STRAIGHTWAY AND HYANNISPORT WATER TREATMENT FACILITY IMPROVEMENTS
PROPOSED ROLLOVER ENVIRONMENTAL IMPACT REPORT

SEPTEMBER 03, 2024

PROPONENT:
TOWN OF BARNSTABLE DEPARTMENT OF PUBLIC WORKS
BARNSTABLE, MA 02601

EEA FILE # TBD

SUBMITTED TO:
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

PREPARED BY:
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September 3, 2024

Secretary Rebecca Tepper
Executive Office of Energy and Environmental Affairs
Att: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02108

And
Tori Kim, Director
Massachusetts Environmental Policy Act
100 Cambridge Steet, Suite 900
Boston, MA 02108

SUBJECT: **Straightway and Hyannisport Water Treatment Facilities Improvements Project**
MEPA Expanded Environmental Notification Form and
Proposed Environmental Impact Report

Dear Secretary Tepper and Director Kim:

The Expanded Environmental Notification Form (EENF) and proposed Rollover Environmental Impact Report (EIR) are submitted for your review on behalf of the Town of Barnstable (the Town). This project will provide an important public health benefit for the community served by the Town's Hyannis Water System (HWS) by constructing improvements to the HWS's existing water infrastructure located at 228 Straightway and 132 Smith Street in Barnstable. These improvements are needed to restore supply, pumping and treatment capacity as well as to improve resiliency for meeting current and future conditions.

The project triggers the MEPA threshold 301 CMR 11.03(4)(b)5 requiring an ENF for the expansion of an existing drinking water treatment facility by the greater of 1,000,000 gallons per day or 10% of existing capacity. As the project is located within one mile of an Environmental Justice (EJ) population, the project is also required to prepare an EIR in accordance with 301 CMR 11.06(7)(b).

As allowed by 301 CMR 11.06(13), the Town submits this dual Expanded ENF and Proposed EIR requesting that the Secretary allow a Rollover EIR. If any comments during the public comment period require additional consideration, the Town requests a Single EIR in accordance with 301 CMR 11.06(8).

These documents have been prepared with the intent to present a complete and definitive description and analysis of the project and its alternatives, along with an assessment of its potential environmental and public health impacts and mitigation measures.

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The documentation indicates that the project will not materially exacerbate any existing unfair or inequitable environmental burden impacting an EJ population, and will provide a public health benefit to the EJ populations served by HWS.

With the helpful guidance of the MEPA office and EJ Coordinator, the Town has provided meaningful opportunities for public involvement by EJ populations. The Town provided advance notice screening to community-based organizations and mailed notices of a virtual public meeting to the nearly 4,000 addresses located within a one-mile radius of the project. The Town hosted the virtual meeting in early August and provided Portuguese and Spanish translators, as well as provided a website for project information.

Thank you in advance for your consideration, and please contact me with any questions or clarification needed on this submittal.

Sincerely,

KLEINFELDER



Kirsten N. Ryan
Senior Project Manager
kryan@kleinfelder.com

Cc: Full Circulation list is provided in Appendix A

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ABBREVIATIONS

AC	Asbestos Cement
ACEC	Area of Critical Environmental Concern
ACS	American Community Survey
adt	Average Daily Trips
ASHP	Air Source Heat Pump
AUL	Activity Use Limitation
bgs	Below Ground Surface
BRP	Bureau of Resource Protection
CBO	Community Based Organization
COC	Contaminants of Concern
CT	Contact Time
CZM	Office of Coastal Zone Management
DGA	Designated Geographic Area
DI	Ductile Iron
DPW	Department of Public Works
DWSRF	Drinking Water State Revolving Fund
EEA	Executive Office of Energy and Environmental Affairs
EEM	Energy Efficiency Measure
EENF	Expanded Environmental Notification Form
EIR	Environmental Impact Report
EJ	Environmental Justice
ENF	Environmental Notification Form
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FFRMS	Federal Flood Risk Management Standard
FWS	Fish And Wildlife Service
GAC	Granular Activated Carbon
GHG	Greenhouse Gas
gpd	Gallons per Day
gpm	Gallons per Minute
GS	Greensand
HWS	Hyannis Water System
IPaC	Information For Planning and Consultation
IUP	Intended Use Plan
LBW	Low Birth Weight

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LID	Low Impact Development
LPD	Light Power Density
MA DPH	Massachusetts Department of Public Health
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MassGIS	Massachusetts Bureau of Geographic Information
MBTA	Massachusetts Bay Transportation Authority
MCP	Massachusetts Contingency Plan
MDD	Maximum Daily Demand
MEPA	Massachusetts Environmental Policy Act
MGD	Million Gallons per Day
MHC	Massachusetts Historical Commission
MMCL	Massachusetts Maximum Contaminant Level
MWh/year	Megawatt Hour per Year
NEFO	New England Field Office
NEPA	National Environmental Policy Act
ng/L	Nanograms/Liter
NHESP	National Heritage Endangered Species Program
NMFS	National Marine Fisheries Service
NOI	Notice Of Intent
NPDES	National Pollutant Discharge Elimination System
NRC	Natural Resources Conservation
ORSG	Office of Research Standards Guideline
ORW	Outstanding Resource Waters
PFA	Project Financial Application
PFAS	Per- and Polyfluoroalkyl Substances
PFAS6	The Sum of the concentrations of PFOS, PFOA, PFHxS, PFNA, PFHhA, and PFDA
PNF	Project Notification Form
RB	Residence B District
RMAT	Resilient Massachusetts Action Team
RTA	Regional Transit Agency
SCADA	Supervisory Control And Data Acquisition
SERO	Southeast Regional Office
SMCL	Secondary Maximum Contaminant Level
SRF	State Revolving Fund
SWTF	Straightway Water Treatment Facility
TDM	Transportation Demand Management
TRI	Toxic Release Inventory
UIC	Underground Injection Control

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USDA	United States Department of Agriculture
USGS	United States Geological Survey
UST	Underground Storage Tank
UV-AOP	UV Advanced Oxidation Process
VFD	Variable Frequency Drive
VOC	Volatile Organic Compound
WTP	Water Treatment Plant

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1 PROJECT EXECUTIVE SUMMARY

1.1 PROJECT INFORMATION

Project Name: Straightway & Hyannisport Water Treatment Plant

EEA File Number: TBD

Project Location: 228 Straightway and 132 Smith Street, Barnstable, MA 02601

Project Proponent: Town of Barnstable Department of Public Works (DPW)

In accordance with the Massachusetts Environmental Policy Act (MEPA) regulations set forth in 301 CMR 11.00, the Town of Barnstable DPW (the "Proponent"), submits this Expanded Environmental Notification Form (EENF) and Proposed Environmental Impact Report (EIR) for the planned Straightway and Hyannisport Water Treatment Plant (WTP) project (the "Project") located at 228 Straightway and 132 Smith Street in Barnstable, Massachusetts. See Figure 1, Locus Map and Figure 2, Site Plan for the project location.

The proposed Project meets the threshold for an Environmental Notification Form (ENF) due to the proposed construction of a new drinking water treatment plant with a capacity of 1,000,000 or more gallons per day (gpd) (301 CMR 11.03(4)(b)(4)). Additionally, as the Project's limit of disturbance is located within one mile of Environmental Justice (EJ) populations, the Proponent is required to submit an EIR in accordance with 301 CMR 11.06(7)(b). As the Project is seeking approval to file a Single EIR or Rollover EIR, submittal of an EENF, which includes an expanded analysis of EJ impacts, is required (in place of an ENF).

The Proponent submits this Proposed EIR requesting the Secretary allow a Rollover EIR in accordance with 301 CMR 11.06(13), or a Single EIR in accordance with 301 CMR 11.06(8) if any comments submitted during the public comment period require additional consideration.

1.2 PROJECT NEEDS AND BENEFITS

This Project will improve the reliability, water quality, and resiliency of the Town of Barnstable's Hyannis Water System (HWS). The system is critical to the public health of a serviced population of approximately 18,000 year-round residents, which surges to about 35,000 in the summer. The HWS supply and treatment system consists of three drinking water treatment complexes with a total of 12 wells. All the HWS's wells are impacted by per- and polyfluoroalkyl substances (PFAS) contamination and are treated to remove PFAS. Beginning in 2016, when the United States Environmental Protection Agency's (EPA's) PFAS Health Advisory was lowered by 70 nanograms per liter (ng/L), the Town voluntarily implemented emergency PFAS treatment by installing unwinterized granular activated carbon (GAC) filtration units.

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Due to an increase in demand for drinking water and stricter regulations, the PFAS treatment systems initially installed by The Town now require improvements. Recent summer demand has hit record highs, and without the proposed improvements, all treatment facilities must operate continuously during the summer. System capacity remains strained in the winter since unwinterized GAC filters must be taken offline. The Town has already begun to address this issue by winterizing the PFAS treatment systems at both the Mary Dunn and Maher water treatment facilities. Concurrent with work discussed in this EIR, the Town of Barnstable will be winterizing the four existing PFAS GAC filtration units at the Project site. In addition, the Project's Straightway and Hyannisport Treatment Complexes require other improvements to maximize the existing permitted capacity, pumping, and treatment capacity to ensure quality, reliability and protect the facilities against impacts from climate change.

The existing Straightway and Hyannisport Treatment Complexes consist of four wells, five pumping and/or treatment buildings (totaling approximately 7,639 square feet), a 40,000-gallon capacity storage tank, and four unwinterized PFAS GAC filtration units. Under the HWS's Water Management Act Permit, the four existing wells have a combined permitted withdrawal limit of 4.03 million gallons per day (MGD), which represents one-third of HWS's total permitted withdrawal. However, the existing treatment facilities only have a capacity of 2.16 MGD, greatly limiting the water supply available to HWS. In addition, well supply limitations exist. The specific project components to address these needs are described below:

- Supply – Well yields for the Hyannisport and Simmons Pond Wells are significantly reduced, and the wells need replacement due to screen and aquifer plugging with iron and manganese. The Project will replace them with new, more reliable, and productive wells. The Straightway Well 2 is offline due to water quality concerns. Treatment improvements (described below) will allow the well to be reactivated, increasing available supply.
- Resiliency – The Hyannisport and Simmons Pond wells are currently within the 500-year floodplain. They will be relocated to higher elevations outside of the 500-yr floodplain. Treatment operations will be relocated and centralized at the Straightway site, providing more protection from flooding. The original buildings, comprising approximately 1,400 square feet, will be demolished to restore the floodplain.
- Treatment – Raw water needs improved treatment due to exceedances of the following contaminants of concern (COCs) at concentrations above either the EPA's Secondary Maximum Contaminant Levels (SMCLs), the Massachusetts Department of Environmental Protection (MassDEP) Massachusetts Maximum Contaminant Levels (MMCLs) or MassDEP's Office of Research Standards Guidelines (ORSG): iron (Fe), manganese (Mn), 1,4-dioxane, and/or the sum of the concentrations of six PFAS including PFOS, PFOA, PFHxS, PFNA, PFHpA, and PFDA (PFAS6). See Table 1 for Water Quality Results. This Project will winterize the existing PFAS filtration units, and construct a new 10,660 square foot water treatment facility to provide the following improvements:
    - Installation of five 12-foot diameter greensand (GS) pre-treatment filters to remove iron and manganese, which will improve the lifespan and operational efficiency of the GAC

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filtration units, reduce down-time, and increase capacity and reliability of the PFAS treatment system.

- Manganese is a naturally occurring mineral necessary for normal biological functions. However, in high doses it can cause detrimental neurological effects, which vary based on an individual's susceptibility. It is believed to have more significant effects in children and newborns. (MassDEP - Drinking Water Program).
- Iron is a naturally occurring mineral, necessary for normal biological functions. High concentrations in drinking water can lead to aesthetic effects such as rusty color, sediment, metallic taste and reddish or orange staining. (US Environmental Protection Agency)

Installation of UV advanced oxidation process (UV-AOP) treatment technology to remove 1,4-dioxane.

- 1,4-Dioxane is a chemical solvent used in a variety of products. The EPA has determined that the chemical presents a cancer risk when ingested through drinking water. It is highly soluble and dissolves into water even at high concentrations. Ingestion and inhalation are both potential exposure pathways for the chemical. (US EPA)

- Installation of eight new 10-foot diameter GAC filtration units to treat the resulting system will have sufficient treatment capacity for the full 4.03 MGD of permitted wells.
  - PFAS are widely used chemicals that have been found to have negative health effects. High exposure to PFAS is believed to cause fetal defects, as well as negatively affect the liver, kidneys, immune system, thyroid, and certain hormones. Some studies have also suggested that PFAS increases the risk of certain cancers. (MassDEP).
- Chemical treatment for pH adjustment, chlorination, and corrosion control currently occurs in both the Hyannisport Treatment Facility and the Straightway Treatment Facility, within this complex. This Project will relocate all chemical treatment into the proposed Straightway Water Treatment Facility (SWTF).

- Pumping – The existing Booster Pump Station is undersized for future needs. The pumping capacity will be approximately doubled from 1,500 gallons per minute (gpm) to 3,000 gpm to treat the proposed facility capacity. In addition, the pumps for the Hyannisport, Simmons Pond, Straightway Well 1, and Straightway Well 2 will be upgraded.
- Environmental and Environmental Justice Benefits - The Project will benefit the environment by relocating two existing wells beyond the wetland resources and floodplain to protect both the wells and the environment. The majority of HWS's service population consists of EJ populations (see Section 10). This Project provides a clear public health benefit to HWS's served EJ population.

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Table 1. Water Quality Results

Well	Fe (mg/L)	Mn (mg/L)	1,4-Dioxane (µg/L)	PFAS6 (ng/L)
Level of Concern*	0.3	0.05	0.3	20
Straightway 1	ND	0.112	ND	44
Straightway 2	0.42 – 0.46	0.765 – 0.961	0.40 – 0.66	85 – 93
Hyannisport	ND	0.126	ND	45
Simmons Pond	ND	0.129 – 0.148	0.15 – 0.40	79 – 80

Notes:
Concentrations represent the full range of values measured (Kleinfelder).
Bolded = Concentrations which exceed the SMCL
mg/L = milligrams per liter
ng/L = nanograms per liter
*Level of Concern for Mn is Massachusetts SMCL, limit for PFAS is MMCL, limit for 1,4-dioxane is guideline from ORSG

1.3 PROJECT ALTERNATIVES

The Proponent analyzed three alternatives to address the situation: a no build alternative, a two-plant alternative, and a single plant alternative. Ultimately, the single plant alternative was chosen, since it minimizes cost and environmental impact. This alternative includes the replacement of the Hyannisport and Simmons Pond wells and pump stations at 132 Smith Street, as well as replacement of the existing Straightway and Hyannisport treatment facilities with a single new proposed treatment facility at the existing Straightway Treatment Complex at 228 Straightway in Barnstable, MA. Project alternatives are described in further detail in Section 4.

1.4 PROJECT PERMITS

The Project will require permits from the United States Fish and Wildlife Service (FWS), the Office of Coastal Zone Management (CZM), the Massachusetts Historical Commission (MHC), MassDEP, Barnstable Site Plan Review, the Barnstable DPW, the Barnstable Building Division, and the Barnstable Conservation Commission. A comprehensive summary of all permitting efforts and their status is included in Section 2.4.

1.5 PROJECT FUNDING

The Project was awarded funding in the 2024 Drinking Water State Revolving Fund (DWSRF) Intended Use Plan (IUP). It has also received a $35,500,000 appropriation from the Town of Barnstable Town Council. It will not include any Land Transfers.

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1.6 PROJECT IMPACTS AND MITIGATION

The Project is expected to have positive environmental and public health impacts. Primary beneficial environmental impacts of the Project include the relocation of critical infrastructure from wetland and riverfront resources to outside of the 500-year floodplain, restoration of land within the 500-year floodplain and wetlands buffer zone, and enhanced energy efficiency in accordance with the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) 2010 Greenhouse Gas (GHG) Emissions Policy and Protocol. Primary beneficial public health impacts include the removal of PFAS and 1,4-dioxane from public drinking water supplies, both of which have been linked to negative health impacts.

To achieve the project benefits, construction activities have been designed to avoid, minimize and mitigate negative environmental impacts to the extent feasible. Unavoidable negative impacts include tree removal and construction activities within wetland buffer zones. To mitigate these impacts, the Proponent will adhere to FWS recommendations to avoid impacts to endangered species and will obtain a Wetlands Order of Conditions from the Barnstable Conservation Commission. Temporary negative public health impacts may include noise during construction related activities. To mitigate this impact, work on this Project will occur during the day, and, as applicable, in accordance with the Town of Barnstable Noise Ordinance. For a detailed discussion of the Project's impacts, see Section 6. For a detailed discussion of mitigation measures, see Section 8.

