

CIVIL

SHEET TITLE

Site Plan Option 4C - Submersible Pump Station and Separate Above Grade Control Building – Self-cleaning Wet Wells

7.4.3.3A

PATH/FILENAME: Autodesk Docs://Chelmsford MA Proposals - Revit 2023/04191990 - Mech St PS - Model Submit_Temp3_V2_Arch - Option 3.rvt
LAST UPDATE: 7/14/2025 12:59:42 PM
PLOT DATE: 7/14/2025 12:59:42 PM



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DISCIPLINE

CIVIL

SHEET TITLE

Perspective View Option 4C - Submersible Pump Station and Separate Above Grade Control Building – Self-cleaning Wet Wells

7.4.3.3B

PATH/FILENAME: Autodesk Docs://Chelmsford MA Proposals - Revit 2023/04191990 - Mech St PS - Model Submission Period 2 Arch - Option 3.rvt
LAST UPDATE: 7/14/2025 12:59:43 PM
PLOT DATE: 7/14/2025 12:59:43 PM



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LAST UPDATE: 7/14/2025 12:59:45 PM
PLOT DATE: 7/14/2025 12:59:45 PM

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DISCIPLINE

CIVIL

SHEET TITLE

Perspective View Option 4C - Submersible Pump Station and Separate Above Grade Control Building – Self-cleaning Wet Wells

7.4.3.3C



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Date:	**JULY 2025**
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DISCIPLINE

CIVIL

SHEET TITLE

Perspective View Option 4C - Submersible Pump Station and Separate Above Grade Control Building – Self-cleaning Wet Wells

7.4.3.3D

APPENDIX A
MECHANICS STREET PUMP STATION
RECORD DRAWINGS

CITY OF PORTSMOUTH
NEW HAMPSHIRE

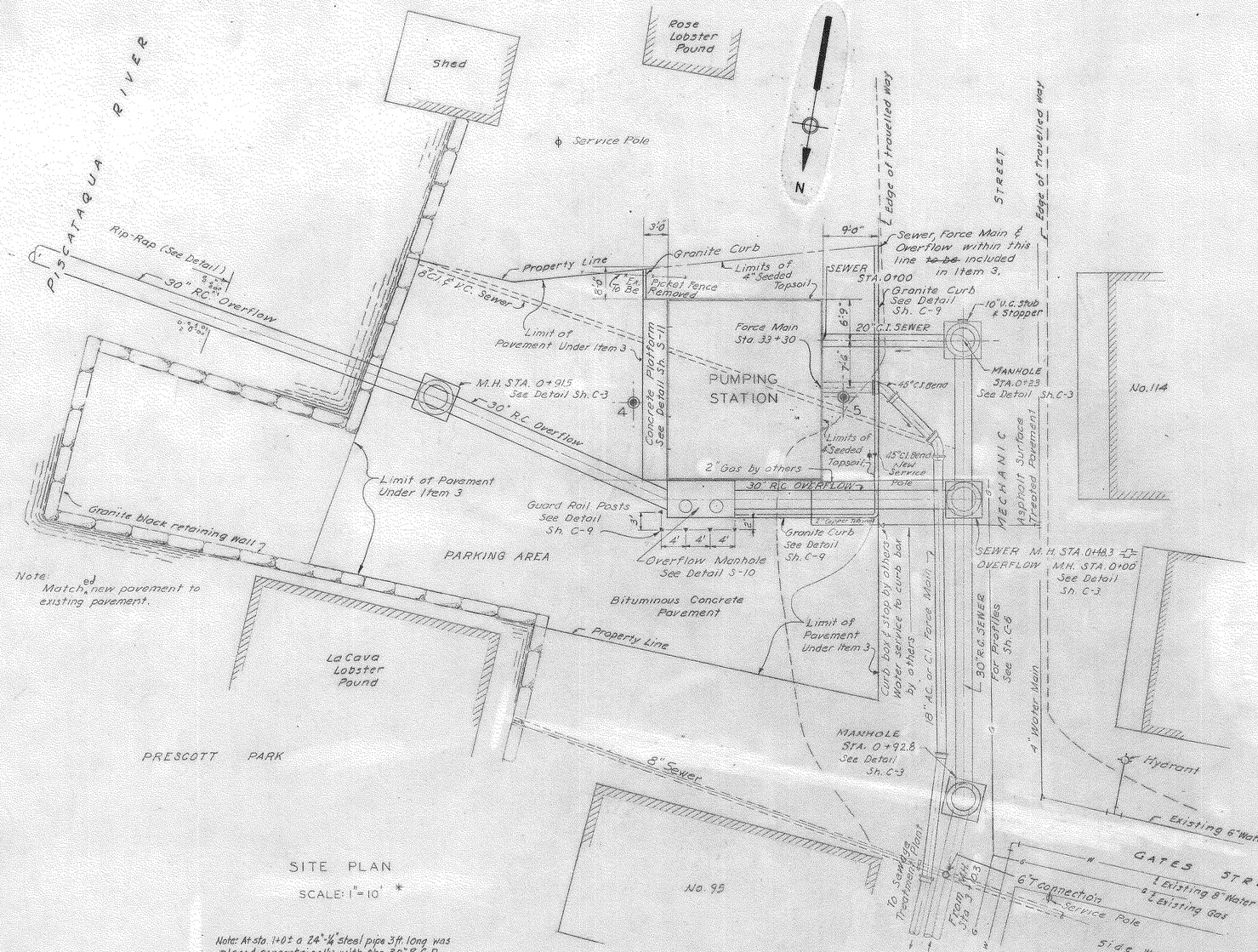
SEWAGE TREATMENT PLANT
PUMPING STATIONS
AND
APPURTENANT WORK

CONTRACT DRAWINGS
CONTRACT 1963-1

METCALF & EDDY
ENGINEERS
BOSTON, MASS.

RECORD DRAWING

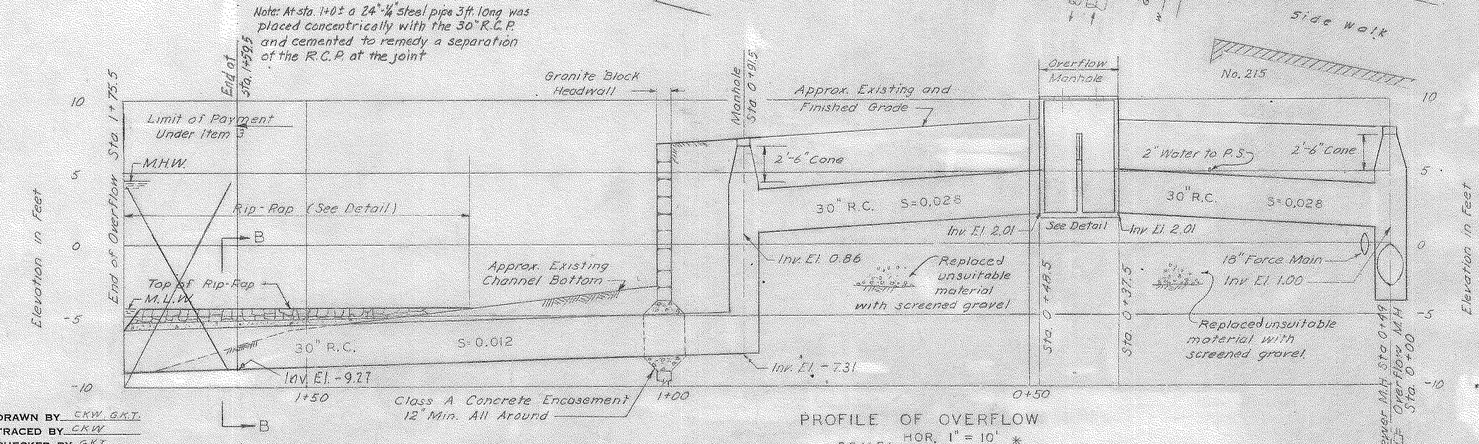
H-3601B-1



SITE PLAN

SCALE: 1" = 10' *

Note: At sta. 1+0± a 24"×¼" steel pipe 3ft. long was placed concentrically with the 30" R.C.P. and cemented to remedy a separation of the R.C.P. at the joint



PROFILE OF OVERFLOW

SCALE: HOR. 1" = 10' *
VER. 1" = 5'

BORINGS

NO. 4 — El. 7.8

		B.O.S.
0.0' – 2.0'	Sand, gravel & cinder Fill	24
2.0' – 6.4'	Cinder Fill	2
Water 6.4'		
6.4' – 8.0'		2
8.0' – 10.0'	Fine Sand	9
10.0' – 15.0'	Fine to Medium sand & some Medium coarse gravel	64
15.0' – 18.4'	Fine to Medium sand and some Medium gravel	36
18.4' – 23.6'	Cored Rock Run No.1 Recovered 27" Badly Fractured Shale	C
23.6'	Bottom of Boring	

10/25/62

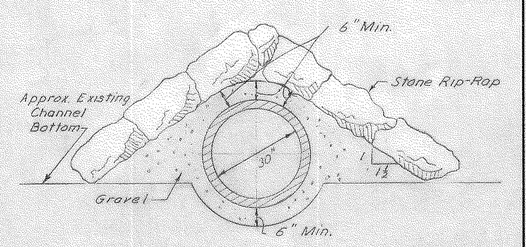
NO. 5 — El. 7.5

		B.O.S.
0.0' – 2.0'	Sand & cinder Fill	10
2.0' – Water 6.5'	Fine sand and Organic silt	3
6.5' – 8.0'		3
8.0' – 14.0'	Fine to Medium Sand & little Medium gravel	14
14.0' – 23.6'	Fine to Medium Sand & some Medium coarse gravel	29 41
23.6' – 28.4'	Cored Rock Run 1 Recovered 14" Shale badly Fractured	C

10/26/62

BORING NOTES

1. Borings are shown on Site Plan, thus ◉5
2. Borings are designated by numbers 4 & 5
3. Elevations shown are based on U.S.C.S. datum.
4. Figures in the B.O.S. column indicate number of blows required to drive a 2 inch O.D. split sampler 12 inches with a 140 lb. weight falling 30 inches.



SECTION B-B

SCALE $\frac{1}{2}$" = 1'-0" *

* DOES NOT APPLY WHEN DRAWING SIZE HAS BEEN CHANGED BY REPRODUCTION.

DRAWN BY CKW, GKT.
TRACED BY CKW
CHECKED BY GKT

RECORD DRAWING

REVISION	MADE BY	CHECKED BY	DESCRIPTION
② 6-65	E.B.M.	G.K.T.	Revised for Record Dwgs.
① 5-15-63	D.E.S.	G.E.T.	CHANGE GAS LINE DIA.

CITY OF PORTSMOUTH, N.H.

PUMPING STATION

GATES & MECHANIC STREET
SITE PLAN & OVERFLOW

CIVIL

SCALE, AS SHOWN — MARCH, 1963

METCALF & EDDY
ENGINEERS
BOSTON, MASS.

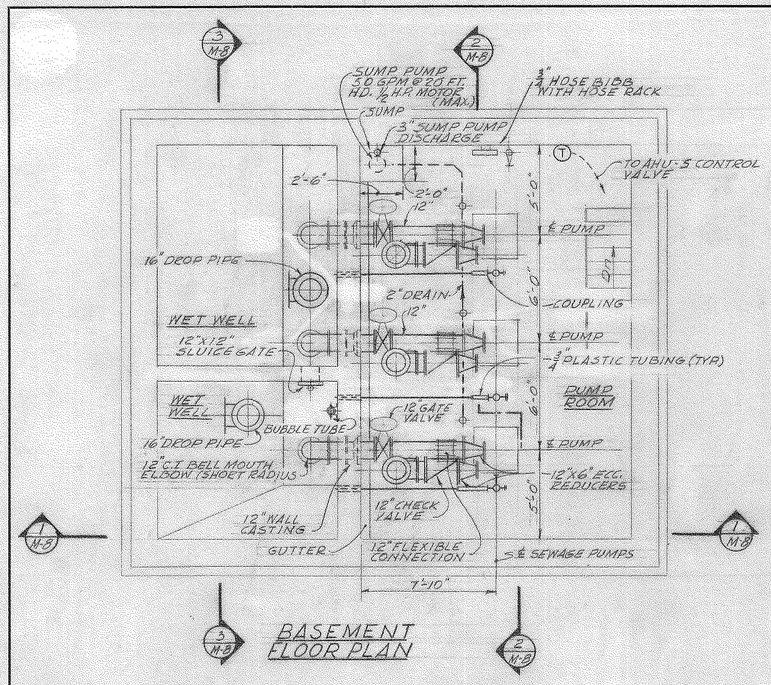
H 360.30 1

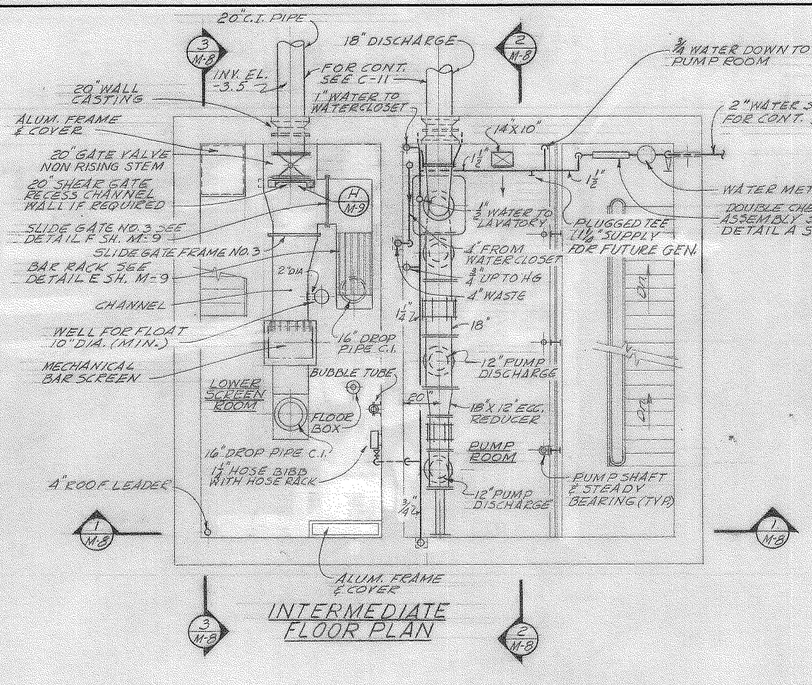
THE STATE OF NEW HAMPSHIRE — JOHN S. BETHEL JR. No. 750 — REGISTERED PROFESSIONAL ENGINEER

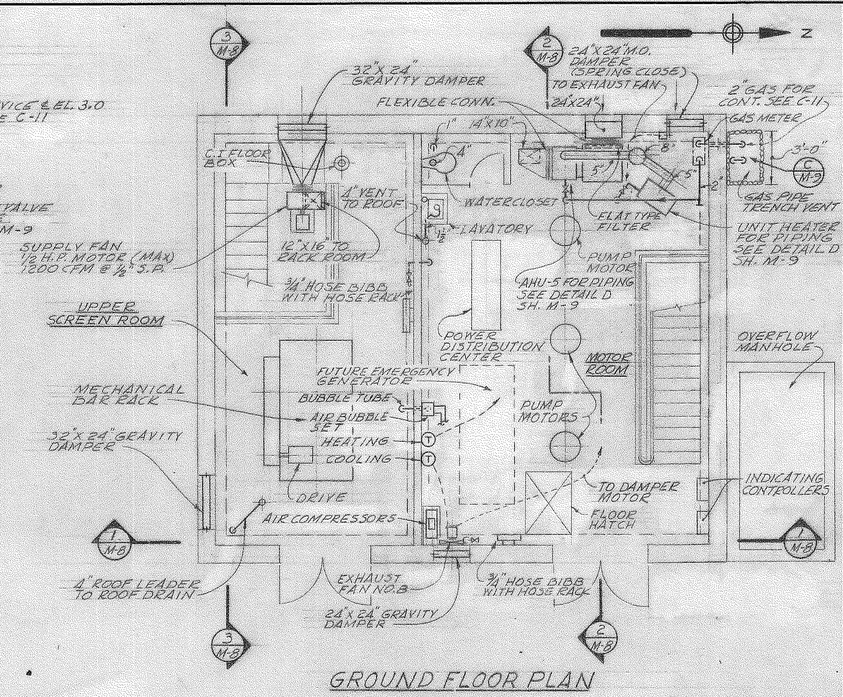
APPROVED
FOR METCALF & EDDY, ENGINEERS
John S. Bethel Jr. 4/1/63
REG. PROF. ENGR. N.H. NO. 750 — DATE

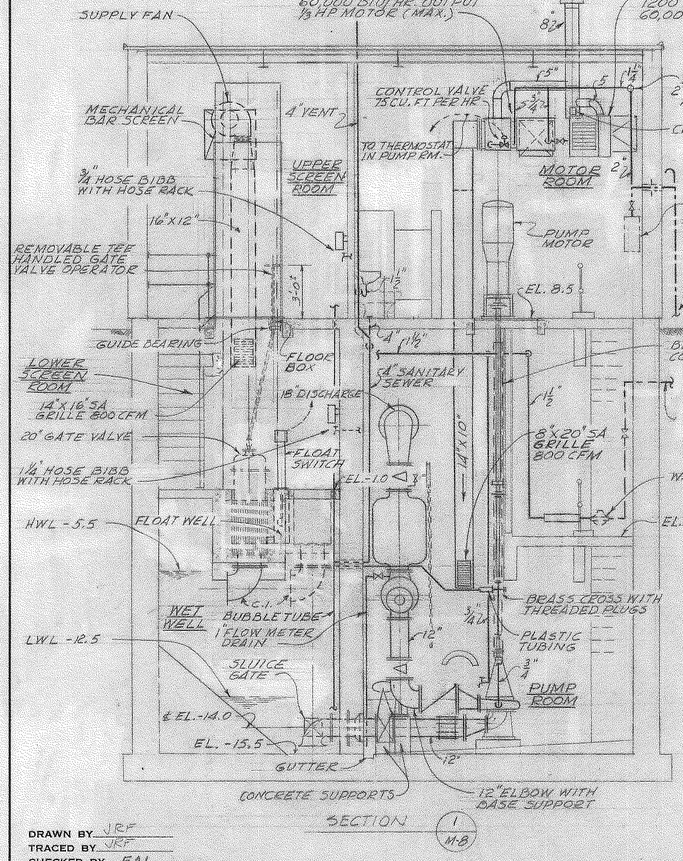
CONTRACT 1963-1 SHEET C-11

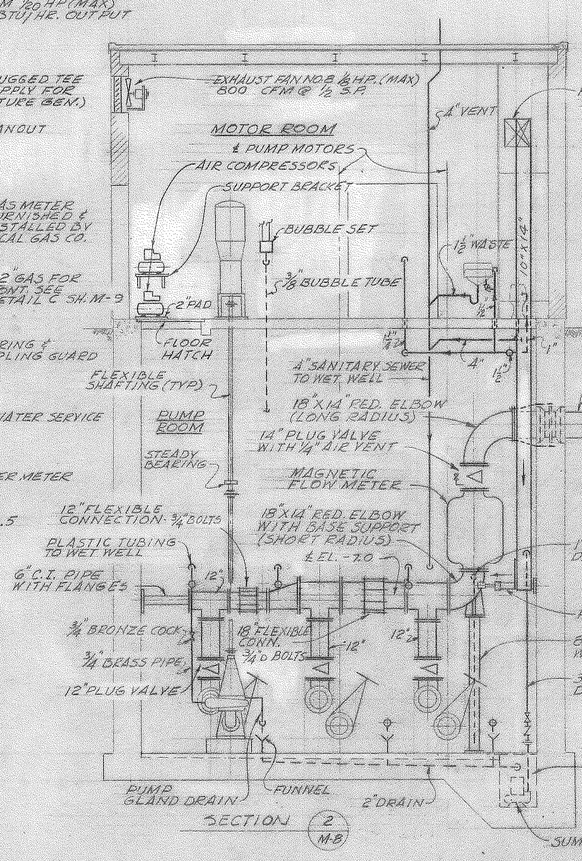
BOOK N146 D. L. M. INC.

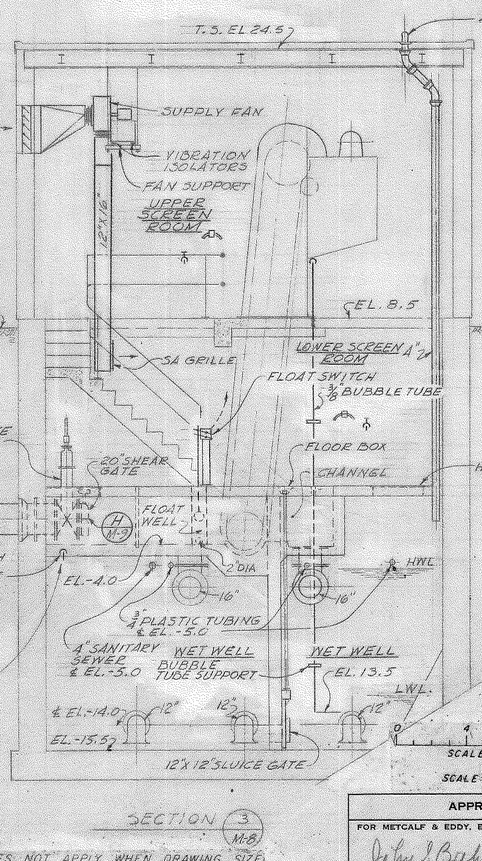












NOTES

1. ALL PIPES PASSING THROUGH WALL BETWEEN SCREEN ROOMS AND PUMP ROOM ~~SHALL BE~~ WERE CAULKED GAS TIGHT IN THEIR SLEEVES.
2. FOR GENERAL NOTES SEE M-2
3. MECH. SCREEN ~~7'-0"~~ 7'-2½" FURNISHED IN SECTIONS TO PERMIT INSTALLATION & REMOVAL.
4. FOR PUMP CONTROL DIAGRAM SEE M-9

RECORD DRAWING

REVISION	MADE BY	CHECKED BY	DESCRIPTION
②	6-65	E.B.M.	Revised for Record Dwgs.
△	5/27/63	JRF	EAL	REVISED PUMP CONTROL & MISC. DETAILS FOR ESTIMATE & BID, DELETED SHT. M-9 ADDED 1 SHEET TO DWG. FILM. SWITCH & SLUICE GATE.

THE STATE OF NEW HAMPSHIRE JOHN S. BETHEL JR. No. 750 REGISTERED PROFESSIONAL ENGINEER

CITY OF PORTSMOUTH, N.H.

PUMPING STATION

GATES & MECHANICS STREET

PIPING PLUMBING & HEATING

MECHANICAL

SCALE: AS SHOWN — MARCH, 1963

METCALF & EDDY ENGINEERS BOSTON, MASS.

H 56058 1

SCALE IN FEET 0 4 8 12

SCALE: ½" = 1'-0" *

APPROVED

FOR METCALF & EDDY, ENGINEERS

John S. Bethel Jr. 4/17/63

REG. PROF. ENGR. N.H. NO. 750 — DATE

DRAWN BY JRF
TRACED BY JRF
CHECKED BY EAL

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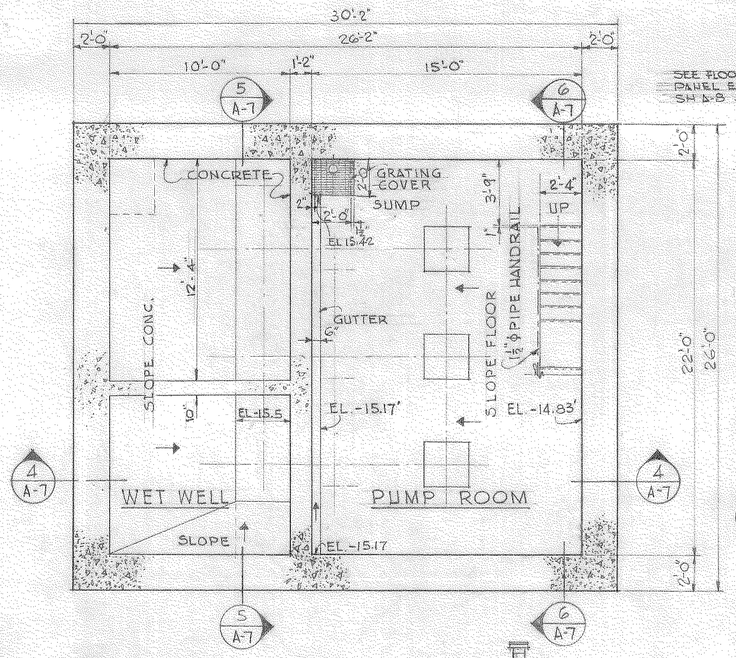
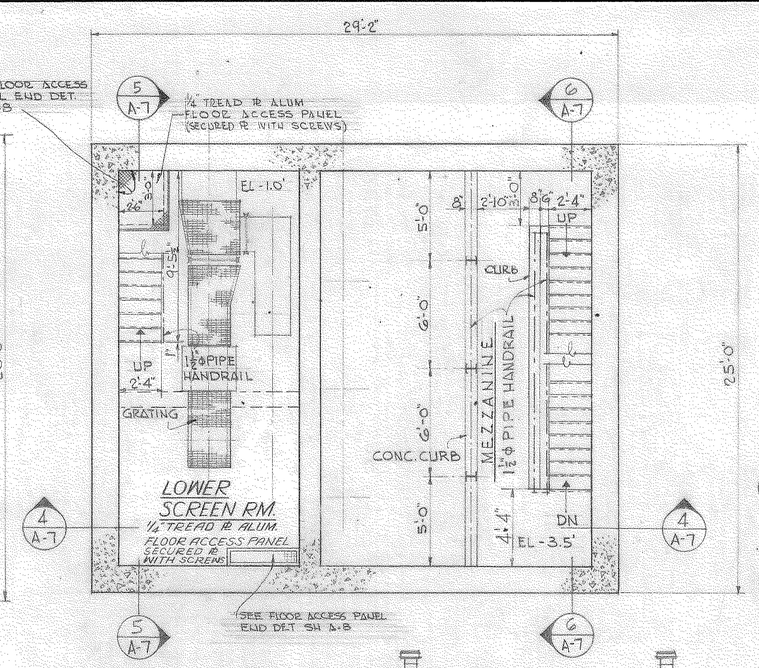
CONTRACT 1963-1 SHEET M-8

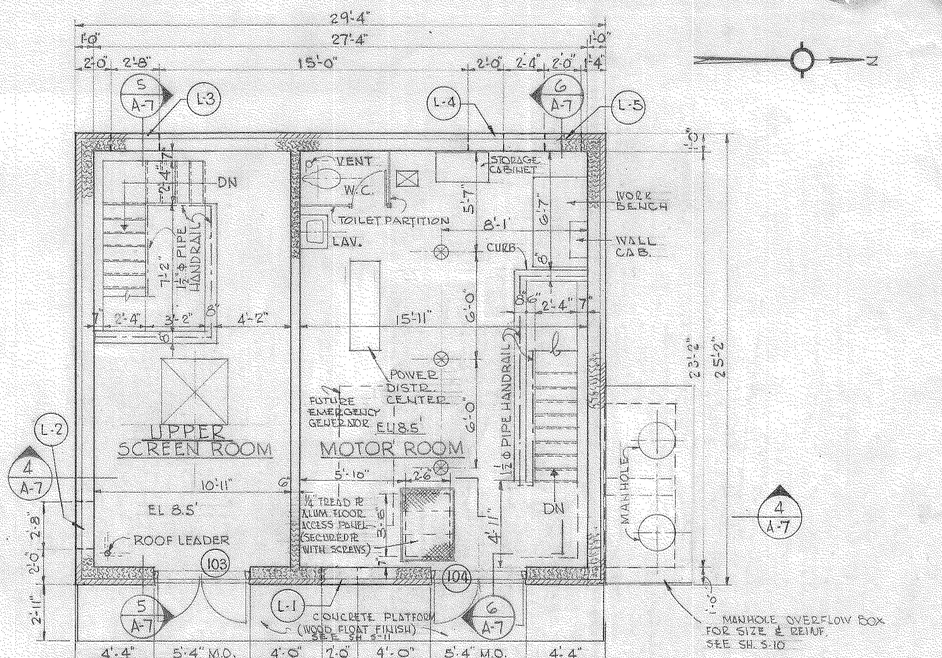
NIX N166 S. L. M. INC.



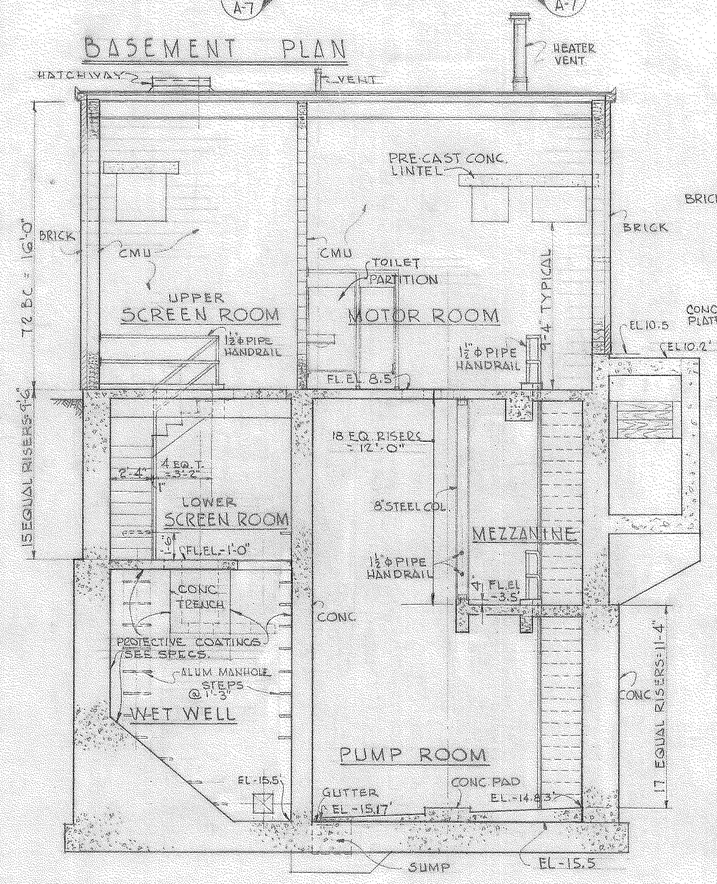
BASEMENT PLAN



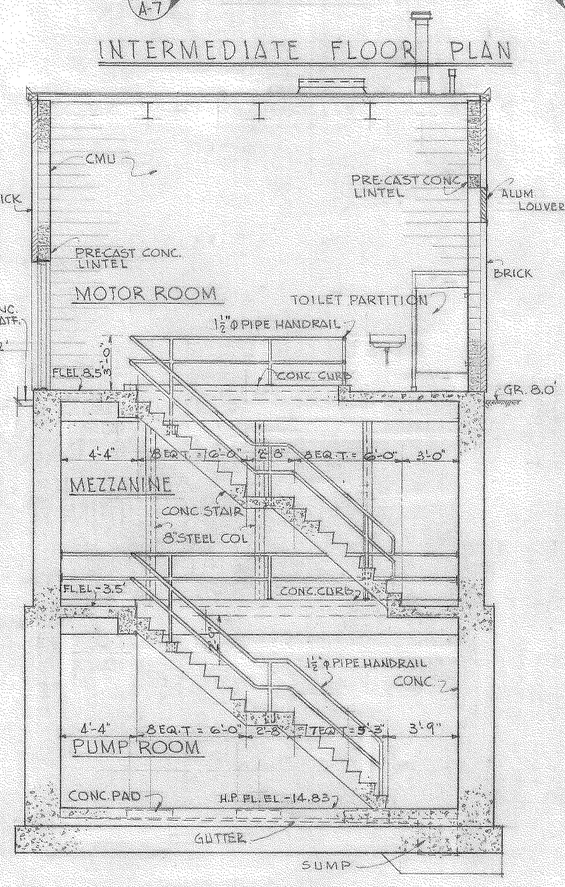
INTERMEDIATE FLOOR PLAN



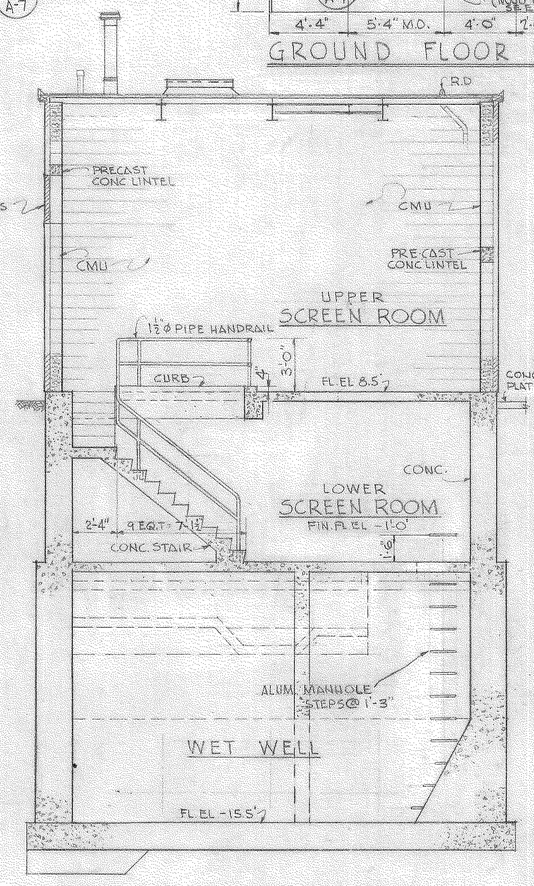
GROUND FLOOR PLAN



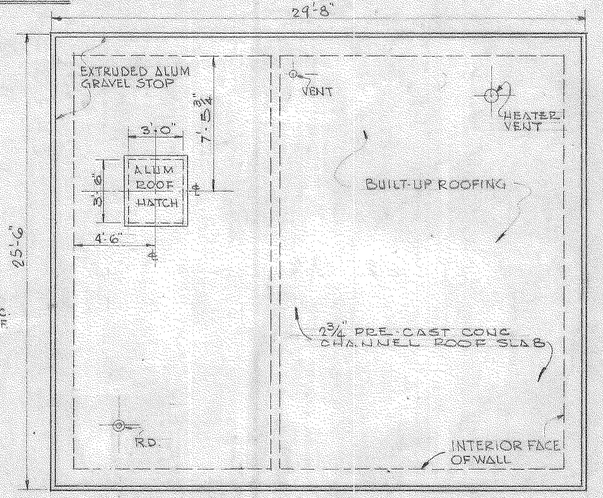
SECTION 4 / A-7



SECTION 6 / A-7



SECTION 5 / A-7



ROOF PLAN

RECORD DRAWING

②	8-65	E.B.M.	GET	Revised for Record Dwgs.
①	5/16/66	TAC	DES	GRADING WALL & CURBINGS ADDED REVISED LOCATION OF SUMP IN PUMP RM.
REVISION		MADE BY	CHECKED BY	DESCRIPTION

CITY OF PORTSMOUTH, N.H.