As this EIR is being submitted as a request for a Rollover EIR concurrently with the EENF, there have been no changes to the Project since any prior project filings with MEPA.

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2 PROJECT DESCRIPTION

Water, electrical, and gas utilities are buried at both the Straightway and Hyannisport Complexes. All onsite utilities service the existing water treatment infrastructure. The Straightway Treatment Complex is serviced from utility mains on Straightway. The Hyannisport Treatment Complex is serviced from utility mains on Smith Street. There is no existing sewer service at either complex. Neither location contains bathrooms nor generates sanitary waste. Process waste from analyzers at the Straightway Treatment Complex flows to an on-site drywell. See the site plans included in Appendix B, Preliminary Design Drawings for detailed information on utility locations.

2.1 OVERVIEW

The Project is located on two separate complexes, approximately 1,700 feet apart and are connected by a dirt access road, with the Straightway Complex located to the north and the Hyannisport Complex located to the south. The Straightway Complex includes Straightway Well 1 and Straightway Well 2 on the north complex. The Hyannisport Complex includes the Hyannisport and Simmons Pond wells. See Figure 2, Site Plan. The Straightway Complex is primarily developed open space and deciduous forest. Impervious surfaces within the developed open space consist of the existing buildings, water storage tank, and access roadways. The Hyannisport Complex is primarily deciduous forest with a small area of developed open space; impervious surfaces consist of the existing buildings and access roadways. Land use maps for the Project are included in Figure 3, Project Area Land Use.

The proposed design is for a new centralized SWTF, which will treat water originating from the four wells by utilizing the following technologies:

- Five 12-foot greensand filtration units for iron and manganese removal, thus eliminating the need for sequestering agents currently added at the individual wells.
- Eight 10-foot GAC filtration units for PFAS removal.
- A UV-AOP treatment system for the destruction of 1,4-dioxane.
- Chemical treatment for corrosion control, pH adjustment, and disinfection.

The proposed process flow diagram is shown in Appendix B, Preliminary Design Drawings.

Additional proposed infrastructure upgrades include:

- Upgrades to the existing booster pump station to increase capacity to 4 MGD and modifications to the disinfection contact time (CT) approach.
- Winterization of existing GAC filters.
- Upgrades to both the Straightway 1 and Straightway 2 pumps to accommodate the additional head imposed by new treatment processes (the existing Straightway Treatment Facility housing both wells will remain in place).

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- Filling in of the unlined backwash lagoon and installation of a new backwash waste holding tank below the proposed treatment facility building.
- Replacement of the Hyannisport and Simmons Ponds wells, pumps, and pump stations.

Following the construction, testing, MassDEP acceptance, and startup of the new facilities, the existing Straightway building chemical feed systems will be decommissioned, but the building will remain since it houses the Straightway 1 and Straightway 2 Wells. The existing Hyannisport Well and Simmons Pond Wells will be abandoned in accordance with MassDEP guidelines and the existing Hyannisport and Simmons Pond facilities will be demolished.

The selected site layout includes a 113-foot x 87-foot SWTF building on the south side of the Straightway Treatment Complex, directly south of the existing water storage tank. This location allows an infiltration basin for stormwater management to be installed at the north side of the Straightway Complex where sheetflow runoff is naturally directed. A looped access drive is provided for usage by equipment and chemical delivery trucks. This alternative also provides adequate available space to the north for future Straightway Well 1 and Straightway Well 2 replacement within the 250-foot maximum well replacement radii, in accordance with MassDEP's Guidelines for Public Water Systems. This location requires clearing of some existing trees and vegetation and additional paving around the building to provide access for fire trucks in cases of emergency as well as chemical and equipment deliveries. It will also provide access to the existing Hyannisport and Simmons Pond access drive. See drawings in Appendix B, Preliminary Design Drawings for the proposed site layout. The existing backwash lagoon will be backfilled with common fill or structural fill, as indicated in the construction drawings. New evergreen tree screening will be provided between the new facilities and the abutting residential properties.

Each of the improvements is described in further detail below.

2.2 STRAIGHTWAY COMPLEX PROPOSED IMPROVEMENTS

Winterization of Existing GAC Filters: In 2020, the Town installed emergency unwinterized GAC units at the Straightway Treatment Complex. The existing GAC filtration units are shown in photographs in Figure 4, Site Photographs. At that time, due to funding and time constraints, the Town was not able to add a climate-controlled shelter to the construction contract. Since PFAS levels at all four wells associated with the Project are over the 20 ng/L PFAS6 MMCL, and the GAC filtration units are not winterized, the associated wells must be taken offline every fall. As a result, HWS has no redundancy in the fall and winter should one of its winterized sources need repair. This Project will construct a climate-controlled shelter over the existing filters and will allow the Town to operate the existing wells and facilities year-round.

New SWTF: The proposed SWTF will be designed to treat the total combined existing permitted withdrawal of 2,800 gpm from all four wells with GS filtration for Iron (Fe) and Mn removal, UV-AOP for 1,4-dioxane destruction, and GAC filtration for PFAS removal. Chemical treatment at the proposed facility will include Sodium Hydroxide (NaOH) for pH adjustment, Sodium Hypochlorite (NaOCl) for pre-oxidation

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and disinfection, hydrogen peroxide (H_2O_2) for UV-AOP treatment, and C-9 (zinc orthophosphate) for corrosion control. Existing chemical treatment, which currently includes NaOH, NaOCl, C-9, and C-5 (polyphosphate) for Fe and Mn sequestration, will be removed from the existing well buildings.

The SWTF will include a subgrade backwash waste holding tank for backwash recycle and sludge removal. The SWTF will also contain a Supervisory Control and Data Acquisition (SCADA) and controls room, electrical room, bathroom, generator room, and janitorial closet. The site will also include a tight tank for storing sanitary waste.

Booster Station: The existing booster pump station will be upgraded to increase the pumping capacity to the distribution system from 1,500 gpm to 2,800 gpm. The current booster pump station includes three pumps, two in operation and one standby pump. Kleinfelder proposes the replacement of the three existing vertical turbine pumps with three new larger vertical turbine pumps, each with a design capacity of 1,500 gpm, to pump water from the water storage tank to the distribution system.

Contact Time (CT) Modifications: With the additional 1,300 gpm capacity added to the system, operational modifications to the existing water storage tank will be needed to achieve adequate CT for 4-log disinfection prior to entering the distribution system. Water level set points will be reprogrammed in SCADA to increase the minimum storage capacity within the existing 400,000-gallon contact tank from 45,000 gallons to 79,000 gallons to achieve 4-log disinfection. Following construction, startup, testing and acceptance of the new SWTF and appurtenances, the existing chlorine injection building will be decommissioned and demolished.

Straightway Wells 1 and 2: Due to the additional head imposed by the new treatment equipment, pump upgrades will be required to maintain the permitted flow from Straightway Wells 1 and 2. The wells will also be cleaned and redeveloped when the pumps are removed for replacement. In addition to the pump upgrades, the existing 8-inch diameter discharge piping will be increased to 12 inches from the discharge location at the Straightway 2 Pump to the connection point at the new SWTF to accommodate the increase in flow. These improvements will allow Straightway Well 2 to be re-activated following the construction and start-up of the new treatment plant.

2.3 HYANNISPORT COMPLEX PROPOSED IMPROVEMENTS

Improvements proposed at the Hyannisport site at 132 Smith Street consist of the replacement of both the Hyannisport and Simmons Pond wells to increase well yield and to move the pump station locations outside of the 500-year flood plain. Since the installation of the wells in 1975, clogging of the aquifer and fouling of the well screens has led to decreased well yields. As a result, the Hyannisport and Simmons Pond wells are producing approximately 80 percent and 65 percent, respectively, of their MassDEP approved withdrawals. As a secondary benefit, the required well replacements will be located at elevations outside of the 500-year floodplain. In January 2024, exploratory borings were advanced for each replacement well and pump tests were conducted to evaluate the proposed well replacement

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locations. The design approach for the proposed replacement wells is described in further detail in Appendix C, Pump Test Proposal and Approval.

Replacement well pumps will need to be upsized from the existing equipment to overcome the additional head imposed by proposed treatment processes at the new SWTF. At each replacement well location, a modular, precast concrete pump station will be installed. The new Simmons Pond pump station will house only the Simmons Pond well pump and associated electrical equipment. The new Hyannisport pump station will be larger to accommodate a bathroom connected to a new tight tank, as required by the revised state Plumbing Code, and a new generator. Site security measures will be upgraded to include fencing around the pump stations, security cameras, and lighting. Following construction of the new pump stations, the existing facilities will be decommissioned and demolished and areas within the wetlands buffer zone and floodplain will be restored.

2.4 PERMITS AND APPROVAL SUMMARY

The required permits and approvals for this Project are summarized in Table 2, Permitting Summary and discussed in detail below.

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Table 2. Permitting Summary

Agency	Permit/Approval/Standard	Status
FEDERAL		
US Fish and Wildlife Service	Endangered Species Act Consultation	Completed
US Fish and Wildlife Service	Migratory Birds Treaty Act Consultation	Completed
US Fish and Wildlife Service	Bald and Golden Eagles Consultation	Completed
Massachusetts Coastal Zone Management (CZM) Office	Federal Consistency Review	Completed
Federal Emergency Management Agency/MassDEP	Federal Flood Risk Management Standard	Completed
STATE		
Massachusetts Historical Commission (MHC)	Project Notification Form	Completed
Massachusetts Environmental Policy Act (MEPA) Office	MEPA filing	In progress
State Revolving Fund	Project Financial Application	In progress
MassDEP	Pumping Test Proposal	Approved
MassDEP	WS 06 – Registration of a Class V UIC Well	To be obtained
MassDEP	WS 20 – Approval to Construct a Source	To be obtained
MassDEP	WS 25 – Water Treatment Plant Modifications	To be obtained
MassDEP	WS 29 – Chemical Feed Modifications	To be obtained
LOCAL		
Barnstable Conservation Commission	Wetlands Order of Conditions	To be obtained
Barnstable DPW	Stormwater Management Permit	To be obtained
Barnstable Site Plan Review Committee	Site Plan Review	To be obtained
Barnstable DPW	Road Opening/Trench Permit	To be obtained
Building Division	Building Permit	To be obtained

2.4.1 Federal Permits and Approvals

Since this Project will receive federal funding through the DWSRF program, the Proponent must obtain the following approvals.

Endangered Species Act (ESA) Section 7 Consultation [COMPLETED]

A consultation with the FWS is required to determine potential impacts on endangered species and design mitigation measures to avoid negative impacts, if any. Four ESA-listed species were identified in the project area:

- Endangered Species

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  - Northern Long-eared Bat (*Myotis septentrionalis*)
  - American Chaffseed (*Schwalbea americana*)
  - Sandplain Gerardia (*Agalinis acuta*)
- Proposed Endangered Species
  - Tricolored Bat (*Perimoyotis subflavus*)

In addition, one non-jurisdictional Candidate Species (Monarch Butterfly) (*Danaus Plexippus*) was identified, which does not require consultation under the ESA.

The Proponent has consulted with the FWS, assessed potential project impacts on these species, and proposed measures that will be taken to mitigate negative impacts. Through discussions with FWS, the proponent determined that the Project would have No Effect on American Chaffseed or Sandplain Gerardia. The Proponent reached a May Affect, Not Likely to Adversely Affect determination for impacts to both the Northern Long-eared Bat and the Tricolored Bat. Potential impacts to bat species will be mitigated through a time-of-year restriction on tree clearing. Tree clearing will only occur between October 1 and March 14. This analysis was submitted to the FWS on August 13, 2024. On August 14, 2024, FWS provided a letter documenting that they concurred with the Proponent's findings. See Appendix D, Fish and Wildlife Service Consultations.

Migratory Bird Treaty Act Consultation [COMPLETED]

A consultation with the FWS is required to determine potential impacts on migratory birds in the project area. The Proponent has consulted with the FWS to determine that there are 27 migratory bird species that may live in the project area. According to the FWS, the Proponent can sufficiently mitigate impacts on listed birds by constraining tree clearing to October 1 through March 14, outside of the migratory birds nesting season. The Proponent has committed to FWS' recommended mitigation strategies. (See Appendix D, Fish and Wildlife Service Consultation.)

Bald and Golden Eagle Protection Consultation [COMPLETED]

A consultation with the FWS is required to determine potential impacts on Bald and Golden Eagles in the project area. The Proponent has consulted with the FWS and determined that no bald or golden eagles live at the project site; therefore, no mitigation measures are required. (See Appendix D, Fish and Wildlife Service Consultation.)

Coastal Zone Management Federal Consistency Review [COMPLETED]

A consultation with the CZM Office is required to determine potential impacts to the coastal zone, and a federal consistency review is required if deemed necessary by CZM. Since this Project is not along the shoreline and will not impact tidal areas or flood zones, CZM determined that it does not meet the criteria for a federal consistency review and the Project can continue without further consultation with the CZM Office. (See Appendix E, Coastal Zone Management Letter.)

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Federal Flood Risk Management Standard [STANDARD MET]

Executive Order 14030 reinstated the previously revoked Federal Flood Risk Management Standard (FFRMS) requirement for fiscal year 2022 State Revolving Fund (SRF) capitalization projects. It requires that any federally funded new construction or substantial modification of critical infrastructure must occur outside of the 500-year flood plain and three vertical feet outside of the 100-year flood plain. This Project only includes work at locations and elevations that meet these criteria. Furthermore, the demolition of existing buildings at the Hyannisport Treatment Complex restores land within the floodplain.

2.4.2 State Permits and Approvals

MHC Project Notification Form [COMPLETED]

MHC reviews proposed projects to assess their impact on historical and archaeological resources identified within the Commonwealth of Massachusetts. This Project requires MHC review since it will receive federal and state funding through a DWSRF grant. Project work at the Hyannisport Treatment Complex is located within the Hyannis Port Area (BRN.AS), an inventoried historic area in the MHC's inventory. (See Figure 5, Environmental Constraints.) Work at this site includes the demolition of the existing Hyannis Treatment Facility and the Existing Simmons Pond Pump Station. The Town constructed these buildings after 1975 and the buildings are not expected to have any historic significance. A Project Notification Form (PNF) detailing this information was sent to MHC in June 2024. MHC chose not to comment on the Project, clearing the Project to proceed. See Appendix F, Massachusetts Historical Commission Documentation.

Massachusetts Environmental Policy Act (MEPA) Approval [IN PROGRESS]

The Project meets the threshold for an ENF due to the proposed construction of a new drinking water treatment plant with a capacity of 1,000,000 or more gpd (301 CMR 11.03(4)(b)4). Additionally, as the Project's limit of disturbance is located within one mile of EJ populations, the Proponent is required to submit an EIR in accordance with 301 CMR 11.06(7)(b). However, since the EIR requirement is only triggered by the presence of an EJ population, the Proponent is submitting this EIR as a rollover EIR to expedite the approval process, in accordance with 301 CMR 11.06(8). If comments require additional attention, the Proponent will seek a single EIR, in accordance with 301 CMR 11.06(13).

Drinking Water State Revolving Fund (DWSRF) Project Financial Application (PFA) [IN PROGRESS]

Funding for this Project has been set aside in the Massachusetts DWSRF 2024 IUP. To obtain access to these funds, the Project must submit a Project Financial Application (PFA) which includes all necessary permits for construction and final bid documentation for the Project. The Proponent is working to obtain permits and finalize designs for this Project. Approval of this EIR is expected to be the last approval necessary to file the DWSRF PFA.

WS06 – Registration of a Class V Underground Injection Control (UIC) Well [IN PROGRESS]

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The SWTF will discharge analyzer waste to a drywell. This will require a Bureau of Resource Protection (BRP) Water Supply 06 – Registration of a class V UIC Well permit. The Proponent will submit this permit application upon the completion of the design work for the Project.

WS20 – Approval to Construct a Source / Well Replacement Approval [IN PROGRESS]

The relocation of the Hyannisport and Simmons Pond wells will require that a BRP Water Supply 20 - Approval to Construct a Source of 70 Gallons per Minute or Greater approval is obtained from MassDEP. On May 08, 2024, the Proponent submitted a well replacement pumping test proposal to the MassDEP Southeast Regional Office (SERO) Drinking Water Program. The plan was approved on July 16, 2024. (See Appendix C, Pumping Test Proposal and Approval.) Pumping tests will be completed during the construction of the Project. Upon completion of the pumping tests, a source final report will be submitted to the SERO. Simultaneously, HWS will submit a BRP Water Supply 20 - Approval to Construct a Source of 70 Gallons per Minute or Greater filing. Only upon final approval of all submissions will the wells be placed into use.

WS25 – Water Treatment Plan Modification [TO BE OBTAINED]

The MassDEP SERO must review and approve designs for this Project. The Project designs will be submitted under the Bureau of Resource Protection Water Supply 25 - Approval of Treatment Facility Modification Permit upon the completion of the Proposed SWTF design.

WS29 – Chemical Feed Modification [TO BE OBTAINED]

The MassDEP SERO must review and approve designs for this Project. The Project designs will be submitted under the BRP Water Supply 25 - Chemical Addition Retrofit of Water Systems Serving More than 3,300 People Permit upon the completion of the Proposed SWTF design.

2.4.3 Local Permits and Approvals

Barnstable Conservation Commission Order of Conditions [TO BE OBTAINED]

Any project with work inside of a 100-foot wetland buffer zone or within 200 feet of a Riverfront Area must submit a Notice of Intent (NOI) to the local conservation commission, in accordance with 310 CMR 10.00 and the Barnstable Town Code Chapter 237 Wetlands Protection. Project work the Straightway Treatment Complex and the Hyannisport Treatment Complex requires an NOI submission. See Section 6.1.3 for a discussion of wetlands impacts associated with the Project. To mitigate environmental effects of this work, the Proponent will adhere to all conditions provided by the Barnstable Conservation Commission in its Order of Conditions. The Proponent plans to submit an NOI to the Barnstable Conservation Commission upon the completion of the 60% Design.

Barnstable Site Plan Review [TO BE OBTAINED]

The Town of Barnstable's Site Plan Review is an administrative process established to advise the Building Commissioner. The objective of Site Plan Review is to assure development standards are met in all

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business, commercial, industrial, and multifamily projects. Site Plan Review is composed of representatives from the following Town Departments: Health, Building, Conservation, Planning and Development, and Department of Public Works - Engineering Department as well as the applicable water and fire district representatives (in this case, Hyannis Water System and Hyannis Fire Department). The Proponent will submit the Project for Site Plan Review upon the completion of 60% design.

Barnstable Storm Water Ordinance Permit [TO BE OBTAINED]

The Town of Barnstable recently adopted a new Storm Water Ordinance as Chapter 903 of the Barnstable Town Code, which requires DPW approval of stormwater management designs. Project designs will be coordinated with the Town staff, and to the maximum extent practicable, designs will align with and with comply the requirements of this ordinance.

Road Opening and Trenching Permit [TO BE OBTAINED]

Work on Straightway to replace the existing connection to the water main and work on Smith Street to remove the existing connection to the water main will require a Road Opening and Trenching Permit. The Contactor is responsible for obtaining this permit.

Building Permit [TO BE OBTAINED]

This project must be filed with the Town of Barnstable Building Division. The General Contractor is responsible for obtaining this permit prior to the start of construction.

2.5 LAND TRANSFER

This project does not require or include any land transfers.

2.6 COST AND FINANCIAL ASSISTANCE

At 30% design. the total opinion of probable capital cost for the new SWTF and ancillary facilities is $45,100,000. This includes a 20% design contingency, 15% for contractor overhead and profit, engineering services during construction and 10% construction contingency, and is escalated to the approximate midpoint of construction.

DWSRF has allocated $36,000,000 in the 2024 IUP for the construction of both the concurrent winterization project (See Section 2.3) and the Straightway and Hyannisport Water Treatment Plant Project.

The Proponent has applied for additional funding in the 2025 DWSRF IUP and will know if additional funding was granted when the Final IUP is published, likely in April 2025.

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The Town of Barnstable Town Council has already appropriated $35,500,000 in funding for the winterization and Straightway and Hyannis Water Treatment Projects.

2.7 TIMETABLE AND METHODS OF CONSTRUCTION OF THE PROJECT

The Project is currently progressing from 30% towards 60% design phase. The Proponent plans to complete the project design and permitting during Fall/Winter 2024 and bid the Project in March 2025. The start of construction is planned for July 2025 and is anticipated to take approximately 24 months. Construction progress is highly dependent on availability of equipment and materials that comply with federal procurement regulations. To maintain use of the existing facilities during construction of the new SWTF, specific sequencing of construction tasks will need to be followed. However, regardless of the sequencing used, the existing facilities will need to be taken offline for some activities to allow for connections to be made between existing facilities and the new work. Work that requires the existing facilities to be taken offline will be scheduled outside periods of high demand. A preliminary construction schedule is included in Figure 6, Construction Schedule.

2.7.1 Straightway Complex Construction Sequencing

The construction sequence will consist of the following major steps:

1. Install valving and piping to facilitate integration of existing filters to the new SWTF and allow for easy switching between the existing operation and full operation of the new SWTF.
2. Construct winterization of the existing GAC filters.
3. Install Straightway 1 and Straightway 2 new pumps and booster pump replacements during the winter period of low demand, as this will require the temporary shutdown of these facilities. Make pipe modifications in the existing Straightway Treatment Facility and Booster Pump Station during this shutdown period.
4. Abandon in place existing asbestos cement (AC) piping at the Booster Station discharge, in accordance with 310 CMR 7.15. Replace with 16” ductile iron (DI) pipe.
5. Make necessary electrical upgrades to allow for operation of the new pumps. Construct the new SWTF and complete all utility connections.
6. Complete commissioning and startup testing of new SWTF and submit request for approval to MassDEP. During this time, switch operation back to the existing GAC filters.
7. Upon receipt of MassDEP approval to operate the facility, commence operation.
8. Demolish existing chlorination building.
9. Complete remaining site work such as paving, fencing, stormwater management, and restoration.
10. Remove and properly dispose of all existing chemical treatment equipment in the existing Straightway Treatment Facility.

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2.7.2 Hyannisport and Simmons Pond Complex Construction Sequencing

The construction sequence will consist of the following major steps:

1. Schedule replacement well drilling and pump testing for off peak season (beginning in October). Install new replacement wells and conduct 48-hour pump tests using temporary pumping equipment. Discharge location will be downgradient of the wellhead, use sediment control and velocity dissipation measures, in accordance with the Barnstable Conservation Commission's Order of Conditions.
2. Submit replacement well water quality testing results to MassDEP for review and approval.
3. Make replacement well discharge piping connections to existing raw water transmission main. Existing wells may need to be taken offline for a short period to make the necessary connections. Cap replacement well casing pipes for future connection to vertical turbine pump discharges.
4. Install prefabricated pump stations over new replacement wells. Install new pumps. Make all electrical and raw water supply connections to new facilities. Install emergency back-up generator.
5. Continue to operate existing well pumps and chemical treatment at existing Simmons Pond Pump Station and existing Hyannisport Treatment Facility until new wells are approved and authorized to begin operation.
6. Once new SWTF receives MassDEP approval, activate new wells and operate at full approved capacity.
7. Remove and properly dispose of all existing chemical treatment equipment from the existing Hyannisport Treatment Facility and Simmons Pond Pump Station.
8. Abandon existing Hyannisport and Simmons Pond wells in accordance with MassDEP requirements.
9. Demolish existing Simmons Pond Pump Station and existing Hyannisport Treatment Facility.
10. Abandon existing AC raw water main in place in accordance with MassDEP Asbestos Cement Guidance Document, 2019.
11. Perform Site restoration including re-paving of existing access road, construction of new security fence, and stormwater management upgrades.

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3 CONSISTENCY WITH PLANNING

3.1 STATE PLANNING AND COORDINATION

The Commonwealth of Massachusetts has been a leader in adopting policies to address PFAS contamination of drinking water. In October 2020, the state adopted an MMCL of 20 ng/L for the sum of for PFAS6. Since instituting this regulation, the state has supported municipalities in testing and treating for PFAS6 through their free PFAS analysis program and through prioritizing PFAS projects when awarding DWSRF funding.

This project aligns with the State's commitment to PFAS treatment as it increases the HWS's availability of PFAS-treated water, particularly for the EJ community that HWS serves. The project has been granted DWSRF funding and is working closely with MassDEP.

The Proponent has worked closely with MassDEP's State Revolving Fund Office to determine project timelines and receive guidance on funding requirements. At the start of the Project, the Proponent participated in a kickoff meeting with MassDEP. Subsequently, the Proponent has been in frequent communication to keep MassDEP up to date with project scheduling timelines. At MassDEP's suggestion, the Proponent has submitted a second PEF for the 2025 IUP cycle, in case project permitting stretches longer than expected.

The Proponent has also coordinated with the MEPA Office. On June 6, 2024, the Proponent participated in a pre-filing consultation with MEPA and the EJ Office to ensure that the project Proponent was aware of all MEPA requirements and familiar with Environmental Justice Protocols and Greenhouse Gas Policy.

The Proponent has coordinated with the MassDEP SERO to confirm which BRP Water System permits will be required for the Project. A Well Replacement Proposal has already been submitted to MassDEP SERO and was approved. See Appendix C, Pumping Test Proposal and Approval.

3.2 REGIONAL PLANNING AND COORDINATION

The Proponent works with the Cape Cod Commission on regional planning efforts. The 2021 Cape Cod Regional Policy Plan includes a number of priorities that align with the Project. It identifies the goal of improving infrastructure, especially through projects that address climate change concerns (Cape Cod Commission). The Resilient Massachusetts Action Team (RMAT) analysis tool (see Appendix G, RMAT Analysis), the identified project areas with increased flood risks due to climate change. Proposed critical infrastructure was designed to avoid these areas. Furthermore, the Project seeks to reduce GHG emissions

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by proposing to fully electrify the proposed SWTF and by designing all proposed buildings to support roof-mounted solar panels.

3.3 LOCAL PLANNING AND COORDINATION

The Project aligns with a number of goals detailed in the Town of Barnstable's 2010 Local Comprehensive Plan. First, the Town pledges to "ensure that all areas of town will be provided with adequate drinking water supply, quality, flow and pressure to meet demand" (Town of Barnstable). Due to limitations present in the existing treatment processes which reduce drinking water output below the maximum permitted withdrawal, upgrades to The HWS are required. This project addresses that concern by completing upgrades that will allow the withdrawal of the full permitted capacity of the Straightway water treatment facility. (Town of Barnstable)

A second goal of the Town's Local Comprehensive Plan is to "Provide infrastructure required for growth centers and redevelopment areas" (Town of Barnstable). A critical growth center identified in the document is the Hyannis Growth Zone, which relies on HWS for water. To continue to grow this area in line with the stated goal, water supply resiliency is critical, especially in the summer months.

This project is also in line with the Town's planning efforts related to climate change. In 2022, the Town published an update to their Hazard Mitigation Plan, which calls for projects that "identify, evaluate, and fund measures to reduce the vulnerability of critical facilities" (Woodard & Curren). The Proposed project accomplishes these tasks. The project identified flood vulnerabilities of the existing Hyannisport and Simmons Pond wells, evaluated new locations for this critical infrastructure to protect from flood risks, and obtained DWSRF funding to accomplish the work. Stormwater management design at the Straightway Complex identified and evaluated the effects of increased storm frequency and severity due to climate change to protect infrastructure at that location as well.

The Proponent has notified and educated local community members about the Project through the submittal of the EJ screening form to local organizations (see Appendix H, EJ Screening Form Distribution List) and hosting a community meeting to share information about the Project and answer questions. The EJ Screening Form included contact information to allow interested parties to request a meeting. No parties, including those that received the EJ Screening Form, requested a meeting; however, the Proponent made the decision to hold an informational meeting regardless, so the public could learn more, ask questions, and give feedback about the Project. This meeting was held on August 6, 2024. Notices for this meeting were distributed widely two weeks prior to over 4,000 properties within 1 mile of the Project Area as well as to the EJ Distribution List and to the additional local community-based organizations (CBOs). All resources have been distributed in both English, Spanish, and Portuguese in accordance with the EJ guidelines.

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4 ALTERNATIVES TO THE PROJECT

This section details and compares Project alternatives. The purpose of this alternatives analysis is to consider the potential environmental impacts of different build scenarios compared to the no-build condition as a baseline. Additionally, this alternatives analysis considers whether any alternative exists that effectively achieves the Project goal of improving drinking water quality at the Straightway and Hyannisport sites with lesser environmental and EJ impact than the selected build alternative.

4.1 NO BUILD ALTERNATIVE

The "No Build" alternative includes no well improvements or treatment facility upgrades. At present, all four wells treated at this site have PFAS concentrations above the MMCL and proposed federal regulations. As described in detail in Section 1.2, without additional treatment, HWS is limited to a summertime capacity of 5.04 MGD. In 2022, the HWS had a maximum daily demand (MDD) of 5.3 MGD, a new historic maximum. As a result, all wells and treatment infrastructure must pump continuously in the summer. If a treatment facility fails or experiences any issues, the system may not be able to meet demand. Operating so close to capacity in the summer months is an unacceptable option and the No Build alternative was deemed unfeasible.

Furthermore, if the Hyannisport and Simmons Pond wells are not relocated, HWS critical infrastructure will remain within the 500-year floodplain and near wetland resources. This increases the system's susceptibility to flooding.

4.2 OFF-SITE ALTERNATIVE

No locations outside of the current project site were considered for the Project. There is no feasible off-site alternative that would result in a lower environmental impact. Installation of water mains from the well locations to an off-site treatment plant is cost prohibitive, disruptive to local residents, including nearby EJ populations, and greatly increases the project footprint. There is no available open Town-owned land suitable for water supply development which could be implemented in a short time frame. The following alternatives for treatment options onsite were evaluated as part of the alternatives analysis.

4.3 TWO-PLANT ALTERNATIVE

In November 2021, Kleinfelder produced a Piloting Report titled, "Pilot Study Report: Straightway and Hyannisport Facilities Hyannis Water System" (Kleinfelder), which evaluated a two-plant alternative for the Project and was developed to maximize overall firm yield. The two-plant alternative consisted of one new treatment facility at the Straightway Complex to treat water from Straightway 1 and Straightway 2

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Wells and one new treatment facility at the Hyannisport Complex to treat water from the Hyannisport and Simmons Pond wells. In this alternative, both treatment facilities would include greensand filtration, UV-AOP treatment, GAC filtration units, and chemical injection for pH, corrosion control, and chlorination. This alternative required the installation of either a tank or a contact loop at the Hyannisport Treatment Facility to achieve the required contact time.

The major benefit of the two-plant alternative was that it provided additional resiliency in the case that one of the two treatment plants failed. Major downsides to the alternative included a much higher construction and operating cost and a larger environmental impact. Constructing two buildings increased the overall building footprint for the Project and would have required additional tree clearing. Furthermore, the Hyannisport treatment facility would have encroached on the nearby wetlands buffer zone and been at an increased flood risk compared to the Straightway plant location.

4.4 SINGLE PLANT- SELECTED BUILD ALTERNATIVE

In May 2023, Kleinfelder published an update to the Piloting Report, titled, “Update to November 2021 Pilot Study Report: Straightway & Hyannisport Evaluation of Single Plant Option”. (Kleinfelder) In this update, the single plant alternative was evaluated as a second construction alternative. It consists of a single treatment plant at the Straightway Complex, along with the well and pump station replacements proposed at the Hyannisport site, as described in Section 2. Treatment at the plant includes greensand filtration, UV-AOP, GAC filtration units, and chemical injection for pH, corrosion control, and chlorination. The plant design re-uses the existing GAC filters that are already onsite at the Complex and adds additional GAC filtration to treat the entire permitted value for the four wells at the new facility.

Major benefits of this design include a lower construction cost, shorter construction period, and a lower environmental impact, due to the smaller building footprint, reduced tree clearing, and minimized work in the wetland buffer zone. Furthermore, this alternative provides greater protection from flooding for critical infrastructure. The RMAT analysis tool (See Appendix G) found that the project site was at high risk of coastal and precipitation event flooding as a result of climate change. Moving all treatment equipment to a higher elevation site protects the critical infrastructure from future threats. For these reasons, the Single Plant Alternative is the chosen alternative.