PUMPING STATION

GATES & MECHANIC STREET

PLANS & BUILDING SECTIONS

ARCHITECTURAL

SCALE: 1/4" = 1'-0" MARCH, 1963

METCALF & EDDY
ENGINEERS
BOSTON, MASS.

H 36058 1

THE STATE OF NEW HAMPSHIRE — JOHN S. BETHEL JR. No. 750 — REGISTERED PROFESSIONAL ENGINEER

APPROVED

FOR METCALF & EDDY, ENGINEERS

REG. PROF. ENGR. N.H. NO. 750 — DATE 4/1/63

DRAWN BY M.J.G
TRACED BY M.J.G
CHECKED BY J.J.J

CONTRACT 1963 - 1 SHEET A - 7

B. L. M. INC.

BASEMENT PLAN

SCALE IN FEET
SCALE: 1/4" = 1'-0"

INTERMEDIATE FLOOR PLAN

SCALE IN FEET
SCALE: 1/4" = 1'-0"

GROUND FLOOR PLAN

SCALE IN FEET
SCALE: 1/4" = 1'-0"

ROOF PLAN

TOP OF STEEL EL. 24.8 EXCEPT AS NOTED

SCALE IN FEET
SCALE: 1/8" = 1'-0"

NOTE:
DIMENSIONS NOT SHOWN ~~SHALL BE~~ DETERMINED IN FIELD.

OPENING E LOCATION ~~TO~~ SUITS EQUIP.

4-#5T., 2 EACH SIDE CONCRETE PLATFORM

FOR CONC. PLATFORM SEE SH. S-11

FOR SLAB REINF. SEE PLAN

FOR SLAB REINF SEE PLAN

FOR REINF. SEE LEFT WALL

OVERFLOW BOX (FOR INFO. SEE S-10)

OVERFLOW BOX (SEE SECT. 1)

SEE TYP BRNG. PL DETAIL

L HANGERS (SEE RESISTOR BANK PLATE DET)

PROVIDE 3/4"ϕ EYEBOLT BOTTOM FLANGE

PLAN — TYP BEARING PLATE DETAIL

SCALE IN FEET
SCALE: 3"/4" = 1'-0"

SECTION — TYP BEARING PLATE DETAIL

SECTION (4/S-9)

SECTION — RESISTOR BANK PLAT. DETAILS

PLAN — RESISTOR BANK PLAT. DETAILS

NOT TO SCALE

SECTION (1/S-9)

SCALE IN FEET
SCALE: 1/4" = 1'-0"

SECTION (2/S-9)

SCALE IN FEET
SCALE: 1/4" = 1'-0"

SECTION (3/S-9)

SCALE IN FEET
SCALE: 1/4" = 1'-0"

NOTE:
FOR WALL AND MAT REINF. SEE SECT. 2

BEAM SCHEDULE

BEAM MARK	B x D	SKETCH (CLEAR SPAN)	STIRRUPS SIZE TYPE	STIRRUPS LEFT	STIRRUPS RIGHT
BM 1	8x12	2-#5, 2-#6, 2-#4, 2-#5	#3	1@9" REM@24	DO LEFT
BM 2	18x24	3-#8, 4-#8, 2-#4, 3-#8	#3	1@12 REM@24	DO LEFT
BM 3	12x18	2-#6, 3-#7, 2-#4, 2-#6	#3	1@12 REM@24	DO LEFT
BM 4	8x18	2-#6, 2-#7, 2-#4, 2-#6	#3	1@12 REM@24	DO LEFT

DRAWN BY RWS, A.F.D.
TRACED BY RWS, A.F.D.
CHECKED BY J.V.

REVISION	MADE BY	CHECKED BY	DESCRIPTION
② 6-65	E.B.M.	G.K.T.	Revised for Record Dwgs.
⚠ 5-15-63	R.L.B.	C.S.R.	DIVIDING WALL & OPENINGS ADDED

* DOES NOT APPLY WHEN DRAWING SIZE HAS BEEN CHANGED BY REPRODUCTION.

DETAIL OF EXTRA WALL REINFORCEMENT

RECORD DRAWING

APPROVED
FOR METCALF & EDDY, ENGINEERS
REG. PROF. ENGR. N.H. NO. 750 — 4/17/63 DATE

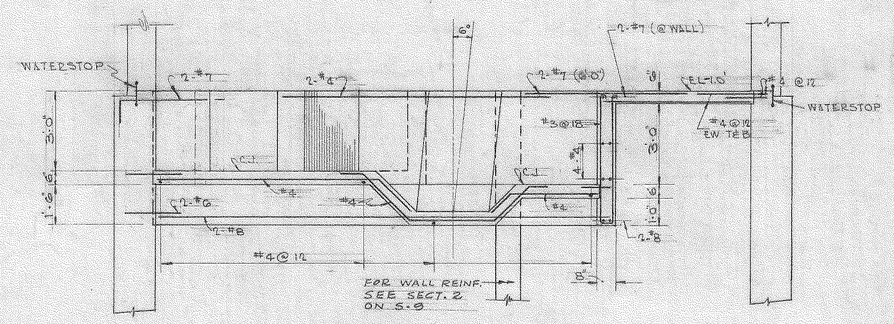
THE STATE OF NEW HAMPSHIRE — JOHN S. BETHEL JR. No. 730 — REGISTERED PROFESSIONAL ENGINEER

CITY OF PORTSMOUTH, N.H.
PUMPING STATION
GATES & MECHANIC STREET
PLANS & SECTIONS
STRUCTURAL
SCALE: AS SHOWN — MARCH, 1963

METCALF & EDDY
ENGINEERS
BOSTON, MASS.

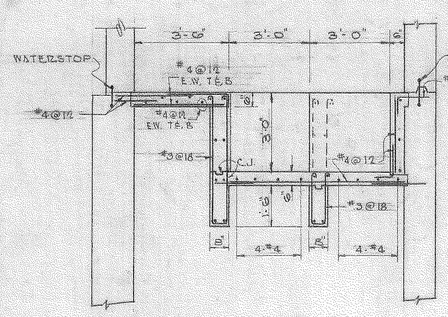
H 36048 1

CONTRACT 1963-1 SHEET S-9



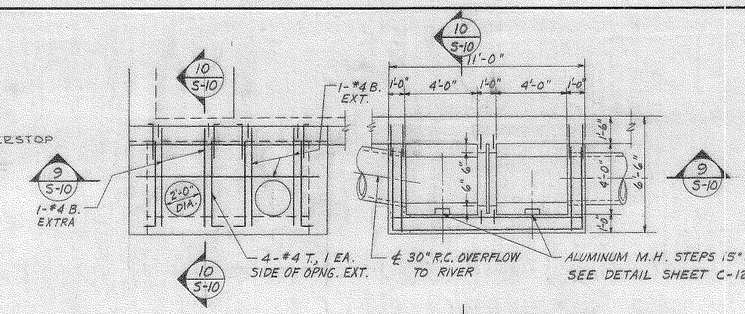
SECTION 5 / S-9

SCALE IN FEET
SCALE 1/4" = 1'-0"



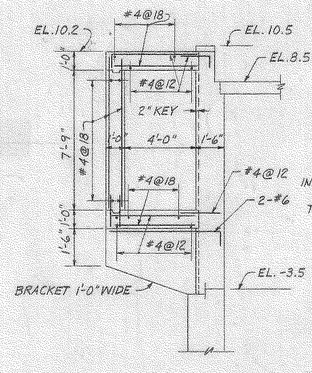
SECTION 6 / S-9

SCALE IN FEET
SCALE 1/4" = 1'-0"



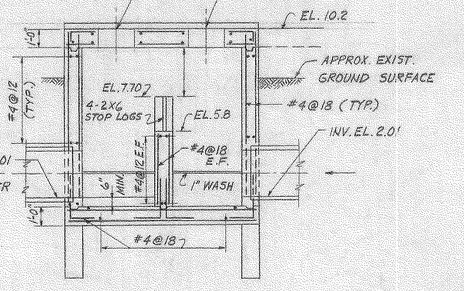
PLAN

SECTIONAL PLAN 10 / S-10



SECTION 10 / S-10

MECHANIC'S FOUNDRY C-4113
~~FLOCKHART FDRY. CO., TYPE 630, CAT. NO. 62B60~~
MANHOLE FRAMES & COVERS ~~OR APPROVED EQUAL~~.

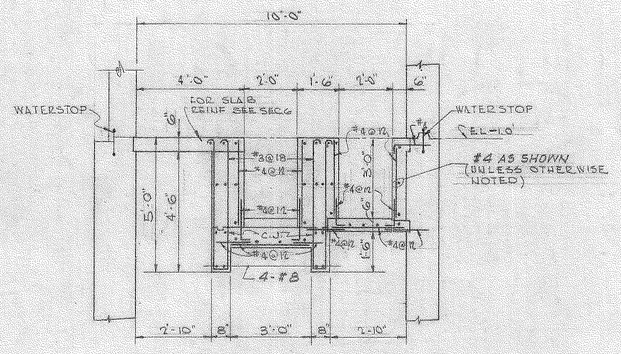


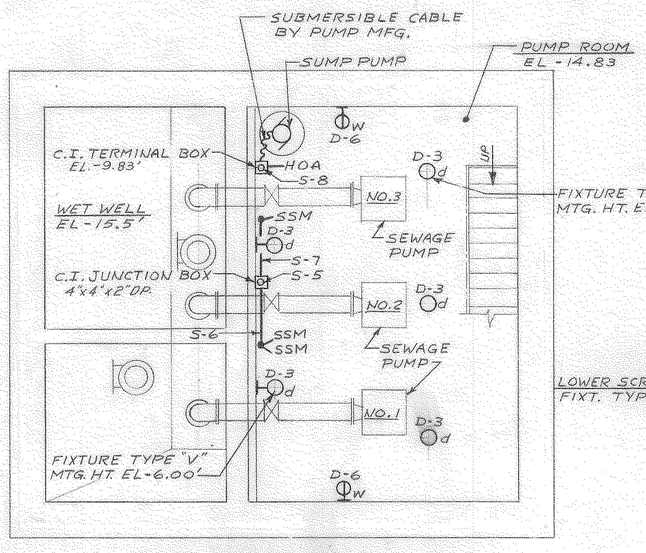
SECTION 9 / S-10

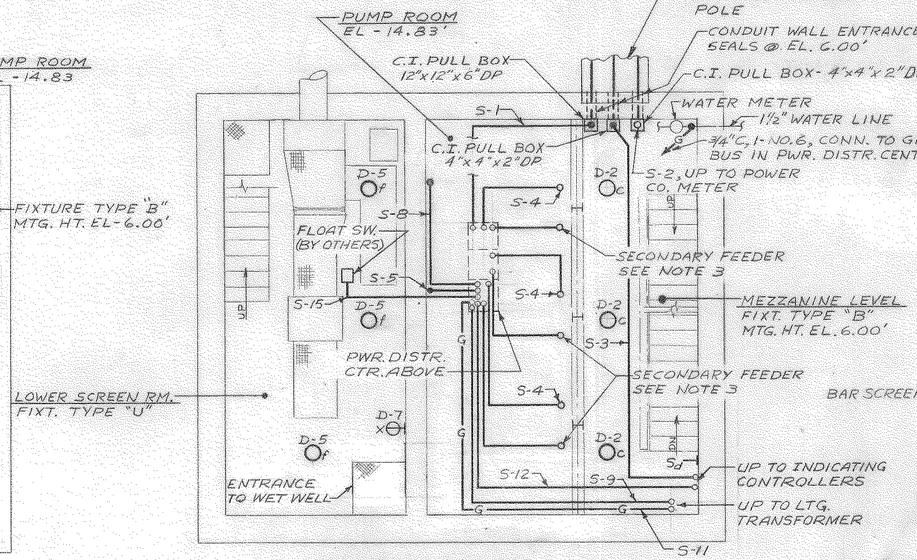
OVERFLOW MANHOLE

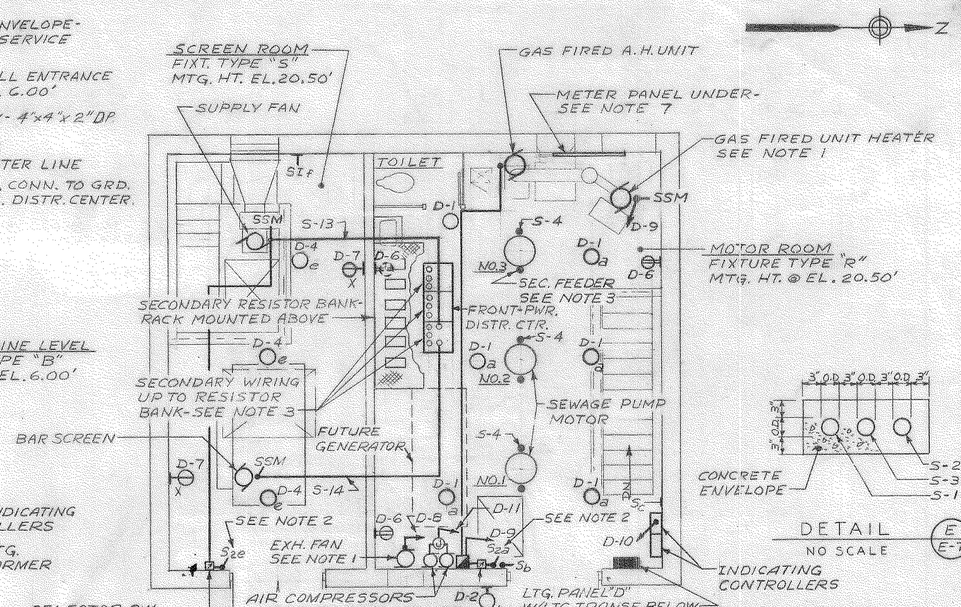
FOR LOCATIONS SEE S-9

SCALE IN FEET
SCALE 1/4" = 1'-0"


15'-0"
4'-0"
2'-6"
1'-6"
2'-6"
6"
WATERSTOP
FOR SLAB REINF. SEE SEC. 6
WATERSTOP
EL.-1.0
#4 AS SHOWN (UNLESS OTHERWISE NOTED)
#3@18
#4@12
#4@12
#4@12







DETAIL (E) NO SCALE E-7

BASEMENT FLOOR PLAN

SCALE IN FEET 0 4 8 12

SCALE: 1/4" = 1'-0"

INTERMEDIATE FLOOR PLAN

SCALE IN FEET 0 4 8 12

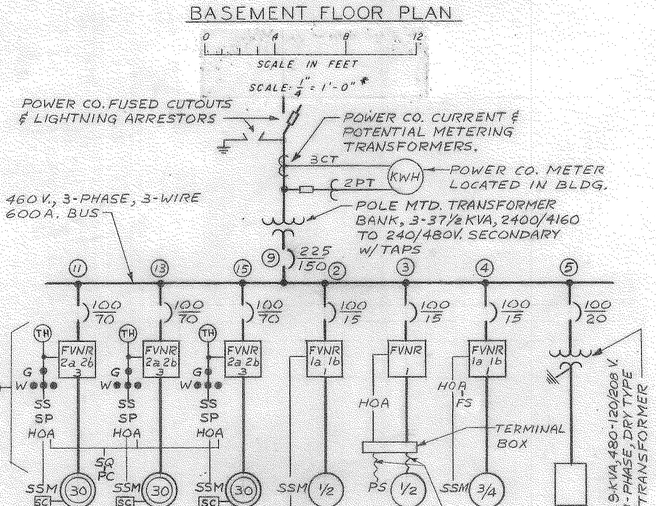
SCALE: 1/4" = 1'-0"

MAIN FLOOR PLAN

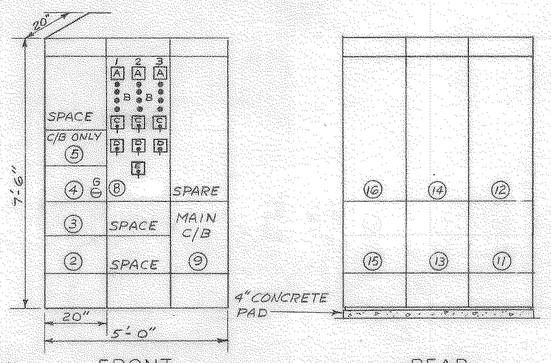
SCALE IN FEET 0 4 8 12

SCALE: 1/4" = 1'-0"

RECORD DRAWING



SINGLE LINE DIAGRAM



POWER DISTRIBUTION CENTER

NO SCALE

DRAWN BY E.D.V
TRACED BY R.J.C.
CHECKED BY E.M.M. Cp/S

LIGHTING PANEL "D"

SERVICE - 120/208 V., 3-PHASE, 4-WIRE
MAIN - LUGS ONLY
BRANCHES - CIRCUIT BREAKERS
CABINET - SURFACE MTD. w/ LOCK & KEYS

PANEL SCHEDULE

CIR. NO.	EQUIPMENT DESIGNATION	H.P.	K.V.A.	BRANCH CIRCUITS FRAME AMPS.	TRIP AMPS.	POLES
1	LTG. - MOTOR ROOM		1.20	50	20	1
2	MEZZANINE & OUTSIDE LT.		0.80			
3	PUMP ROOM		1.00			
4	UPPER SCREEN RM.		0.90			
5	LOWER SCREEN RM.		0.90			
6	RECEPT. - MOTOR ROOM & LOWER PUMP RM.		0.60			
7	UPPER & LOWER SCREEN ROOM		0.45			
8	EXH. FAN	1/3	0.83			
9	UNIT HTR (1/20) & A.H. UNIT (1/3)		0.94			
10	INSTRUMENT CABINET	—	—			
11	AIR COMPRESSORS 2@1½ HP		0.50			
12	SPARE					
13						
14						

LIGHTING FIXTURE SCHEDULE

TYPE	MFR. & CATALOG NO.	LAMP NO.	LAMP TYPE	MOUNTING	REMARKS
B	BENJAMIN 6502	1	200W. INCAND.	PENDENT	VAPORTIGHT
R	E-1803-¾	1	200W.	PENDENT	RLM
S	7504	1	300W.	PENDENT	EXPLOSIONPROOF
U	7504-CX	1	300W.	CEILING	EXPLOSIONPROOF
V	RUSSELL & STOLL 6254	1	200W.	WALL	VAPORTIGHT
W	HOLOPHANE 420	1	200W.	WALL	OUTSIDE

CONTROL PANEL (8)

1-2-3 NAMEPLATES MARKED SEWAGE PUMPS 1 OR 2 OR 3.

A 1-2-3 TOTAL HOUR METERS

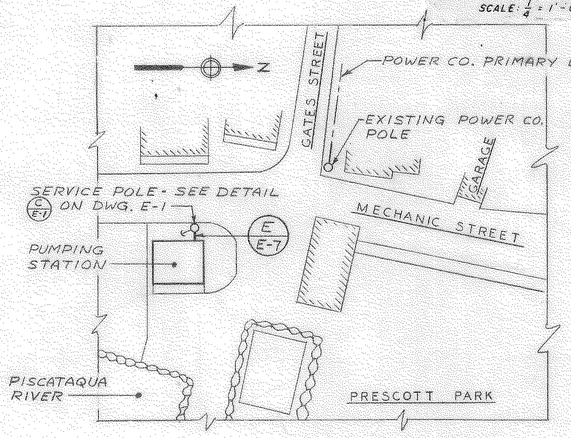
B 1-2-3 GREEN "OFF" IND. LIGHT & 3-WHITE SPEED IND. LIGHTS.

C 1-2-3 START - STOP SELECTOR SWITCHES

D 1-2-3 HAND-OFF-AUTO & SPEED SELECTOR SWITCHES MARKED AUTO, OFF, MANUAL LOW, MED, HI - SPEED.

E SEQUENCE SELECTOR SWITCH MARKED PUMPS 1-2, PUMPS 2-3, PUMPS 3-1

G HAND-OFF-AUTO SEL. SWITCH

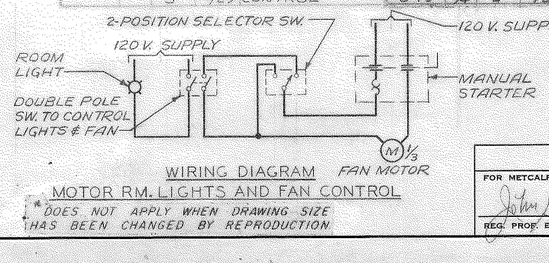


SITE PLAN

SCALE 1" = 40'

WIRE & CONDUIT SCHEDULE

CONDUIT NO.	CONDUIT SIZE	CABLE NO.	CABLE SIZE	REMARKS
S-1	2	3	1/0	MAIN FEEDER
S-2	1½	—	19/25	PWR. CO. METERING
S-3	1	—	—	LEASED TEL. LINES
S-4	1¼	3	4	SEW. PUMP PRI. FDR.
S-5	1	7	19/25	CONTROL
S-6	¾	4	19/25	CONTROL
S-7	¾	2	19/25	CONTROL
S-8	1	3	12	POWER
		3	19/25	CONTROL
S-9	¾	3	12	TRANSF. PRIMARY
S-10	¾	4	10	TRANSF. SECOND.
S-11	¾	1	10	GROUND WIRE
S-12	2½	42	19/25	CONTROL
S-13	¾	3	12	POWER
		2	19/25	CONTROL
S-14	1	3	12	POWER
		4	19/25	CONTROL
S-15	¾	2	19/25	CONTROL



WIRING DIAGRAM MOTOR RM. LIGHTS AND FAN CONTROL

DOES NOT APPLY WHEN DRAWING SIZE HAS BEEN CHANGED BY REPRODUCTION

THE STATE OF NEW HAMPSHIRE JOHN S. BETHEL JR. No. 750 REGISTERED PROFESSIONAL ENGINEER

APPROVED

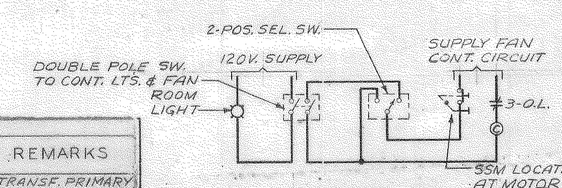
FOR METCALF & EDDY, ENGINEERS

John S. Bethel Jr. 4/14/63

REG. PROF. ENGR. N.H. NO. 750 DATE

NOTES

1. ALL CONTROL DEVICES & WIRE (EXCEPT SSM PUSHBUTTON) ~~WERE WILL BE~~ FURNISHED AND INSTALLED BY HEATING AND VENTILATING CONTRACTOR.
2. DOUBLE POLE SWITCH TO CONTROL LIGHTS & FAN (SEE WIRING DIAGRAMS).
3. SEWAGE PUMP MOTORS SECONDARY WIRE & CONDUIT SIZE ~~SHALL BE~~ WERE DETERMINED BY THE CHARACTERISTICS OF MOTORS ACTUALLY FURNISHED.
4. ALL ELECTRICAL EQUIPMENT INCLUDING CONDUIT AND FITTINGS IN THE UPPER & LOWER SCREEN ROOM ~~SHALL~~ WILL COMPLY WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE FOR HAZARDOUS LOCATIONS, CLASS I, GROUP D.
5. FOR GENERAL NOTES AND SYMBOLS SEE SHEET E-8.
6. ALL CONDUITS PASSING THROUGH FLOOR OVER SCREEN ROOM AND ENTERING MOTOR ROOM, OR CONDUITS PASSING THROUGH WALL BETWEEN SCREEN ROOM AND PUMP ROOM ~~SHALL BE~~ WERE CAULKED GAS TIGHT IN THEIR SLEEVES.
7. A ¾" MARINE PLYWOOD PANEL, 3' x 4', ~~SHALL BE~~ WAS MOUNTED ON UNISTRUT SUPPORTS FOR MOUNTING OF NEW HAMPSHIRE ELEC. CO. METERING EQUIPMENT. THE PANEL ~~SHALL BE~~ WAS GIVEN 2-COATS OF PAINT TO MATCH ROOM COLOR PRIOR TO MOUNTING OF EQUIPMENT.



WIRING DIAGRAM SCREEN RM. LIGHTS & FAN CONTROL

NO.	DATE	BY	CHECKED BY	DESCRIPTION
	6-6-63	E.D.V.		Revised for Record Dwgs.
1	5/17/63	E.D.V.	E.M.M.	REVISED POWER SUPPLY TO SCREEN ROOM, REVISED CONTROL OF EXH. FAN, REM. PROCESS TIMER FOR SCREEN ROOM, MISC. CHANGES
REVISION	MADE BY	CHECKED BY	DESCRIPTION	

CITY OF PORTSMOUTH, N.H.

PUMPING STATION

GATES & MECHANICS STREET

POWER & LIGHTING PLAN

ELECTRICAL

SCALE: AS SHOWN MARCH, 1963

METCALF & EDDY ENGINEERS BOSTON, MASS.

H 36066 1

CONTRACT 1963-1 SHEET E-7

CITY OF PORTSMOUTH, NEW HAMPSHIRE

CONSTRUCTION DRAWINGS

SCREENINGS REMOVAL WASHING SYSTEM
MECHANIC STREET PUMPING STATION

SRF PROJECT NO. CS 330106-03

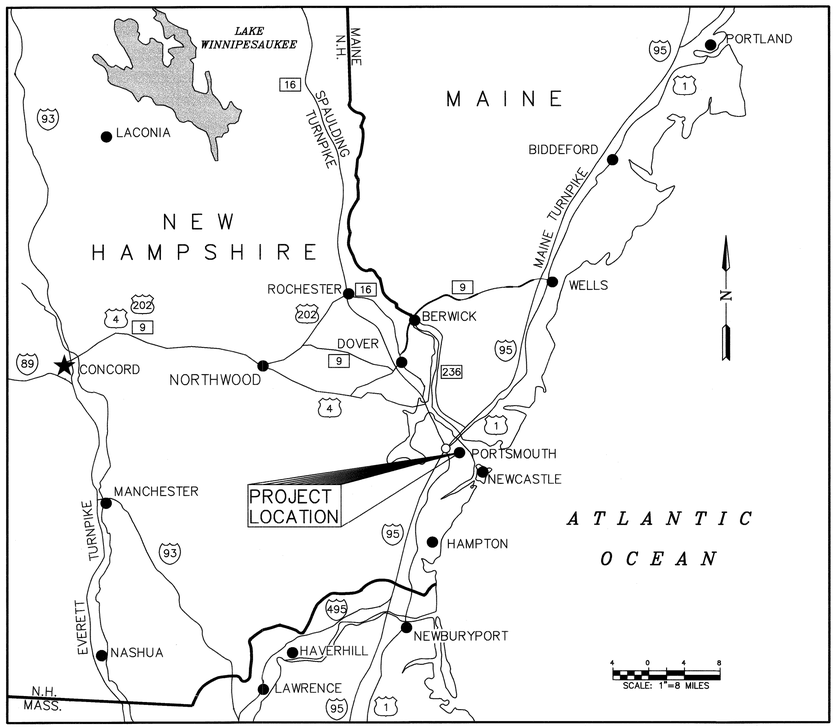
PREPARED BY

UNDERWOOD ENGINEERS, INC.

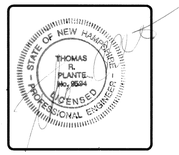
PORTSMOUTH, NEW HAMPSHIRE

FEBRUARY 2000

LOCATION PLAN



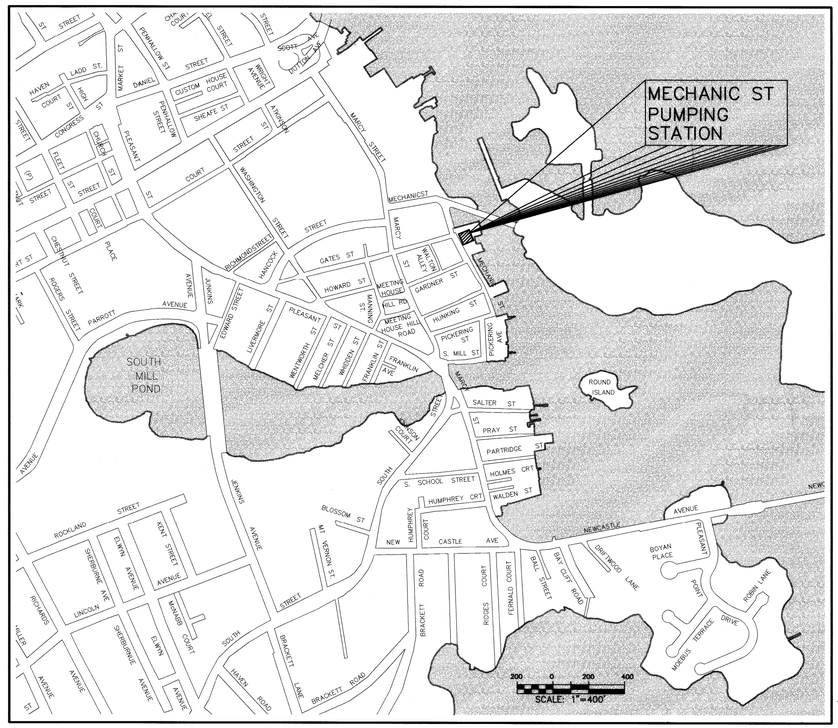




PLAN INDEX

	DWG NO	SHT NO	TITLE
GENERAL	G1	1	NOTES AND LEGEND
CIVIL	C1	2	DEMOLITION SITE PLAN
	C2	3	SITE PLAN
	C3	4	CIVIL DETAILS
ARCHITECTURAL	A1	5	WEST AND NORTH ELEVATIONS
	A2	6	EAST AND SOUTH ELEVATIONS
	A3	7	ARCHITECTURAL DETAILS
MECHANICAL	D1	8	DEMOLITION PLANS / SECTIONS
	M1	9	PLANS AND SECTIONS
	M2	10	MECHANICAL DETAILS
	M3	11	BYPASS PUMP
HEAT/VENT	HV1	12	PLANS AND SECTIONS
	HV2	13	HEAT/VENT DETAILS
ELECTRICAL	E1	14	PLANS AND SECTIONS
	E2	15	ELECTRICAL DETAILS

VICINITY MAP



839

H:\SIS\PROJ\839\839cover.dwg Wed Mar 01 11:41:07 2000 ROX

LEGEND:

EXISTING	PROPOSED	
		STRUCTURES/BUILDINGS
		APPROXIMATE PROPERTY LINE
		APPROXIMATE EASEMENT LINE
		APPROXIMATE SETBACK LINE
		PAVED ROAD/DRIVE
		SLOPED GRANITE CURB
		VERTICAL GRANITE CURB
		GRAVEL ROAD/DRIVE/TRAIL
G	G	UNDERGROUND PROPANE LINE
W	PW	WATER LINE
CL		CHLORINE LINE
UE	PUE	UNDERGROUND ELECTRIC LINE
FM	PFM	FORCE MAIN
OHU	OHU	OVERHEAD UTILITIES
S	S	SEWER LINE
D	D	DRAIN LINE
ESL		EXISTING SLUDGE LINE
EWW		EXISTING WASTEWATER LINE
PW		PLANT WATER
UU		UNDERGROUND UTILITIES
126	126	1' AND 2' CONTOUR ELEVATION
130	130	10' CONTOUR ELEVATION
126	126	SPOT ELEVATION
		SPLIT RAIL FENCE
		STOCKADE FENCE
		CHAINLINK FENCE
		BARBWIRE FENCE
		GUARDRAIL
		STONEWALL
		RETAINING WALL
		LIMIT OF CUT/FILL
		RAILROAD
		WETLAND
		EDGE OF WETLAND
		SOIL LINE
C		C STREAM/BROOK
		EDGE OF WATER
		C DRAINAGE DITCH
		DIRECTIONAL FLOW ARROW
		SILT FENCE
		HAY BALES
		EDGE OF VEGETATION
		DECIDUOUS TREE
		CONIFER TREE
		BUSH
		BUSH LINE
		DEMOLITION
		APPROX. LEACH FIELD (SIZE & LOCATION)
		EROSION STONE
		EROSION MATTING
		CHECK DAM
		LIMIT OF WORK

55-23	TAX MAP AND LOT NUMBER
POINT NUMBER ELEVATION DESCRIPTION	TRAVERSE STATION
	SURVEY SIDE SHOT
	CONCRETE/GRANITE BOUND
	LIGHT POLE
	GUY POLE
	UTILITY POLE
	UTILITY POLE W/ LIGHTS
	MAST ARM POLE
PB	PULL BOX
	PEDESTRIAN SIGNAL BOX
SWL	SINGLE WHITE LINE
DYL	DOUBLE YELLOW LINE
	SIGN
I.P.F. I.R.F.	I.R.S. IRON PIPE – IRON ROD
D.H.F.	DRILL HOLE
	HYDRANT
	WATER SHUT–OFF
	GAS SHUT–OFF
	GAS/WATER VALVE
W	WELL
S	SEWER MANHOLE
	CATCH BASIN
C.C.B.	LEACHING CATCH BASIN
D	DRAIN MANHOLE
BS	BORING
PS	PROBE
	TEST PIT
PT	PERC TEST
R	SUBSURFACE REFUSAL
N/R	SUBSURFACE NO REFUSAL
W	SUBSURFACE GROUNDWATER
J	LOCATION OF STRUCTURES
	CENTER LINE
	PROPERTY LINE
	SETBACK LINE
	ROCKS

NOTES:

1. THIS IS A STANDARD LEGEND SHEET, THEREFORE SOME ABBREVIATIONS MAY APPEAR ON THIS SHEET AND NOT ON THE DRAWINGS.
2. CONTACT ENGINEER FOR ABBREVIATIONS USED BUT NOT SHOWN ON THIS DRAWING.
3. SEE DRAWINGS M1, E1 FOR ABBREVIATONS PERTAINING TO MECHANICAL, AND ELECTRICAL DISCIPLINES.