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5 EXISTING ENVIRONMENT

5.1 REGIONAL AND LOCAL CONDITIONS

The Town of Barnstable is located on Cape Cod in the Commonwealth of Massachusetts. Barnstable is abutted by Yarmouth to the east, Sandwich and Mashpee to the west, Nantucket Sound to the south, and Cape Cod Bay to the north. It has an overall year-round population of approximately 49,000. (U.S. Census Bureau). Tourism is a primary industry in Barnstable, and as a result, the population increases in the summer. Barnstable is comprised of seven villages. Barnstable, and specifically the village of Hyannis, is home to Cape Cod's largest healthcare facilities, shopping centers, and transportation operations, including an airport, bus services, and ferries to Martha's Vinyard and Nantucket. (Town of Barnstable).

This project will service the Town's Hyannis Water System. Hyannis is an urbanized and commercialized area of Barnstable. It includes the Town's business district, town offices, and several shopping centers, in addition to residential areas, like those surrounding the project area. Hyannis is the most diverse village in Barnstable, with 30% of the population identifying as non-white. As described further in Section 10, the populations served by the Hyannis Water System largely consist of Environmental Justice populations.

5.2 EXISTING SITE CONDITIONS

The project area is comprised of two gated sites inter-connected by a gravel access road, located in Hyannis, Massachusetts. Both sites are owned by the Town of Barnstable. Multiple buried utilities, light poles, a paved road, and a gravel path are present at both the sites.

The existing Straightway Treatment Complex, located at 228 Straightway, includes the existing Straightway Treatment Facility (which houses both Straightway Wells No. 1 and No. 2), a 400,000-gallon above ground water-storage tank (the Straightway Tank), a backwash lagoon basin, four non-winterized GAC filtration units, a 1,500-gpm,) booster pumping station, chlorination building, and the Straightway Facility Building.

The Straightway site is surrounded by a chain link fence and is bounded by a small section of Straightway (a municipal road) and residential properties to the west; residential properties, wooded areas, and Ben's Pond to the north; wetlands and residential properties to the east; and residential properties and the Hyannisport site to the south. Ben's Pond is to the north and has a water level elevation of less than 15 feet above sea level. Existing grades across the site vary from approximately 20 feet above sea level to 32 feet above sea level. See Appendix I, Geotechnical Report.

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The existing Hyannisport Treatment Complex, located at 132 Smith Street, is to the south of the Straightway Site. It includes the current Hyannisport Water Treatment Facility, which houses the Hyannisport Well. Another separate existing pump station building houses the Simmons Pond Well.

The Hyannisport Treatment Complex is partially surrounded by a chain link fence and is bounded by the Straightway site to the north, Smith Street and residential properties to the south, Simmons Pond and wetlands to the east, and residential properties and wooded areas to the west. Existing grades across the site vary between approximately 8 feet above sea level and 20 feet above sea level. A vegetated/wooded slope is present along the central and northern edges of the Hyannisport site. The Simmons Pond has a water level elevation of around 5 feet above sea level. See Appendix I, Geotechnical Report.

Land use data obtained from the "2016 Land Cover/Use" layer in the Massachusetts Bureau of Geographic Information (MassGIS), MassMapper application. The project site is primarily deciduous forest (2.01 acres) and developed open space (1.51 acres). Additional land uses at the site include grassland (0.29 acres), palustrine forested wetland (0.15 acre), and evergreen forest (0.07 acre). The site currently includes 0.73 acres of impervious area within the developed open space. See Figure 3, Project Area Land Use for additional details on the land uses surrounding the project site.

5.2.1 Zoning

The project parcels are located in a Residential B (RB) District and within a Wellhead Protection Overlay District. According to the Town of Barnstable, the principal permitted use of the Residential B District is a single-family residential dwelling. See Figure 7, Zoning Map for additional information.

5.2.2 Topography and Soils and Surficial Geology

The topography of the immediate Project area is relatively flat, with surrounding land sloping toward the surface water bodies and wetlands located to the north and east. A full site topographic survey of the Straightway and Hyannisport Complexes was performed during the Project's conceptual design phase.

Kleinfelder conducted a recent subsurface exploration program between April 15, 2024, and April 18, 2024. The subsurface exploration program consisted of eight (8) test borings (B-1 through B-8) in the Straightway Site, and two (2) test borings in the Hyannisport/Simmons Pond Site. The test borings were advanced by Geologic Earth Explorations of Norfolk, Massachusetts. See Appendix I, Geotechnical Report. A summary of findings is presented below.

Straightway Treatment Complex Soils

Borings at the Straightway Treatment Complex documented that, in general, topsoil was encountered from the ground surface to a maximum depth of approximately 10 inches below ground surface (bgs), underlain by an approximate 5.9- to 11.8-foot-thick "fill" layer consisting of sand with varying amounts of

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silt, gravel, cobbles and organic matter, followed predominantly by sand with varying amounts of gravel. This information generally aligns with the United States Department of Agriculture (USDA) Natural Resources Conservation (NRC) Service, which identified the surficial geology at this location as being comprised of Carver coarse sand with 0 to 3 percent slopes (252A), Carver coarse sand with 3 to 8 percent slopes (252B), and Freetown coarse sand with 0 to 3 percent slopes and sanded surface (55A).

Hyannisport Treatment Complex Soils

Borings at the Hyannisport Treatment Complex documented that, in general, topsoil was encountered from the ground surface to a maximum depth of approximately 12 inches bgs, underlain by an approximate 3.0- to 3.7-foot-thick layer consisting of sand with varying amounts of silt and gravel, followed by sand. This information generally aligns with the USDA NRC Service, which identified the surficial geology at this location as being comprised of Carver coarse sand with 0 to 3 percent slopes (252A), and Carver coarse sand with 3 to 8 percent slopes (252B).

Groundwater

Kleinfelder obtained groundwater measurements as part of the April 2024 subsurface investigation. All elevation measurements referenced North American Vertical Datum of 1988 (NAVD88). Groundwater was observed during drilling between approximately 6.0 and 16.0 feet bgs (between approximately El. 15.0 and El. 26.0) at the Straightway Site. Groundwater was observed during drilling between approximately 8.0 and 8.5 feet bgs (between approximately El. 9.0 and El. 9.5) at the Hyannisport and Straightway Site. For additional information on the findings of the subsurface investigation, see Appendix I, Geotechnical Report.

It should be noted that water was introduced in the borehole during drilling. Therefore, the collected groundwater measurements may not be representative of actual groundwater conditions. Furthermore, groundwater levels fluctuate due to local and regional factors including, but not limited to, site topography, tidal action, seasonal changes, well pumping, and periods of wet or dry weather, nearby construction, or other below grade activities, such as excavation, dewatering, infiltration basins, etc.

5.2.3 Energy Sources

Natural gas lines run to the existing generators at both the Straightway and Hyannisport Complexes. All other equipment onsite is run on electricity.

5.2.4 Protected Species and Habitats

No federally recognized Critical Habitat or state recognized Estimated Habitat of Rare Wildlife or Priority Habitat of Rare Species are mapped within the project site. The site consists of maintained open space and wooded areas. As discussed in Section 5.2.6. Wetlands Resources, there are four wetlands within 200 feet of the project site.

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There are four federally listed endangered or proposed endangered species, and one non-jurisdictional candidate species under the ESA that may exist in the project area. For a full discussion of these species, see Section 6.1.2, Protected Species and Habitats. Species of plants located in the project area were documented as part of the wetlands survey completed by Lucas Environmental, LLC in November 2023. For additional information and lists of common plant species, see Appendix J, Wetlands Summary Letter.

5.2.5 Wetland Resources

There are four wetland areas whose buffer zones overlie a portion of the project area: Simmons Pond and surrounding wetlands, Halls Creek, Ben's Pond, and an unnamed marsh east of the Straightway Facility. All of these water bodies are within the Halls Creek Watershed. For additional information on wetland boundaries and conditions, see Appendix J, Wetlands Summary Letter. A brief description of each is provided below.

Simmons Pond and Surrounding Wetlands

Simmons Pond is an 8.4-acre open water body located to the east of the Hyannisport Treatment Complex (Schlezinger, Howes and Horvet). The pond is immediately surrounded by shrub swamp and wooded swamp. The existing Simmons Pond Pump Station is within the 50-foot wetland buffer of this wetland. The proposed Simmons Pond Pump Station will be outside of the 50-foot wetland buffer. The existing Hyannisport Treatment Facility is within the 100-foot wetland buffer of this wetland. The proposed Hyannisport Pump Station will also be within this 100-foot wetland buffer. Once existing pump stations are relocated, the old structures will be demolished and reseeded with native plants.

Halls Creek

Halls Creek is located to the southwest of the Hyannisport Treatment Complex. The existing Hyannisport Treatment Facility is located within the inner 100-foot Riverfront Area of this creek. The proposed Hyannisport Pump Station is located within the 200-foot Riverfront Area of this creek.

Ben's Pond

Ben's Pond is a 4.97-acre open water body to the north of the Straightway Treatment Complex (Schlezinger, Howes and Horvet) The existing Straightway Treatment Facility is partially within the 100-foot wetland buffer of this pond's adjacent wetlands. The existing gas main and AC water main for the Straightway Treatment Complex run through both the 50-foot and 100-foot buffers of the Ben's Pond wetlands. Proposed work within the 100-foot wetland buffer will include capping the existing AC water main and abandoning it in place, installing a replacement water main outside of the 50-foot wetland buffer, installing additional electrical and gas lines to service the new treatment building, and paving as part of a new access road to the new treatment facility.

Unnamed Marsh

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There is an unnamed marsh to the east of the Straightway Treatment Complex. A short length of existing below grade electrical lines exists within the 100-foot buffer of this wetland. Proposed work in the 100-foot buffer zone includes tree clearing and re-grading for storm water management. Once re-grading occurs, the area will be replanted with native vegetation.

5.2.6 Stormwater

The existing stormwater infrastructure at both the Straightway and Hyannisport Complexes is minimal. At the Straightway Complex, an infiltrating catch basin is located north of the existing pump station. Three 8-foot diameter leaching pits infiltrate stormwater at the center of the site. Rainfall falling directly into the existing backwash infiltration basin is infiltrated through the basin. During rainfall events that overwhelm existing infrastructure, stormwater may also flow overland into low-lying areas. There is no existing stormwater management at the Hyannisport Complex. Existing stormwater infrastructure at both sites is insufficient for precipitation levels predicted by the RMAT tool for the 2070 100-year storm, which was used as the design goal for the Project. See the site plans included in Appendix B, Preliminary Design Drawings for the layout of existing stormwater infrastructure.

5.2.7 Flood Zone

The Straightway Treatment Complex is outside of both the Federal Emergency Management Agency (FEMA) 100-year and 500-year flood zones. However, both the existing Hyannisport Treatment Facility and the existing Simmons Pond Pump Station are with the 500-year FEMA flood zone. See Figure 8, FEMA Flood Zone Map.

5.2.8 Article 97 Lands

Article 97 of the Amendments to the Massachusetts Constitution establishes a right to a clean environment, including its natural, scenic, historical, and aesthetic qualities for the citizens of the Commonwealth. Article 97 also declares the conservation of natural resources a public purpose and provides that land or easements subject to Article 97 shall not be used for other purposes or disposed of without a two-thirds roll call vote of the Legislature.

Article 97 land information was obtained from the MassGIS MassMapper application. The project site is mapped as Article 97 property. See Figure 5, Environmental Constraints. The project does not require approvals under Article 97 of the Massachusetts Constitution as the Town of Barnstable is retaining ownership and possession of the land and the land will continue to be used for public drinking water supply purposes.

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5.2.9 Impaired Waters

There are three impaired water bodies within a half mile of the Project (Halls Creek, Stewarts Creek, and an unnamed tributary to Halls Creek). Halls Creek (MA96-93) and Stewarts Creek (MA96-94) are contaminated with fecal coliform. The unnamed tributary to Halls Creek (MA96-100) is contaminated with E. coli. See Figure 9, Resource Map for impaired water body locations.

5.2.10 Coastal Zone

The entirety of Cape Cod, including the Project site, is located within the Coastal Zone, as shown in Figure 10, Coastal Zone Map. The project is approximately 1 mile from the coast and is not located near tidal resources.

5.2.11 Areas of Critical Environmental Concern and Outstanding Resource Waters

Based on information obtained from the MassGIS MassMapper application, there are no Areas of Critical Environmental Concern (ACECs) or Outstanding Resource Waters (ORW) in the project area. See Figure 5, Environmental Constraints.

5.2.12 Historic Resources

The Hyannisport Treatment Complex at 132 Smith St is part of an MHC-inventoried area, MHC # BRN.AS Hyannis Port Area. (See Figure 5, Environmental Constraints.) The existing Simmons Pond and Hyannisport pump stations, which will be demolished, are within this inventoried area. However, the pump stations were constructed in 1995 and do not have historical significance. This information was included in the PNF that was submitted to the MHC. The MHC chose not to comment on the submission, therefore, clearing the Project to continue. There are no known historic structures or archeological sites in the project area.

5.2.13 Roadways and Traffic

The project is located off Straightway and Smith Street. Both streets are two-lane roadways in residential areas. Due to the residential nature of the local area, the local traffic level is expected to be low. The project does not exceed any MEPA review thresholds for traffic generation, nor does it require any state permits related to state-controlled roadways.

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5.2.14 Air Quality and Noise

The existing treatment facility does not largely impact air quality or noise. Noise associated with typical operation is not audible outside of the existing buildings and is in compliance with the Town of Barnstable's noise ordinance. Water treatment operations do not generate significant air pollution. The operation of the proposed site upgrades is also expected to have minimal effect on noise and air quality on site.

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6 ASSESSMENT OF IMPACTS

The Project is expected to have overall positive environmental and public health impacts. Short-term disruptions of traffic, noise, and work within wetland buffer zones are expected to lead to the long-term positive result of an improved and more resilient drinking water system.

6.1 ENVIRONMENTAL IMPACTS

6.1.1 Energy Impacts

The GHG Policy requires a project to quantify CO_2 emissions and identify measures to avoid, minimize or mitigate such emissions, quantifying the effect in terms of energy savings and emissions reduction. CO_2 emissions were quantified for: (1) the Base Case corresponding to the 10th Edition of the Massachusetts Building Code that includes the 2021 IECC Commercial Code with non-stretch code Massachusetts amendments, and (2) the Proposed Design, which includes all energy efficiency measures (EEMs).

A GHG emissions analysis was performed for the Project by Tech Environmental. See Appendix K, GHG Emissions Report.

An important EEM for this Project is high-efficiency process equipment. Studies by the Water Research Foundation, EPRI and the American Council for an Energy Efficient Economy estimate energy efficiency design in a water supply and treatment plant can reduce electrical consumption by 10% to 30% for individual pieces of equipment. (Water Research Foundation and Electric Power Research Institute) (ACEEE) For this analysis, we have assumed an overall 15% reduction in process electricity use for the following Design Best Practices that are included in the SWTF design:

- Correctly sized pumps and motors to meet anticipated loads.
- High efficiency electric motors for all pumps with Variable Frequency Drive (VFD) and SCADA control to ensure electrical use is reduced with demand.
- SCADA System. The plant will connect to the Town's existing SCADA system to remotely monitor the Plant VFDs, analyzers, pressure transmitters, level instruments, and flow meters to provide complete process control and minimize electricity use.
- Recycling of decanted backwash waste reduces the volume of process wastewater, which in turn reduces the amount of water that needs to be pumped from the wells.

The Base Case process electrical use is assumed to be 3,227 megawatt hours per year (MWh/year) and the Proposed Design is 2,743 MWh/year. This analysis used the eQUEST energy design software (version 3.65.7175), which incorporates the U.S. Department of Energy's DOE-2 building energy use model, and a

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CO_2 emission rate of 658 lb/MWhr. (ISO New England Inc.) CO_2 emissions produced by project motor vehicle trips were calculated using the EPA MOVES model. Table 3, CO_2 Emissions, summarizes total CO_2 emissions for the Base Case, and the Proposed Design (which includes all energy saving measures). The eQUEST model input files have been provided to the Massachusetts Department of Energy Resources (DOER).

The Proponent commits to the CO_2 reduction presented below but retains the flexibility to achieve this goal using energy efficiency measures that may be refined at the stage of detailed design. Table 3 reveals that the Proposed Design will reduce CO_2 emissions (for stationary sources) by 15.2% compared to the Base Case. Transportation Demand Management (TDM) measures for the Project will reduce Project-related motor vehicle CO_2 emissions by 2%. The net reduction of the Project's total CO_2 emissions (stationary sources plus transportation) is 15.2% compared to the Base Case.

Table 3. CO_2 Emissions

Source	Base Case	Proposed Design	Change in GHG Emissions
Direct Emissions	0.0	0.0	--
Indirect Emissions	1,092.2	926.0	-15.2%
Subtotal Direct and Indirect Emissions	1,092.2	926.0	-15.2%
Transportation Emissions	0.45	0.44	-2.0%
Total CO_2 Emissions	1,092.7	926.4	-15.2%

6.1.2 Protected Species and Habitats Impacts

The Proponent has analyzed the Project to understand its impacts on state and federally listed species and habitats. The Massachusetts Natural Heritage Endangered Species Program (NHESP) maps were reviewed to ensure that no priority species or habitats exist in the project area, as shown in Figure 5, Environmental Constraints.

Federally listed species and critical habitats were evaluated using FWS's Information for Planning and Consultation (IPaC) analysis tools. IPaC analysis identified no critical habitats in the project area. However, it identified the following four federally listed species: Northern Long-eared Bat, American Chaffseed, Sandplain Gerardia, and Tricolored Bat. It also identified one Candidate species: Monarch Butterfly.

The Proponent has analyzed the proposed project impacts on the listed species, and the findings are detailed below. Findings have been submitted to the New England Field Office (NEFO) of FWS and the NEFO has concurred with all determinations. See Appendix D, Fish and Wildlife Service Consultation.

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Northern Long-eared Bat (*Myotis septentrionalis*) (Endangered) (May affect, not likely to adversely affect)

The Northern Long-eared bat is an endangered bat species found throughout the United States. It is primarily threatened by white nose syndrome, a disease that has spread through populations across the country. During summer months, the bats roost in forested habitats. During winter months, the bats typically hibernate in caves or mines. Since land clearing for the Project will only occur between October 1 and March 14, the Project is unlikely to accidentally "take" any of these bats. The Proponent determined, and the FWS concurred, that the Project "May Affect, Not Likely to Adversely Affect" this species.

American Chaffseed (*Schwalbea americana*) (Endangered) (No effect)

American Chaffseed is an endangered species found in grassland habitats. Through consultations with FWS, the proponent has determined that it is highly unlikely that this species will be found onsite due to a lack of suitable habitat. Therefore, FWS has concurred with the Proponent's determination of "No Effect" for this species.

Sandplain Gerardia (*Agalinis acuta*) (Endangered) (No effect)

Sandplain Gerardia is an endangered species found in grassland habitats. Through consultations with FWS, the proponent has determined that it is highly unlikely that this species will be found onsite due to a lack of suitable habitat. Therefore, FWS has concurred with the Proponent's determination of "No Effect" for this species.

Tricolored Bat (*Perimoyotis subflavus*) (Proposed Endangered) (May affect, not likely to adversely affect)

The Tricolored Bat has been proposed as an endangered species. This means that the Proponent is required to assess project impacts on this species. The Tricolored Bat is found throughout the United States. It is primarily threatened by white nose syndrome, a fungal disease that has spread through populations across the country. During summer months, the bats roost in forested habitats. During winter months, the bats typically hibernate in caves or mines. Since land clearing for the Project will only occur between October 1 and March 14, the Project is unlikely to accidentally "take" any of these bats. As such, the proponent determined, and FWS has concurred, that the Project "May Affect, Not Likely to Adversely Affect" this species.

Monarch Butterfly (*Danaus Plexippus*) (Candidate, no determination)

The Monarch Butterfly is a candidate species identified in the project area. As a candidate species, the Proponent is encouraged, but not required, to assess the Project's effect on this species. The Project has opted to consider impacts on the Monarch Butterfly and will take measures to protect the species. Monarch Butterflies are found in Massachusetts from the months of May through October. During this time, they lay eggs on milkweed plants. Caterpillars hatch on the milkweed and feed on the plant until they pupate into adult butterflies. Since land clearing for the Project will only occur between October and April, the Project has no potential to remove milkweed plants containing monarch caterpillars. As such, the Proponent has determined that the Project is "not likely to adversely affect" the Monarch Butterfly.

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6.1.3 Wetland Impacts

There are four wetland areas whose buffers overlie a portion of the project area: Simmons Pond and surrounding wetlands, Halls Creek, Ben's Pond, and an unnamed marsh east of the Straightway Facility. All of these water bodies are within the Halls Creek Watershed. The locations of the wetlands and surface water bodies are depicted on Figure 9, Resource Map. Construction of the Project will occur near wetlands, with some activities occurring within the 100-foot wetland buffer zone and within a Riverfront Area. All work will be conducted in accordance with the MassDEP Wetlands Protection Act regulations (310 CMR 10.00) and applicable Town of Barnstable ordinances, including Chapter 237, Wetlands Protection. The Proponent will submit a Notice of Intent to obtain and comply with a Town of Barnstable Conservation Commission Order of Conditions.

The extent of the wetlands impact of the Project are summarized in Table 4, Wetlands Impact Summary.

Table 4. Wetlands Impact Summary

Resource Area	Temporary Impact (square feet)	Permanent Impact (square feet)
100-foot Wetland Buffer	76,592	18,756
200-foot Riverfront Area	20,645	3,227

Potential negative impacts on surrounding wetlands include sedimentation and erosion from construction activities flowing into the wetlands, and loss of wetland habitat. To mitigate sedimentation and erosion impacts during construction, the Proponent will implement sedimentation and erosion controls, such as silt sacks installed in catch basins, straw wattles, etc., as required by the Barnstable Conservation Commission. To mitigate potential loss of wetland habitat, the Proponent will re-seed impacted areas with native seed mix.

This project is expected to have a number of beneficial impacts on the wetlands. First, the Simmons Pond Pump Station will be moved outside of the 100-foot wetland buffer zone and the existing location will be seeded with native plants, returning that land to a natural condition. The existing Hyannis Treatment Facility, which is within the 100-foot wetland buffer zone and within a Riverfront Area, will also be removed and seeded with native plants.

6.1.4 Stormwater Impacts

Under the proposed conditions, the impervious area at the Straightway and Hyannisport Treatment Complexes will be increased by approximately 47,674 square feet. In accordance with the Town of Barnstable Stormwater Management Policies, a stormwater management system will be installed to manage stormwater. The proposed stormwater system will be designed in accordance with the Massachusetts Stormwater Management Standards and Town of Barnstable regulations. To the extent practicable, the stormwater management system will be sized to accommodate a rainfall event of 9.7 inches at the Straightway Complex and 8.7 inches at the Hyannisport Complex, which are the design

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storms suggested by the RMAT tool. The proposed systems will rely on stormwater infiltration, since the USDA NRC Service soil mapping data of the project site, and the geotechnical borings advanced, indicate the presence of predominantly sandy soils. which are reported to be excessively drained. This project is expected to have a beneficial impact on stormwater management since the proposed systems are robust while the existing system at the Straightway Complex is minimal and the existing system at the Hyannisport Complex is non-existent.

6.1.5 Flood Zone Impacts

This project is expected to have beneficial impacts on the 500-year floodplain. Work at the Hyannisport Treatment Complex will move buildings out of the 500-year floodplain, protecting critical infrastructure from floods as well as removing encroachments from the 500-year floodplain. This is particularly important since the area is expected to experience flooding of greater severity and frequency due to climate change.

6.1.6 Article 97 Lands Impacts

Although the Project is located on Article 97 lands, it will have no impact on these lands that would require approvals under Article 97 of the Massachusetts Constitution. This is because the Town of Barnstable is retaining ownership and possession of the land and the land will continue to be used for public drinking water supply purposes. See Figure 5, Environmental Constraints.

6.1.7 Impaired Waters Impacts

The Project is not expected to impact the three on-site impaired water bodies due to the proposed stormwater management system, stormwater infiltration on pervious surfaces, and the containerization of sewage in a tight tank while awaiting off-site disposal. See Figure 9, Resource Map.

6.1.8 Coastal Zone Impacts

While the project site is within the Coastal Management Zone, after consultation with the Proponent, the CZM Office concluded that the Project does not meet minimum thresholds for a federal consistency review. Documentation of this decision is included in Appendix E, Coastal Zone Management Letter.

6.1.9 Areas of Critical Environmental Concern and Outstanding Resource Waters Impacts

There are no ACECs or ORWs within the project area. See Figure 5, Environmental Constraints.

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6.1.10 Historic Resources Impacts

As discussed in Section 2.4.2, the Proponent submitted a PNF to MHC, who chose not to comment on the Project, indicating that the Project is expected to have no potential adverse impacts on historic or archaeological resources.

6.2 PUBLIC HEALTH IMPACTS

Public health is the primary driver behind the Project. The improvements proposed by the proponent will improve the water quality, resiliency, and capacity of a public water system that serves EJ communities. This project will provide improved treatment to remove manganese, PFAS, and 1,4-dioxane, all of which have the potential to negatively impact public health. An EJ analysis is provided in Section 10, including enhanced analysis, summary of health impacts and benefits.

6.2.1 Roadways and Traffic Impacts

Traffic impacts are expected during work in a public roadway, which will only occur while capping the existing connection to the Hyannisport Treatment Complex in Smith Street and for connecting new piping to the water main in Straightway. This work will occur on a residential street and will only require closure of one lane of the road. The work is anticipated to be completed within one week. The estimated low traffic flow in this area means that it should be possible to implement one-way traffic, when required. To mitigate any traffic-related concerns, the Proponent will coordinate with the Town of Barnstable Police Department to have officers direct traffic to ensure public safety.

Short-term lane closures may occur to facilitate large equipment deliveries to the site. In these instances, police details will be coordinated with the Town and the Barnstable Police Department.

6.2.2 Air Quality and Noise Impacts

Construction for the Project is expected to last two years in total. Activities associated with the Project are expected to result in noise typical of a heavy machinery and commercial construction project and air emissions from the associated construction equipment. Work resulting in elevated noise levels includes, but is not limited to, pile driving at the Straightway Treatment Complex, and the installation of the new public drinking water wells. For each of these individual activities, work is expected to last no more than two weeks.

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6.3 CONCLUSION

Overall, the Project is expected to have limited short-term negative impacts in service of long-term positive impacts on public health and water supply system resiliency.

In the short term, local communities, including EJ communities, may see small traffic disturbances and noise associated with construction-related activities. Direct abutters may witness land clearing and construction activities. To minimize disruption to the residents and the users of the municipal roads during road opening activities, the proponent will comply with the Town of Barnstable noise ordinance and coordinate with the Town of Barnstable Police Department to manage vehicular and pedestrian traffic during road opening activities.

Although tree clearing will be required, the proposed project will restore previously disturbed wetlands, and remove critical infrastructure from the 500-year floodplain. Existing buildings within the 500-year floodplain will be demolished and the land seeded with native plants, thus restoring both the 500-year floodplain and wetland buffer zones.

In the long-term, the Project will improve critical public health measures for the population it serves by providing reliable access to safe drinking water.

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7 STATUTORY AND REGULATORY STANDARDS AND REQUIREMENTS

This project is subject to regulatory requirements stemming from Federal and State legislation, as well as standards developed by Federal and State agencies. Applicable standards and requirements are listed below, in accordance with 301 MCR 11.07(6)(i).

7.1 MASSACHUSETTS ENVIRONMENTAL POLICY ACT (MEPA)

To receive DWSRF funds, the Project must complete a review similar to the National Environmental Policy Act (NEPA) review. In Massachusetts, the relevant review is the MEPA review. MEPA regulations are codified in 301 CMR 11.00. The proposed project meets the threshold for an ENF due to the proposed construction of a new drinking water treatment plant with a capacity of 1,000,000 or more gpd (301 CMR 11.03(4)(b)(4)). Additionally, as the Project's limit of disturbance is located within one mile of EJ Populations, the Proponent is required to submit an Environmental Impact Report EIR in accordance with 301 CMR 11.06(7)(b).

In compliance with this regulation, the Proponent is submitting an EENF and this EIR. The Proponent is submitting both simultaneously as they are requesting a Rollover EIR in order to expedite this public health project and maximize access to SRF funding.

7.2 NATIONAL HISTORIC PRESERVATION ACT, ARCHEOLOGICAL PRESERVATION ACT, AND NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT

The National Historic Preservation Act was passed in 1966. It requires that states inventory important historic locations and requires that federal projects and funds are used in ways that preserve these historic locations. The Archeological Preservation Act was passed in 1974. It requires that federally funded or executed projects preserve objects of historic and archeological importance that would otherwise be destroyed by a project. The Native American Graves Protection and Repatriation Act was passed in 1990. It requires that if any artifacts related to Native American graves are discovered, they are returned to surviving family members.

All of these regulations are implemented in Massachusetts by the MHC. To remain in compliance with these laws, the Proponent has submitted a PNF to MHC. As the MHC chose not to comment on the PNF, the Project can progress without further consultation.

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7.3 ENDANGERED SPECIES ACT (ESA)

The Endangered Species Act (ESA) was passed in 1973 to protect and recover imperiled species and the ecosystems they rely on. The ESA is administered by the FWS as well as NOAA's National Marine Fisheries Service (NMFS). The Act prohibits the "take" of endangered species and their critical habitats. It requires that federally funded projects consult with FWS and NMFS to ensure project work will not negatively impact endangered species or critical habitats and that proposed projects implement measures to mitigate any potential impacts.

To comply with this law, the Proponent has used the IPaC analysis tool at the FWS website to generate an Official Spies List for the project area. The Proponent is in the process of coordinating with FWS to identify best management practices to mitigate any potential harm to the identified species.

There are no critical habitats in the project area and no consultation with NMFS is required, since the Project is solely on land.

7.4 MASSACHUSETTS WETLANDS PROTECTION ACT

The Massachusetts Wetlands Protection Act (MGL Chapter 131 Section 40) went into effect in 1972. It regulates work in or near protected wetland resources by requiring review of projects that may impact them. The law assigns local conservation commissions with the responsibility to implement the regulations (310 CMR 10.00). In addition, the law grants authority to the CZM Office to review projects occurring in the Coastal Zone.

To comply with this regulation, the Proponent will submit an NOI to the Town of Barnstable Conservation Commission at the 60% design phase for the Project. All conditions required by the Commission will be implemented. Furthermore, the Proponent submitted documentation to the CZM Office for review. CZM concluded that, while the Project will occur in the coastal zone, it does not meet the minimum requirements for a federal consistency review and no further coordination will be required.

7.5 MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act was passed in 1918. It makes it federally illegal to 'take' listed migratory birds. The Act was originally passed to protect birds from hunting, however the largest present-day threat to these birds is loss of habitat. The Act requires that projects consult with the Fish and Wildlife Service to ensure that a project will not harm listed bird species.

To comply with this regulation, the Proponent completed the IPaC analysis through the FWS website to determine that there are 27 listed migratory birds in the project area. In consultation with FWS, the

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Proponent agreed to constrain tree removal to October through April. In this way, the Project will not interfere with the breeding season of migratory birds.

7.6 FEDERAL FLOOD RISK MANAGEMENT STANDARD (FFRMS)

Executive Order 14030 reinstated the previously revoked FFRMS requirement for fiscal year 2022 State Revolving Fund capitalization projects. It requires that any federally funded new construction or substantial modification of critical infrastructure must occur outside of either the 500-year floodplain or three (3) vertical feet outside of the 100-year floodplain. Alternatively, projects can develop a climate model to determine an appropriate flood elevation.

This project will meet this standard since all new construction for the Project is proposed to take place outside of the 500-year floodplain and three vertical feet outside of the 100-year floodplain.

7.7 MEPA GREENHOUSE GAS EMISSIONS POLICY

In 2010, the Massachusetts Executive Office of Energy and Environmental Affairs issued the Revised MEPA Greenhouse Gas Emissions Policy and Protocol (GHG Policy), which requires that all MEPA projects undergo a greenhouse gas emissions evaluation. To comply with this requirement, a full GHG emissions analysis was completed by Tech Environmental. See Appendix K, GHG Analysis Report. The GHG Policy requires a project to quantify CO_2 emissions and identify measures to avoid, minimize or mitigate such emissions, quantifying the effect in terms of energy savings and emissions reduction. The results of this analysis compared a base case project with no EEM to the proposed design, which includes EEM. It found that the proposed project will decrease CO_2 emissions by 15.2%, compared to the base case.