ABBREVIATIONS

APPROX	APPROXIMATE	PSF	POUNDS PER SQUARE FOOT
BLDG	BUILDING	PSI	POUNDS PER SQUARE INCH
CB	CATCH BASIN	PT	PRESSURE TREATED
CFS	CUBIC FEET PER SECOND	PVC	POLYVINYL CHLORIDE
CI	CAST IRON PIPE	PVMT	PAVEMENT
CL	CENTERLINE	PVSL	PVC SAMPLE LINE
CMP	CORRUGATED METAL PIPE	R (RAD)	RADIUS
CO	CLEANOUT	RCP	REINFORCED CONCRETE PIPE
CONST	CONSTRUCT	RD	ROAD
CONT	CONTINUOUS, CONTINUATION	REQD	REQUIRED
D	DRAIN	R/W	RIGHT OF WAY
DI	DUCTILE IRON	RW	RAW WATER
DIA	DIAMETER	S	MUNICIPAL SEWER
DIP	DUCTILE IRON PIPE	S	SLOPE
DMH	DRAIN MANHOLE	SCH	SCHEDULE
DN	DOWN	SEW	SEWAGE
EL	ELEVATION	SF	SQUARE FEET
ENGR	ENGINEER	SHT	SHEET
EOP	EDGE OF PAVEMENT	SIM	SIMILAR
EXIST	EXISTING	SMH	SEWER MANHOLE
FDN	FOUNDATION	ST	STEEL
FFE	FINISHED FLOOR ELEVATION	STA	STATION
FPS	FEET PER SECOND	STD	STANDARD
FT	FOOT OR FEET	TD	TANK DRAIN
GEN	GENERATOR	TRANS	TRANSFORMER
GPM	GALLONS PER MINUTE	TYP	TYPICAL
HDPE	HIGH DENSITY POLYETHYLENE	V	VENT
IN	INCH	VCD	VC DRAIN
INV	INVERT ELEVATION	VCP	VITRIFIED CLAY PIPE
LB	POUND	VERT	VERTICAL
LF	LINEAR FEET	W	WATER
LP	LIQUID PROPANE	WD	WOOD
MH	MANHOLE	W/	WITH
MJ	MECHANICAL JOINT	(E)	EAST
MON	MONUMENT	(N)	NORTH
NA	NOT APPLICABLE	(S)	SOUTH
NGVD	NATIONAL GEODETIC VERTICAL DATUM	(W)	WEST
N/F	NOW OR FORMERLY	@	AT (SPACING)
OC	ON CENTER		
OD	OUTSIDE DIAMETER		
PCF	POUNDS PER CUBIC FOOT		
PL	PROPERTY LINE		

VALVE SYMBOLS

DOUBLE LINE	SINGLE LINE	
		AIR/VACUUM RELEASE
		BALL
	V	(VEE) BALL
		BUTTERFLY
		(BALL) CHECK
		(SWING) CHECK
		DIAPHRAGM
		FLUSHING CONNECTION
		GATE
	HO	(HAND OPERATED) GATE
	K	(KNIFE) GATE
		GLOBE
		HOSE BIBB
	M	MUD
		MULTI–PORT
		NEEDLE
		PINCH
		(ECCENTRIC) PLUG
		PRESSURE CONTROL
		PRESSURE RELIEF
		QUICK CONNECT
	S	SAMPLE
	S	SOLENOID

NOTES

STORMWATER MANAGEMENT, EROSION AND SEDIMENTATION CONTROL NOTES:

1. THE CONTRACTOR SHALL SUBMIT, FOR REVIEW AND APPROVAL, A SCHEDULE TO INCLUDE ALL EARTHWORK ACTIVITIES IN ACCORDANCE WITH SECTION 01310 OF THE PROJECT MANUAL. EARTHWORK SHALL BE PERFORMED, IN GENERAL, WITH THE APPROVED CONSTRUCTION SEQUENCE.
2. EXCAVATION AND EARTHWORK SHALL BE CONDUCTED IN A MANNER THAT WILL MINIMIZE EFFECTS OF EROSION THROUGHOUT CONSTRUCTION.
   - THE CONTRACTOR SHALL, TO THE EXTENT POSSIBLE, PHASE EARTH WORK ACTIVITIES SO THAT THE SMALLEST PRACTICAL LAND AREA IS EXPOSED AT ANY GIVEN TIME.
   - THE CONTRACTOR SHALL LOAM, SEED AND MULCH ALL CUT SLOPES IMMEDIATELY FOLLOWING FINAL GRADING. TEMPORARY SEEDING AND MULCH SHALL BE APPLIED AT ALL UNVEGETATED AREAS THAT WILL BE EXPOSED FOR A PERIOD EXCEEDING TWENTY (20) DAYS.
   - HAYBALES, SILT FENCING AND EROSION STONE SHALL BE INSTALLED WHERE NECESSARY TO CONTROL EROSION AND SEDIMENTATION. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO CONTROL EROSION AND PREVENT THE DEGRADATION OF DOWNSTREAM PROPERTIES AND DRAINAGE.
3. DRAINAGE SWALES SHALL BE MONITORED AND MAINTAINED THROUGHOUT CONSTRUCTION. SILT SHALL BE PERIODICALLY REMOVED FROM SWALES TO MAINTAIN DESIGN CAPACITY.
4. HAY BALE BARRIERS SHALL BE INSTALLED ALONG SWALES AT 100 FOOT INTERVALS, AROUND CATCH BASINS AND AT ALL AREAS WHERE STORMWATER OR TRENCHWATER IS BEING DIVERTED.
5. HAY BALE BARRIERS AND SEDIMENT TRAPS ARE TO BE MAINTAINED AND KEPT CLEAN UNTIL ALL EXPOSED AREAS HAVE A HEALTHY STAND OF GROUND COVER, AT WHICH TIME TEMPORARY MEASURES ARE TO BE REMOVED. CONTRACTOR IS RESPONSIBLE FOR PROPER DISPOSAL OF ALL TEMPORARY MATERIALS AND SILT.
6. CONTRACTOR SHALL PROVIDE ANY ADDITIONAL MEASURES REQUIRED TO PREVENT EROSION. ALL WORK SHALL BE COMPLETED IN CONFORMANCE WITH THE LATEST EDITION OF "STORM WATER MANAGEMENT AND EROSION AND SEDIMENT CONTROL HANDBOOK FOR URBAN AND DEVELOPING AREAS IN NEW HAMPSHIRE."
7. DISTURBED AREAS, SHALL BE LOAMED AND SEEDED. MINIMUM DEPTH OF LOAM SHALL BE 4 INCHES.

CONSTRUCTION SEQUENCE (FOR EROSION CONTROL):

1. INSTALL SILT FENCING, SEDIMENT TRAPS AND HAYBALES.
2. CLEAR AND GRUB AREA WITHIN LIMITS OF WORK.
3. ROUGH GRADE AREA. INSTALL ADDITIONAL SILT FENCING AND HAYBALES WHERE NECESSARY.
4. CONSTRUCT DEWATERING SYSTEM AND EXCAVATIONS. AN EXCAVATION AND DEWATERING PLAN SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW PRIOR TO EXCAVATION IN YARD AREA.
5. COMPLETE CONSTRUCTION OF ALL STRUCTURES, YARD PIPING, ACCESS AREAS, ELECTRICAL AND INCIDENTALS.
6. INSPECT VEGETATED AREAS – RESEED AND RESOIL WHEREVER NECESSARY.
7. REMOVE ALL TEMPORARY EROSION MEASURES ONCE VEGETATION IS ESTABLISHED AND GRADED AREAS HAVE BEEN STABILIZED.

PIPING NOTES:

1. LAY PIPE TO UNIFORM GRADE BETWEEN INDICATED ELEVATION POINTS.
2. SIZE OF FITTINGS SHOWN ON PLANS SHALL CORRESPOND TO ADJACENT STRAIGHT RUN OF PIPE, UNLESS OTHERWISE INDICATED. TYPE OF JOINT AND FITTING MATERIAL SHALL BE THE SAME AS SHOWN FOR ADJACENT STRAIGHT RUN OF PIPE.
3. FINAL PIPE SUPPORT REQUIREMENTS SHALL BE DETERMINED IN THE FIELD AND REVIEWED BY THE ENGINEER PRIOR TO INSTALLATION. MAXIMUM SPACING SHALL BE AS SPECIFIED.
4. ALL JOINTS SHALL BE WATERTIGHT. WALL PIPES SHALL BE USED WHEREVER PIPING PASSES FROM A STRUCTURE TO EARTH.
5. SYMBOLS, LEGENDS, AND PIPE IDENTIFICATION SHOWN UNDER THE MECHANICAL DISCIPLINE SHALL ALSO BE FOLLOWED THROUGHOUT OTHER DISCIPLINES IN THE PROJECT PLANS. NOT ALL OF THE VARIOUS PIPING COMPONENTS SHOWN IN THE LEGEND ARE NECESSARILY USED IN THIS PROJECT.
6. PROVIDE UNIONS TO FACILITATE CONVENIENT REMOVAL OF VALVES, PIPING, AND MECHANICAL EQUIPMENT FOR SMALL DIAMETER CHEMICAL FEED AND WATER PIPING SYSTEMS.
7. SIZES OF EQUIPMENT FOUNDATIONS INDICATED ON THE DRAWINGS ARE APPROXIMATE. EXACT DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FOR THE EQUIPMENT FURNISHED. ALL FLOOR MOUNTED EQUIPMENT SHALL BE SET ON CONCRETE PADS CONFORMING TO DETAILS SHOWN ON THE STRUCTURAL AND/OR MECHANICAL DRAWINGS.

GENERAL NOTES:

1. THE CONTRACTOR IS RESPONSIBLE FOR THE LOCATION, PROTECTION AND REPAIR (IF DAMAGED) OF ALL EXISTING ON–SITE STRUCTURES, UTILITIES AND SERVICES. THE APPROXIMATE LOCATIONS OF UTILITIES AND SERVICES ARE SHOWN ON THE DRAWINGS, NOTIFY DIG–SAFE PRIOR TO COMMENCING CONSTRUCTION (1–888–344–7233).
2. DATUM OF ELEVATION IS NGVD OF 1929 (APPROXIMATE MEAN SEA LEVEL = 0.00'). ALL DIMENSIONS, UNLESS OTHERWISE NOTED, ARE IN FEET.
3. THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING THE WORK SUCH THAT AT ALL TIMES EXISTING WTP WILL MAINTAIN OPERATIONS. NO LOSS IN PLANT CAPACITY OR PROCESS PIPING CAN OCCUR WITHOUT OWNER APPROVAL. THE CONTRACTOR WILL PROVIDE BYPASS PUMPING WHERE EXISTING PIPING IS BEING REMOVED OR SCHEDULE THE WORK TO INSTALL THE REPLACEMENT LINES BEFORE LOSS OF THE EXISTING LINES. THE CONTRACTOR SHALL MAINTAIN VEHICLE ACCESS.
4. THE SCHEDULE AND SEQUENCE FOR ABOVE WORK IS DESCRIBED IN SECTION 01010 OF THE PROJECT MANUAL.
5. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS REQUIRED TO MAINTAIN 3 PHASE UTILITY INCOMING PRIMARY POWER LINE WHILE MAINTAINING THE EXISTING SERVICE AND TRANSFORMER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER REMOVAL AND DISPOSAL OF EXCESS SUITABLE MATERIALS AND UNSUITABLE MATERIALS.
7. THE CONTRACTOR IS RESPONSIBLE FOR SITE SECURITY AND SAFETY.

LAYOUT NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLATION AND MAINTENANCE OF GRADE STAKES FOR ELEVATION CONTROL. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR FINAL LOCATION OF SITE FACILITIES.
2. ALL BUILDING DIMENSIONS / COORDINATES ARE TO THE OUTSIDE FACE.

CONSTRUCTION EXCAVATION AND DEWATERING:

1. THE CONTRACTOR IS RESPONSIBLE FOR SUPPORTING THE EXCAVATION AND MAINTAINING THE WATER TABLE BELOW THE DEPTH OF EXCAVATION DURING THE CONSTRUCTION OF ALL PLANT IMPROVEMENTS. THE CONTRACTOR SHALL DETERMINE THE METHODS OF EXCAVATION, SHEETING, BRACING, AND DEWATERING.
2. THE CONTRACTOR SHALL PROVIDE A PLAN OF THE PROPOSED METHODS OF DEWATERING AND SHEETING BEFORE THE START OF EXCAVATION. THIS PLAN SHALL BE DESIGNED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF NEW HAMPSHIRE.
3. THE PLAN SHALL, AT A MINIMUM, PROVIDE FOR TIGHT SHEETING TO SHORE EMBANKMENTS OF EXCAVATION AND PROVIDE FOR CONTINUOUSLY MAINTAINING THE WATER TABLE BELOW THE DEPTH OF EXCAVATION DURING FOUNDATION AND WALL CONSTRUCTION, UNTIL THE WALLS ARE BACKFILLED. ALL BACKFILL SHALL BE PLACED IN A DRY CONDITION.
4. ALL EXCAVATION, SHORING, SHEETING AND BRACING NECESSARY TO SUPPORT EXISTING STRUCTURES, EQUIPMENT OR UTILITIES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE PART OF THE LUMP SUM BID ITEM.
5. FOUNDATION WALLS SHALL NOT BE BACKFILLED UNTIL THEY HAVE REACHED THE 7–DAY STRENGTH SPECIFIED IN THE CONTRACT DOCUMENTS.
6. CONTRACTOR SHALL DISPOSE OF ALL UNSUITABLE AND SUITABLE MATERIALS ENCOUNTERED DURING EXCAVATION.

PIPE AND FITTING SYMBOLS

DOUBLE LINE	SINGLE LINE	
		EXISTING PIPE
		NEW PIPE
		EXISTING PIPE TO BE ABANDONED
		EXISTING PIPE TO BE REMOVED
		WELDED JOINT
		GROOVED END JOINT
		FLANGED JOINT
		MECHANICAL JOINT
		PUSH–ON JOINT
		FLANGED COUPLING ADAPTER
		ELBOW 90
		ELBOW 90 UP
		ELBOW 90 DOWN
		ELBOW 45
		ELBOW 45 UP
		ELBOW 45 DOWN
		TEE
		TEE UP
		TEE DOWN
		WYE
		WYE UP
		WYE DOWN
		CROSS
		CONCENTRIC REDUCER
		ECCENTRIC REDUCER
		UNION
		CAP (BLIND FLANGE)
		ANCHOR

ISSUE FOR			
APPROVAL	By		
Date 2/1/00	By TRP		
CONSTRUCTION			
Date 12/25/00	By TRP		
RECORD DRAWING			
Date –	By –		
			APP'D
		REVISIONS	
			NO.

Drawn	RMC
Designed	TRB
Checked	PHR
Approved	TRP
Date	JAN 2000
Book No.	
Project No.	839
Dwg. ID	839GEN.DWG
Scale	AS SHOWN

Underwood Engineers, Inc.
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603–436–6192 Fax. 603–431–4733

NOTES AND LEGEND

SREENINGS REMOVAL WASHING SYS.
MECHANIC STREET PUMP STATION
CITY OF PORTSMOUTH, NH

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DWG NO	SHEET
G1	1 OF 15

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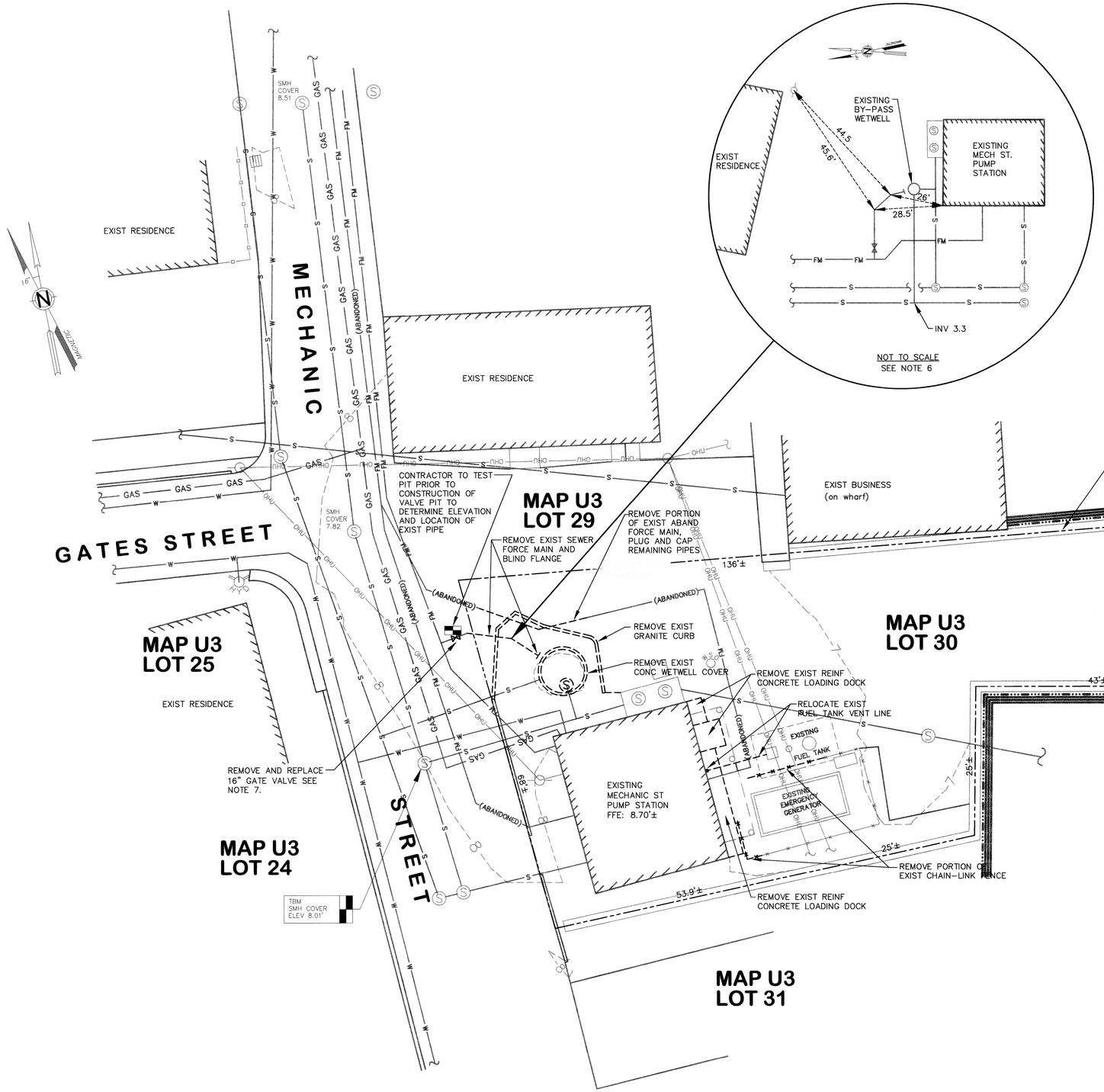

1 C1 **DEMOLITION SITE PLAN**
SCALE: 1"=10'

NOTES:

1. PROPERTY LINES ARE BASED ON TAX MAPS.
2. THIS IS NOT A BOUNDARY SURVEY.
3. PARCEL TAX MAP U-3, LOT 30
4. WATERFRONT BUSINESS ZONE.
5. THIS PLAN IS BASED ON SITE SURVEY AND 1963, 1977 AND 1991 PUMPING STATION UPGRADES RECORD PLANS. NOT ALL UTILITY LOCATIONS VERIFIED. REFERENCED PLANS ARE AVAILABLE FOR REVIEW AT UNDERWOOD ENGINEERS OFFICE, 25 VAUGHAN MALL, PORTSMOUTH, NH OR PORTSMOUTH DPW, 680 PEVERLY HILL ROAD, PORTSMOUTH, NH.
6. PIPE LOCATION TIES TAKEN FROM 1990 RECORD PLANS.
7. EXISTING 16" GATE VALVE IS NOT OPERABLE. SEPTAGE DISPOSAL WILL BE NEEDED WHEN THIS VALVE IS REMOVED. THE NEAREST ISOLATION VALVES IS ON THE MAIN FORCE MAIN TO PEIRCE ISLAND WWTP JUST BEFORE THE PEIRCE ISLAND BRIDGE. PUMPING STATION WILL NEED TO BE SHUT DOWN AND FORCE MAIN PARTIALLY DRAINED TO INSTALL NEW 16" GATE VALVE.

GRAPHIC SCALE

10 0 10 20
SCALE: 1 INCH = 10 FT.

ISSUE FOR APPROVAL Date 2/1/00 By TRP
ISSUE FOR CONSTRUCTION Date 2/25/00 By TRP
RECORD DRAWING Date – By –

NO.	REVISIONS	APP'D

Drawn JNM/TRB
Designed TRB
Checked PHR
Approved TRP
Date JAN. 2000
Book No. – 839
Project No. 839SDEMO
Dwg. ID AS SHOWN
Scale AS SHOWN

Underwood Engineers, Inc.
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

DEMOLITION SITE PLAN

SREENINGS REMOVAL WASHING SYS.
MECHANIC STREET PUMP STATION
CITY OF PORTSMOUTH, NH

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DWG NO C1
SHEET 2 OF 15

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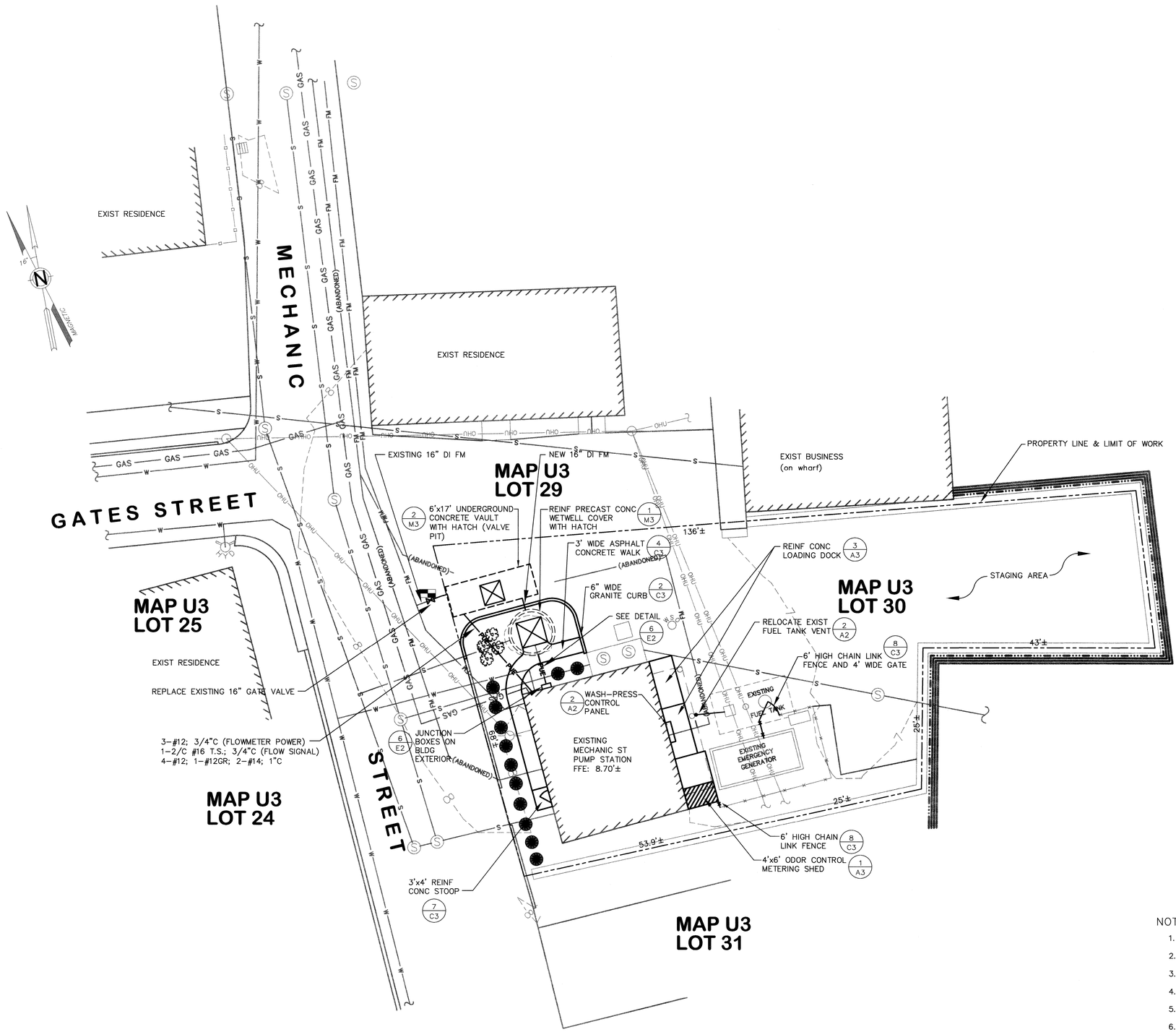

1 C2 **SITE PLAN**
SCALE: 1"=10'

NOTES:

1. PROPERTY LINES ARE BASED ON TAX MAPS.
2. THIS IS NOT A BOUNDARY SURVEY.
3. PARCEL TAX MAP U-3, LOT 30
4. WATERFRONT BUSINESS ZONE.
5. NOT ALL LOCATION OF EXISTING UTILITIES VERIFIED.
6. LOAM & SEED, BY CONTRACTOR, ALL DISTURBED AREAS NOT BEING PAVED. FINAL LANDSCAPING AND ORNAMENTAL PLANTINGS BY OTHERS.
7. SEE DRAWINGS E1 & E2 AND DIVISION 16 FOR ADDITIONAL ELECTRICAL DETAILS.

GRAPHIC SCALE

10 0 10 20
SCALE: 1 INCH = 10 FT.

ISSUE FOR
APPROVAL
Date 2/1/00 By TRP
CONSTRUCTION
Date 2/25/00 By TRP
RECORD DRAWING
Date — By —

NO.	REVISIONS	APP'D

Drawn JNM/TRB
Designed TRB
Checked PHR
Approved TRP
Date JAN 2000
Book No. —
Project No. 839
Dwg. ID 839SPLAN
Scale AS SHOWN

Underwood Engineers, Inc.
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SITE PLAN

SREENINGS REMOVAL WASHING SYS.
MECHANIC STREET PUMP STATION
CITY OF PORTSMOUTH, NH

DWG NO C2
SHEET 3 OF 15

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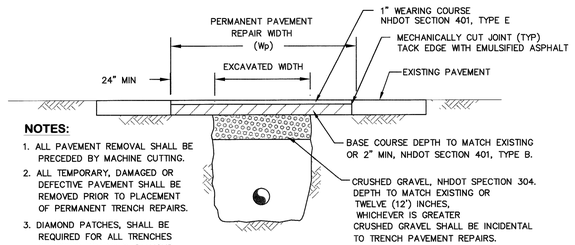


NOTES:

1. ALL PAVEMENT REMOVAL SHALL BE PRECEDED BY MACHINE CUTTING.
2. ALL TEMPORARY, DAMAGED OR DEFECTIVE PAVEMENT SHALL BE REMOVED PRIOR TO PLACEMENT OF PERMANENT TRENCH REPAIRS.
3. DIAMOND PATCHES, SHALL BE REQUIRED FOR ALL TRENCHES CROSSING ROADWAY. DIAMOND PATCHES SHALL MEET NHDOT REQUIREMENTS.

1/C3 PERMANENT TRENCH PAVEMENT REPAIR

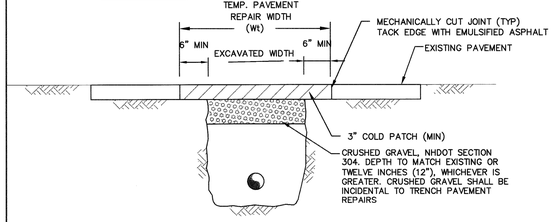
NOT TO SCALE

MINIMUM TRENCH PAVEMENT WIDTHS

PIPE I.D.	Wt (INCHES)	Wp (INCHES)
1–21 INCHES	72	108
24–30 INCHES	84	120
> 30 INCHES	96	132

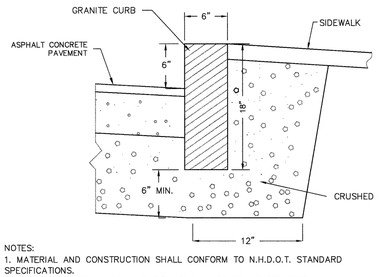
NOTE:

THE DIMENSIONS SHOWN SHALL BE CONSIDERED PAVEMENT PAYMENT WIDTHS FOR 0–10' DEEP CONSTRUCTION. Wt AND Wp SHALL BE INCREASED BY 4'–0" FOR TRENCHES 10' TO 15' AND BY 8'–0" FOR TRENCHES 15' TO 20' IN DEPTH.



3/C3 TEMPORARY TRENCH PAVEMENT REPAIR

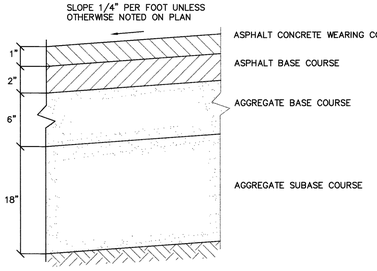
NOT TO SCALE



NOTES:
1. MATERIAL AND CONSTRUCTION SHALL CONFORM TO N.H.D.O.T. STANDARD SPECIFICATIONS.
2. CURVES LESS THAN 20' IN RADIUS SHALL NOT BE CONSTRUCTED FROM STRAIGHT SECTIONS OF CURBING.

2/C3 GRANITE CURB

NOT TO SCALE

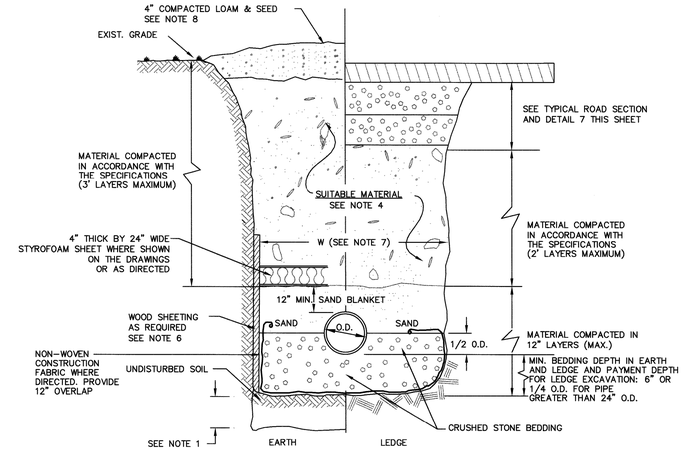


4/C3 TYPICAL PAVEMENT DETAIL

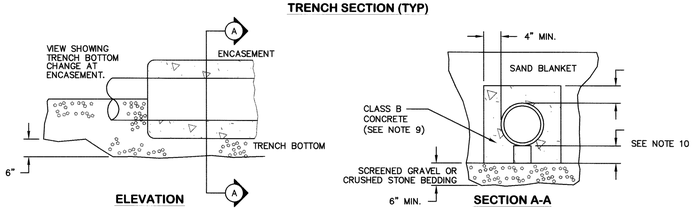
NOT TO SCALE

GRAVITY SEWER TRENCH NOTES:

1. ORDERED EXCAVATION OF UNSUITABLE MATERIAL BELOW GRADE: BACKFILL AS STATED IN THE TECHNICAL SPECIFICATIONS OR AS SHOWN ON THE DRAWINGS.
2. BEDDING: SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATER AND MEETING ASTM C33.
   100% PASSING 1" SCREEN
   90–100% PASSING 3/4" SCREEN
   20–55% PASSING 3/8" SCREEN
   0–10% PASSING #4 SIEVE
   1–5% PASSING #8 SIEVE
   WHERE ORDERED BY THE ENGINEER TO STABILIZE THE TRENCH BASE, GRADED SCREEENED GRAVEL OR CRUSHED STONE 1/2 INCH TO 1–1/2 INCH SHALL BE USED.
3. SAND BLANKET: CLEAN SAND FREE FROM ORGANIC MATTER, SO GRADED THAT 90–100% PASSES A 1/2 INCH SIEVE AND NOT MORE THAN 15% WILL PASS A #200 SIEVE. BLANKET MAY BE OMITTED FOR CAST–IRON, DUCTILE IRON, AND REINFORCED CONCRETE PIPE PROVIDED HOWEVER, THAT NO STONE LARGER THAN 2" IS IN CONTACT WITH THE PIPE.
4. SUITABLE MATERIAL: IN ROADS, ROAD SHOULDERS, WALKWAYS AND TRAVELED WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE COURSE OF CONSTRUCTION, BUT SHALL EXCLUDE DEBRIS; PIECES OF PAVEMENT; ORGANIC MATTER; TOP SOIL; ALL WET OR SOFT MUCK, PEAT, OR CLAY; ALL EXCAVATED LEDGE MATERIAL; ALL ROCKS OVER 6 INCHES IN LARGEST DIMENSION; AND ANY MATERIAL WHICH, AS DETERMINED BY THE ENGINEER, WILL NOT PROVIDE SUFFICIENT SUPPORT OR MAINTAIN THE COMPLETED CONSTRUCTION IN A STABLE CONDITION. IN CROSS–COUNTRY CONSTRUCTION, SUITABLE MATERIAL SHALL BE AS DESCRIBED ABOVE, EXCEPT THAT THE ENGINEER MAY PERMIT THE USE OF TOP SOIL, LOAM, MUCK, OR PEAT, IF HE IS SATISFIED THAT THE COMPLETED CONSTRUCTION WILL BE ENTIRELY STABLE AND PROVIDED THAT EASY ACCESS TO THE SEWER, FOR MAINTENANCE AND POSSIBLY RECONSTRUCTION, WILL BE PRESERVED.
5. BASE COURSE AND PAVEMENT SHALL MEET THE REQUIREMENTS OF THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION'S LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES – DIVISIONS 300 AND 400 RESPECTIVELY.
6. WOOD SHEETING, IF REQUIRED: WHERE SHEETING IS PLACED ALONGSIDE THE PIPE AND EXTENDS BELOW MID–DIAMETER, IT SHALL BE CUT OFF AND LEFT IN PLACE TO AN ELEVATION 1 FOOT ABOVE THE TOP OF PIPE. WHERE SHEETING IS ORDERED BY THE ENGINEER TO BE LEFT IN PLACE, IT SHALL BE CUT OFF AT LEAST 3 FEET BELOW FINISHED GRADE, BUT NOT LESS THAN 1 FOOT ABOVE THE TOP OF THE PIPE.
7. W = MAXIMUM ALLOWABLE TRENCH WIDTH FOR ROCK EXCAVATION, FOR ORDERED EXCAVATION BELOW GRADE AND HANDLING OF EXCAVATED CONTAMINATED SOILS. FOR PIPES 15 INCHES NOMINAL DIAMETER OR LESS, W SHALL BE NO MORE THAN 36 INCHES. FOR PIPES GREATER THAN 15 INCHES IN NOMINAL DIAMETER, W SHALL BE 24 INCHES PLUS PIPE OUTSIDE DIAMETER (O.D.)
   W = MAXIMUM ALLOWABLE TRENCH WIDTH TO A PLANE 12 INCHES ABOVE THE PIPE. FOR PIPES 6" INCHES NOMINAL DIAMETER OR LESS; W SHALL BE NO MORE THAN 30 INCHES. ALSO, W SHALL BE THE PAYMENT WIDTH FOR LEDGE LEDGE EXCAVATION AND FOR ORDERED EXCAVATION BELOW GRADE.
8. FOR CROSS COUNTRY CONSTRUCTION, BACKFILL OR FILL SHALL BE MOUNDED TO A HEIGHT OF 6 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
9. CONCRETE FOR ENCASEMENT SHALL CONFORM TO THE REQUIREMENTS OF SECTION 520, (NHDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION.
10. CONCRETE FULL ENCASEMENT: IF FULL ENCASEMENT IS UTILIZED, DEPTH OF CONCRETE BELOW PIPE SHALL BE 1/4 I.D. (4" MINIMUM). BLOCK SUPPORT SHALL BE SOLID CONCRETE BLOCKS.
11. GRAVEL DRIVEWAY AND SHOULDER RESTORATION: CRUSHED GRAVEL IN DRIVEWAYS AND ROAD SHOULDERS SHALL MATCH EXISTING WITH A MINIMUM OF 12". GRAVEL REPLACEMENT SHALL BE INCIDENTAL TO SEWER CONSTRUCTION AND WILL NOT BE MEASURED FOR PAYMENT.



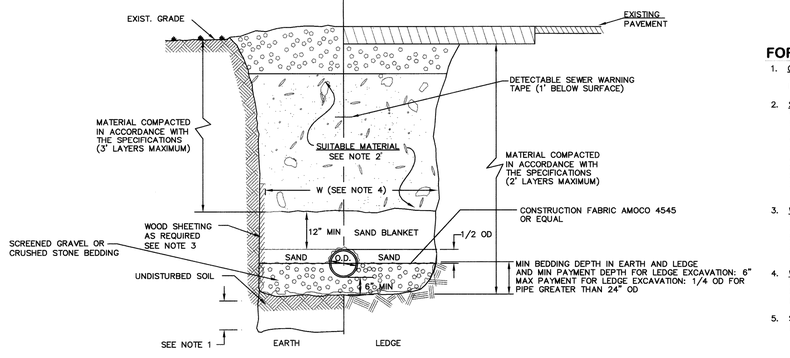
TRENCH SECTION (TYP)



TRENCH SECTION WITH CONCRETE ENCASEMENT

5/C3 TRENCH - GRAVITY SEWER

NOT TO SCALE

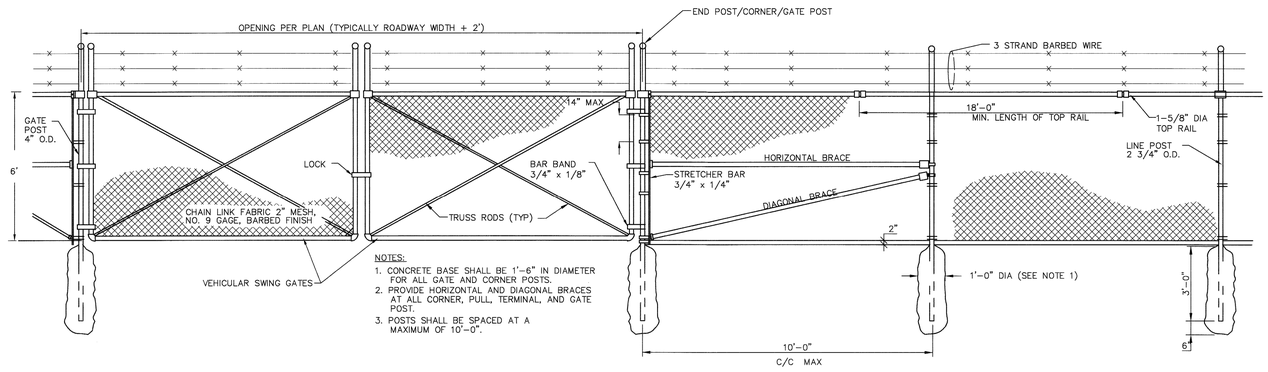


FORCE MAIN TRENCH NOTES:

1. ORDERED EXCAVATION OF UNSUITABLE MATERIAL BELOW GRADE: BACKFILL AS STATED IN THE TECHNICAL SPECIFICATIONS OR AS SHOWN ON THE DRAWINGS.
2. SUITABLE MATERIAL: IN ROADS, ROAD SHOULDERS, WALKWAYS AND TRAVELED WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE COURSE OF CONSTRUCTION, BUT SHALL EXCLUDE DEBRIS; PIECES OF PAVEMENT; ORGANIC MATTER; TOP SOIL; ALL WET OR SOFT MUCK, PEAT, OR CLAY; ALL EXCAVATED LEDGE MATERIAL; ALL ROCKS OVER 6 INCHES IN LARGEST DIMENSION; AND ANY MATERIAL WHICH, AS DETERMINED BY THE ENGINEER, WILL NOT PROVIDE SUFFICIENT SUPPORT OR MAINTAIN THE COMPLETED CONSTRUCTION IN A STABLE CONDITION. GRAVEL EXCAVATED FROM BELOW OR ADJACENT TO THE ROAD SHALL BE USED AS BACKFILL TO MATCH EXISTING UNDISTURBED PORTION OR TRENCH.
3. WOOD SHEETING, IF REQUIRED: WHERE SHEETING IS PLACED ALONGSIDE THE PIPE AND EXTENDS BELOW MID–DIAMETER, IT SHALL BE CUT OFF AND LEFT IN PLACE TO AN ELEVATION 1 FOOT ABOVE THE TOP OF PIPE. WHERE SHEETING IS ORDERED BY THE ENGINEER TO BE LEFT IN PLACE, IT SHALL BE CUT OFF AT LEAST 3 FEET BELOW FINISHED GRADE, BUT NOT LESS THAN 1 FOOT ABOVE THE TOP OF THE PIPE.
4. W = MAXIMUM ALLOWABLE TRENCH WIDTH TO A PLANE 12 INCHES ABOVE THE PIPE. FOR PIPES 6" INCHES NOMINAL DIAMETER OR LESS, W SHALL BE NO MORE THAN 30 INCHES. ALSO, W SHALL BE THE PAYMENT WIDTH FOR LEDGE LEDGE EXCAVATION AND FOR ORDERED EXCAVATION BELOW GRADE.
5. SEE STANDARD TRENCH DETAIL AND MANHOLE DETAILS ON THIS SHEET FOR BEDDING AND BLANKET MATERIAL SPECIFICATIONS.

6/C3 TRENCH - FORCE MAIN SEWER

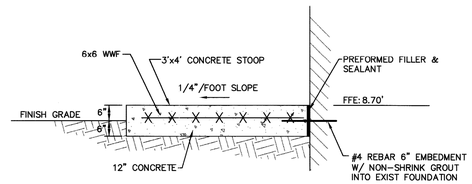
NOT TO SCALE



NOTES:
1. CONCRETE BASE SHALL BE 1'–6" IN DIAMETER FOR ALL GATE AND CORNER POSTS.
2. PROVIDE HORIZONTAL AND DIAGONAL BRACES AT ALL CORNER, PULL, TERMINAL, AND GATE POST.
3. POSTS SHALL BE SPACED AT A MAXIMUM OF 10'–0".

8/C3 CHAIN LINK FENCE AND GATE DETAIL

NOT TO SCALE



7/C3 CONCRETE STOOP DETAIL

NOT TO SCALE

NO.	REVISIONS	By	Date
1	ISSUE FOR APPROVAL	TRP	2/01/00
2	CONSTRUCTION	TRP	2/25/00
3	RECORD DRAWING	TRP	2/25/00

APP'D

Drawn RMG
Designed PHR
Checked TRP
Approved JAN 2000
Book No. 839
Project No. 839
Dwg. ID 839CDTL
Scale AS SHOWN

Underwood Engineers, Inc.
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603–436–6192 Fax. 603–431–4733

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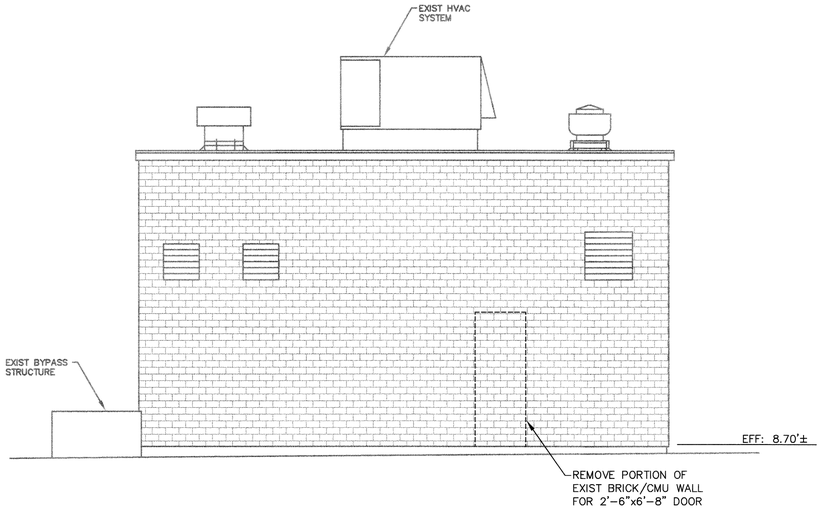
CIVIL DETAILS

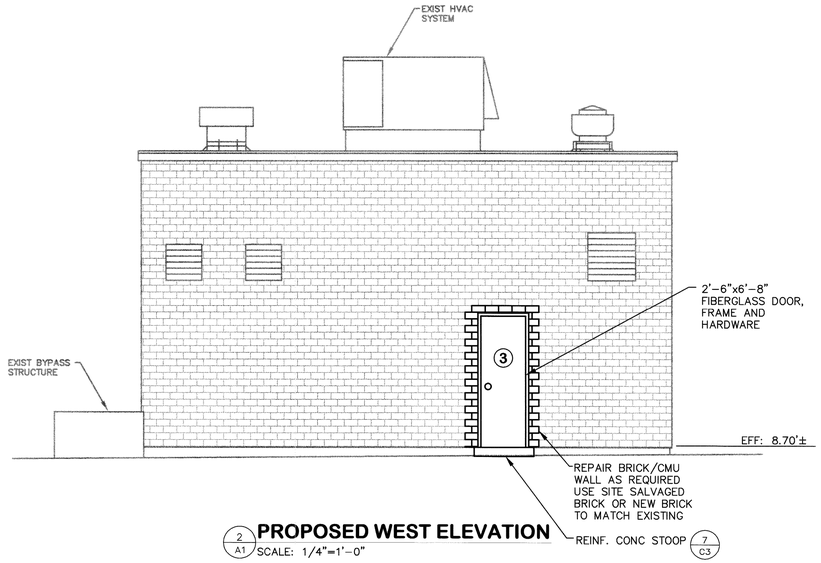
SREENINGS REMOVAL WASHING SYS.
MECHANIC STREET PUMP STATION
CITY OF PORTSMOUTH, NH

DWG NO C3
SHEET 4 OF 15

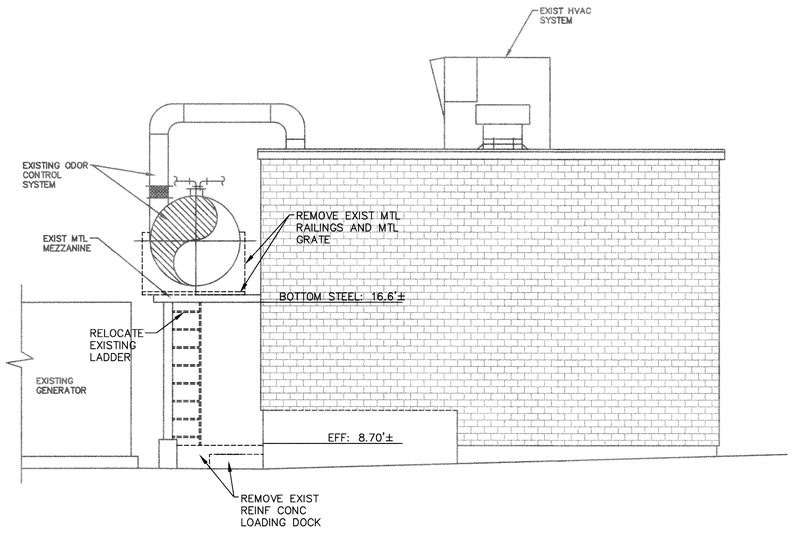
H:\SDSKPRO\839\839CDTL.dwg Wed Mar 01 11:53:31 2000 ROX



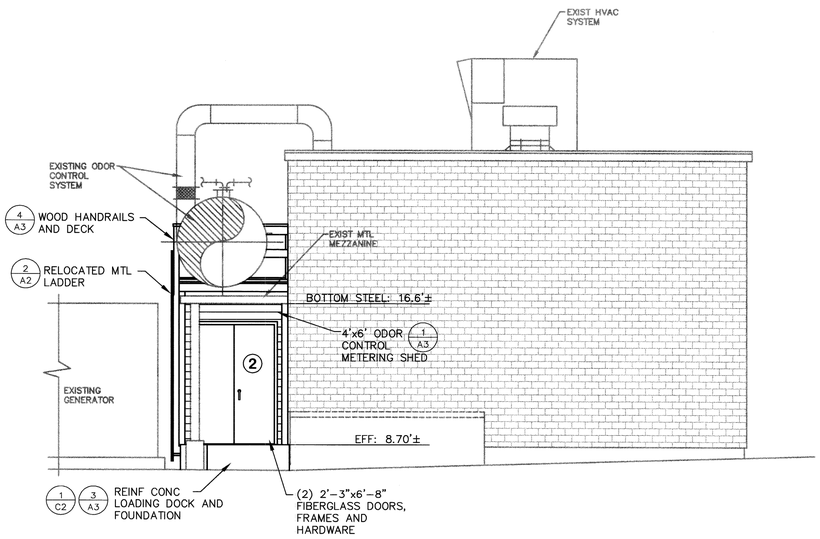
1/A1 **EXISTING WEST ELEVATION**
SCALE: 1/4"=1'-0"



2/A1 **PROPOSED WEST ELEVATION**
SCALE: 1/4"=1'-0"



3/A1 **EXISTING NORTH ELEVATION**
SCALE: 1/4"=1'-0"



4/A1 **PROPOSED NORTH ELEVATION**
SCALE: 1/4"=1'-0"

GRAPHIC SCALE
4 0 4 8
SCALE: 1 INCH = 4 FT.

ISSUE FOR APPROVAL
Date 2/1/00 By TRP
CONSTRUCTION
Date 2/25/00 By TRP
RECORD DRAWING
Date — By —

NO.	REVISIONS	APP'D

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Designed TRB
Checked PHR
Approved TRP
Date JAN 2000
Book No. —
Project No. 839
Dwg. ID 839ELEV
Scale AS SHOWN

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WEST AND NORTH ELEVATIONS

SREENINGS REMOVAL WASHING SYS.
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DWG NO A1
SHEET 5 OF 15

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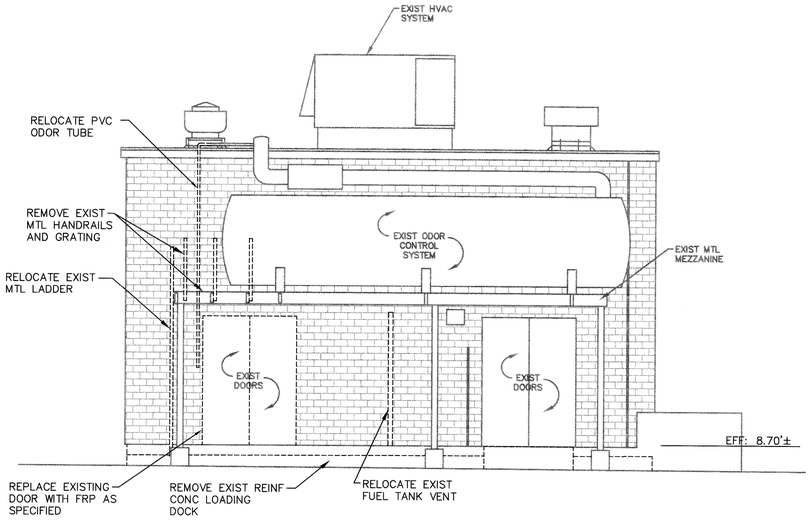
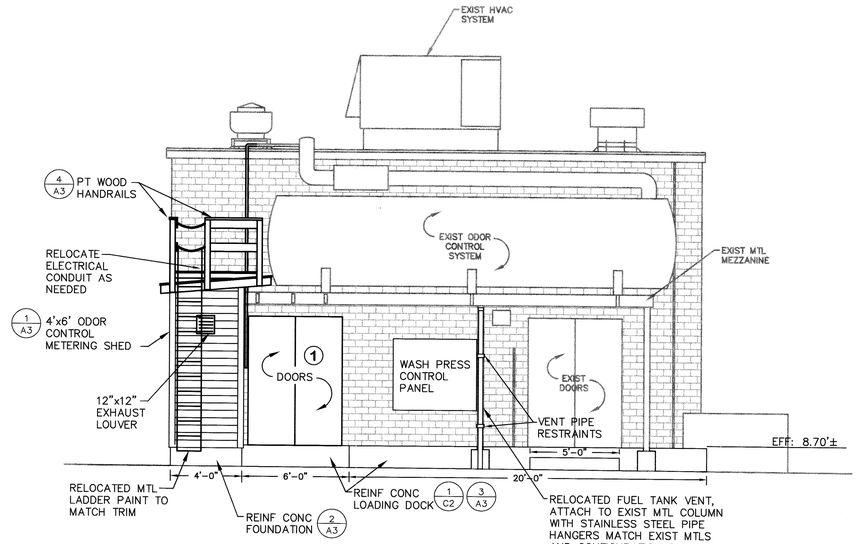


1/A2 EXISTING EAST ELEVATION

SCALE: 1/4"=1'-0"



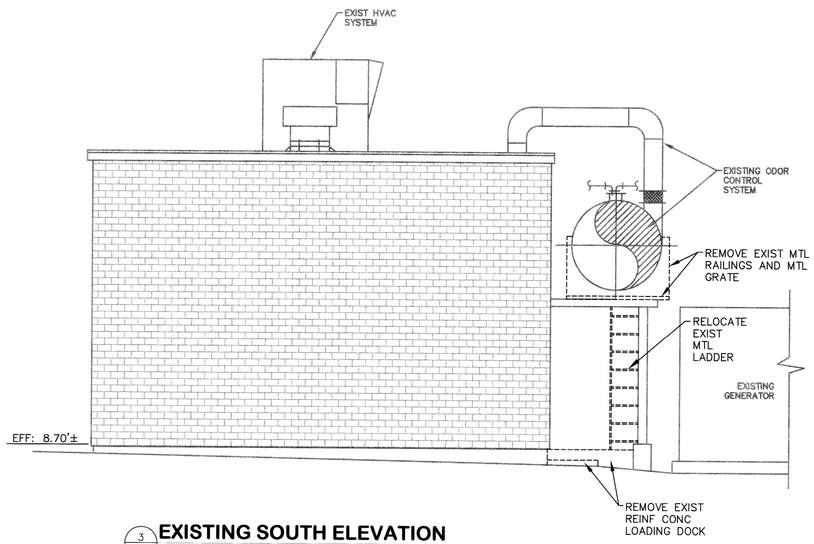
2/A2 PROPOSED EAST ELEVATION

SCALE: 1/4"=1'-0"

DOOR SCHEDULE

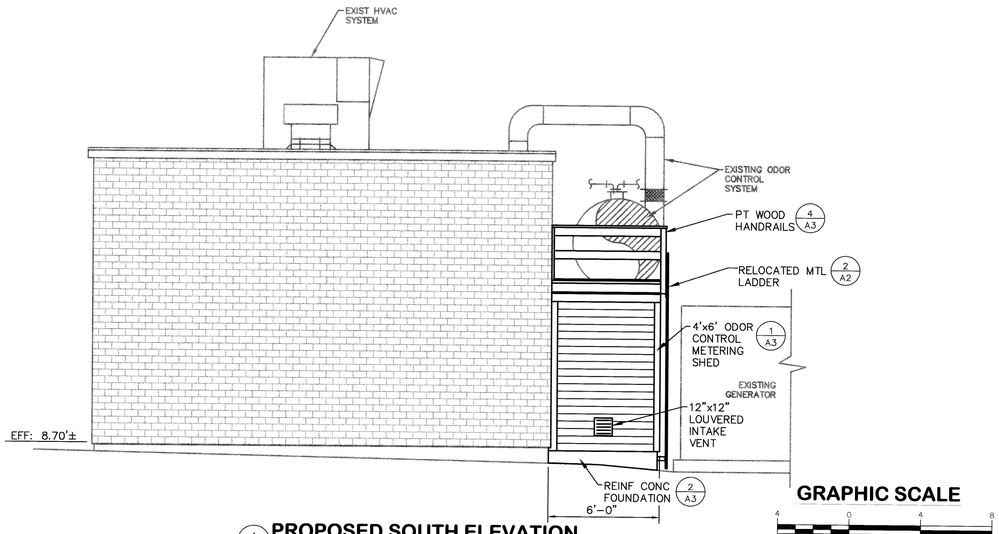
DOOR#	SIZE W	SIZE H	DOOR MTL	JAM MTL
1*	5'-0"	6'-8"	FRP	FRP
2	4'-6"	6'-8"	FRP	FRP
3	2'-6"	6'-8"	FRP	FRP

SEE SPECIFICATION 08111
* CONTRACTOR TO FIELD VERIFY EXISTING R.O.



3/A2 EXISTING SOUTH ELEVATION

SCALE: 1/4"=1'-0"



4/A2 PROPOSED SOUTH ELEVATION

SCALE: 1/4"=1'-0"

GRAPHIC SCALE

4 0 4 8

SCALE: 1 INCH = 4 FT.

NO.	REVISIONS	APP'D
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Drawn TRB
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Approved TRP
Date JAN 2000
Book No. 839
Project No. 839ELEV
Dwg. ID A3 SHOWN
Scale AS SHOWN

STATE OF NEW HAMPSHIRE TIMOTHY R. BOYLE No. 9234 LICENSED PROFESSIONAL ENGINEER

THE STATE OF NEW HAMPSHIRE PAUL H. REGISTERED LANDSCAPE ARCHITECT No. 438

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EAST AND SOUTH ELEVATIONS

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DWG NO A2

SHEET 6 OF 15

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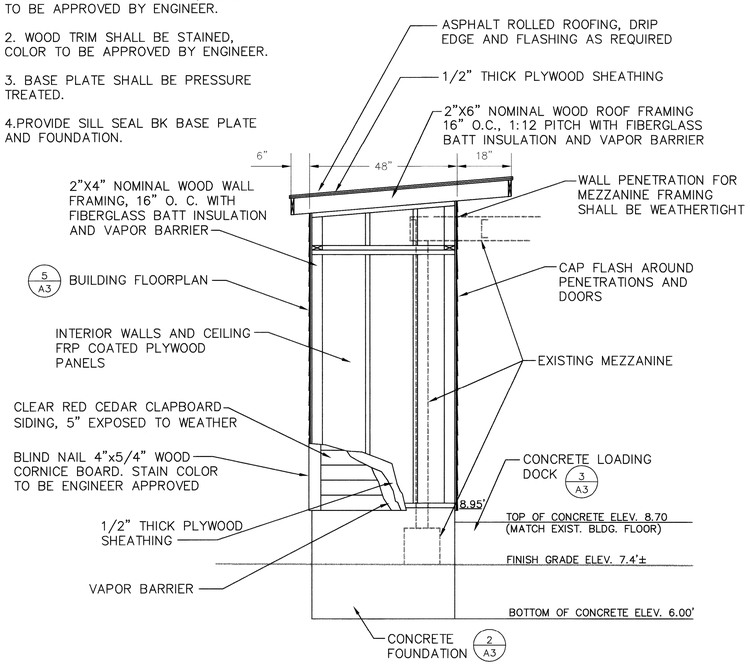
NOTES:

1. SIDING SHALL BE STAINED, COLOR TO BE APPROVED BY ENGINEER.

2. WOOD TRIM SHALL BE STAINED, COLOR TO BE APPROVED BY ENGINEER.

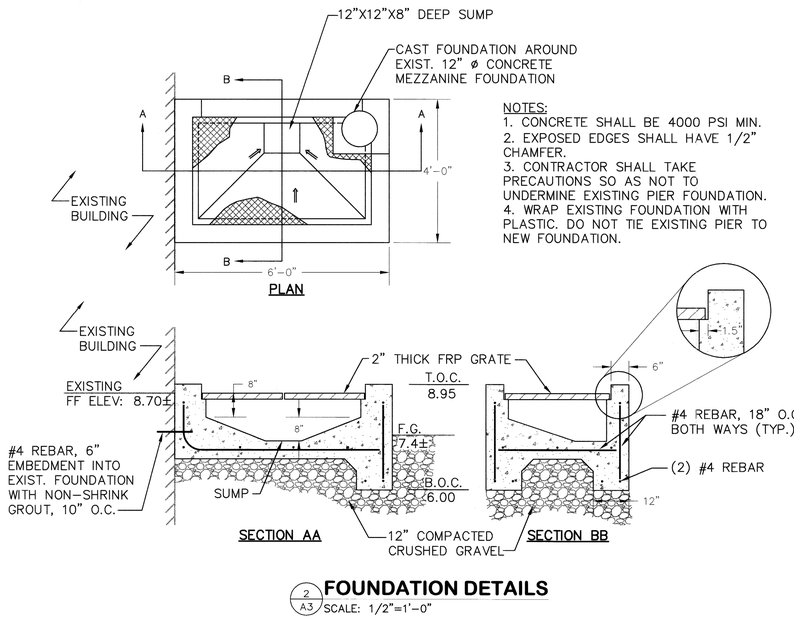
3. BASE PLATE SHALL BE PRESSURE TREATED.

4.PROVIDE SILL SEAL BK BASE PLATE AND FOUNDATION.



1/A3 TYPICAL ODOR CONTROL METERING SHED SECTION

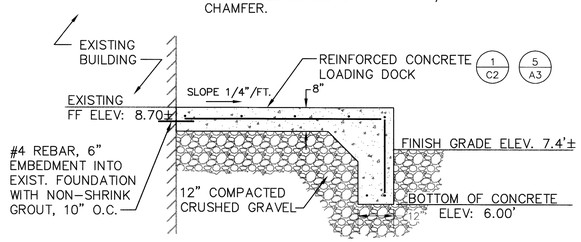
SCALE: 1/2"=1'-0"

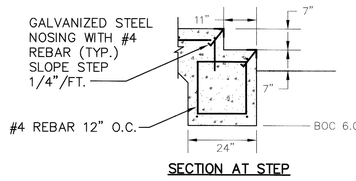


2/A3 FOUNDATION DETAILS

SCALE: 1/2"=1'-0"

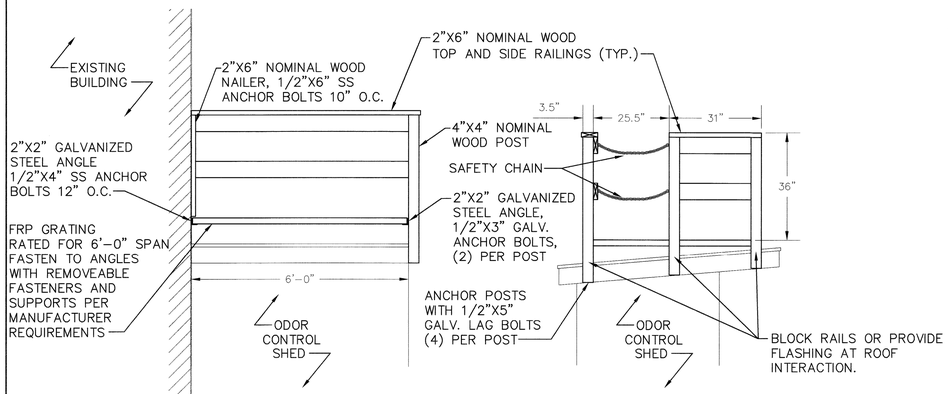
NOTES:
1. CONCRETE SHALL BE 4000 PSI MIN.
2. EXPOSED EDGES SHALL HAVE 1/2" CHAMFER.





3/A3 LOADING DOCK DETAILS

SCALE: 1/2"=1'-0"



NOTES:

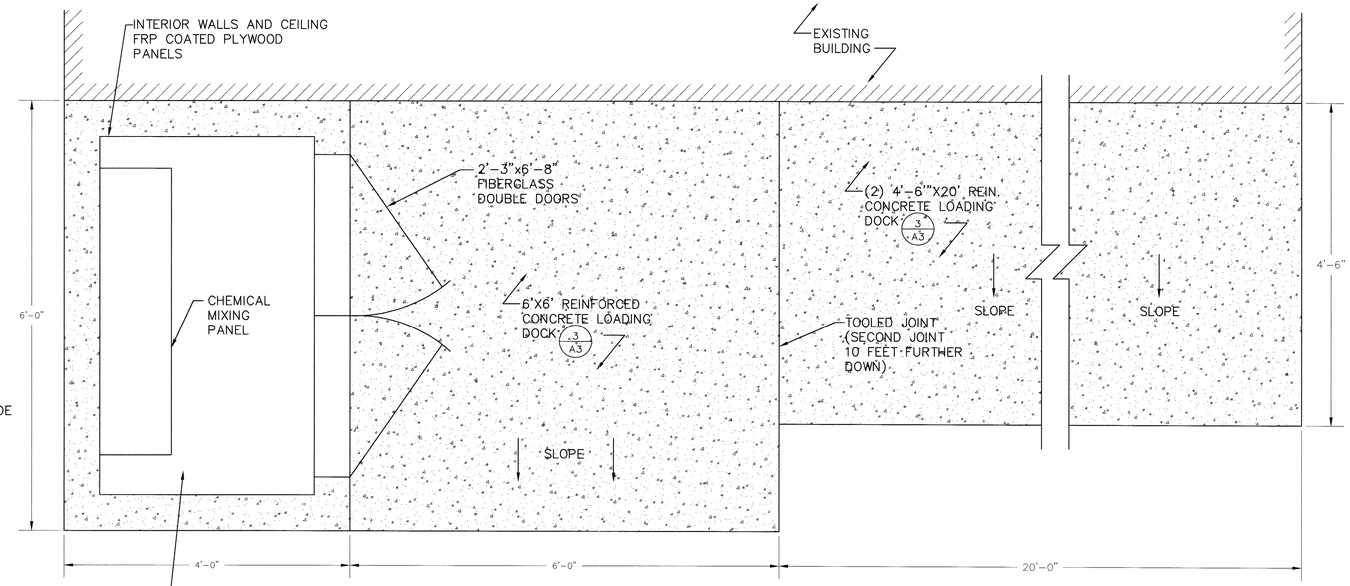
1. ALL WOOD SHALL BE PRESSURE TREATED.

2. SAFETY CHAINS SHALL BE 1/4" THICK GALVANIZED CHAIN. CHAINS SHALL BE PERMANENTLY ANCHORED ON LEFT SIDE WITH 1/4"X4" GALVANIZED EYEBOLTS ATTACHED TO WOOD POST. CHAINS SHALL HAVE HEAVY DUTY CORROSION RESISTANT SNAP HOOKS PERMANENTLY ATTACHED AND CAPABLE OF JOINING TO EYEBOLTS ON RIGHT.

3. FRP GRATING SHALL BE RESISTANT TO ULTRAVIOLET LIGHT, AND SUITABLE FOR EXTERIOR USE. COLOR SHALL BE APPROVED BY ENGINEER.

4/A3 HANDRAILS AND DECK

SCALE: 1/2"=1'-0"



5/A3 ODOR CONTROL METERING SHED FLOOR PLAN

SCALE: 1"=1'-0"

GRAPHIC SCALE

4 0 4 8

SCALE: 1 INCH = 4 FT.