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8 MITIGATION MEASURES

8.1 ENVIRONMENTAL IMPACT MITIGATION MEASURES

8.1.1 Tree Clearing Schedule

Tree clearing for the Project will only occur between October and April. This will protect the identified federally listed species, candidate species and migratory birds. The endangered Northern Long-eared Bat and the proposed endangered Tricolored Bat hibernate in caves through the winter. Winter tree removal will ensure that there is not an accidental 'take' of either species. The Monarch Butterfly (candidate species) migrates through Massachusetts in the summer months. Winter tree removal and land clearing will ensure that there is no accidental 'take' of monarch caterpillars, which live on milkweed plants during the summer. Finally, winter tree removal will protect the 27 listed migratory bird species in the project area who nest in the summer months. This mitigation measure has been discussed with FWS and has been determined to have the above effects.

8.1.2 Sedimentation and Erosion Control

Work at both the Hyannisport and Straightway Complexes has the potential to allow sediment to flow into the nearby wetlands. This can lead to negative consequences such as smothering the wetlands, clouding aquatic habitats, and introducing high levels of nutrients and pollutants into the wetlands. To mitigate the potential for sediment to enter the wetlands, erosion and sedimentation controls stipulated in the Barnstable Conservation Commission's Order of Conditions will be implemented to protect the nearby wetlands.

8.1.3 Land Restoration

The existing Hyannisport Treatment Facility and Simmons Pond Pump Station will be demolished, and the land restored with native species. Not only will this restore important natural resources, but it will also restore land within the 500-year floodplain, thus mitigating future floods.

8.1.4 Site Plan and Building Locations

The project site plan was developed to have minimal environmental effects. The Hyannisport and Simmons Pond Pump Stations were relocated as far from the wetlands as feasible and to be outside of the 500-year floodplain. Furthermore, choosing the single plant alternative reduced the Project's increase in impervious area to the maximum extent possible.

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8.1.5 Stormwater Management

Infiltration practices will be used to manage stormwater peak rates and volumes up to the 2070 100-year storm at the Straightway campus, and the 2070 50-year storm at the Simmons Pond and Hyannisport campus. Where required, additional pretreatment practices will be employed to meet the water quality standards set forth by the MassDEP Stormwater Manual and the Town of Barnstable DPW Stormwater Standards, whichever is more restrictive. Low Impact Development (LID) practices will be employed to the maximum extent possible, without interfering with the proposed facility's operation.

8.1.6 Electrification and Energy Efficiency

The following design choices were made to reduce the energy consumption and CO_2 emissions of the SWTF building and the GAC filter building.

Energy Efficient Building Envelope

The four buildings have pitched roofs with attic and wall insulation that meets Code. The SWTF Building and GAC Filter Building have attic insulation of U=0.021. Their steel-framed walls with R13+R10ci insulation meets Code of U=0.055. The small Hyannisport and Simmons Pond Pump Buildings have concrete walls and qualify for the C402.1.2 Equipment building exemption with minimal heating to 50F. The two pump buildings have attic insulation of U=0.19 and exterior wall rigid foam insulation to achieve U=0.19.

Vertical fenestration as a percentage of wall area will be only 3.3% in the SWTF Building, 3.4% in the GAC Filter Building, 1% in the Hyannisport Pump Building, and 0% in the Simmons Pond Pump Building.

Space Heating and Cooling

The control room/bathroom/janitor closet area in the SWTF Building will have a 1.5-ton air source heat pump (ASHP) for space heating and cooling, and the remainder of the industrial space in the SWTF building will be heated (no cooling) with electric coil unit heaters to 55F. The GAC Filter Building will be heated (no cooling) with electric coil unit heaters to 55F. The two pump buildings will have 2-ton split-system ASHPs for heating to 50F.

SAR Engineering (SAR) states it will consider ASHP units with efficiencies 10% better than Code in the final MEP design, but because public funding is being used for this municipal facility, SAR must first confirm that at least three manufacturers can provide equipment with the desired performance rating.

Hot Water Heaters

The bathrooms in the SWTF Building and Hyannisport Pump Building will each have a small electric storage tank water heater to supply domestic hot water.

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High Efficiency Process Equipment with SCADA System

Best Design Practices have been used to specify equipment that will use 15% less electricity than standard designs. For this analysis, process electricity use is 3,227 MWh/yr (Base Case) and 2,743 MWh/yr (Proposed Design). Eight percent of these amounts are included in the eQUEST model as plug load for the process vessels/chemical containment area to represent waste heat from the equipment. The other 92% of the process electricity amounts are added as an external electricity demand in the analysis.

Energy Efficient Interior Lighting

High-efficiency LED fixtures will be used to reduce interior light power density (LPD) below maximum values set by the Code.

Energy Efficient Exterior Lighting

Energy efficient LED fixtures will be used to light the parking lot and access driveway.

Water Conserving Fixtures

The two bathrooms will have low-flow fixtures.

Use Building Materials with Recycled Content, Building Materials that are manufactured in the Region, Use Rapidly Renewable Building Materials, and Use Low-VOC Building Materials

Whenever practical, the Project will use environmentally friendly building materials, rapidly renewable building materials, and low-volatile organic compound (VOC) materials. Also, when practical, the Project will purchase building materials that are manufactured within the region.

8.2 PUBLIC HEALTH IMPACT MITIGATION

8.2.1 Traffic Mitigation

To mitigate traffic concerns, the Proponent will work closely with the contractor and local officials to plan optimal times for work within the roadway. The Contractor will be required to coordinate road work with the Barnstable DPW to obtain the Road Opening/Trench Permit. In addition, the Proponent will coordinate with the Town of Barnstable Police Department to have Police Officers manage vehicular and pedestrian traffic during road opening activities.

8.2.2 Air and Noise Pollution Mitigation

To mitigate short-term construction impacts, the Proponent will work closely with Town officials and the contractor to develop detailed construction plans. Construction plans will be submitted for review to local fire and building departments. During the preconstruction process, on-site measures to reduce the impacts of noise on local residents will be determined and communicated to the contractor. Measures will include banning nighttime work and enforcing Massachusetts no-idling laws.

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Heavy machinery used for construction has the potential to generate air pollution. To mitigate this impact, the bid specification package will include requirements for the contractor to comply with the Massachusetts Anti-Idling Law (MGL Ch.90, Section 16A; 301 CMR 7.11; and MGL Ch. 111, Sections 142A-142M). Engine idling on-site will be limited to periods of 5 minutes or less, unless the engine is necessary to provide power to another device. For example, drilling of replacement wells relies on the drill rig engine to be running to power the drilling apparatus.

Furthermore, the contractor will be required to adhere to the Massachusetts Department of Transportation (MassDOT) Diesel Retrofit specification, which requires that diesel-powered vehicles are fitted with technology to reduce diesel emissions.

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9 PROPOSED SECTION 61 FINDINGS

In accordance with 301 CMR 11.06(13) for a Rollover EIR, this Section provides a consolidated overview of the proposed mitigation and other environmental and community benefits proposed in order to minimize potential impacts from the proposed Project. Draft templates for Section 61 Findings are also provided in accordance with MGL Chapter 30, Section 61, which states:

> "Any determination made by any agency of the Commonwealth shall include a finding describing the environmental impact, if any, of the Project and a finding that all reasonable measures have been taken to avoid or minimize said impacts."

Draft 61 Findings are provided for those issues that are within the scope of this Rollover EIR. Permits and reviews required by state agencies are listed below:

- Massachusetts Historical Commission
  - Project approval
- Office of Coastal Zone Management
  - Consistency Review or determination that project does not meet review thresholds
- Executive Office of Energy and the Environment
  - MEPA approval
- Department of Energy Resources
  - Project Review
- Massachusetts Department of Environmental Protection
  - WS06 – Registration of a Class V UIC Well
  - WS20 – Approval to Construct a Source 70 gpm or greater (for Replacement Wells)
  - WS25 – Approval of Treatment Facility Modification
  - WS29 – Chemical Addition Retrofit of Water System Serving > 3,300 people

The draft Section 61 Findings are provided for each anticipated State agency permit.

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9.1 MASSACHUSETTS HISTORICAL COMMISSION

MASSACHUSETTS HISTORICAL COMMISSION

SECTION 61 FINDING

PURSUANT TO MGL CHAPTER 30, SECTION 61

PROJECT NAME: Straightway & Hyannisport Water Treatment Plant

PROJECT PROPONENT: Town of Barnstable Department of Public Works

PROJECT MUNICIPALITY: Barnstable

PROJECT LOCATION: 228 Straightway and 132 Smith Street

EOEEA NUMBER: N/A

MGL c. 30, s. 61 (Section 61) requires that "[a]ll … authorities of the Commonwealth… review, evaluate, and determine the impact on the natural environment of all works, project or activities conducted by them and … use all practicable means and measures to minimize [their] damage to the environment. … Any determination made by an agency of the Commonwealth shall include a finding describing the environmental impact, if any, of the Project and a finding that all feasible measures have been taken to avoid or minimize said impact." MGL c. 30, s. 62A requires that the finding required by Section 61 "…shall be limited to those matters which are within the scope of the environmental impact report, if any, required [on a project]."

The potential environmental impacts of the Project have been characterized in the Rollover Environmental Impact Report (Rollover EIR) dated September 2024, which is incorporated by reference into the Section 61 Finding.

DESCRIPTION

The Straightway & Hyannisport Water Treatment Facility Improvements Project (Project) will construct new treatment facilities at Barnstable's Hyannis Water System's (HWS) Straightway and Hyannisport Treatment Complexes to treat raw water for elevated levels of PFAS6 (the sum of PFOS, PFOA, PFHxS, PFNA, PFHpA, and PFDA concentrations), iron and manganese, and 1,4-dioxane. The upgrades will expand the existing seasonal PFAS system and restore the facilities' full permitted capacity, which is equal to one-third of the HWS total capacity. The project will include well replacement for the Hyannisport and Simmons Pond wells, booster pump station upgrades, stormwater management and grading work, and the construction of a water treatment facility with granular activated carbon for PFAS adsorption, greensand filters for removal or iron and manganese, and Ultraviolet Advanced Oxidation Process (UV-AOP) for 1,4-dioxane destruction.

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Review by the Massachusetts Historical Commission (MHC) under Section 106 of the National Historic Preservation Act of 1966 is required due to the utilization of federal funds for the Project.

A Project Notification Form for the Project was sent to the MHC on June 6, 2024. As of August 1, 2024, no comments were received from MHC, clearing the Project to move forward.

MITIGATION MEASURES

As no comments were provided by the MHC, no mitigation measures are required.

FINDINGS

The MHC has reviewed the conditions included in the MEPA Certificate for the Rollover EIR dated September 2024 associated with the Straightway & Hyannisport Water Treatment Plant. As discussed above, the Project as proposed by the Town of Barnstable Department of Public Works is subject to the MHC's approval. Accordingly, the MHC hereby finds pursuant to MGL Chapter 30, Section 61 that all practicable and feasible measures will have been taken to avoid or minimize environmental damage from the Project.

_____ _____

Name/Title Date

For the Massachusetts Historical Commission

_____ _____

Name/Title Date

For the Massachusetts Historical Commission

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9.2 OFFICE OF COASTAL ZONE MANAGEMENT

OFFICE OF COASTAL ZONE MANAGEMENT
SECTION 61 FINDING
PURSUANT TO MGL CHAPTER 30, SECTION 61

PROJECT NAME: Straightway & Hyannisport Water Treatment Plant
PROJECT PROPONENT: Town of Barnstable Department of Public Works
PROJECT MUNICIPALITY: Barnstable
PROJECT LOCATION: 228 Straightway and 132 Smith Street
EOEEA NUMBER: N/A

MGL c. 30, s. 61 (Section 61) requires that "[a]ll … authorities of the Commonwealth… review, evaluate, and determine the impact on the natural environment of all works, project or activities conducted by them and … use all practicable means and measures to minimize [their] damage to the environment. … Any determination made by an agency of the Commonwealth shall include a finding describing the environmental impact, if any, of the Project and a finding that all feasible measures have been taken to avoid or minimize said impact." MGL c. 30, s. 62A requires that the finding required by Section 61 "…shall be limited to those matters which are within the scope of the environmental impact report, if any, required [on a project]."

The potential environmental impacts of the Project have been characterized in the Rollover Environmental Impact Report (Rollover EIR) dated September 2024, which is incorporated by reference into the Section 61 Finding.

DESCRIPTION
The Straightway & Hyannisport Water Treatment Plant Project (Project) will construct new treatment facilities at Barnstable's Hyannis Water System's (HWS) Straightway and Hyannisport Treatment Complexes to remove PFAS6 (the sum of PFOS, PFOA, PFHxS, PFNA, PFHpA, and PFDA concentrations), iron and manganese, and 1,4-dioxane to below the regulatory levels in drinking water. The upgrades will expand the existing seasonal PFAS system and restore the facilities' full permitted capacity, which is equal to one-third of HWS total capacity. The project will include well replacement for the Hyannisport and Simmons Pond wells, booster pump station upgrades, stormwater management and grading work, and the construction of a treatment facility with granular activated carbon for PFAS adsorption, greensand filters for removal or iron and manganese, and Ultraviolet Advanced Oxidation Process (UV-AOP) for 1,4-dioxane destruction.

Review of the MEPA application by the Office of Coastal Zone Management (CZM) is required because the Project is located within the Coastal Zone.

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The Proponent submitted a project summary to the CZM on June 3, 2024. On July 23, 2024, CZM replied with a letter indicating that the Project did not meet the minimum requirements for a federal consistency review and required no additional consultation with the CZM. The letter is attached to this document.

MITIGATION MEASURES

Since the Project does not meet the thresholds for CZM review and was found to be unlikely to affect coastal resources, no mitigation measures for coastal zone impacts are required for the Project.

FINDINGS

The CZM has reviewed the conditions included in the MEPA Certificate for the Rollover EIR dated September 2024 associated with the Straightway & Hyannisport Water Treatment Plant. As discussed above, the Project as proposed by the Town of Barnstable Department of Public Works and is subject to the CZM's approval. Accordingly, the CZM hereby finds pursuant to MGL Chapter 30, Section 61 that all practicable and feasible measures will have been taken to avoid or minimize environmental damage from the Project.

_____ _____

Name/Title Date

For the Office of Energy and Environmental Affairs

_____ _____

Name/Title Date

For the Office of Energy and Environmental Affairs

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9.3 EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS

EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
SECTION 61 FINDING
PURSUANT TO MGL CHAPTER 30, SECTION 61

PROJECT NAME: Straightway & Hyannisport Water Treatment Plant
PROJECT PROPONENT: Town of Barnstable Department of Public Works
PROJECT MUNICIPALITY: Barnstable
PROJECT LOCATION: 228 Straightway and 132 Smith Street
EOEEA NUMBER: N/A

MGL c. 30, s. 61 (Section 61) requires that "[a]ll … authorities of the Commonwealth… review, evaluate, and determine the impact on the natural environment of all works, project or activities conducted by them and … use all practicable means and measures to minimize [their] damage to the environment. … Any determination made by an agency of the Commonwealth shall include a finding describing the environmental impact, if any, of the Project and a finding that all feasible measures have been taken to avoid or minimize said impact." MGL c. 30, s. 62A requires that the finding required by Section 61 "…shall be limited to those matters which are within the scope of the environmental impact report, if any, required [on a project]."

The potential environmental impacts of the Project have been characterized in the Rollover Environmental Impact Report (Rollover EIR) dated September 2024, which is incorporated by reference into the Section 61 Finding.

DESCRIPTION
The Straightway & Hyannisport Water Treatment Facility Improvements Project (Project) will construct new treatment facilities at Barnstable's Hyannis Water System's (HWS) Straightway and Hyannisport Treatment Complexes to treat raw water for elevated levels of PFAS6 (the sum of PFOS, PFOA, PFHxS, PFNA, PFHpA, and PFDA concentrations), iron and manganese, and 1,4-dioxane. The upgrades will expand the existing seasonal PFAS system and restore the facilities' full permitted capacity, which is equal to one-third of HWS total capacity. The project will include well replacement for the Hyannisport and Simmons Pond wells, booster pump station upgrades, stormwater management and grading work, and the construction of a treatment facility with granular activated carbon for PFAS adsorption, greensand filters for removal or iron and manganese, and Ultraviolet Advanced Oxidation Process (UV-AOP) for 1,4-dioxane destruction.

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Review of the MEPA application by the Executive Office of Energy and Environmental Affairs (EEA) is required because the Project meets the threshold for an ENF due to the proposed construction of a new drinking water treatment plant with a capacity of 1,000,000 or more gallons per day (gpd) (301 CMR 11.03(4)(b)4). Additionally, as the Project's limit of disturbance is located within one mile of Environmental Justice (EJ) populations, the Proponent is required to submit an Environmental Impact Report (EIR), in accordance with 301 CMR 11.06(7)(b), in addition to the ENF.