ISSUE FOR APPROVAL
Date 2/1/00 By TRP
CONSTRUCTION
Date 2/25/00 By TRP
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Date - By -

NO.	REVISIONS	APP'D

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Approved TRP
Date JAN 2000
Book No. -
Project No. 839
Dwg. ID 839ADTL
Scale AS SHOWN

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ARCHITECTURAL DETAILS

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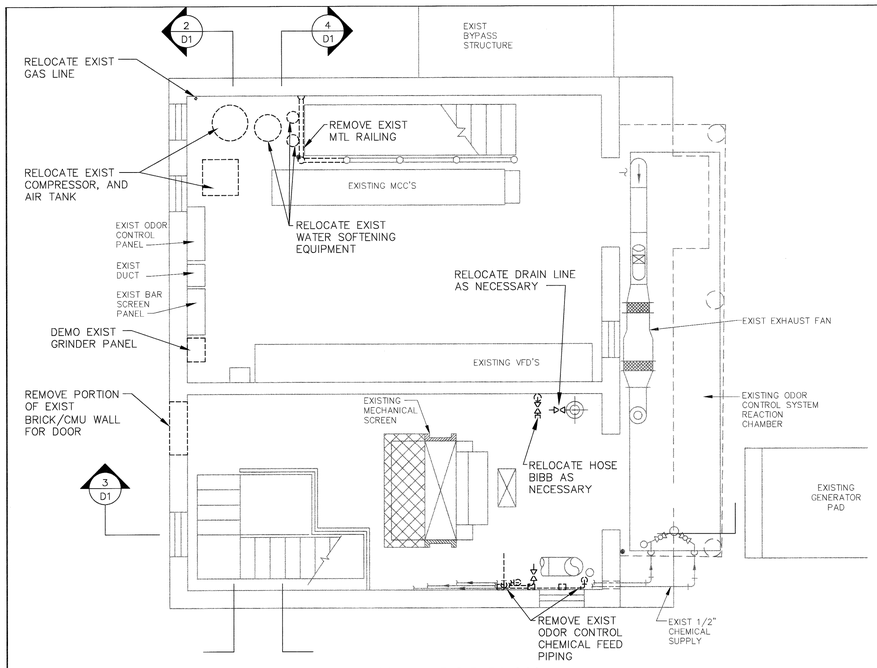
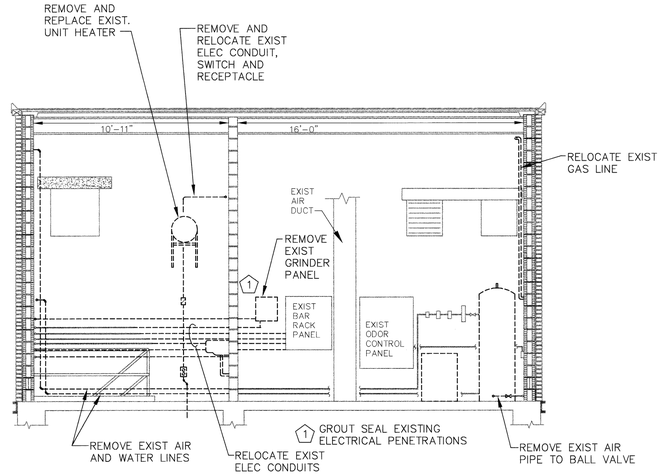
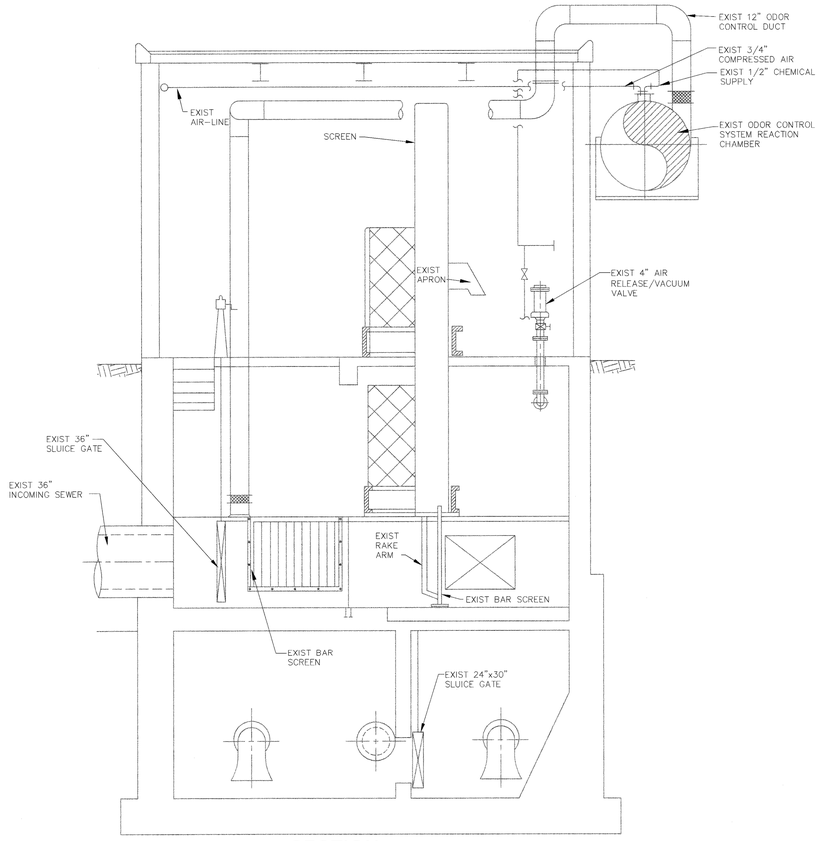


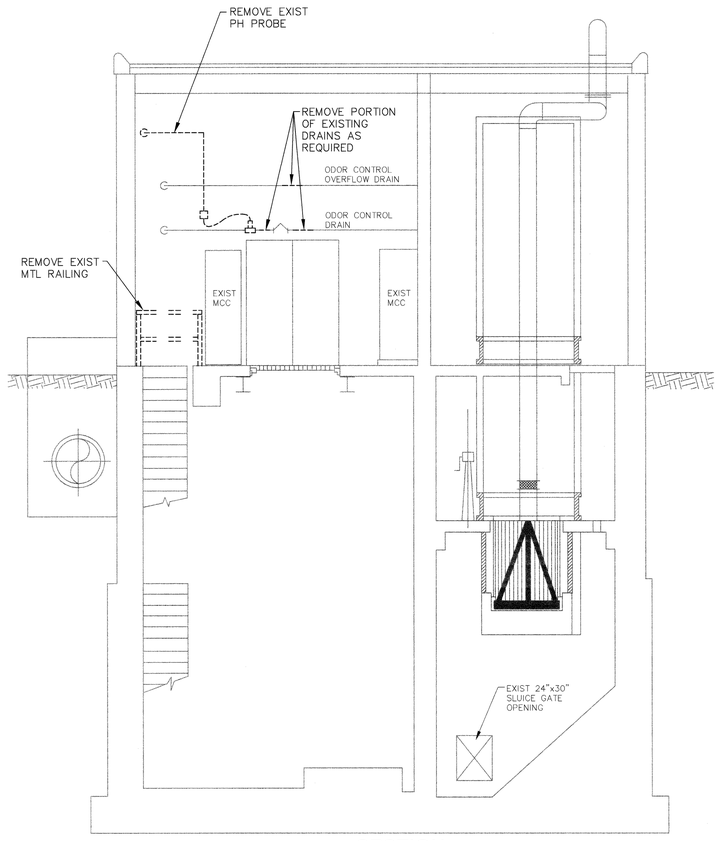
1/D1 GROUND FLOOR PLAN
SCALE: 1/4"=1'-0"



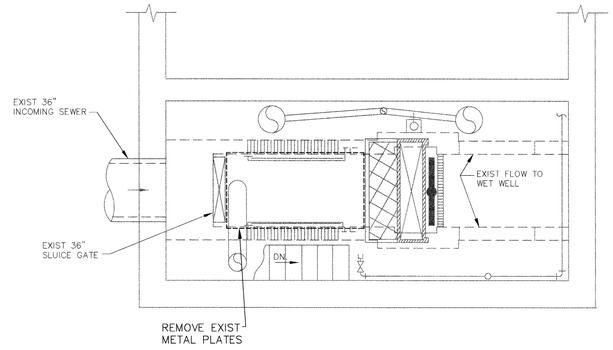
2/D1 PARTIAL SECTION
SCALE: 1/4"=1'-0"



3/D1 SECTION
SCALE: 1/4"=1'-0"



4/D1 SECTION
SCALE: 1/4"=1'-0"



5/D1 SCREEN ROOM PLAN
SCALE: 1/4"=1'-0"

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	2/1/00	TRP
CONSTRUCTION		
	2/25/00	TRP
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Date JAN 2000
Book No. —
Project No. 839
Dwg. ID 839DEMO
Scale AS SHOWN

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DEMOLITION PLANS / SECTS.

SREENINGS REMOVAL WASHING SYS.
MECHANIC STREET PUMP STATION
CITY OF PORTSMOUTH, NH

DWG NO D1

SHEET 8 OF 15

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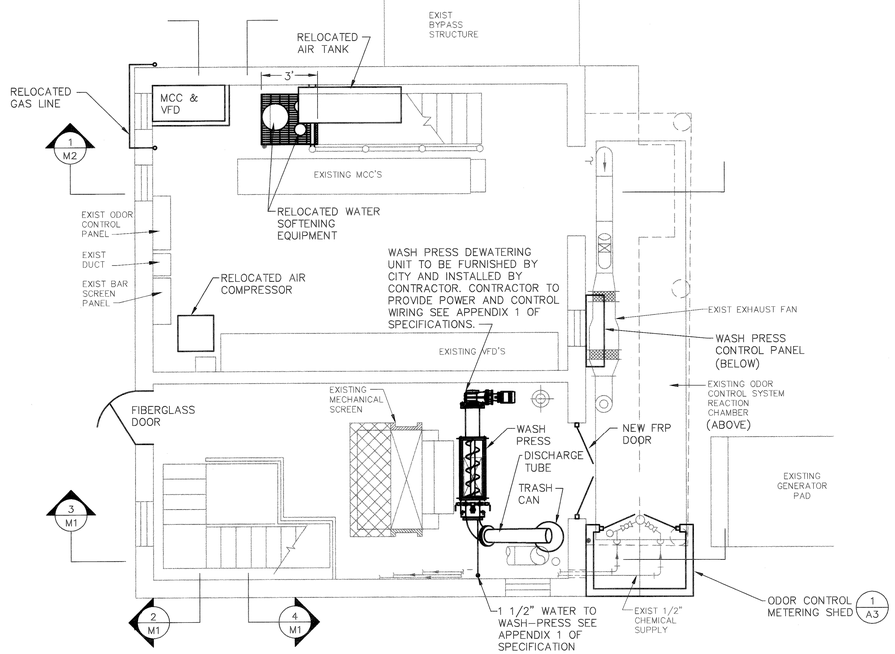
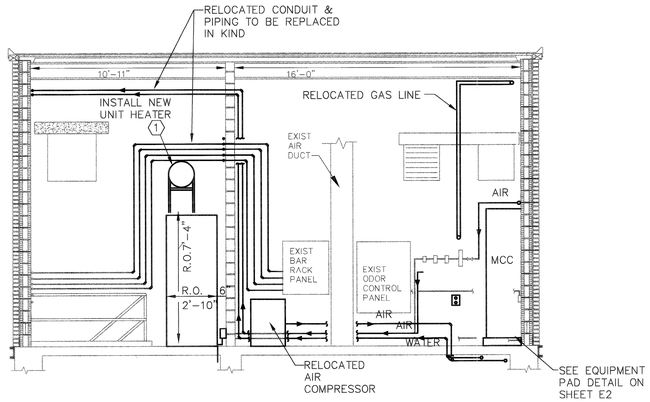
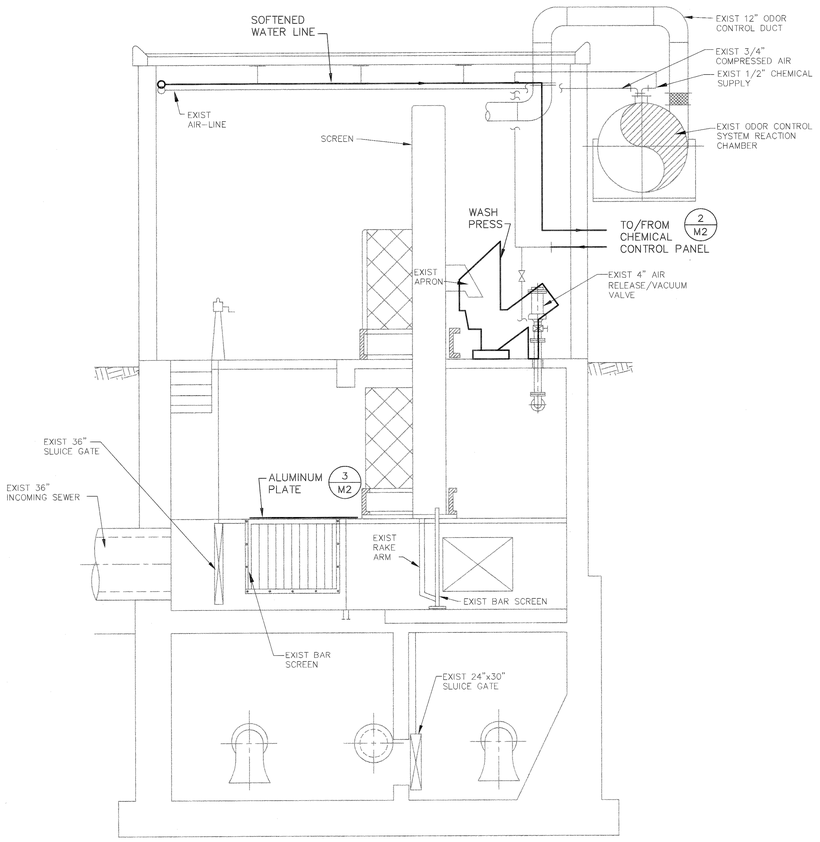


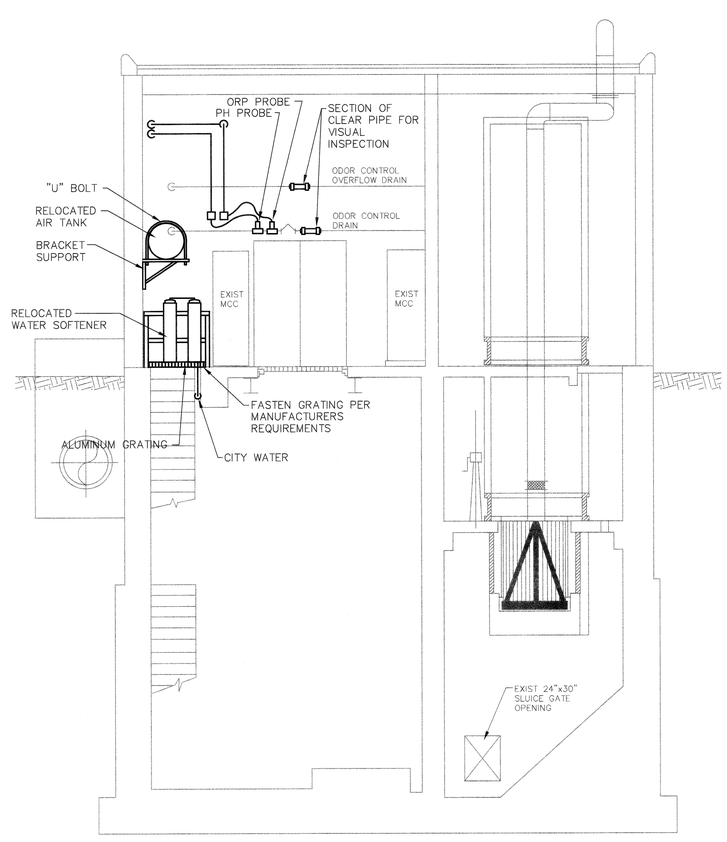
1 M1 GROUND FLOOR PLAN
SCALE: 1/4"=1'-0"



2 M1 SECTION
SCALE: 1/4"=1'-0"

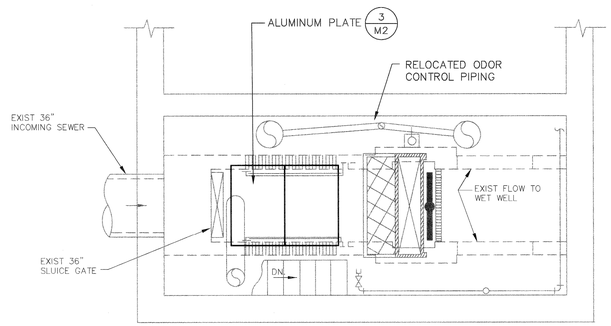


3 M1 SECTION
SCALE: 1/4"=1'-0"



4 M1 SECTION
SCALE: 1/4"=1'-0"

1 INSTALL NEW ELECTRIC UNIT HEATER. HEATER SHALL BE AN INDEECO CAT. #251-F01B0155 U-1234 OR APPROVED EQUAL.



5 M1 SCREEN ROOM PLAN
SCALE: 1/4"=1'-0"

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4		
5		
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Checked PHR
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Book No. —
Project No. 839
Dwg. ID 839PROC1
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PLANS AND SECTIONS

SREENINGS REMOVAL WASHING SYS.
MECHANIC STREET PUMP STATION
CITY OF PORTSMOUTH, NH

DWG NO M1
SHEET 9 OF 15

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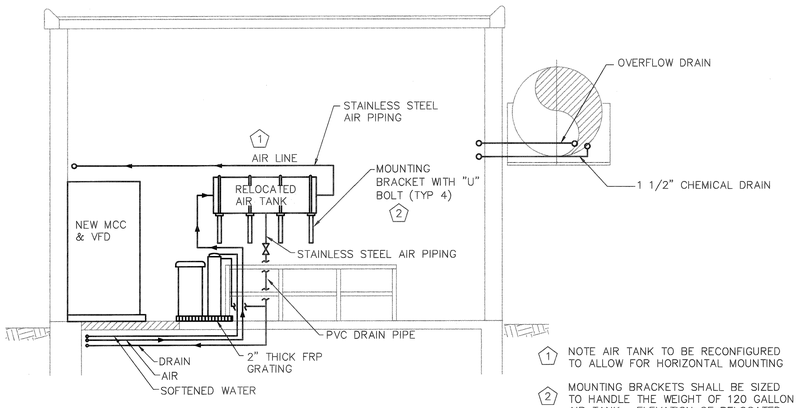


1 NOTE AIR TANK TO BE RECONFIGURED TO ALLOW FOR HORIZONTAL MOUNTING

2 MOUNTING BRACKETS SHALL BE SIZED TO HANDLE THE WEIGHT OF 120 GALLON AIR TANK. ELEVATION OF RELOCATED TANK TO MEET BOCA REQUIREMENT FOR CLEARANCE OVER STAIRS.

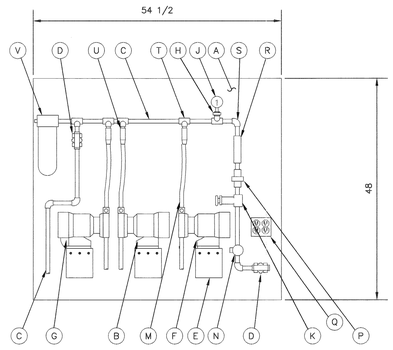
1/M2 PROPOSED SECTION
SCALE: 1/4"=1'-0"

V	1	AMETEK WATER FILTER #10 STANDARD
U	1	INJECTION/ANTI-SYPHON CHECK VALVE
T	5	CPVC SCH. 80 SOCKET TEE
S	5	CPVC SCH. 80 SOCKET FITTING
R	1	INLINE ROTAMETER
Q	1	4 GANG RECEPTICAL FOR CHEMICAL PUMPS
P	1	1/2" PVC DIAPHRAM CHECK VALVE
N	1	1/2" 110VAC BRONZE SELENOID VALVE
M		1/2" POLYETHYLENE FLEXABLE CHEMICAL LINE
L		
K	1	PLAST-O-MATIC PRM050B
J	1	MARSHALL TOWN GAUGE G14491
H	1	PLAST-O-MATIC GGMV030-PP
G	1	NaOH PUMP
F	1	NaOCl PUMP
E	3	LMI 34643 MOUNTING BRACKET
D	2	1/2" PVC BALL VALVE
C		1/2" SCH80 CPVC PIPE & FITTINGS
B	1	ACID PUMP
A	1	6'x4'x1/2" FRP BOARD
ITEM	QTY	DESCRIPTION

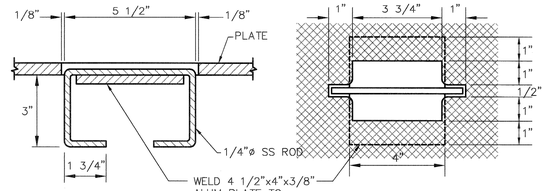
NOTE:

1. FIBERGLASS BACKBOARD IS CONSTRUCTED FROM A PREMIUM VINYL ESTER RESIN COMPATIBLE FOR SERVICE WITH SODIUM HYPOCHLORITE & SODIUM HYDROXIDE.

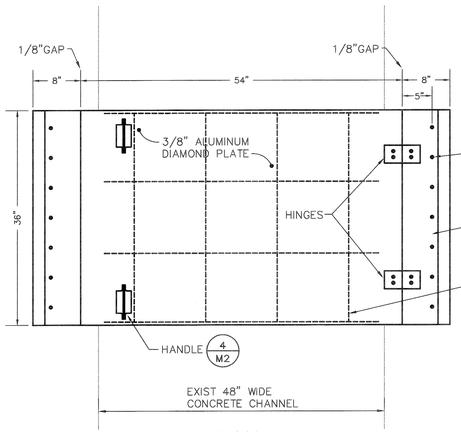
2. ALL CHEMICAL PUMPS ARE EQUIPPED WITH A 120VAC CORD WITH A MALE GROUNDED AND POLARIZED PLUG.



2/M2 CHEMICAL MIXING PANEL
NOT TO SCALE



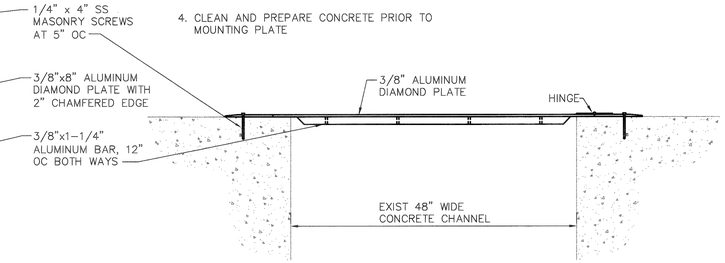
4/M2 FLOOR PLATE HANDLE
NOT TO SCALE



PLAN

NOTES:

1. TWO PLATE ASSEMBLYS ARE REQUIRED, SIDE BY SIDE.
2. HINGES SHOULD BE LOCATED ON SIDE OF CHANNEL OPPOSITE EXIST STAIRS.
3. HINGES SHOULD BE OF SUBSTANTIAL CONSTRUCTION AND BE EITHER ALUMINUM OR STAINLESS STEEL.
4. CLEAN AND PREPARE CONCRETE PRIOR TO MOUNTING PLATE



SECTION

3/M2 ALUMINUM FLOOR PLATE ASSEMBLY TYP. (2)
SCALE: 1"=1'-0"

ISSUE FOR APPROVAL Date 2/1/00 By TRP
CONSTRUCTION Date 2/25/00 By TRP
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Date JAN 2000
Book No. -
Project No. 839
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MECHANICAL DETAILS

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DWG NO M2
SHEET 10 OF 15

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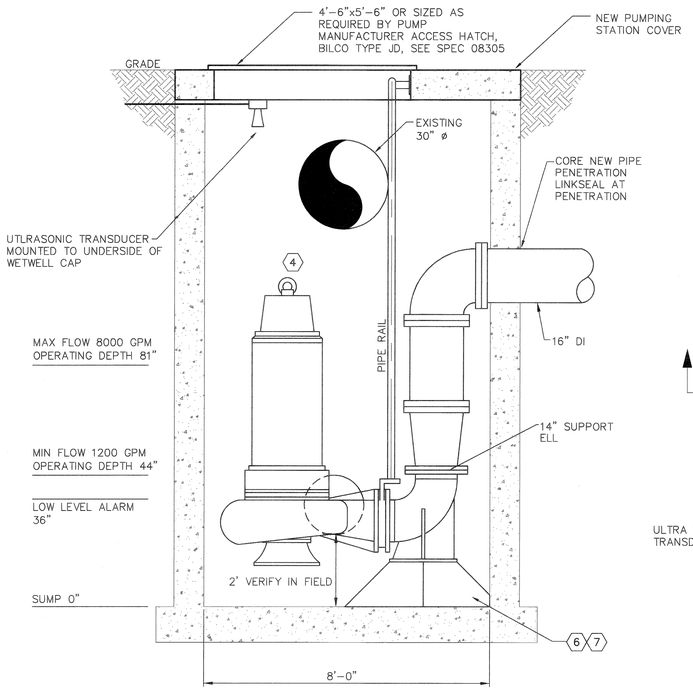

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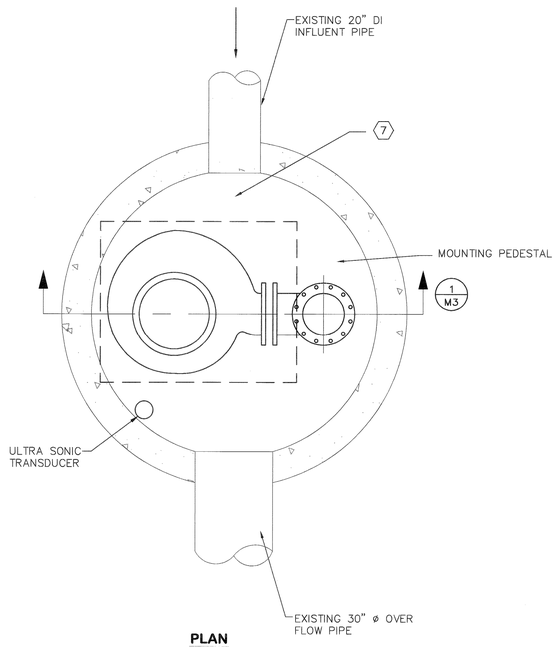
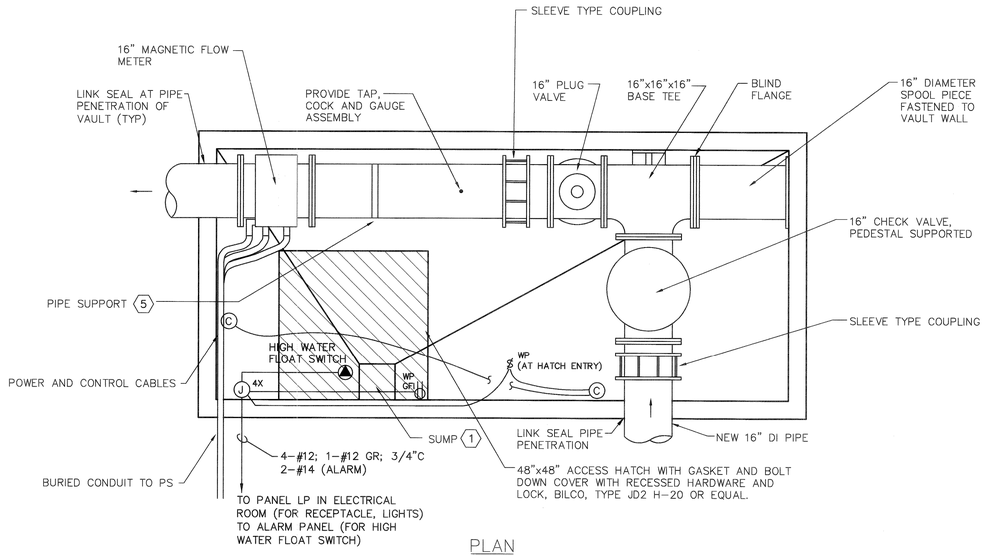


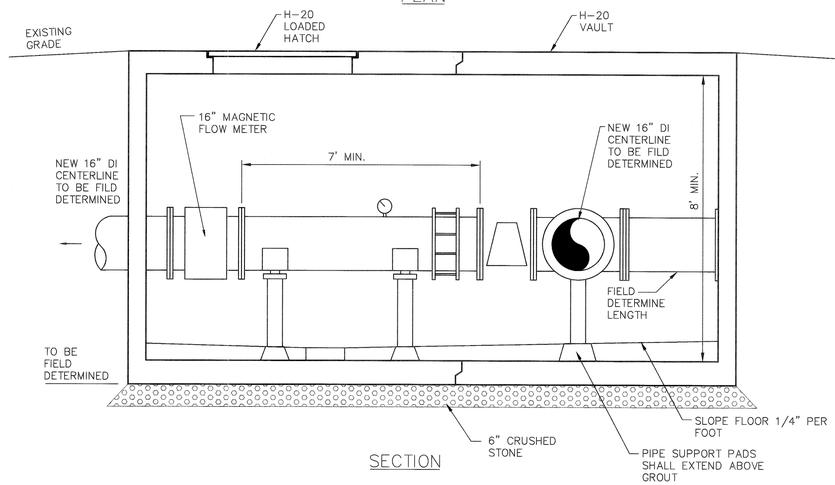
PLAN

BYPASS PUMP

1 / M3 SCALE: 1/2"=1'-0"



PLAN



SECTION

VALVE PIT

2 / M3 NTS

NOTES

1. GROUT FLOOR TO SUMP.
2. CONTRACTOR TO VERIFY IN FIELD INVERT OF EXISTING FORCE MAIN AND WETWELL DIMENSIONS PRIOR TO CONSTRUCTION OF VALVE PIT AND PUMP DISCHARGE PIPE.
3. NEW FORCE MAIN SHALL SLOPE UPWARD FROM PUMP TO EXISTING FORCE MAIN.
4. CONTRACTOR TO STEAM CLEAN AND PATCH EXISTING WETWELL AS NECESSARY.
5. PROVIDE PIPE SUPPORTS AS NECESSARY PER MANUFACTURER.
6. MOUNTING PEDESTAL SHALL BE PER MANUFACTURER'S REQUIREMENTS, SEE SPECIFICATION 11319.
7. CONFIGURATION OF WETWELL INCLUDING EQUIPMENT PAD, DIMENSIONS OF BAFFLE AND LOCATION SHALL BE PROVIDED BY PUMP MANUFACTURER.
8. SEE ELECTRICAL DRAWINGS E1 AND E2 AND DIVISION 16 OF THE CONTRACT SPECIFICATIONS FOR ADDITION ELECTRICAL DETAIL.
9. H-20 LOAD RATED VALVE PIT VAULT SHALL HAVE INTERNAL DIMENSIONS OF 8'-0" BY 17'-5" BY 6'-0" BY SUPERIOR CONCRETE OR EQUAL.

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1	ISSUE FOR APPROVAL By TRP Date 1/00	
2	2/CONSTRUCTION By TRP Date 2/25/00	
3	RECORD DRAWING By - Date -	

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Project No. 839PUMP
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BYPASS PUMP

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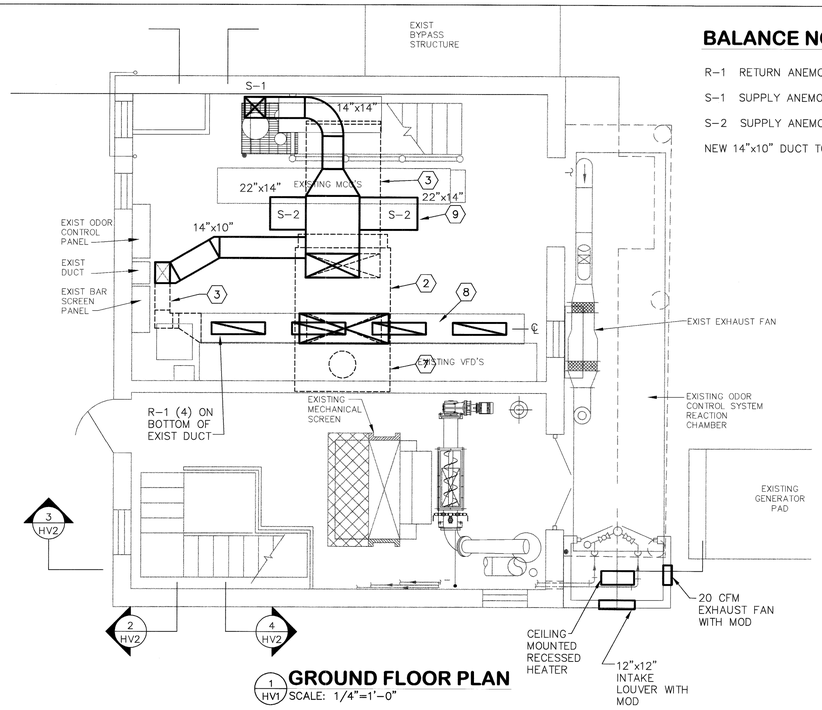


GROUND FLOOR PLAN

1 HV1 SCALE: 1/4"=1'-0"

BALANCE NOTES:

R-1 RETURN ANEMOSTAT GC10 (4 @ 36"x8" W/ OPP. BLADE DAMPER)

S-1 SUPPLY ANEMOSTAT x 2HO 1 @ 14"x14", 1400 CFM

S-2 SUPPLY ANEMOSTAT x 1HO 2 @ 20"x12", 1125 CFM

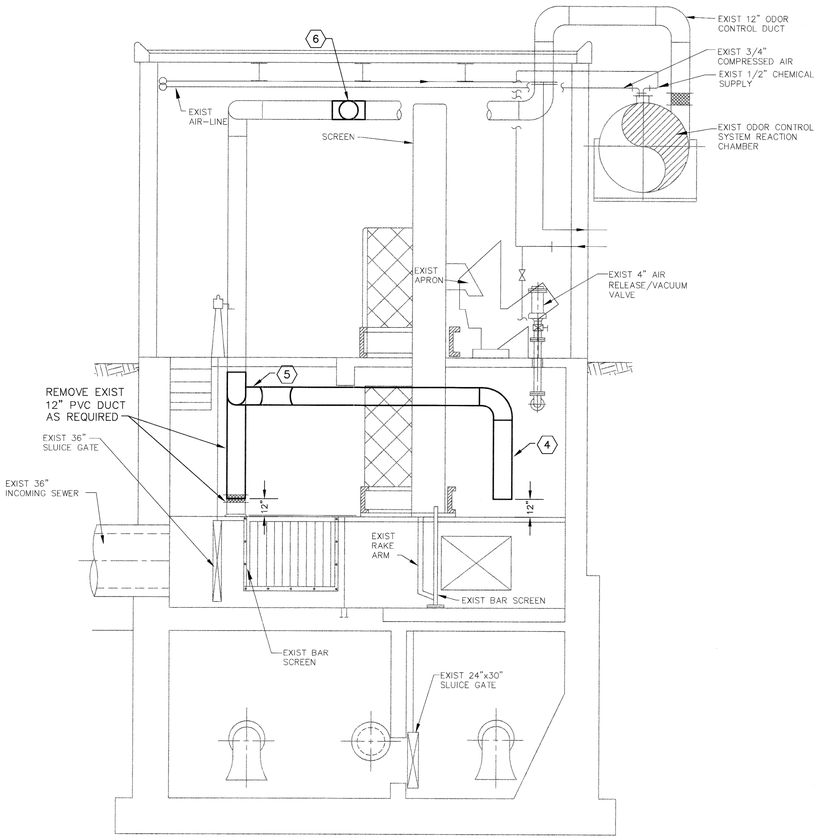
NEW 14"x10" DUCT TO CONNECT TO EXISTING DUCT, 850 CFM

DEMOLITION NOTES:

1. REMOVE 12" DIA. DUCT IN LOWER LEVEL TO FLOOR LEVEL.
2. REMOVE AC-2 AND ALL ASSOCIATED AUTOMATIC CONTROLS.
3. REMOVE AC-2 SUPPLY AND RETURN DUCTS AS SHOWN.

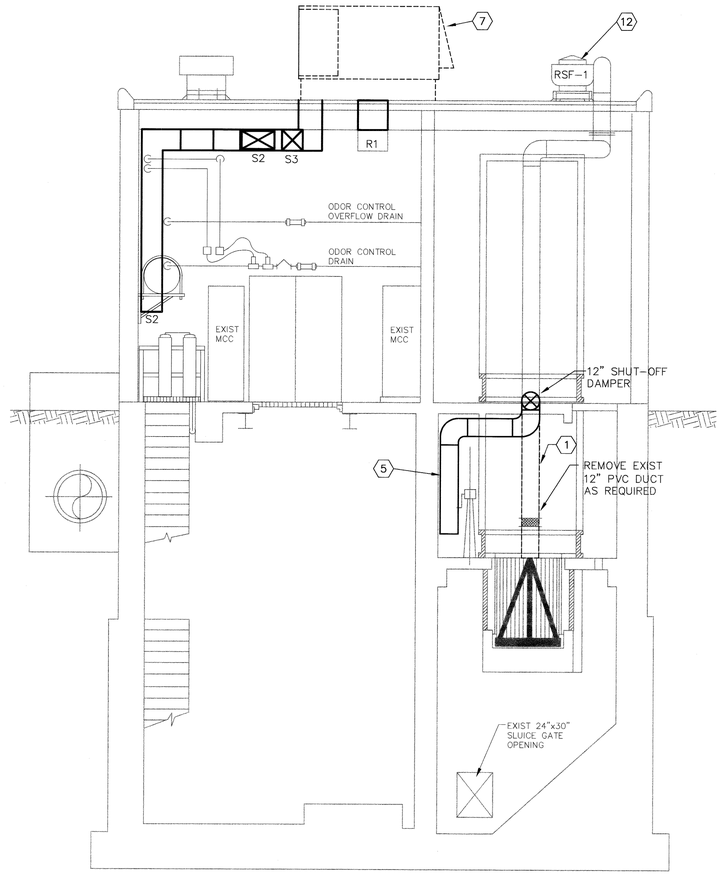
INSTALLATION NOTES:

4. INSTALL 12" DIA. PVC DUCT AS SHOWN TO 12" ABOVE EXISTING SCREEN ROOM FLOOR. INSTALL FULL SIZE DAMPER WITH LOCKING QUADRANT ON OPEN END.
5. INSTALL 12" TEE. CONNECT BRANCH TO 12" DUCT INSTALLED IN 4 ABOVE. INSTALL DAMPER WITH LOCKING QUADRANT ON OPEN END OF TEE.
6. INSTALL 12" TEE IN EXISTING 12" PVC DUCT AT ROOF. INSTALL DAMPER WITH LOCKING QUADRANT ON BRANCH OF TEE.
7. INSTALL AC-2R COMPLETE WITH CONTROLS AND NEW ROOF CURB. REPAIR EXISTING ROOF TO PROVIDE A WATER-PROOF INSTALLATION.
8. REPLACE PERFORATED PLATE ON EXISTING SUPPLY DUCT WITH SOLID SHEET METAL OF SAME GAGE AND MATERIAL AS EXISTING DUCT. INSTALL RETURN GRILLES AND MODIFY EXISTING DUCT TO CONNECT TO AC-2R RETURN.
9. INSTALL SUPPLY DUCT AS SHOWN ON DRAWING COMPLETE WITH REGISTERS.
10. BALANCE AIR FLOWS IN WET WELL AS FOLLOWS:
    EXISTING RSF-1-1200 CFM
    EXHAUST TO ODOR CONTROL SYSTEM-1400 CFM (NOTE THIS MAY REQUIRE ADJUSTING "PLUME ELIMINATOR INTAKE" TO 1000 CFM).
11. BALANCE AIR FLOWS IN DRY WELL AS FOLLOWS:
    OUTSIDE TEMPERATURE ABOVE 50°F
    AC-2R-4500 CFM TOTAL SUPPLY (1400 CFM OUTSIDE AIR)
    EXISTING REF-1-1200 CFM
    OUTSIDE TEMPERATURE 50°F OR BELOW
    AC-2R-4500 CFM (700 CFM) OUTSIDE AIR
    EXISTING REF-1-600 CFM (LOW SPEED).
12. REPLACE EXISTING FILTERS WITH 1/2 MESH BIRD SCREEN, REPLACE DRIVE BELTS AND LUBRICATE.



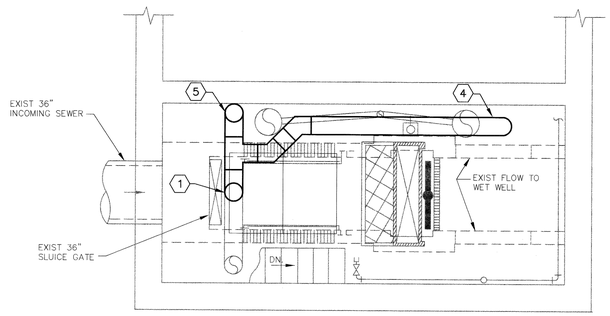
SECTION

3 HV1 SCALE: 1/4"=1'-0"



SECTION

4 HV1 SCALE: 1/4"=1'-0"



WETWELL PLAN

5 HV1 SCALE: 1/4"=1'-0"

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NEW PACKAGE AIR CONDITIONING UNIT SCHEDULE

TAG No.	LOCATION	MANUFACTURER	MODEL No.	TYPE	COOLING DATA					HEATING CAPACITY		FAN DATA						ELECTRICAL DATA					REMARKS
					COOLING MBH		EAT (°F) DB/WB	LAT (°F) DB/WB	CFM	INPUT MBH	OUTPUT MBH	O.A. CFM	R.A. CFM	TYPE	RPM	ESP(IN)	TSP(IN)	FILTERS	VOLTS	PHASE	AIR HANDLER FAN No./HP	CONDENSER FAN No./HP	TOTAL SYSTEM POWER	
					TOTAL	SENSIBLE																		
AC-2R	MECH. ST. ROOF	TRANE	YCD151C4	GAS RFTP	148.0	105.0	80/67	58/56	4500	250/175	203/142	1400	3100	FC	–	.75	–	2" TA	480	3	1 / 3	1 / 1	17.11 KW	

EXISTING SUPPLY FAN SCHEDULE

TAG No.	LOCATION	MANUFACTURER	MODEL No.	TYPE	FAN DATA			ELECTRICAL DATA			REMARKS
					CFM	RPM	SP(IN)	VOLTS	PHASE	HP	
RSF-1*	WET WELL ROOF	GREENHECK	RSF-9	FILTERED	1200	593	.125	120	1	1/6	EXPLOSION PROOF DIRECT DRIVE

SEE BALANCING NOTES HV1

EXISTING EXHAUST FAN SCHEDULE

TAG No.	LOCATION	MANUFACTURER	MODEL No.	TYPE	FAN DATA			ELECTRICAL DATA			REMARKS
					CFM	RPM	SP(IN)	VOLTS	PHASE	HP	
REF-1	DRY WELL ROOF	GREENHECK	CUBE-140-4	UPBLAST	1200/600	99 1 95	.375	460	3	1	TWO SPEED/SINGLE WINDING

ABBREVIATION LIST

AFF	ABOVE FINISHED FLOOR
APD	AIR PRESSURE DIFFERENCE
ATR	AIR TEMPERATURE RISE
BTUH	BRITISH THERMAL UNIT'S PER HOUR
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CKTS	CIRCUITS
CL	CENTERLINE
DB	DRYBULB
DIA	DIAMETER
DIFF	DIFFUSER
DN	DOWN
DX	DIRECT EXPANSION
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
ESP	EXTERNAL STATIC PRESSURE
F	FAHRENHEIT
FA	FRESH AIR
FC	FORWARD CURVE
FLA	FULL LOAD AMPS
FPM	FEET PER MINUTE
FT	FEET
H	HEIGHT
HP	HORSE POWER
IN	INCHES
IPS	INSIDE PIPE SCREW
KW	KILOWATT
L	LENGTH
LAT	LEAVING AIR TEMPERATURE
MBH	1000xBTUH
MIN	MINIMUM
MTD	MOUNTED
MTR	MOTOR
NO	NUMBER
OA	OUTSIDE AIR
QTY	QUANTITY
PSIG	POUNDS PER SQUARE INCH, GAUGE
RA	RETURN AIR
RH	RELATIVE HUMIDITY
RLA	RUNNING LOAD AMPS
RPM	REVOLUTIONS PER MINUTE
SA	SUPPLY AIR
SF	SQUARE FEET
SHC	SENSIBLE HEAT CAPACITY
SP	STATIC PRESSURE
TA	THROW AWAY
TC	TOTAL CAPACITY
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
VEL	VELOCITY
W	WIDTH
WB	WET BULB
WC	WATER COLUMN

HVAC LEGEND

- CONNECT TO EXISTING
- POINT WHERE DEMOLITION STOPS
- (ER) EXISTING TO REMAIN
- (T) THERMOSTAT, ELECTRIC
- (F) FAN SWITCH
- (S) SMOKE DETECTOR
- D DRAIN
- G GAS
- SUPPLY DUCT UP
- SUPPLY DUCT DOWN
- RETURN DUCT UP
- RETURN DUCT DOWN
- TURNING VANES
- TRANSITION
- EQUIPMENT REMOVED

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HEAT/VENT DETAILS

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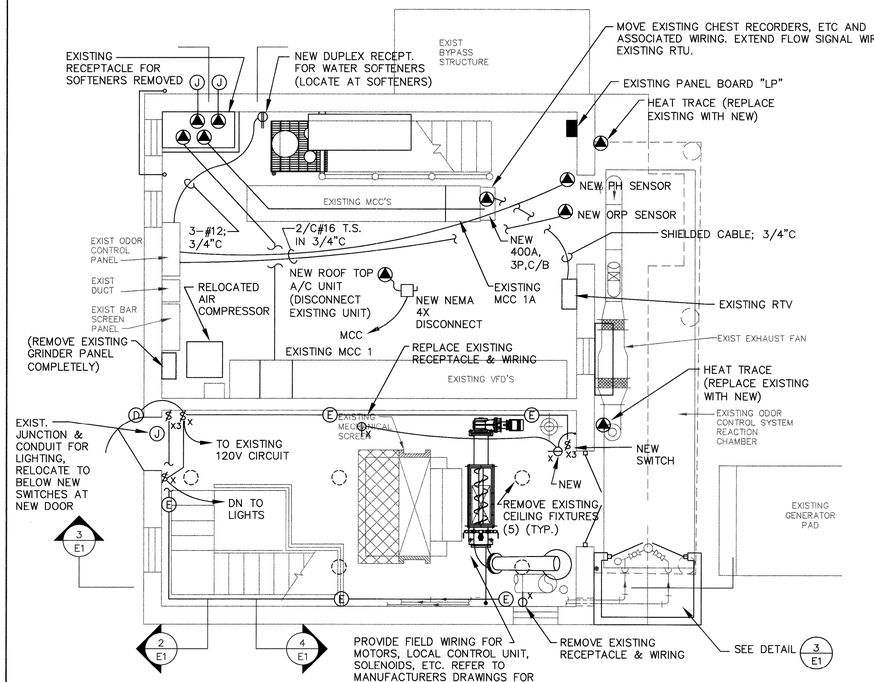
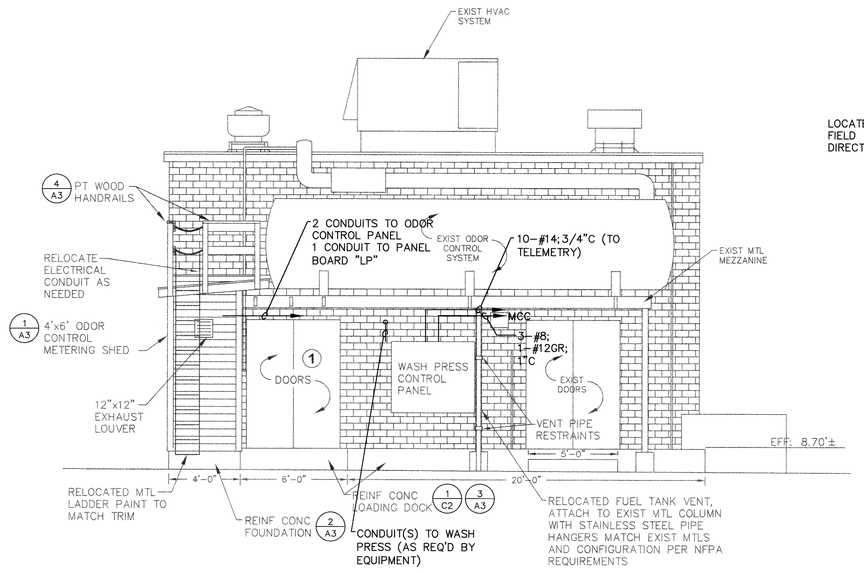
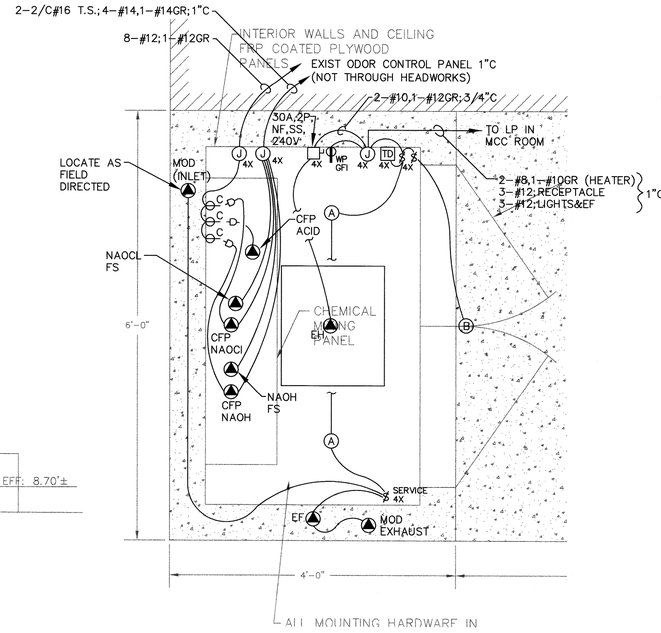


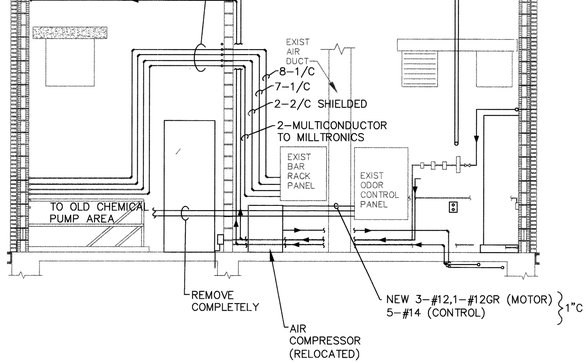
1/E1 GROUND FLOOR PLAN
SCALE: 1/4"=1'-0"



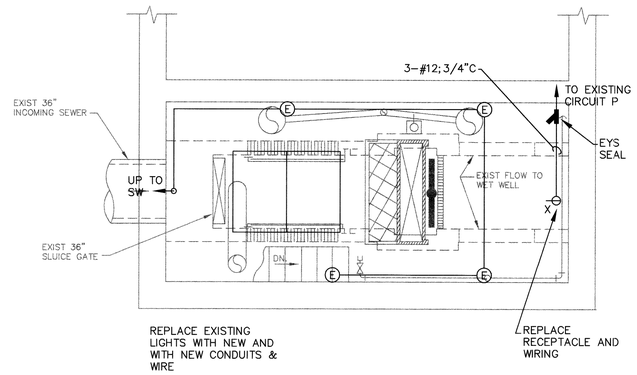
2/E1 PROPOSED EAST ELEVATION
SCALE: 1/4"=1'-0"



3/E1 FLOOR PLAN - CHEMICAL ROOM ADDITION
SCALE: 1"=1'-0"



4/E1 PARTIAL SECTION
SCALE: 1/4"=1'-0"



5/E1 LOWER LEVEL SCREEN ROOM
SCALE: 1/4"=1'-0"

ELECTRICAL NOTES:

1. SEE ADDITIONAL ELECTRICAL ON SHEETS C-2 AND M-3.

2. ELECTRICAL EQUIPMENT PROVIDED IN WETWELL SHALL BE EXPLOSION RATED.

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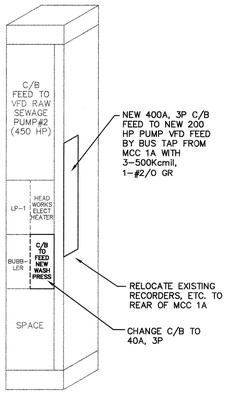
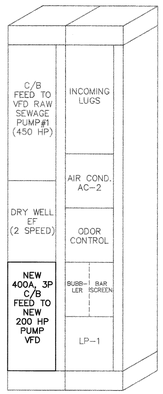


EXISTING MCC 1A AS MODIFIED

E2 NOT TO SCALE



EXISTING MCC 1 AS MODIFIED

E2 NOT TO SCALE

PANEL "LP1" (EXISTING)

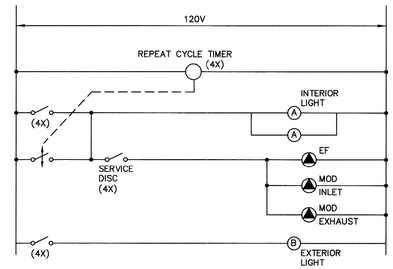
SURFACE MOUNT

CIRCUIT NO.	NO. POLES	RATING	DESCRIPTION	LOAD
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12			EXISTING CIRCUITS – REMAIN	
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24	1	20*	LIGHTS – CHEMICAL BLD & VALVE PIT	0.5
25	1	20	RECEPTACLES – VALVE PIT & CHEMICAL BLDG	0.4
26				
27				
28			EXISTING SPACE – REMAIN	
29				
30				
31/33	2	30	ELECTRIC HEATER CHEMICAL BLDG	4.8
32/34	2	20	SPARE	

* PROVIDE HANDLE LOCK

LIGHT FIXTURE SCHEDULE

TYPE	MAKE/MODEL	LAMPING	MOUNTING
A	CROUSE HINDS VXHF 25 GP	1–75A	CEILING SURFACE
B	RUUD E 4505–1–P–H–V WITH ESB–7	1–50W HPS	WALL, ABOVE DOOR HEIGHT AS FIELD DIRECTED
C	CROUSE HINDS VXH BF 25 GP	1–100A	WALL SURFACE, HEIGHT AS FIELD DIRECTED
D	RUUD E 3501–1–P–H–V WITH ESB–7	1–50W HPS	WALL, ABOVE DOOR HEIGHT AS FIELD DIRECTED
E	CROUSE HINDS EVJ 201 (CLASS 1, DIV.1, GROUP C&D RATED)	1–150A	WALL, HEIGHTS AS FIELD DIRECTED. ADJUST POSITIONS TO CLEAR PIPING & EQUIPMENT



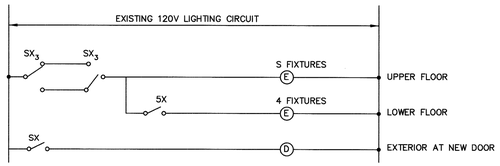
REPEAT CYCLE TIMER, NEMA 4X ENCLOSED.

TIME RANGE FIELD ADJUSTABLE FOR "ON"–"OFF"

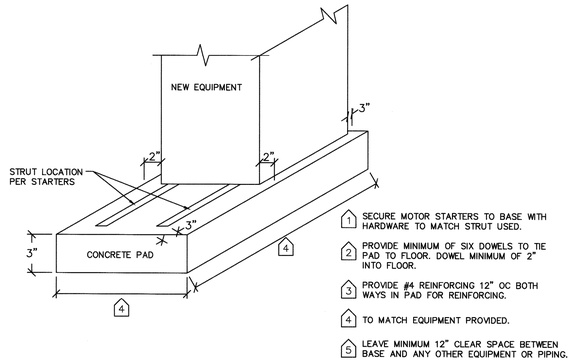
MAX "ON" TIME ____
MIN "ON" TIME ____
MAX "OFF" TIME ____
MIN "OFF" TIME ____

CONTROL WIRING DIAGRAM - NEW CHEMICAL FEED ROOM LIGHTS AND EXHAUST FAN

NOT TO SCALE



HEADWORKS ROOM RELIGHTING CONTROLS W/D



1. SECURE MOTOR STARTERS TO BASE WITH HARDWARE TO MATCH STRUT USED.
2. PROVIDE MINIMUM OF SIX DOWELS TO TIE PAD TO FLOOR. DOWEL MINIMUM OF 2" INTO FLOOR.
3. PROVIDE #4 REINFORCING 12" OC BOTH WAYS IN PAD FOR REINFORCING.
4. TO MATCH EQUIPMENT PROVIDED.
5. LEAVE MINIMUM 12" CLEAR SPACE BETWEEN BASE AND ANY OTHER EQUIPMENT OR PIPING.

FLOOR MOUNTED ELECTRICAL PAD DETAIL

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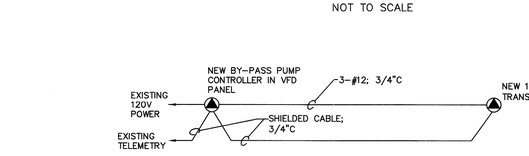
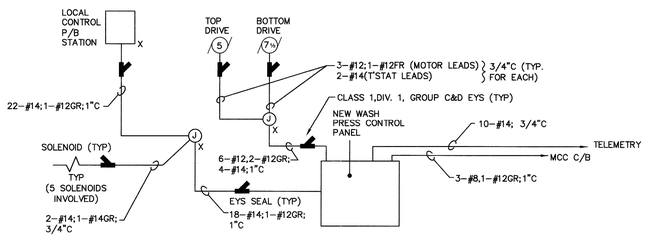
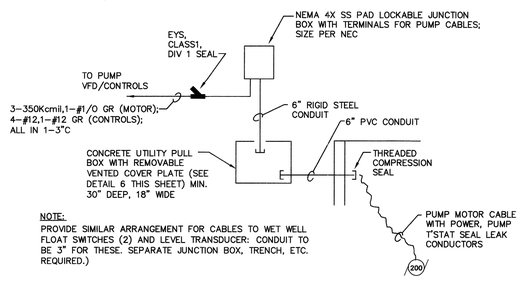


NEW FLOW RECORDER INTERCONNECTIONS

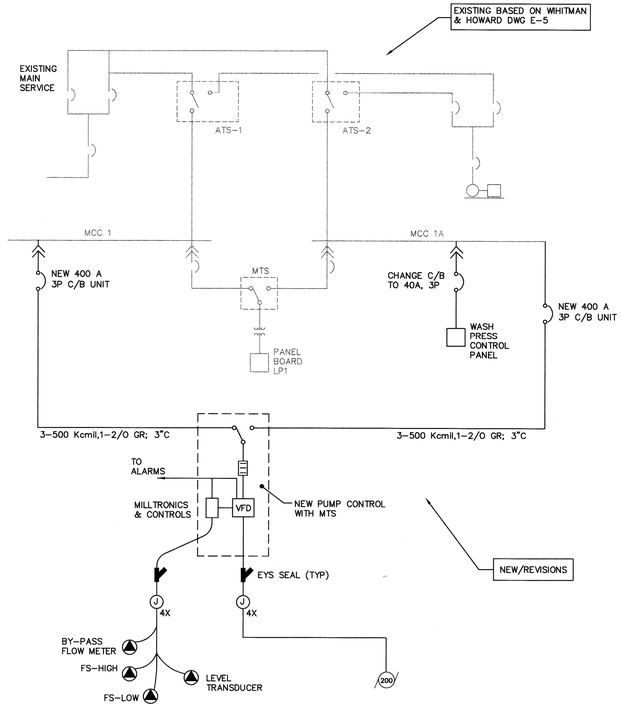


WASH PRESS UNIT INTERCONNECTIONS

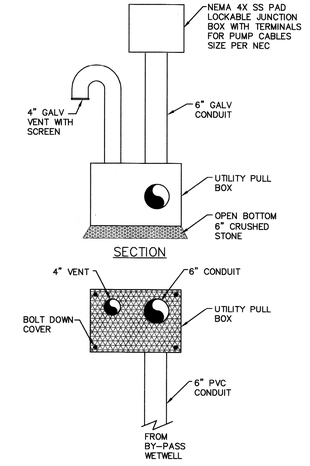


NOTE:
PROVIDE SIMILAR ARRANGEMENT FOR CABLES TO WET WELL FLOAT SWITCHES (2) AND LEVEL TRANSDUCER: CONDUIT TO BE 3" FOR THESE. SEPARATE JUNCTION BOX, TRENCH, ETC. REQUIRED.)

TYPICAL DETAIL; BY-PASS PUMP POWER WIRING TO VFD



POWER ONE-LINE DIAGRAM



6 E2 **BY-PASS PUMP JUNCTION BOX DETAIL**

NOT TO SCALE

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THE STATE OF NEW HAMPSHIRE LEE F. CARROLL NO. 7886 REGISTERED PROFESSIONAL ENGINEER

THE STATE OF NEW HAMPSHIRE DRAKE M. WOODWARD NO. 14188 REGISTERED PROFESSIONAL ENGINEER

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ELECTRICAL DETAILS

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SHEET 15 OF 15

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APPENDIX B
DEER STREET PUMP STATION
HYDRAULICS EVALUATION

Underwood Engineers

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Portsmouth, NH 03801
Tel: 603.436.6192

Technical Memorandum - DRAFT

To: Erich Fiedler, P.E., Tyler Reese, City of Portsmouth, NH

From: Terry Desmarais, P.E., Meghan Abbey, E.I.T., Underwood Engineers, Inc.

Date: August 4, 2025

Subject: Deer Street Pump Station Hydraulics Evaluation

The memorandum was prepared by Underwood Engineers (UE) in accordance with the engineering services contract executed July 29, 2024, to advance the feasibility study of replacing the Mechanic Street Pump Station.

1. Introduction

1.1. Background

The Mechanic Street Pump Station, owned and operated by the City of Portsmouth, NH, serves a combined collection system with 19 other pump stations upstream. The pump station was originally constructed in the 1970's and has since undergone several upgrades. In 2019, a Pump Station Master Plan Report determined that the existing equipment is approaching or has reached its anticipated useful lifespan. The City has decided to move forward with a replacement pump station facility to ensure reliable wastewater conveyance and treatment options. The Deer Street Pump Station is the second largest pump station in the City's collection system and discharges to a gravity main that flows to the Mechanic St. Pump Station. The Deer Street Pump Station wastewater flows account for approximately up to half of Mechanic St. Pump Station wastewater flows.

The goal of this task was to evaluate removing the Deer Street Pump Station from the Mechanic Street Pump Station service area. This would reduce the capacity needs at the Mechanic Street Pump Station by approximately half, and also eliminate double pumping.

2. Existing Conditions

The Deer Street Pump Station was originally constructed in the 1970s and has the City's largest sewer shed, approximately 200,000 linear feet of pipe. The pump station has undergone two major upgrades, the latest being the comprehensive pump station upgrade in 2007, which defines its current operational configuration. The pump station upgrade in 2007 was designed to operate as a triplex station with two duty pumps to meet the peak flow of 12.76 MGD (~8,800 gpm). The third pump is standby, and the standby and duty pumps are alternated between pump starts.

The station is equipped with centrifugal pumps manufactured by Morris (Yoemans Chicago), each having a design point of 4,300 gpm each at 116 ft of head. The pumps have 23 inch diameter impellers, operate at a maximum speed of 890 RPM, and can pass solids up to 4.25 inches. The existing motors are rated at 200 Hp.

See Figure 1 (Attachment A) for the existing Deer St. Pump Station force main configuration. Flow is discharged by the pumps into two force mains just outside of the station that run in parallel along Ceres Street and Market Street. The Ceres Street force main leg continues to Bow Street across Daniel Street and State Street to its point of re-connection with the Market Street leg at the Daniel Street and Bow Street intersections. The Market Street leg of the force main routes along Bow Street to Penhallow Street to Daniel Street back to its reconnection with the Ceres Street force main leg at the Daniel Street and Bow Street intersections. The Market Street leg of the force main has air release valves structures on the main near the intersection of Market Street and Hanover Street and the intersection with Penhallow Street and Commercial Alley.

3. Hydraulic Evaluation

The hydraulic evaluation focused retrofitting the existing Deer St. Pump Station force main to the Peirce Island WWTF. A conceptual workplan for this proposed extension is provided in Figure 2 (Attachment B). The analysis utilized the existing Deer Street Pump Station system curve and incorporated results from pump tests conducted during the station's startup in May 2007 to support the hydraulic calculations.

The evaluation assumed a new 24 inch HDPE force main from the connection to the existing Deer St. force main discharge on Marcy St. to the existing 24-inch sliplined force main at the Peirce Island Bridge. The new force main was measured to be approx. 1,120 feet long. The Peirce Island Force Main and Water Main Replacement Record Drawings, dated October 27, 2022 by AECOM, were used as reference for pipe diameter, length and fittings to calculate head loss through the existing force main system to the Peirce Island WWTF.

Table 1 below includes a summary of existing and proposed calculated total dynamic head conditions for each of the flow rates listed.. Attachment C contains the existing system curve, forcemain extension system curve, the existing two pumps in parallel performance curve, and the pumps in parallel test curves from the 2007 start up.

DRAFT

Table 1 – Deer St. Existing and Proposed TDH

Q(GPM)	Existing Discharge Head (ft)	Modified Discharge Head (ft)
8900	140.15	220.2
8500	129.48	205.0
8000	117.24	187.4
6700	90.62	148.3
5500	71.81	119.6
4000	54.44	94.9
2000	38.64	68.8
0	26.84	53.1

The proposed head increases by approximately 80 ft TDH at the peak design capacity of 12.76 MGD (~8,900 gpm).

4. Pump Retrofit Alternative Evaluation

The feasibility of retrofitting the existing Deer St. pumps to handle the added headloss from the force main extension was evaluated. The existing pumps, installed during the 2007 upgrade, were manufactured by Morris Pumps which is now owned by Grundfos. The design parameters for the forcemain extension used were the peak flow condition of 8,900 gpm at 220 ft of head and the average flow condition of 2,000 gpm at 68.8 ft of head. In order to meet the peak flow condition, the pumps could be retrofitted for two pumps to meet the peak flow in parallel. This would involve replacing each pump with a new complete pullout assembly, meaning a new bearing frame, impeller, coupling, and motor. The new motor would have to be 400 Hp at 1,150 RPM, which is double the Hp of the existing motors on each pump. See Attachment C for the proposed retrofit pump curve in parallel operation.

Due to the impeller size required to achieve the peak flow head condition, the retrofitted pumps would not be capable of operating efficiently at the average flow rate. As a result, a separate jockey pump would be needed to handle the station's average flow conditions.

Under this approach, two pumps would be retrofitted to operate in parallel to handle peak flows, while two new jockey pumps would be installed to accommodate average station flows. This arrangement would only provide redundancy for average flow conditions. Installing four pumps (two jockey and two retrofit) presents a significant challenge due to the station's compact footprint.

According to the Grundfos aftermarket team, the estimated cost to retrofit each of the existing pumps and replace each motor is $350,000. This estimate does not include additional costs for power modifications, engineering, design, or construction.

DRAFT

5. Conclusions and Recommendations

5.1. Extension of Force Main to Peirce Island WWTF

Retrofitting each pump to accommodate the proposed head conditions is not a cost effective solution. The pump room cannot easily accommodate a four pump installation.

Additionally, this alternative would also result in a lack of redundancy for the peak flow conditions. For these reasons, this option was not considered further.