The Proponent submits this Proposed EIR requesting the Secretary allow a Rollover EIR in accordance with 301 CMR 11.06(13), or a Single EIR in accordance with 301 CMR 11.06(8) if any comments submitted during the public comment period require additional consideration.

MITIGATION MEASURES

Measures to mitigate environmental and public health impacts of the Project are summarized in the table below.

Category	Impact	Mitigation Measures	Responsible Party	Schedule for Implementation
Species and Habitats	Harm to threatened or endangered wildlife due to tree clearing and building demolition Reduction in habitat	• Minimize building footprints. • Reseed demolition site land with native plants. • Remove trees only between Oct. 1 – Mar 14. • Demolish buildings only between Oct. 1 – Mar 14.	Consultant Engineer and Contractor	Design and Construction
Wetlands	Sedimentation and erosion entering wetland buffer zones during construction and increased post-construction stormwater runoff due to increased permeable areas	• Sedimentation and erosion control measures as required by the Barnstable Conservation Commission. • Design temporary construction stormwater management. • Relocate proposed infrastructure as far from wetlands as feasible. • Climate resilient stormwater management designs.	Consultant Engineer and Contractor	Design and Construction
500-Year Floodplain	Demolition of buildings within the 500-year floodplain and restoration of the native environment	• Remove buildings within the 500-year floodplain. • Relocate pump stations outside of the 500-year floodplain.	Consultant Engineer	Design
Energy and Green House Gases (GHGs)	Increase GHG emissions	• Energy efficient building envelope • Space heating and cooling • Electric hot water heaters • High efficiency process equipment and SCADA system • Energy efficient interior lighting • Energy efficient exterior lighting • Water conservation fixtures • Building materials	Consultant Engineer and Contractor	Design and Construction

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Category	Impact	Mitigation Measures	Responsible Party	Schedule for Implementation
Water Quality	Improve water quality through the construction of additional treatment	• Do not increase well production over existing treatment capacity until proposed treatment plant is brought online.	Town Operators	Throughout project
Traffic Management	Increased traffic during construction and closure of single lanes of traffic for short-term construction activities within the roadway	• Coordinate with local authorities to plan roadwork for low-traffic time periods. • Utilize Police Officers to manage vehicular and pedestrian traffic during road opening activities.	Contractor	Construction
Short-term Construction Impacts	Noise and air pollution during active construction times	• Only perform daytime work. • Adhere to Massachusetts Anti-Idling Laws. • Adhere to MA Diesel Retrofit Program Requirements. • Adhere to the Town of Barnstable Noise Ordinance.	Contractor	Construction

FINDINGS

The EEA has reviewed the proposed Rollover EIR dated September 2024 associated with the Straightway & Hyannisport Water Treatment Plant. As discussed above, the Project as proposed by the Town of Barnstable Department of Public Works is subject to the EEA's approval. Accordingly, the EEA hereby finds, pursuant to MGL Chapter 30, Section 61, that all practicable and feasible measures will have been taken to avoid or minimize environmental damage from the Project.

_____ _____

Name/Title Date

For the Office of Energy and Environmental Affairs

_____ _____

Name/Title Date

For the Office of Energy and Environmental Affairs

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9.4 DEPARTMENT OF ENERGY RESOURCES

DEPARTMENT OF ENERGY RESOURCES

SECTION 61 FINDING

PURSUANT TO MGL CHAPTER 30, SECTION 61

PROJECT NAME: Straightway & Hyannisport Water Treatment Plant

PROJECT PROPONENT: Town of Barnstable Department of Public Works

PROJECT MUNICIPALITY: Barnstable

PROJECT LOCATION: 228 Straightway and 132 Smith Street

EOEEA NUMBER: N/A

MGL c. 30, s. 61 (Section 61) requires that "[a]ll … authorities of the Commonwealth… review, evaluate, and determine the impact on the natural environment of all works, project or activities conducted by them and … use all practicable means and measures to minimize [their] damage to the environment. … Any determination made by an agency of the Commonwealth shall include a finding describing the environmental impact, if any, of the Project and a finding that all feasible measures have been taken to avoid or minimize said impact." MGL c. 30, s. 62A requires that the finding required by Section 61 "…shall be limited to those matters which are within the scope of the environmental impact report, if any, required [on a project]."

The potential environmental impacts of the Project have been characterized in the Rollover Environmental Impact Report (Rollover EIR) dated September 2024, which is incorporated by reference into the Section 61 Finding.

DESCRIPTION

The Straightway & Hyannisport Water Treatment Facility Improvements Project (Project) will construct new treatment facilities at Barnstable's Hyannis Water System's (HWS) Straightway and Hyannisport Treatment Complexes to treat raw water for elevated levels of PFAS6 (the sum of PFOS, PFOA, PFHxS, PFNA, PFHpA, and PFDA concentrations), iron and manganese, and 1,4-dioxane. The upgrades will expand the existing seasonal PFAS system and restore the facilities' full permitted capacity, which is equal to one-third of HWS total capacity. The project will include well replacement for the Hyannisport and Simmons Pond wells, booster pump station upgrades, stormwater management and grading work, and the construction of a treatment facility with granular activated carbon for PFAS adsorption, greensand filters for removal or iron and manganese, and Ultraviolet Advanced Oxidation Process (UV-AOP) for 1,4-dioxane destruction.

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Review of the MEPA application by the Department of Energy Resources (DOER) is required due to the Green House Gass (GHG) Emissions Analysis mandated for projects that are required to submit an EIR.

MITIGATION MEASURES

Measures to mitigate environmental and public health impacts of the Project are summarized in the table below.

Category	Impact	Mitigation Measures	Responsible Party	Schedule for Implementation
Species and Habitats	Harm to threatened or endangered wildlife due to tree clearing and building demolition Reduction in habitat	• Minimize building footprints. • Reseed demolition site land with native plants. • Remove trees only between Oct. 1 – Mar 14. • Demolish buildings only between Oct. 1 – Mar 14.	Consultant Engineer and Contractor	Design and Construction
Wetlands	Sedimentation and erosion entering wetland buffer zones during construction and increased post-construction stormwater runoff due to increased permeable areas	• Sedimentation and erosion control measures as required by the Barnstable Conservation Commission. • Design temporary construction stormwater management. • Relocate proposed infrastructure as far from wetlands as feasible. • Climate resilient stormwater management designs.	Consultant Engineer and Contractor	Design and Construction
500-Year Floodplain	Demolition of buildings within the 500-year floodplain and restoration of the native environment	• Remove buildings within the 500-year floodplain. • Relocate pump stations outside of the 500-year floodplain.	Consultant Engineer	Design
Energy and Green House Gases (GHGs)	Increase GHG emissions	• Energy efficient building envelope • Space heating and cooling • Electric hot water heaters • High efficiency process equipment and SCADA system • Energy efficient interior lighting • Energy efficient exterior lighting • Water conservation fixtures • Building materials	Consultant Engineer and Contractor	Design and Construction
Water Quality	Improve water quality through the construction of additional treatment	• Do not increase well production over existing treatment capacity until proposed treatment plant is brought online.	Town Operators	Throughout project

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Category	Impact	Mitigation Measures	Responsible Party	Schedule for Implementation
Traffic Management	Increased traffic during construction and closure of single lanes of traffic for short-term construction activities within the roadway	• Coordinate with local authorities to plan roadwork for low-traffic time periods. • Utilize Police Officers to manage vehicular and pedestrian traffic during road opening activities.	Contractor	Construction
Short-term Construction Impacts	Noise and air pollution during active construction times	• Only perform daytime work. • Adhere to Massachusetts Anti-Idling Laws. • Adhere to MA Diesel Retrofit Program Requirements. • Adhere to the Town of Barnstable Noise Ordinance.	Contractor	Construction

FINDINGS

DOER has reviewed the conditions included in the MEPA Certificate for the Rollover EIR dated September 2024 associated with the Straightway & Hyannisport Water Treatment Plant. As discussed above, the Project as proposed by the Town of Barnstable Department of Public Works and is subject to the DOER's approval. Accordingly, the DOER hereby finds pursuant to MGL Chapter 30, Section 61 that all practicable and feasible measures will have been taken to avoid or minimize environmental damage from the Project.

_____ _____

Name/Title Date

For the Department of Energy Resources

_____ _____

Name/Title Date

For the Department of Energy Resources

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9.5 MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

SECTION 61 FINDING

PURSUANT TO MGL CHAPTER 30, SECTION 61

PROJECT NAME: Straightway & Hyannisport Water Treatment Plant

PROJECT PROPONENT: Town of Barnstable Department of Public Works

PROJECT MUNICIPALITY: Barnstable

PROJECT LOCATION: 228 Straightway and 132 Smith Street

EOEEA NUMBER: N/A

MGL c. 30, s. 61 (Section 61) requires that "[a]ll … authorities of the Commonwealth… review, evaluate, and determine the impact on the natural environment of all works, project or activities conducted by them and … use all practicable means and measures to minimize [their] damage to the environment. … Any determination made by an agency of the Commonwealth shall include a finding describing the environmental impact, if any, of the Project and a finding that all feasible measures have been taken to avoid or minimize said impact." MGL c. 30, s. 62A requires that the finding required by Section 61 "…shall be limited to those matters which are within the scope of the environmental impact report, if any, required [on a project]."

The potential environmental impacts of the Project have been characterized in the Rollover Environmental Impact Report (Rollover EIR) dated September 2024, which is incorporated by reference into the Section 61 Finding.

DESCRIPTION

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Review of the MEPA application by the Department of Environmental Protection (MassDEP) is required to obtain the following permits:

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- WS06 – Registration of a Class V UIC Well
- WS20 – Approval to Construct a Source 70 gpm or greater (for Replacement Wells)
- WS25 – Approval of Treatment Facility Modification
- WS29 – Chemical Addition Retrofit of Water System Serving > 3,300 people

MITIGATION MEASURES

Measures to mitigate environmental and public health impacts of the Project are summarized in the table below.

Category	Impact	Mitigation Measures	Responsible Party	Schedule for Implementation
Species and Habitats	Harm to threatened or endangered wildlife due to tree clearing and building demolition Reduction in habitat	• Minimize building footprints. • Reseed demolition site land with native plants. • Remove trees only between Oct. 1 – Mar 14. • Demolish buildings only between Oct. 1 – Mar 14.	Consultant Engineer and Contractor	Design and Construction
Wetlands	Sedimentation and erosion entering wetland buffer zones during construction and increased post-construction stormwater runoff due to increased permeable areas	• Sedimentation and erosion control measures as required by the Barnstable Conservation Commission. • Design temporary construction stormwater management. • Relocate proposed infrastructure as far from wetlands as feasible. • Climate resilient stormwater management designs.	Consultant Engineer and Contractor	Design and Construction
500-Year Floodplain	Demolition of buildings within the 500-year floodplain and restoration of the native environment	• Remove buildings within the 500-year floodplain. • Relocate pump stations outside of the 500-year floodplain.	Consultant Engineer	Design
Energy and Green House Gases (GHGs)	Increase GHG emissions	• Energy efficient building envelope • Space heating and cooling • Electric hot water heaters • High efficiency process equipment and SCADA system • Energy efficient interior lighting • Energy efficient exterior lighting • Water conservation fixtures • Building materials	Consultant Engineer and Contractor	Design and Construction
Water Quality	Improve water quality through the construction of additional treatment	• Do not increase well production over existing treatment capacity until proposed treatment plant is brought online.	Town Operators	Throughout project

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Category	Impact	Mitigation Measures	Responsible Party	Schedule for Implementation
Traffic Management	Increased traffic during construction and closure of single lanes of traffic for short-term construction activities within the roadway	• Coordinate with local authorities to plan roadwork for low-traffic time periods. • Utilize Police Officers to manage vehicular and pedestrian traffic during road opening activities.	Contractor	Construction
Short-term Construction Impacts	Noise and air pollution during active construction times	• Only perform daytime work. • Adhere to Massachusetts Anti-Idling Laws. • Adhere to MA Diesel Retrofit Program Requirements. • Adhere to the Town of Barnstable Noise Ordinance.	Contractor	Construction

FINDINGS

MassDEP has reviewed the conditions included in the MEPA Certificate for the Rollover EIR dated September 2024 associated with the Straightway & Hyannisport Water Treatment Plant. As discussed above, the Project as proposed by the Town of Barnstable Department of Public Works and is subject to the MassDEP's approval. Accordingly, the MassDEP hereby finds pursuant to MGL Chapter 30, Section 61 that all practicable and feasible measures will have been taken to avoid or minimize environmental damage from the Project.

_____ _____

Name/Title Date

For the Department of Energy Resources

_____ _____

Name/Title Date

For the Department of Energy Resources

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10 ENVIRONMENTAL JUSTICE ANALYSIS

10.1 ENVIRONMENTAL JUSTICE POLICY

According to the Massachusetts EEA, the term Environmental Justice (EJ) refers to the principle that all people have a right to be protected from environmental pollution and to live in and enjoy a clean and healthful environment. The EEA has established an EJ Policy (updated June 2021) to "help address the disproportionate share of environmental burdens experienced by lower income people and communities of color" and "ensure their protection from environmental pollution as well as promote community involvement in planning and environmental decision making."

Careful analysis in coordination with the EJ Policy has shown the Project will not adversely affect EJ communities and will provide a public benefit to the EJ communities of the Town of Barnstable by providing high quality drinking water. The Proponent has followed EJ Protocols and best practices to provide outreach and meaningful opportunities for public participation by EJ communities within the Project's designated geographic area (DGA). Refer to Figure 11, Hyannis Water System and EJ Populations for a map depicting the EJ populations and languages spoken near the project site.

10.2 DESIGNATED GEOGRAPHIC AREA

As noted in this EIR, the Project does not exceed any Air thresholds under 301 CMR 11.03(8) nor will the Project generate 150 or more new average daily trips (adt) of diesel vehicle traffic over a duration of 1 year or more. Under both existing and future build conditions, the Project is accessed only by Town staff or contract operators for daily maintenance rounds. It will not generate additional daily vehicle trips. Therefore, the DGA for the Project is a 1-mile radius from the Project.

The EJ Map included as Figure 12 shows a circle denoting the one-mile and five-mile radius around the Project Site and establishes the DGA that will be used as the basis for analyzing potential Project impacts and for public outreach purposes.

MEPA has classified areas of Massachusetts as to whether they meet the criteria of an EJ population by using the United States Census data to determine whether a census block group meets one or more of the following criteria:

- Within a 1-mile radius:
    - The annual median household income is not more than 65% of the statewide annual median household income;
    - Minority groups comprise 40% or more of the population;
    - 25% or more of households lack English language proficiency;

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    - Minority groups comprise 25% or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150% of the statewide annual median household income; or
- Within a 5-mile radius:
    - The Secretary has determined that a particular neighborhood should be designated as an EJ population.

Within one mile of the Project Site, the DGA for the Project, the following EJ populations have been identified:

- Minority (Block Group 4/Census Tract 125.02, Block Group 3/Census Tract 126.02, and Block Group 2/Census Tract 126.01),
- Minority and Income (Block Group 1/Census Tract 126.02, Block Group 4/Census Tract 126.02, Block Group 2/Census Tract 153, Block Group 2/Census Tract 125.02), and
- Minority and English Isolation (Block Group 3/Census Tract 125.02).

Within five miles of the Project Site, the following EJ populations have been identified:

- Minority (Block Group 4/Census Tract 125.02, Block Group 1/ Census Tract 126.01, Block Group 2/Census Tract 126.02, Block Group 1/Census Tract 120.02, Block Group 4/Census Tract 121.01, Block Group 4/Census Tract 121.02, Block Group 2/Census Tract 121.01, Block Group 3/Census Tract 126.02),
- Minority and Income (Block Group 1/Census Tract 153, Block Group 3/Census Tract 153, Block Group 2/Census Tract 153, Block Group 2/Census Tract 125.02, Block Group 4/Census Tract 126.02, Block Group 1/Census Tract 126.02),
- Minority and English Isolation (Block Group 3/Census Tract 125.02,
- Minority, Income, and English Isolation (Block Group 2/Census Tract 126.02), and
- Income (Block Group 1/Census Tract 121.02, Block Group 3/Census Tract 121.02).

Languages spoken by more than 5% of the population within the one- and five-mile radius of the project site include Portuguese or Portuguese Creole at 8.3% and 7.1%, respectively.