Attachments

Attachment A- Figure 1 Deer St. Pump Station Existing Force Main System Conceptual Schematic (1 Page)
Attachment B- Figure 2 Deer St. Pump Station Force Main System Retrofit Conceptual Schematic (1 Page)
Attachment C- Deer St. Pump Station Proposed System and Pump Curves (1 page)
Attachment D- Deer St. Pump Station Existing Pump Curves (3 pages)

References

1. Record Drawings
    (i) Peirce Island Force Main and Water Main Replacement by AECOM, August 2021
    (ii) Renovations to Deer Street and Mechanic Street Pumping Stations by Whitman & Howard, July 1990
    (iii) Peirce Island Wastewater Treatment Facility Upgrade by AECOM, February 2016

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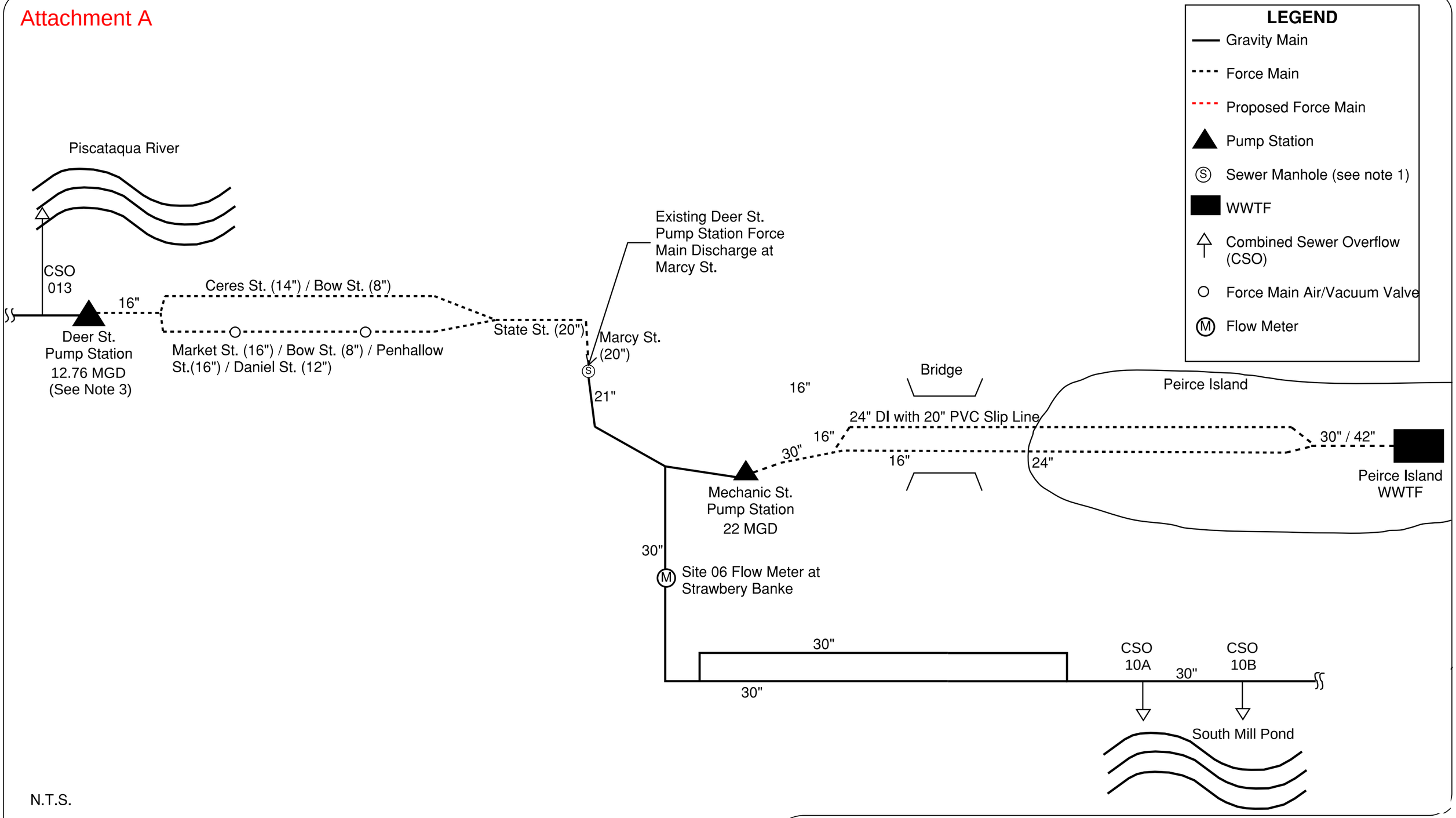
Attachment A



N.T.S.

Notes:
1. Sewer manholes only shown for transition from force main to gravity main.
2. Not all gravity collector pipe connections shown.
3. Pump station peak design flow restricted to reduce discharges at Marcy Street

DATE		FIG.
9/24	Deer St. Existing Force Main Conceptual Schematic	1
PROJECT 3082		

Underwood Engineers
25 Vaughan Mall, Portsmouth, NH 03801
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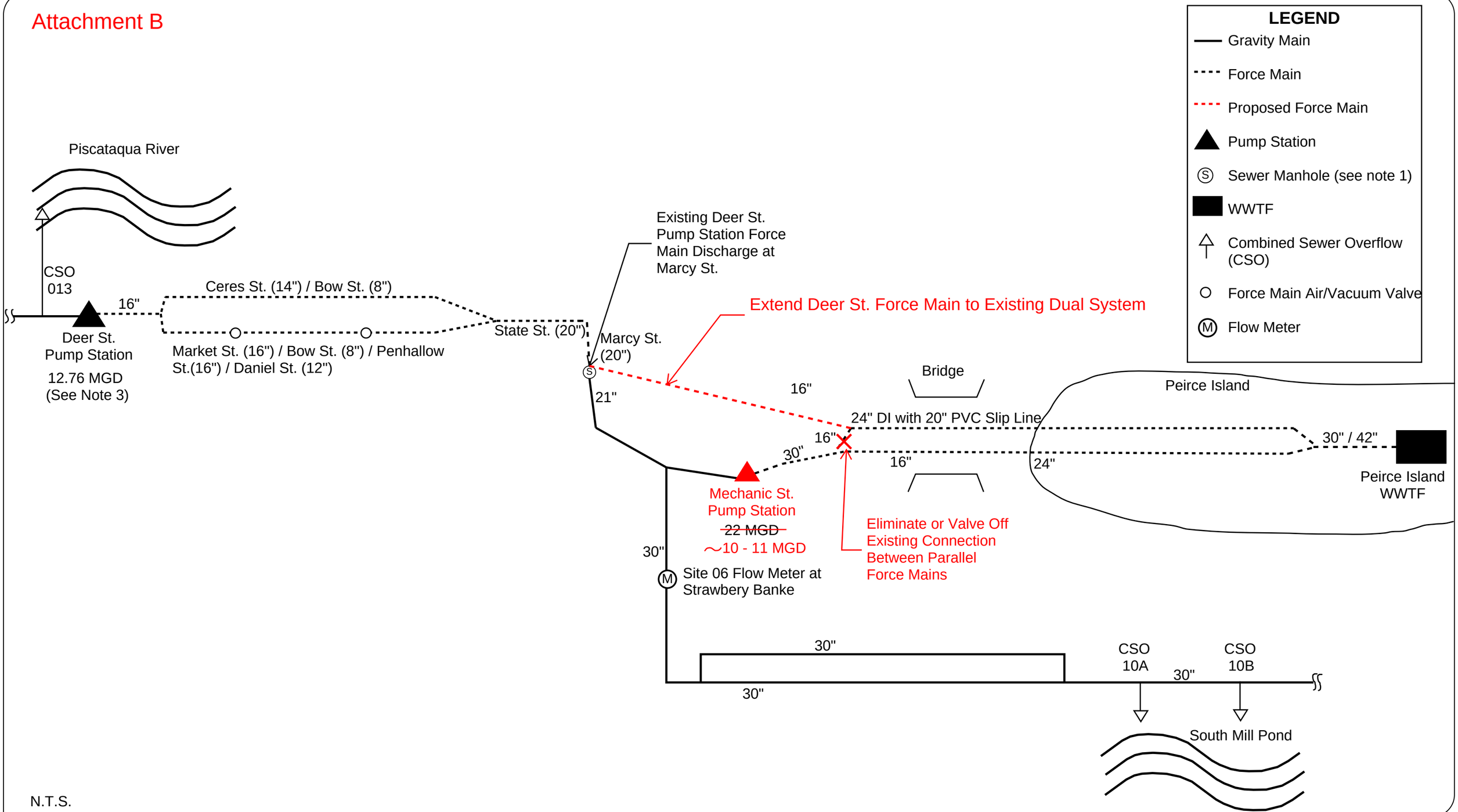
Attachment B

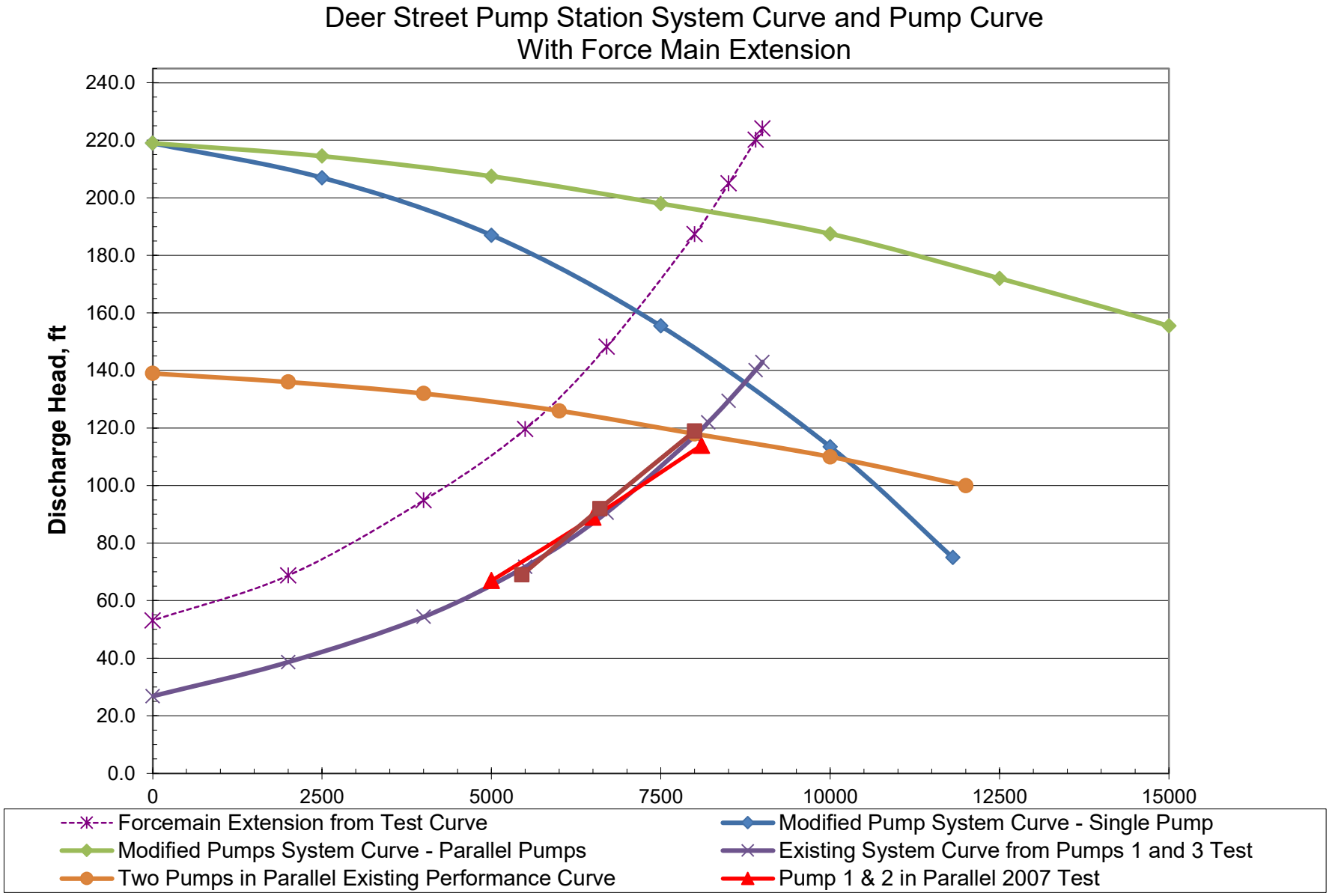


N.T.S.

Notes:
1. Sewer manholes only shown for transition from force main to gravity main.
2. Not all gravity collector pipe connections shown.
3. Pump station peak design flow restricted to reduce discharges at Marcy Street

DATE		FIG.
9/24	Underwood Engineers 25 Vaughan Mall, Portsmouth, NH 03801 Tel. 603.436.6192	2
PROJECT 3082	Deer St. Express Force Main Conceptual Schematic	

Attachment C



Attachment D

S.O. # 9810688
PORTSMOUTH, NH
UNIT A 1 OF 3
IMP DIAMETER = 23.00"
CERTIFIED PERFORMANCE

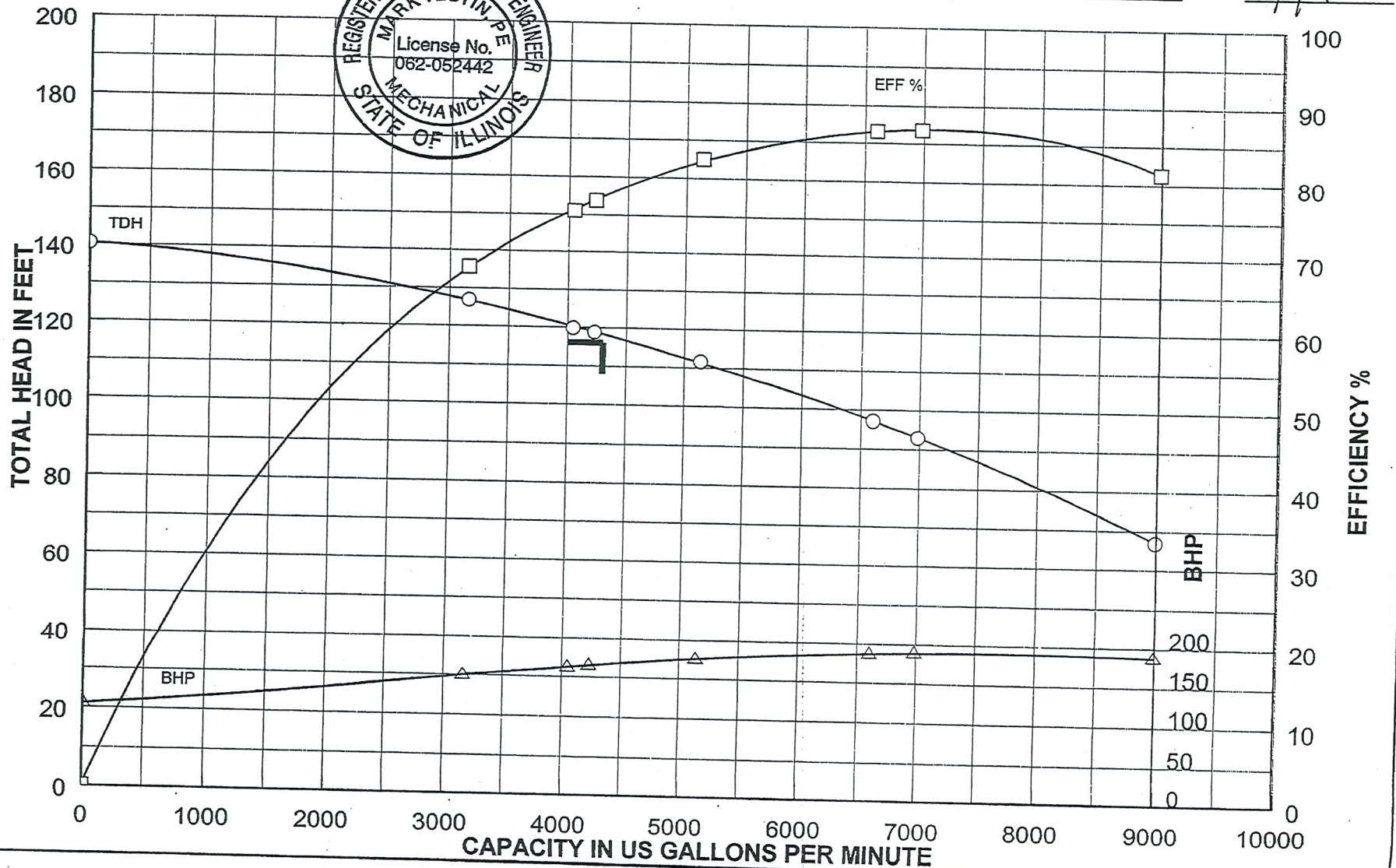
MORRIS

Morris Pumps
YEOMANS CHICAGO CORPORATION AURORA, ILLINOIS

CURVE NO. 38891 **TEST NO.** NC14A10 TD
PUMP NC 12X14-25 3V **SOLIDS** 4.25" **IMPELLER** C6438900AA
RATING 4300 **U.S.G.P.M. at** 116 **FT. T.D.H.**
SPEED 890 **RPM** **DATE** 9 APR 07 **AE:**
Guarantee covers Specified Rating as recommended by the Hydraulic Institute Standard when handling clear, cold fresh water at a temperature of not over 85° F and not over 15 ft Suction lift.

REGISTERED PROFESSIONAL ENGINEER
MARK TESTIN, PE
License No.
062-052442
MECHANICAL
STATE OF ILLINOIS

CERTIFIED TEST BY : Mark Testin PE **DATE:** 4/9/07



S.O. # 9810688
PORTSMOUTH, NH
UNIT B 2 OF 3
IMP DIAMETER = 23.00"
CERTIFIED PERFORMANCE

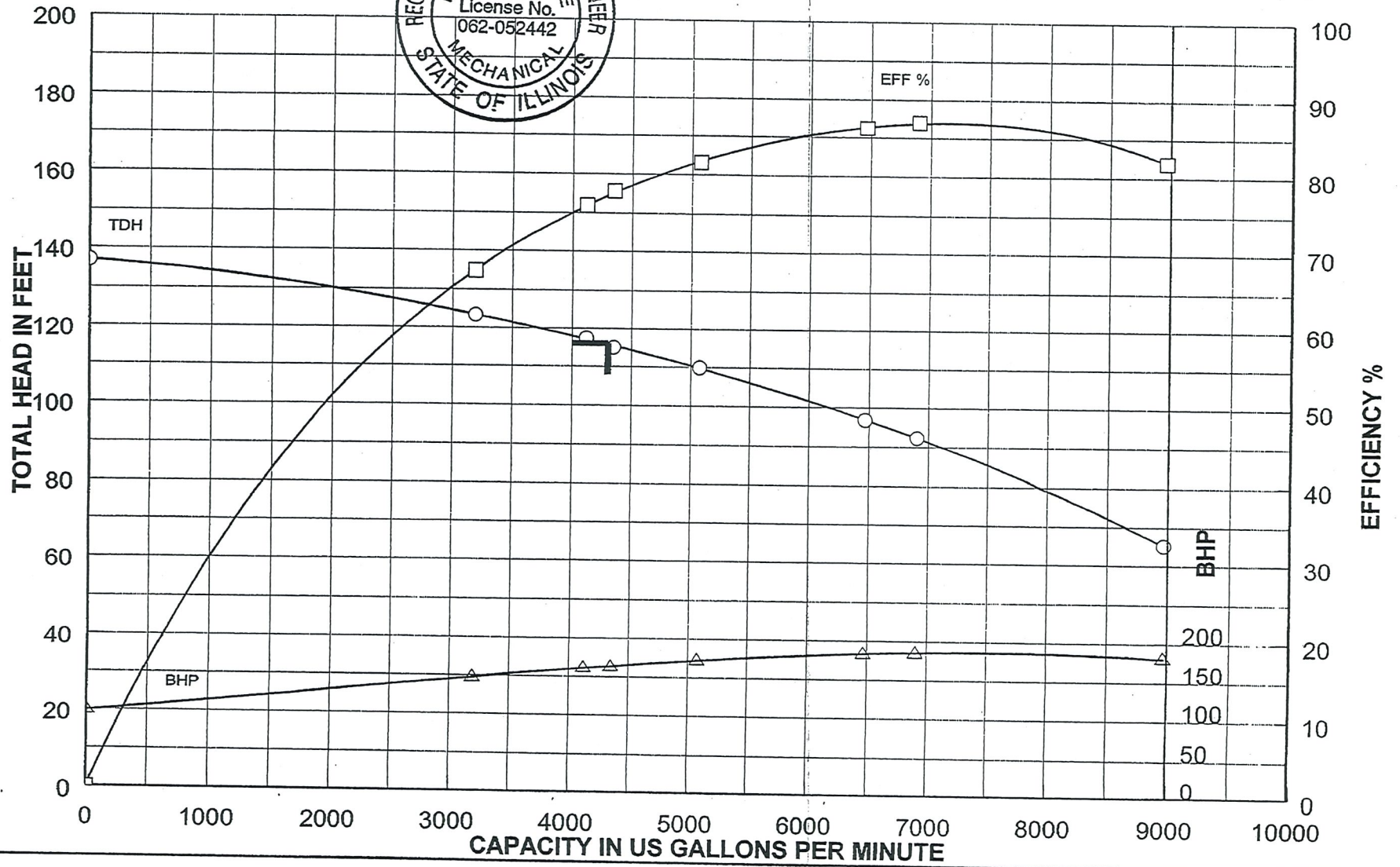
MORRIS

Morris Pumps
YEOMANS CHICAGO CORPORATION AURORA, ILLINOIS

CURVE NO. 38892 **TEST NO.** NC14A11 TD
PUMP NC 12X14-25 3V **SOLIDS** 4.25" **IMPELLER** C6438900AA
RATING 4300 **U.S.G.P.M. at** 116 **FT. T.D.H.**
SPEED 890 **RPM** **DATE** 9 APR 07 **AE:**
Guarantee covers Specified Rating as recommended by the Hydraulic Institute Standard when handling clear, cold fresh water at a temperature of not over 85° F and not over 15 ft Suction lift.

REGISTERED PROFESSIONAL ENGINEER
MARK TESTIN, PE
License No.
062-052442
MECHANICAL
STATE OF ILLINOIS

CERTIFIED TEST BY : Mark Testin, PE **DATE:** 4/9/07



S.O. # 9810688
PORTSMOUTH, NH
UNIT C 3 OF 3
IMP DIAMETER = 23.00"
CERTIFIED PERFORMANCE

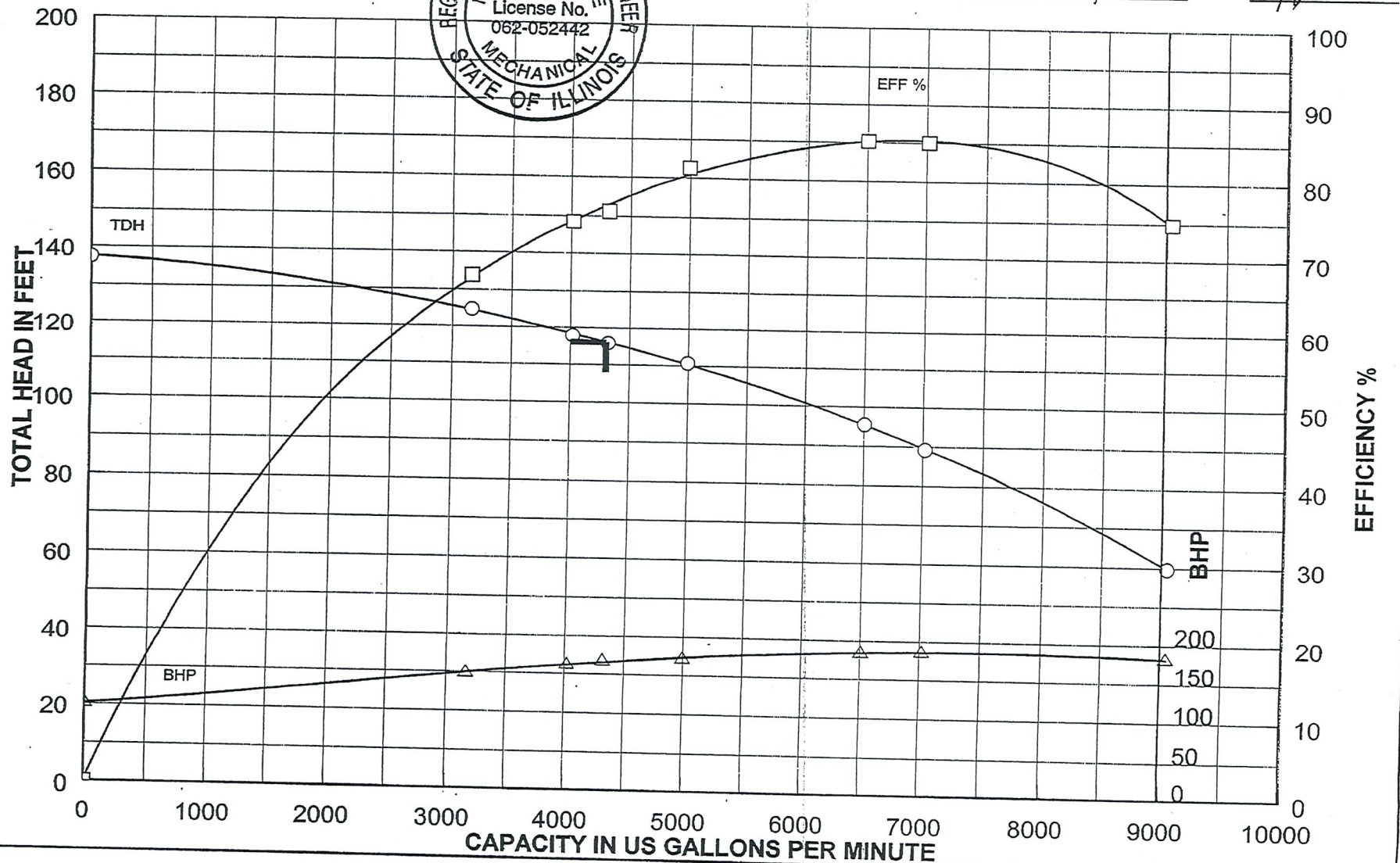
MORRIS

Morris Pumps
YEOMANS CHICAGO CORPORATION AURORA, ILLINOIS

CURVE NO. 38893 **TEST NO.** NC14A12 TD
PUMP NC 12X14-25 3V **SOLIDS** 4.25" **IMPELLER** C6438900AA
RATING 4300 **U.S.G.P.M. at** 116 **FT. T.D.H.**
SPEED 890 **RPM** **DATE** 9 APR 07 **AE:**
Guarantee covers Specified Rating as recommended by the Hydraulic Institute Standard when handling clear, cold fresh water at a temperature of not over 85° F and not over 15 ft Suction lift.

REGISTERED PROFESSIONAL ENGINEER
MARK TESTIN, PE
License No.
062-052442
MECHANICAL
STATE OF ILLINOIS

CERTIFIED TEST BY : Mark Testin PE DATE: 4/9/07

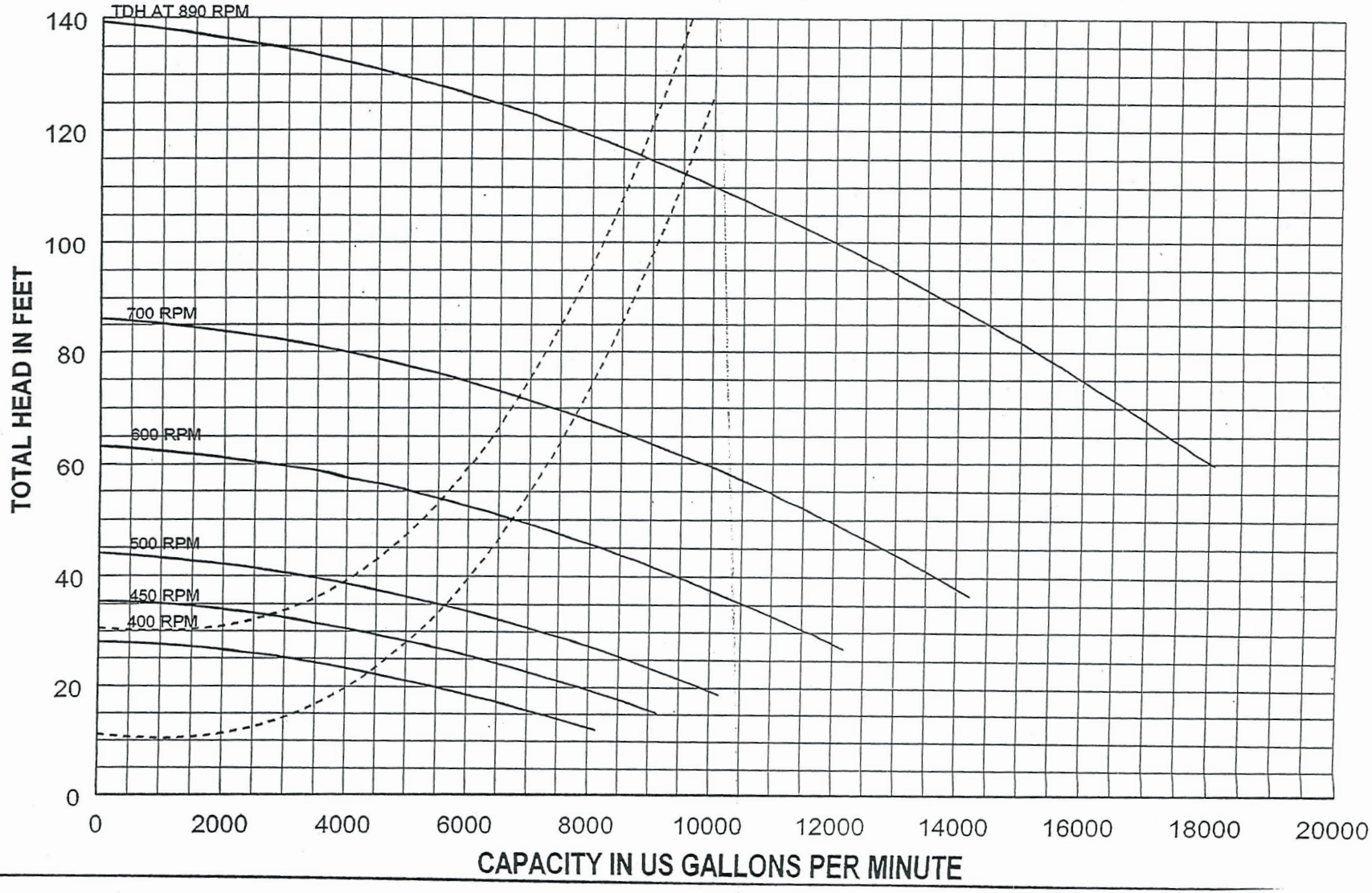


S.O. # 9810688
PORTSMOUTH, NH
IMP DIAMETER = 23.38"
TYPICAL PERFORMANCE - (2) PUMPS IN PARALLEL

MORRIS

Morris Pumps
YEOMANS CHICAGO CORPORATION AURORA, ILLINOIS

CURVE NO. 38432-2 **TEST NO.** NC14A01X
PUMP NC 12X14-25 3V **SOLIDS** 4.25" **IMPELLER** C6438900A
RATING 4300 **U.S.G.P.M. at** 116 **FT. T.D.H.**
SPEED MULTIPLE **RPM** **DATE** 24 OCT 06 **AE:**
Guarantee covers Specified Rating as recommended by the Hydraulic Institute Standard when handling clear, cold fresh water at a temperature of not over 85° F and not over 15 ft Suction lift



APPENDIX C
MECHANICS STREET PUMP STATION
FLOOD RISK ASSESSMENT

Underwood Engineers

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Technical Memorandum

To: Erich Fiedler, P.E., Tyler Reese, City of Portsmouth, NH

From: Terry Desmarais, P.E., Meghan Abbey, E.I.T., Underwood Engineers, Inc.

Date: May 13, 2025

Subject: Mechanic St. Pump Station Flood Risk Assessment

The memorandum was prepared by Underwood Engineers (UE) in accordance with the engineering services contract executed July 29, 2024, to advance the feasibility study of replacing the Mechanic Street Pump Station.

1. Introduction

1.1. Background

The Mechanic Street Pump Station is owned and operated by the City of Portsmouth. The existing station has exceeded its lifespan and has suffered critical failures in the recent years. The City is evaluating the feasibility of alternatives to replace the existing pump station. Some of these alternatives are located at or adjacent to the existing pump station. The project alternatives under consideration are located adjacent to the waterfront on a back channel of the tidal Piscataqua River. This memorandum reviews guidance related to flooding, anticipated sea level rise, and potential storm surge in order to determine to what minimum flood elevation the new infrastructure must be protected.

The project is being funded by an ARPA grant awarded to the City for improvements to the Mechanic Street Pump Station (ARPA grant CW-3314106-03). The design flood elevations for the project must be evaluated against the City of Portsmouth Zoning Ordinance and the NHDES Design Guidelines (Env-Wq 700). Figure A demonstrates the comparison of the elevations from the City of Portsmouth Zoning Ordinance and NHDES Design Requirements.

2. City of Portsmouth Zoning Ordinance

Both the existing pump station and 95 Mechanic St. are located in a FEMA Zone AE Elevation 8 ft (NAVD 88). For reference, the existing grade adjacent to the pumping station is elevation 7.24 ft. According to Section 10.628.40 of the City of Portsmouth's Zoning Ordinance, any new construction of a nonresidential structure in Special Flood Hazard Areas shall have the lowest floor, including basement, elevated to at least 2 feet above the base flood elevation if in Zone AE. Else, the structure should be floodproofed so that below two feet above the base flood elevation (10.0 ft.) in Zone AE the structure is watertight with walls impermeable to water and have the structural components capable of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy, as certified by a registered professional engineer or architect.

3. NHDES Design Requirements

The proposed project must comply with Env-Wq 700 Standards of design and construction for sewerage and wastewater treatment facilities. NHDES published a draft rule revision to Env-Wq 706.03 dated September 27, 2024 that requires further considerations for flooding requirements. Env-Wq 706.03(b) states that new and modified critical components of pump stations shall be designed to provide for uninterrupted operation of all process units during a 100-year flood. Additionally, it requires new or critical components to be placed above or otherwise protected against damage from 3 feet above the 100-year flood (same as TR-16 Guides for Design of Wastewater Treatment Works, 2016), a 500-year flood elevation, or an elevation determined from best available scientific approach. The scientific approach is defined as using readily available, actionable hydrologic and hydraulic data, and methods that integrate current and future changes in flooding based on latest climactic predictions.

Draft Env-Wq 706.03(f) requires further evaluation of flood hazard elevation for projects located within coastal zone municipalities. Determination of the flood hazard elevation specified in (b) shall address projected storm surge, sea level rise, and precipitation events identified in the “New Hampshire Coastal Flood Risk Summary – Part I: Science and Part II: Guidance for Using Scientific Projections" prepared for the New Hampshire Coastal Flood Risk Science and Technical Advisory Panel 2019. A representative concentration pathway (RCP) of RCP 4.5 or higher and a “low” or “very low” tolerance for flood risk shall be applied. This requirement results in the analysis being consistent with the FFRMS analysis as summarized in the next sections.

3.1. Freeboard Approach

The Freeboard Approach is generally used and accepted by the New Hampshire Department of Environmental Services (NHDES). The Freeboard Approach adds three feet to the 100-year floodplain base flood elevation. Both the existing pump station and 95 Mechanic St. are located in a FEMA Zone AE-EL 8 ft (See FEMA FIRM #33015C0259F, revised January 29, 2021, in Attachment A). This specifies that the project is located within a Special Flood Hazard Area with a 1% annual chance of flooding, also known as the 100-year flood event, and have a base flood elevation (BFE) of 8 feet (NAVD88). Using the freeboard approach, the freeboard flood hazard area (FHA) would be 11 feet.

3.2. Climate Informed Science Approach

As stated above, NHDES requirements entail review of the climate informed science approach to establishing flood elevations. The University of New Hampshire (UNH) published the *New Hampshire Coastal Flood Risk Summary* in 2019/2020, a two-part report that has been adopted by the State of New Hampshire and is the recommended policy in regulatory permitting by NHDES. The purpose of *New Hampshire Coastal Flood Risk Summary - Part I: Science* was to establish updated projections of sea-level rise, coastal storms, groundwater rise, precipitation, and freshwater flooding for coastal New Hampshire. *New Hampshire Coastal Flood Risk Summary - Part II: Guidance for Using Scientific Projections* is intended to inform coastal land use planning and decision making.

3.3. Evaluation using New Hampshire Coastal Flood Risk Summary Guidance

The guidance provides a seven-step approach for selecting and incorporating updated coastal flood risk projections into projects. Relative Sea Level Rise (RSLR) projections for coastal New Hampshire presented in *Part 1* were developed based on four global greenhouse gas concentration scenarios referred to as Representative Concentration Pathways (RCPs). The RCPs represent different climate outcomes, including an ambitious mitigation scenario (RCP 2.6), two intermediate stabilization scenarios (RCP 4.5 and RCP 6.0), and a growing greenhouse gas concentration scenario (RCP 8.5). Env-Wq 706.03 requires use of RCP 4.5 or higher for flood risk assessment. The guidance recommends using RCP 4.5 RSLR estimates for the following reasons:

- “RCP 4.5 is an intermediate stabilization pathway and represents a somewhat optimistic perspective whereby global greenhouse gas emissions peak at 2040 and decline to 2080 before stabilizing throughout the remainder of the century”.
- “RSLR estimates for RCP 6.0 are only provided to 2100 as only a few of the global climate model runs using RCP 6.0 extend beyond 2100. Given the limited projections available for RCP 6.0, it is not a preferred scenario at this time”.
- “RCP 2.6 represents a very optimistic scenario that requires immediate reduction in global greenhouse gas emissions. RCP 8.5 represents a high emissions scenario and there is ongoing scientific debate about whether it is a possible future given some assumptions regarding reservoirs of accessible fossil fuels (see Section 4.5 in Part I: Science17)”.

The guidance provides recommended decadal RSLR estimates in feet above 2000 levels based on RCP 4.5, project timeframe, and tolerance for flood risk. Env-Wq 706.03 requires new and modified critical components of pump stations to use a “low” or “very low” tolerance for flood risk in the evaluation. Based on the classifications provided, it was determined that the project alternative would classify as having a low tolerance for flood risk. Projects with low tolerance for flood risk include those that have high value or

replacement costs; lack of capacity to adapt or be adapted, are critical to public function or safety, and/or are highly sensitive to inundation.

The project timeframe of 2080 was used, assuming the project is completed by 2030 and is designed for a 50-year life. Based on a low tolerance for flood risk and the 2080 timeframe, the guidance recommends planning for a 3.9 ft RSLR estimate compared to sea level in the year 2000.

To calculate the RSLR adjusted design flood elevation (DFE), the guidance states to add the RSLR estimate to current flood protection standards established in the New Hampshire State Building code and in local floodplain zoning regulations in order to account for larger future floods caused by storms occurring on top of higher sea levels. The current Base Flood Elevation (BFE) for the project area, equal to the 1% annual chance flood, is Zone AE Elevation 8 ft NAVD88. The guidance also recommends adding at least 1 ft of freeboard to projects with low tolerance for flood risk. Using Table 1 below from Step 4 of the guidance report, the RSLR-adjusted DFE with the minimum recommended freeboard is elevation 12.9 ft NAVD88.

Table 1: RSLR – Adjusted Design Flood Elevations (DFE) ***from New Hampshire Coastal Flood Risk Summary - Part II: Guidance for Using Scientific Projections***

<table>
<tr><th></th><th>HIGH
TOLERANCE FOR FLOOD RISK</th><th>MEDIUM
TOLERANCE FOR FLOOD RISK</th><th>LOW
TOLERANCE FOR FLOOD RISK</th><th>VERY LOW
TOLERANCE FOR FLOOD RISK</th></tr>
<tr><td>IF PROJECT AREA IS LOCATED IN:</td><td colspan="4">RSLR-ADJUSTED DESIGN FLOOD ELEVATION (DFE) =</td></tr>
<tr><td>A, AO, OR AE ZONE* NOT IDENTIFIED AS COASTAL A ZONE**</td><td rowspan="2">[BFE] + RSLR</td><td rowspan="2">[BFE + (required freeboard ≥ 1 ft)] + RSLR</td><td>[BFE + (required freeboard ≥ 1 ft)] + RSLR</td><td rowspan="2">Whichever is greater:
[BFE + (required freeboard ≥ 2ft)] + RSLR
OR
0.2% annual chance flood elevation + RSLR</td></tr>
<tr><td>VE ZONE*** AND COASTAL A ZONE</td><td>[BFE + (required freeboard ≥ 2 ft)] + RSLR</td></tr>
</table>

3.3.1. Assessing Cumulative Coastal Flood Risk

The New Hampshire Sea-level Rise, Storm Surge, and Groundwater Rise Mapper was used to visualize RSLR adjusted water levels. The data incorporated in the mapper was created by NH Granit and the Earth Systems Research Center at the University of New Hampshire and published in April 2023. According to NHDES, the mapper is currently undergoing revision to include a more dynamic modeling approach and will be published at a later date.

The current version of the Sea Level Rise Mapper uses a bathtub model approach, where the sea level rise scenario magnitude is added directly to existing tide elevations. The mean higher-high water (MHHW) elevation for the Seavey Island Station, ME (8419870), located close to the project site, is elevation 4.2 ft (NAVD88). Figure 1 below shows the MHHW baseline for the project area.



Figure 1 - MHHW Baseline

The project area has experienced extreme storms and flooding in recent years. A severe flooding event occurred on December 23, 2022, when a winter storm combined with high tide. Flooding at the project site reached nearly 1 ft in depth, up to approximately elevation 9 ft (NAVD 88). On another storm event that occurred January 13, 2024, Portsmouth experienced high tide and storm surge causing flooding 1.5 ft in depth at the site, up to elevation 9.5 ft.

The New Hampshire Sea-level Rise, Storm Surge, and Groundwater Rise Mapper also includes flooding scenarios under 1 ft, 2 ft, 4ft, 6 ft, and 8 ft sea level rise projections. Using the closest to the 3.9 ft sea level rise as determined in Section 3.1, the MHHW plus 4 ft of sea level rise is illustrated in Figure 3 below for the project area. This shows an inundation of between 2 to 4 ft for the project area. When combined with a 1% storm surge, this would increase the inundation for the majority project area to between 8 to 10 ft (Figure 4), meaning flooding up to elevation 18 ft (NAVD 88).



Figure 3 – MHHW + 4 ft SLR

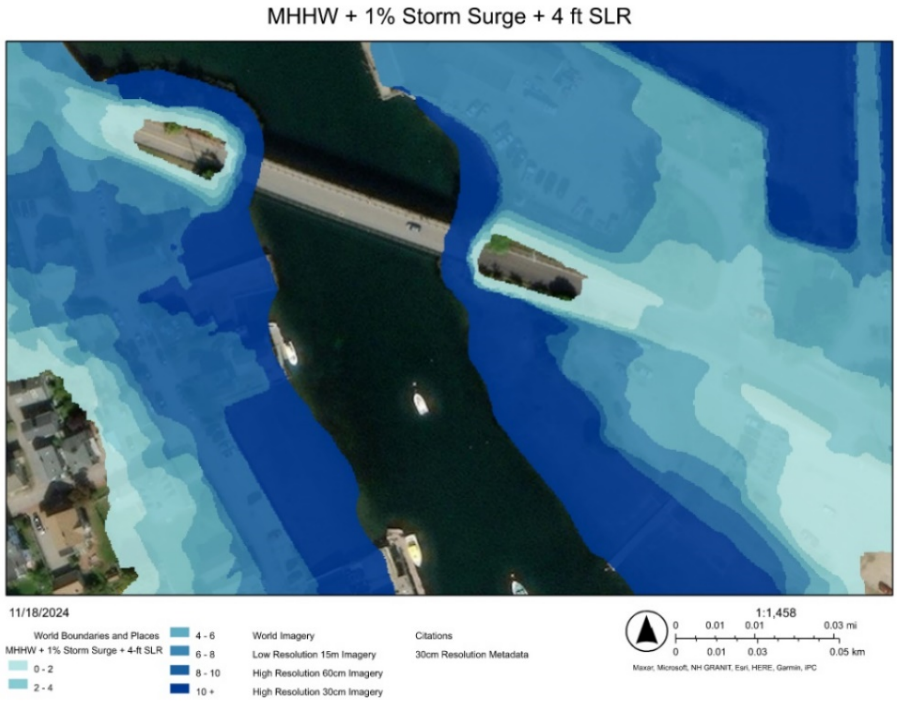

Figure 4 – MHHW + 1% Storm Surge + 4 ft SLR

4. Comparison to Peirce Island WWTF Design Elevations

The Mechanic Street Pump Station conveys all effluent to the Peirce Island Wastewater Treatment Facility (WWTF). The WWTF's design flood elevations for new structures account for 1.7 feet of sea level rise above the current Mean Higher High Water (MHHW) 100-year storm surge elevation. Refer to Figure 5 below for the facility's hydraulic profile, as documented in the Peirce Island WWTF Upgrade Record Drawings by AECOM (2022).

All considered design elevations for Mechanic St. Pump Station are are lower than the critical invert elevations at the WWTF, ensuring the facility remains hydraulically higher and capable of receiving incoming flows.

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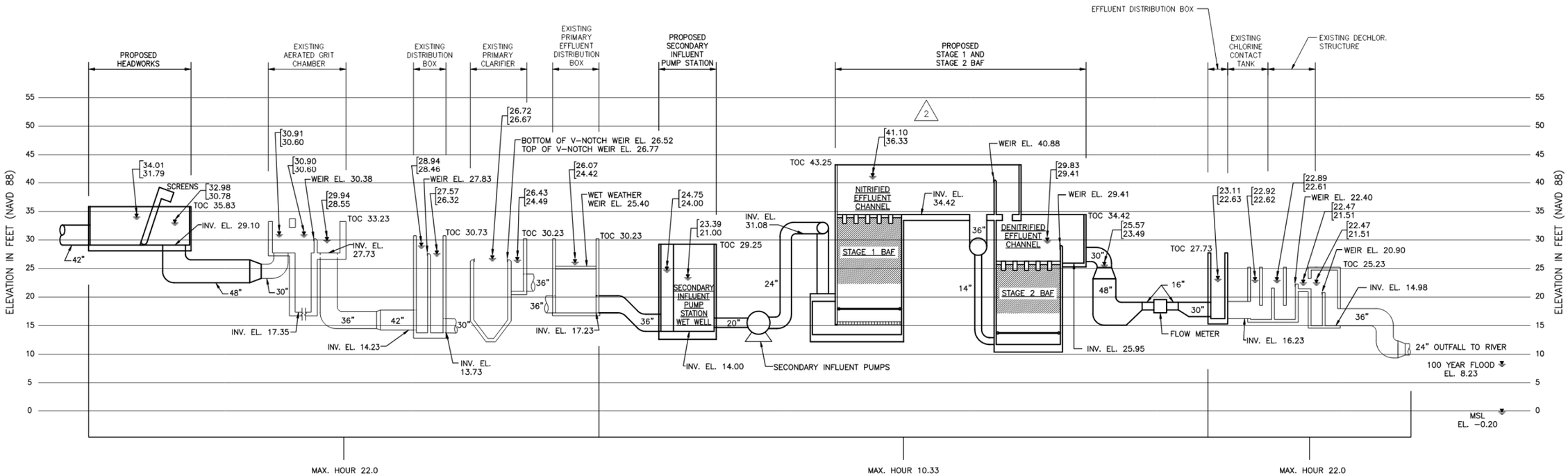
Figure 5 – Peirce Island WWTF Upgrade Hydraulic Profile



ABBREVIATIONS

ANN	ANNUAL
AVG	AVERAGE
BAF	BIOLOGICALLY ACTIVE FILTER
HGL	HYDRAULIC GRADE LINE
MAX	MAXIMUM
MHHW	MEAN HIGH HIGH WATER
MSL	MEAN SEA LEVEL
TOC	TOP OF CONCRETE

FLOW CONDITIONS

MAX HOUR	=	22.0 MGD (PRIMARY AND DISINFECTION)
MAX HOUR	=	10.33 MGD (SECONDARY)
AVERAGE ANNUAL	=	6.13 MGD

LEGEND

HGL AT MAX HOUR FLOW – ALL UNITS ONLINE
HGL AT AVG ANN FLOW – ALL UNITS ONLINE

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Portsmouth, NH 03801
Tel: 603.436.6192

5. Conclusions and Recommendations

See Attachment B for a comparison figure of flood hazard elevations. Based on the climate informed science approach and past history of flooding in the project area, the following is concluded.

- Freeboard Approach and TR-16 at 11.0 ft:
  - The freeboard approach's determined flood hazard elevation of 11 ft is not conservative enough to meet the design life of the project.
  - It also does not address the proposed NHDES requirements for RSLR.
- RSLR adjusted design flood elevation as determined in Section 3.1 of 12.9 ft:
  - RSLR adjusted design flood elevation is more conservative but does not consider storm surge.
- New Hampshire Sea-level Rise, Storm Surge, and Groundwater Rise Mapper at 18.0 ft:
  - This evaluation provided an elevation of 18.0 ft including storm surge and sea level rise.
  - Recommending this elevation would be the most conservative approach but would have a dramatic and significant effect on the design and is beyond the 50-year design life of the proposed pump station. Flooding under this scenario would impact a much broader area of the City and the seacoast overall. It is anticipated this level of impact due to flooding would be addressed as part of a larger flood resiliency plan to protect the City.

Based on following the proposed NHDES requirements for this project, UE recommends the following design flood elevations:

1. For new or retrofitted structures located within the footprint of the existing Mechanic St. Pump Station and 95 Mechanic St., a design flood elevation of 12.9 ft should be used.
2. For new structures located adjacent to the bridge abutment, a design flood elevation of 12.9 ft should be used or higher as needed to suit existing site elevations.
3. For other features on the site that are designed for a shorter design life (<50 years), such as a fully enclosed standalone generator, a lower elevation than 12.9 ft may be considered and evaluated during future design.

Attachments

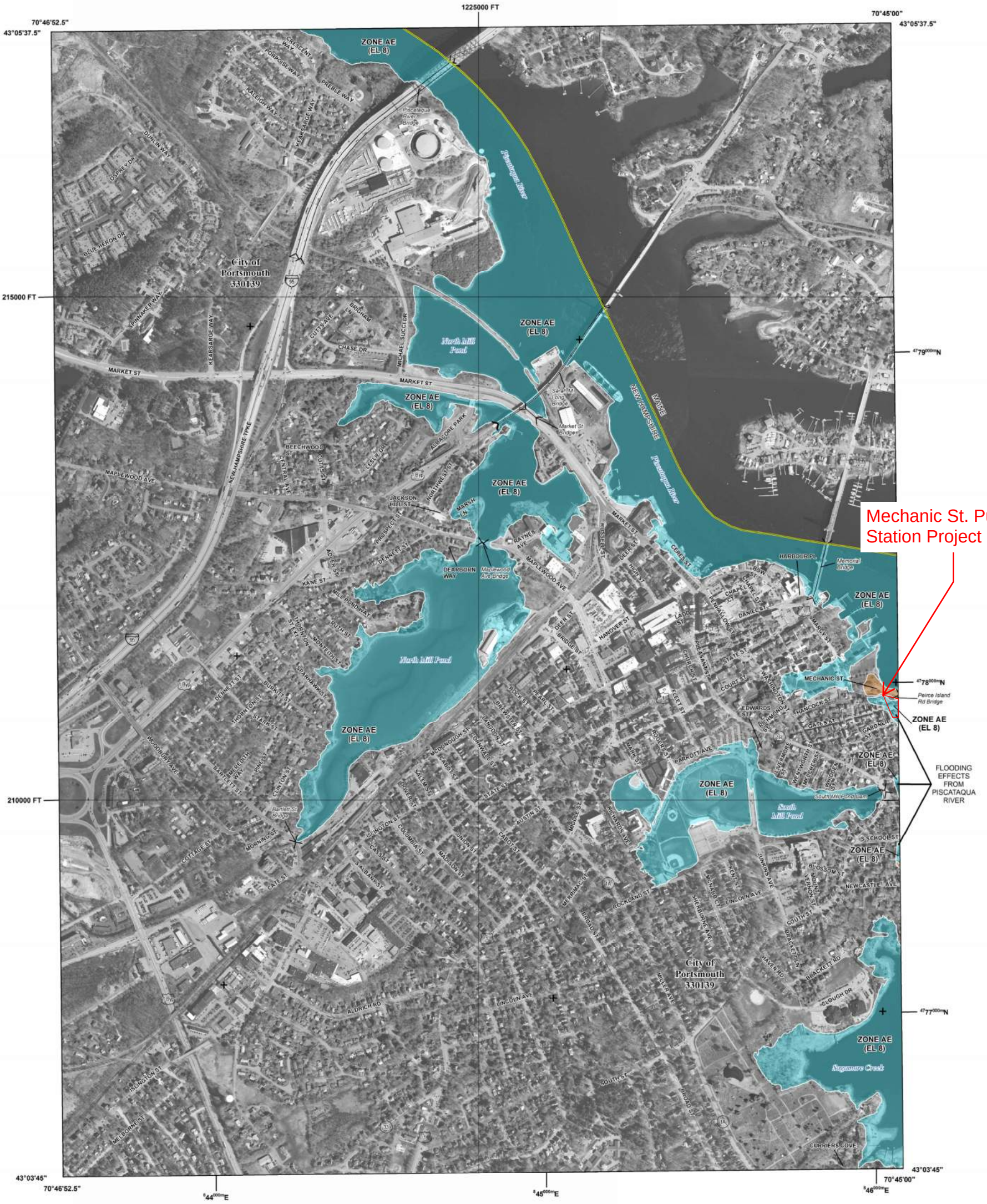
Attachment A- FEMA FIRM
Attachment B- Comparison Figure of Flooding Elevations

References

New Hampshire Coastal Flood Risk Summary – Part I: Science Wake, C., Knott, J., Lippmann, T., Stampone, M., Ballestero, T., Bjerklie, D., Burakowski, E., Glidden, S., Hosseini-Shakib, I., Jacobs, J., NH Coastal Flood Risk Science and Technical Advisory Panel (2019), University of New Hampshire, 2019.

New Hampshire Coastal Flood Risk Summary – Part II: Guidance for Using Scientific Projections, NH Coastal Flood Risk Science and Technical Advisory Panel (2020), University of New Hampshire, 2020.

TR-16 Guides For The Design of Wastewater Treatment Works, NEIWPCC, 2011 Ed., rev 2016



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	E 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
	8 Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Mapping and Insurance eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Mapping and Insurance eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). This information was derived from digital orthophotography at a 1-foot resolution from photography dated 2010.

SCALE

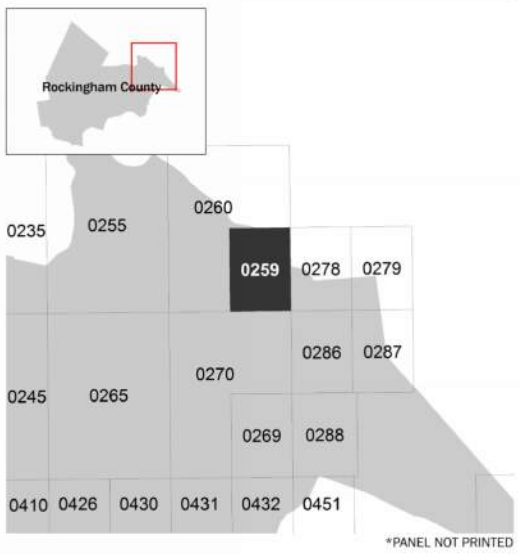
Map Projection:
NAD 1983 StatePlane New Hampshire FIPS 2800 Feet;
Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 Feet

0 130 260 520 Meters

PANEL LOCATOR



*PANEL NOT PRINTED

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

ROCKINGHAM COUNTY, NEW HAMPSHIRE
(All Jurisdictions)

PANEL 259 OF 681

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
PORTSMOUTH, CITY OF	330139	0259	F

VERSION NUMBER
2.3.2.1

MAP NUMBER
33015C0259F

MAP REVISED
January 29, 2021



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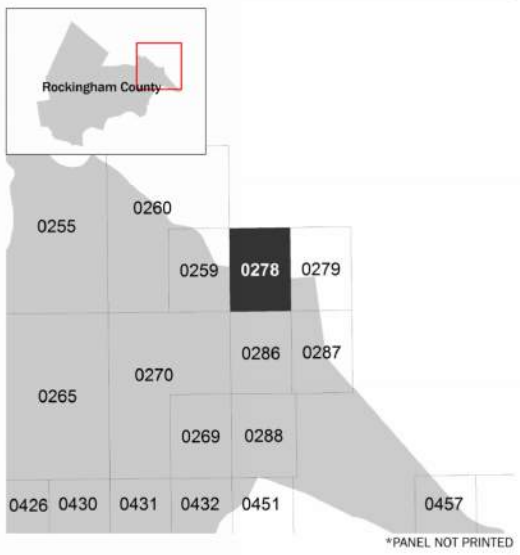

*PANEL NOT PRINTED

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

ROCKINGHAM COUNTY, NEW HAMPSHIRE
(All Jurisdictions)

PANEL 278 OF 681

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
NEW CASTLE, TOWN OF	330135	0278	F
PORTSMOUTH, CITY OF	330139	0278	F

VERSION NUMBER
2.3.2.1

MAP NUMBER
33015C0278F

MAP REVISED
January 29, 2021

Existing

Potential Proposed

Elev. 18.0 ft — MHHW + 4 ft SLR + 1% Storm Surge[3]

Elev. 12.9 ft — RSLR Adjusted Design Flood Elevation (8 ft BFE + 3.9 ft SLR + 1 ft Freeboard)[2]
NHDES Design Proposed Revised Guidelines (Env-Wq 700)

Elev. 11.0 ft — Freeboard Approach (8 ft BFE + 3 ft Freeboard)[1]
TR-16 Design Guidelines

Elev. 10.0 ft — City of Portsmouth Zoning Ordinance

MHHW + 4 ft SLR[3] — Elev. 9.0 ft

Mechanic St. Pump Station FFE — Elev. 8.5 ft

BFE (FEMA Flood Zone AE)[4] — Elev. 8.0 ft

Project Grade — Elev. 7.24 ft

MHHW — Elev. 4.2 ft

Note: All elevations are based on datum NAVD 88.

References

1. Freeboard approach determined based on Federal Flood Risk Management Standard (FFRMS).
2. Relative Sea Level Rise (RSLR) Adjusted Design Flood Elevation determined using *New Hampshire Coastal Flood Risk Summary - Part II: Guidance for Using Scientific Projections.*
3. Mean high-high water (MHHW) + 4 ft Sea Level Rise (SLR) + 1% Storm Surge based on visualization using the New Hampshire Sea-level Rise, Storm Surge, and Groundwater Rise Mapper.
4. Base Flood Elevation (BFE) based on FEMA FIRM #330139 Panel 0259, revised January 29, 2021.

DATE 1/25

PROJECT 3088

Underwood Engineers
25 Vaughan Mall, Portsmouth, NH 03801
Tel. 603.436.6192

Comparison of Flood Elevations
Mechanic St. PS Replacement
Feasibility Study

FIG.

APPENDIX D
MECHANICS STREET PUMP STATION
PERMITTING

Underwood Engineers

25 Vaughan Mall
Portsmouth, NH 03801
Tel: 603.436.6192

Technical Memorandum - DRAFT

To:	Erich Fiedler, P.E., City of Portsmouth, NH
From:	Terry Demarais, P.E., Steve Smith, CEng, MICE (UK), Meghan Abbey, E.I.T.
Date:	August 5, 2025
Subject:	Mechanic St. Pump Station Replacement Permitting Review

1. Introduction and Goals

The memorandum was prepared by Underwood Engineers (UE) in accordance with the engineering services contract executed July 29, 2024, to advance the feasibility study of replacing the Mechanic Street Pump Station.

The Mechanic Street Pump Station is owned and operated by the City of Portsmouth. The existing station has exceeded its lifespan and has suffered critical failures in the recent years. The City is evaluating the feasibility of alternatives to replace the existing pump station. Some of these alternatives are located at or adjacent to the existing pump station. The project is being funded by an ARPA grant awarded to the City for improvements to the Mechanic Street Pump Station (ARPA grant CW-3314106-03).

The project alternatives under consideration are located adjacent to the waterfront on a back channel of the tidal Piscataqua River. Attachment A demonstrates project alternative areas evaluated. This memorandum reviews required permitting requirements per the City of Portsmouth's Zoning Ordinance and New Hampshire Department of Environmental Services (NHDES) Regulations.

2. City of Portsmouth Historic District

The proposed work is within the City of Portsmouth's Historic District. The following summarizes the permitting requirements for demolition and new construction within the City of Portsmouth's Historic District, per Section 10.634–10.635 of the Zoning Ordinance (as amended through May 5, 2025).

A Certificate of Approval (COA) is required for any construction, demolition, repair, renovation or alteration of a building or structure within the Historic District. Applications must be submitted through the Code Official and include applicable fees and a Building/Change of Use Permit. The Commission review process involves consenting to site visits by Commissioners and Code Officials, encouraged work sessions, and a mandatory public hearing.

3. Wetlands

3.1 City of Portsmouth Zoning Ordinance

Certain tidal wetlands are identified as jurisdictional areas under the City of Portsmouth's Zoning Ordinance. Specifically, Section 10.1013 designates portions of the Piscataqua River shoreline—from the northwest side of the I-95 bridge to the waterfront parcel on Porpoise Way—as jurisdictional. Since the project area lies outside this designated jurisdiction, it is not subject to the setback requirements outlined in the ordinance.

3.2 NHDES Regulations

New Hampshire Department of Environmental Services (NHDES) requires wetlands permits to excavate, remove, fill, dredge or construct structures within certain jurisdictional areas of New Hampshire. Specific resource types in New Hampshire have buffers.

The Major Impact wetlands permit addresses impacts within the 100-foot tidal buffer zone, and the Shoreland permit addresses all impacts between the 100-foot tidal buffer zone and the 250-foot shoreland setback. The following sections delineate resource types and identify permitting needs.

3.2.1 Prime Wetlands

There are no prime wetlands within 100 feet of the project site, therefore no permitting is required under RSA 482-A-15.

3.2.2 Tidal Buffer Zone and Tidal Wetlands

NHDES defines tidal buffer zones in Env-Wt 602.52 as " the area identified in RSA 482-A:4, I as bordering on tidal waters within 100 feet of the highest observable tide line (HOTL), which can contain banks, upland areas, bogs, salt marsh, swamps, meadows, flats, or other lowlands subject to tidal action". The HOTL defines the farthest landward limit of tidal flow, not including storm events, that can be recognized by indicators such as the presence of a strand line of flotsam and debris, the landward margin of salt tolerant vegetation, or a physical barrier that blocks farther inland flow of the tide. The HOTL will need to be delineated by a wetland's scientist.

Although the HOTL has not been delineated, it is anticipated work will be within 100 feet of the tidal buffer zone. Work within the 100 feet tidal buffer zone requires application a Major Impacts permit to the Wetlands Bureau. Army Corps of Engineers approval may also be required as part of the wetlands permitting process.

Proposed Alternatives on Existing Pump Station Site and Adjacent Area
The NHDES Wetlands Mapper was used as a preliminary evaluation for wetlands within the project area. As seen in Attachment B, the project alternatives located at the existing Mechanic St. site and adjacent 95 Mechanic St. and Prescott Park Parcel are adjacent to tidal wetlands. Due to proximity to tidal wetlands, wetlands boundaries will need to be delineated by a certified wetland scientist as required by Env-Wt 406.02. Compensatory wetlands mitigation will also likely be required.

Proposed Pump Station Relocation to Peirce Island.
For the alternative involving relocation of the pump station to Peirce Island, the proposed micro tunneling across the back channel of the Piscataqua River includes construction of a 20 ft diameter inlet chamber near the existing pump station and a 20 ft outlet chamber on Peirce Island. The tunnel would house an 84-inch steel casing and be located at least 10 feet below the lowest known bedrock elevation, based on available boring data. While the tunnel itself is not expected to impact wetlands or tidal waters, temporary and permanent work associated with chamber construction may. Therefore, wetland permitting is anticipated for this alternative as well.

Temporary and permanent work in tidal wetlands and waters require wetland permitting. Additional application information is required for projects in tidal areas. A Coastal Functional Assessment (CFA) is required for minor or major standard permit applications and must be performed by a certified wetland scientist or qualified coastal professional. A vulnerability assessment is also required for work in tidal waters and wetlands. Compensatory wetlands mitigation will also likely be required.

3.2.3 Priority Resource Areas (PRAs)

In New Hampshire, Priority Resource Areas (PRAs) are areas within the jurisdiction of the Wetlands Bureau protected under state law in RSA 482-A and identified by rule in Env-Wt 103.66. As shown in Attachment A, potential work is located within Flood Plain Wetlands Adjacent to Tier 3 Streams and tidal wetlands which area considered Priority Resource Areas (PRA's). Due to proximity of PRA's, a Wetlands Standard Dredge and Fill Application will be needed for work within delineated Flood Plain Wetlands Adjacent to Tier 3 Streams and tidal wetlands.

A project that impacts a PRA and that does not qualify for a project-type exception (PTE) under Env-Wt 407.04 are classified as a major project regardless of the size of the impact. This project will not qualify for a PTE and therefore will be considered a major project.

4. Shoreland Water Quality Protection Act (SWQPA)

The Shoreland Water Quality Protection Act (SWQPA) establishes minimum standards for the subdivision, use and development of shorelands adjacent to the state's public waterbodies within 250 feet of the shoreline, referred to as the Protected Shoreland.

Protected shoreland includes all land located within 250 feet of the reference line of public waters, measured horizontally from a bird's-eye view. The Shoreland permit addresses all impacts between the 100-foot tidal buffer zone and the 250-foot shoreland setback. Within this area, vegetation removal, excavation, fill, and development are regulated. The Piscataqua River is considered a public water as it is an associated tidal river of the Great Bay Estuary. The reference line is defined by the highest observable tide line (HOTL), which is the furthest landward limit of tidal flow not including storm events. The HOTL has not been formally delineated for this project, but work is taking place within 250 feet of the observable HOTL.

All proposed project alternatives require a shoreland permit for work between the 100-foot tidal buffer zone and the 250-foot shoreland setback and can be accomplished with a shoreland permit by notification.

5. Environmental Review

The project is being funded by an ARPA grant through the Clean Water State Revolving Fund (CWSRF) and therefore an Environmental Review is required.

6. River Management

The Piscataqua River is not regulated under the State of New Hampshire Rivers Management and Protection Program, therefore no permitting requirements under this program are required.

7. General Construction

A majority of the site work is located within the 250-foot protected shoreland. Because earth-moving activities are not expected to exceed 50,000 square feet, a permit application to the NHDES Alteration of Terrain Bureau is not required.

Construction activities will involve dewatering, which may result in discharges to both surface water and groundwater. For discharges to surface water, the U.S. Environmental Protection Agency (EPA) requires coverage under the Dewatering and Remediation General Permit (DRGP), issued under the National Pollutant Discharge Elimination System (NPDES). This permit is required regardless of site size or whether the water is contaminated.

For temporary discharges to groundwater, a Temporary Discharge Permit from the New Hampshire Department of Environmental Services (NHDES) is required. This permit applies to short-term discharges (120 days or less) that are infiltrated on-site without runoff and must meet Ambient Groundwater Quality Standards.

Attachments

Attachment A – Project Alternatives Map
Attachment B – NHDES Wetlands Mapper

DRAFT