10.3 OUTREACH PERFORMED TO-DATE

The Project team met with the MEPA Office and Deputy Director of Environmental Justice on June 6, 2024, to discuss the Project and proposed EJ outreach efforts.

The Proponent circulated the EJ Screening Form (see Appendix H, EJ Screening Form and Distribution List) on July 1, 2024, to the EJ Distribution List provided by EEA as well as to several local CBOs serving these populations. To ensure consistency with the EJ Involvement Protocol, the Proponent reviewed U.S. Census Bureau's 2015 American Community Survey (ACS) data to identify EJ populations having a population with five percent or more of the EJ population having been identified as not speaking English "very well" within

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the DGA. Portuguese was identified by the U.S. Census Bureau's 2015 ACS data as spoken by 5% or more of the population. Therefore, the EJ Screening Form was translated into Portuguese and distributed as well. The form was also translated into Spanish, since Spanish is the second-most common language.

The EJ Screening Form included contact information to allow interested parties to request a meeting. No parties, including those that received the EJ Screening Form, requested a meeting, however, the Proponent made the decision to hold an informational meeting regardless so the public could learn more, ask questions, and give feedback about the Project. Notices for the meeting were distributed widely to over 4,000 properties within the 1-mile DGA as well as to the EJ Distribution List and to the additional local CBOs.

The informational meeting was held on August 6, 2024. It included Portuguese and Spanish language translators. Slides of the meeting were posted to the Town's website.

The Project will continue to go through the local zoning and planning approval processes during which additional public meetings will be held to discuss the Project. Additionally, the Proponent will continue to include the EJ Distribution List provided by the MEPA EJ office on all future correspondence and MEPA submittals.

10.4 ENHANCED ANALYSIS OVERVIEW

The EJ Analysis Protocol applies to "any project that is likely to cause damage to the environment and is located within a distance of one mile of an EJ population; provided, that for a project that impacts air quality, such environmental impact report shall be required if the Project is likely to cause damage to the environment and is located within a distance of five miles of an environmental justice population.
Under the EJ Analysis Protocol, the analysis must include:

- An assessment of existing unfair or inequitable environmental burdens on the EJ population.
- An assessment of the Project's impacts to determine disproportionate adverse effect (if existing unfair or inequitable environmental burdens exist) on the EJ population.
- An analysis of the Project to determine Climate Change Effects (if existing unfair or inequitable environmental burdens exist).
- Mitigation and Section 61 Findings (if the Project impacts cause a disproportionate adverse effect or Climate Change Effects on the EJ population).

As described below, the Project is not anticipated to have a disproportionate adverse effect on nearby EJ populations or have climate change effects that would impact nearby EJ populations.

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10.4.1 Vulnerable Health Criteria

The vulnerable health EJ criteria are four environmentally related health indicators to identify populations with evidence of higher-than-average rates of environmentally related health outcomes. Multiple terms are used to describe the vulnerable health EJ criteria as it relates to the EJ populations. These terms are defined and described below.

The vulnerable health EJ criteria are reported for a population in a specific area. The area can be a state, town, or census tract. Census tracts are small, relatively permanent areas of land with a population typically between 1,200 and 8,000 people.

Health criteria are reported as rates, or the number of people with the identified condition divided by the population in consideration. The Massachusetts Department of Public Health (MA DPH) EJ tool compares the community rate, or the town or census tract of interest, to the statewide rate, or the rate for the population of Massachusetts. Two rate types are used: crude rate and age-adjusted rate. The crude rate is the rate calculated as number of individuals with a condition divided by the entire population. The age-adjusted rate is statistically modified to consider how different age groups have different rates of prevalence, as in the case of heart attack rate.

Rates are also classified as stable or unstable. Unstable rates occur when there are too few cases in a community for a rate to be considered reliable, such that the addition or deletion of a small number of cases would lead to a large change in the rate. Stable rates are the opposite: there are enough cases in a population so that the rate will not fluctuate dramatically. A confidence interval refers to the minimum and maximum value such that the actual rate has a 95% chance of occurring between the calculated range. In other words, the specified rate has a high likelihood to be included in the range of values. The confidence interval is helpful to determine if a rate for a community is much higher than the statewide rate and not due to chance. A case count refers to the number of surveyed individuals that had the condition of interest. For example, if out of 40 children screened for blood lead levels, 1 child had elevated levels, the case count would be equal to 1.

As described above, the first step is to determine whether EJ populations within the DGA have experienced higher rates of four different vulnerable health criteria when compared to the statewide rate. Specifically, the guidance states the following:

First, Proponents should consult the MA DPH EJ Tool to identify whether any municipality or census tract that includes any of the identified EJ populations exhibits any of four “vulnerable health EJ criteria.” Such criteria are environmentally related health indicators that are measured to be 110% above statewide rates based on a five-year rolling average. Any EJ population that exists within those municipalities or census tracts could then be viewed as exhibiting “vulnerable health EJ criteria,” and therefore potentially bearing an “unfair or inequitable” environmental burden and related public health consequences. The Proponent

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is encouraged to conduct its own research into localized sources of data that may show additional public health vulnerabilities of the identified EJ population.

The MA DPH EJ tool provides information on four different vulnerable health criteria: heart attack hospitalizations, childhood blood lead exposure, low birth weight, and childhood asthma for the most recent five-year period of available data. It should be noted that each of these datasets are available at different geographies, heart attack hospitalizations and childhood asthma are available at the community level, while low birth weight and childhood blood lead exposure are available at the census tract level. Each of these specific criteria are described below along with the results of the analysis for the designated geographic area.

Heart Attack Hospitalizations

As described on the MA DPH website, heart attack hospitalization is a criterion used to identify vulnerable health EJ populations. Exposure to air pollution can increase the risk for heart attack and other forms of heart disease, and it is indicative of a serious chronic illness that can lead to disability, decreased quality of life and premature death. People living in EJ areas have higher than average heart attack hospitalization rates when compared to other communities.

Heart attack hospitalization data is based on data collected from all hospitals in Massachusetts and reflects individuals greater than 35 years of age who have been admitted to the hospital for a heart attack. The vulnerable health criterion for Heart Attack Hospitalizations is the most recent five-year average age-adjusted rate of hospitalization for myocardial infarction that is equal to or greater than 100% of the state rate. This indicator is available on a community basis.

Heart Attack Vulnerable Health Criteria for the Project

As described above, heart attack data is available at the community level. Analysis of this indicator for the Town of Barnstable found that the heart attack rate is 26 per 10,000 individuals. This is less than 110% of the state-wide heart attack rate of 29 per 10,000. The heart attack rate for the Town of Barnstable is considered stable and statistically lower than the statewide level. **Therefore, the Town of Barnstable, at the community level, does not meet the Vulnerable Health Criteria for heart attack rate**.

Childhood Blood Lead Levels

As described on the MA DPH website, childhood lead exposure is a criterion used to identify vulnerable health EJ populations because lead exposure disproportionately impacts lower income communities and communities of color, and childhood exposure to relatively low levels can cause severe and irreversible health effects, including damage to a child's mental and physical development.

Childhood Blood Lead Level data is based on data collected as part of the Massachusetts Lead Poisoning Prevention and Control Act, which is a state law that requires all children to be screened each year for

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lead poisoning through age three and children in high-risk communities must be screened through age four. The vulnerable health criterion for Childhood Blood Lead Level is the five-year average prevalence of elevated (≥5 ug/dL estimated confirmed) childhood blood lead levels (ages 9-47 months) that is equal to or greater than 110% of the state prevalence. This indicator is available at the community and census tract levels.

Childhood Blood Lead Levels Vulnerable Heath Criteria for the Project

As described above, the childhood blood lead level indicator is available for individual census tracts as well as at the community level. 110% of the state-wide rate for childhood blood lead levels between 2016-2020 was 16 per 1,000 individuals. At the community level, the Town of Barnstable's blood lead level rate of 5 cases per 1,000 is less than 110% of the state-wide rate. This indicator was further examined for the census tract within the DGA. In the three Census Tracts with EJ block groups within the DGA, no cases were reported from 2016-2020.

The Town of Barnstable, at the community level, does not meet the Vulnerable Health Criteria for childhood blood lead levels.

Low Birth Weight

As described on the MA DPH website, low birth weight (LBW) is a criterion used to identify vulnerable health EJ populations because exposure to environmental contaminants can increase the risk of delivering a LBW baby and LBW is a significant predictor of maternal and infant health. Women of color and women of low income have a higher risk of delivering a LBW baby. LBW can increase the risk of infant mortality and morbidity, health problems throughout childhood, developing cognitive disorders, developmental delay and chronic diseases as an adult, such as cardiovascular diseases and type 2 diabetes.

LBW data are collected by the Registry of Vital Records and Statistics. Medical data, such as birth weight and gestational age, are based on information supplied by hospitals and birthing facilities. The vulnerable health criterion for LBW is the five-year average low birth weight rate among full-term births that is equal to or greater than 110% of the state-wide rate. This indicator is available at both the community and census tract level.

Low Birth Weight Vulnerable Health Criteria for the Project

As described above, the LBW indicator is available at the community and census level. 110% of the state-wide rate for low birth weight was 239 per 1,000 individuals between 2011-2015. The Town of Barnstable's community-level rate is 206 per 1,000, which is below 110% of the state-wide rate. The LBW rate for the Town of Barnstable is considered unstable, meaning there are not enough cases to be considered reliable.

The Town of Barnstable does not meet the Vulnerable Health Criteria for low birth weight.

This indicator was further examined in the census tracts containing EJ block groups within the DGA.

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None of the Census Tracts reported any LBW cases between 2011-2015. This census track rate is considered unstable due to the small number of raw, case count numbers. In addition, it is not statistically significantly different than the state-wide average. Based on this information, the EJ population within the DGA does not meet the vulnerable health criteria for low birth weight.

Childhood Asthma

As described on the MA DPH website, childhood asthma is a criterion used to identify vulnerable health EJ populations because people of color and low-income individuals are at greater risk for asthma exacerbations due to increased exposure to asthma triggers. Uncontrolled asthma can impact an individual's overall health and wellbeing. For example, uncontrolled asthma can reduce activity levels, negatively impact cardiovascular fitness, and increase school absenteeism.

Childhood asthma data are based on data collected from all hospitals in Massachusetts and reflect children between the ages of 5 and 14 years of age that have visited an emergency room for treatment for asthma. The vulnerable health criterion for childhood asthma is the five-year average rate of emergency department visits for childhood (5-14 years) asthma that is equal to or greater than 110% of the state rate. This indicator is available at the community, or town-wide, level.

Childhood Asthma Vulnerable Heath Criteria for the Project

As described above, the childhood asthma indicator is available on a community level. The childhood asthma rate for the Town of Barnstable is 68 per 10,000 individuals. This rate is less than 110% of the state-wide childhood asthma rate of 73 per 10,000.

The Town of Barnstable, at the community level, does not meet the Vulnerable Health Criteria for childhood asthma.

Vulnerable Health Criteria Summary

Based on the information described above, the Town of Barnstable does not meet any of the vulnerable health criteria. Based on the descriptions provided above, the EJ communities in the DGA are not considered vulnerable and are not subject to existing environmental burdens.

10.4.2 Potential Sources of Pollution

As described in the EJ Analysis Protocol, the next step of the existing environmental burden analysis focuses on other potential sources of pollution within the boundaries of the EJ population.

Specifically, the MEPA Protocol provides the following description of the requirements for this analysis:

- Second, the Proponent should consult additional data layers in the MA DPH EJ Tool to survey other potential sources of pollution within the boundaries of the EJ population. While comparisons to statewide averages are not presently available in the DPH EJ Tool, the Proponent should provide a narrative description of the estimated number and type of mapped

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facilities/infrastructure in the area, and survey enforcement histories of any facilities permitted by MassDEP.

Available mapping layers in the MA DPH EJ Tool include the following:

- MassDEP major air and waste facilities
- M.G.L. c. 21E sites
- "Tier II" toxics use reporting facilities
- MassDEP sites with AULs
- MassDEP groundwater discharge permits
- Wastewater treatment plants
- MassDEP public water suppliers
- Underground storage tanks
- EPA facilities
- Road infrastructure
- Massachusetts Bay Transportation Agency (MBTA) bus and rapid transit
- Other transportation infrastructure
- Regional transit agencies
- Energy generation and supply

Analysis of each of these layers in the MA DPH EJ Tool indicates the following:

MassDEP Major Air and Waste Facilities

MassDEP major air and waste facilities are facilities that have air operating permits, treat, store, generate or recycle large quantities of hazardous waste or utilize large quantities of toxics. These facilities are further specified in the following sections and include airports; facilities with air permits; draft National Pollutant Discharge Elimination System (NPDES) permits; hazardous waste, treatment, storage, recycling, or disposal facilities; large quantity generators; large quantity toxics users; land disposal of solid waste; and toxics release inventory sites.

The Project will not impact these air facilities in a manner that adversely impacts EJ populations within the DGA.

	Facility Name	Address	Community
	PREMIER MAZDA	141 STEVENS ST	HYANNIS
	VOLVO CARS CAPE COD	270 NORTH ST	HYANNIS

M.G.L. c. 21E Sites

21E Sites are sites that have experienced a release of a hazardous material above a certain threshold. Once a release is reported to MassDEP, it must be cleaned up within a year or it is classified as Tier I, Tier

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ID, or Tier II. A Tier I site poses an immediate hazard, a Tier 1D site has not yet posed a permanent solution or final classification of the site, while a Tier II site does not meet the criteria for an immediate hazard.

There is one 21E site within a one-mile radius of the Project Site; the 21E site is classified as a Tier 1D site. **The Project will not impact the 21E site in a manner that adversely impacts EJ populations within the DGA.**

OBJECTID	RTN	Name
17	4-0024076	RESIDENCE

Tier II Toxic Facilities

A facility is required to submit a Tier II report to emergency response agencies if it uses over a certain threshold of hazardous chemicals during a calendar year. The purpose of Tier II reports is to help facilitate emergency response in the event the fire department would need to respond to an emergency at the facility.

There are five (5) Tier II facilities located within one mile of the Project Site, two of which are part of the Project, the existing Straightway Treatment Facility and the existing Hyannisport Treatment Facility. All necessary precautions will be taken throughout the Project to ensure proper facilitation of emergency response. **The Project will not impact the other three (3) Tier II facilities in a manner that adversely impacts EJ populations within the DGA.**

MassDEP Sites with AULs

An Activity Use Limitation (AUL) provides notice of the presence of oil and/or hazardous material contamination remaining at a location after a cleanup has been conducted pursuant to Chapter 21E and the Massachusetts Contingency Plan (MCP) (40 CFR 30.0000). An AUL is a legal document that identifies activities and uses of the property that may and may not occur, as well as the property owner's obligation and maintenance conditions that must be followed to ensure the safe use of the property.

There is one (1) facility with AULs located within one mile of the Project Site. **The Project will not impact these AULs in a manner that adversely impacts EJ within the DGA.**

RTN	Name	Address
4-0001301	EXXON STATION 3 5751	484 SOUTH ST

MassDEP Groundwater Discharge Permits

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This dataset contains the locations of permitted discharges of groundwater. This includes discharges from: Sanitary sewage more than 10,000 gpd, coin operated laundromats, car washes, industrial facilities, and reclaimed water (used in cooling towers and other closed-loop systems, no actual discharge).

There are five facilities with MassDEP Groundwater Discharge Permits identified within one mile of the Project Site. **The Project will not impact these facilities in a manner that adversely impacts EJ populations within the DGA.**

Wastewater Treatment Plants

The MA DPH tool provides information on facilities that have received NPDES permit coverage. The NPDES permitting program is for facilities that discharge point-source stormwater to surface water.

There are no facilities located within one mile of the Project Site that hold a draft or final NPDES permit.

MassDEP Public Water Suppliers

This dataset contains locations of public community surface and groundwater supply sources based on data available in the DEP's Water Quality Testing System database for tracking water supply data. A community water system refers to a public water system that services at least 25 year-round residents.

The Proponent is considered a Public Water Supplier. **The Proponent is the only Public Water Supplier located within the DGA.**

Underground Storage Tanks

MassDEP regulates the registration, installation, operation, maintenance, inspection, and closure of petroleum fuel and hazardous substance-containing underground storage tank (UST) systems.

As part of the UST program, there are five USTs located within the DGA. **The Project does not propose to maintain an underground storage tank as a part of this Project.**

FACILITY ID	FACILITY NAME	ADDRESS
398780	ER&C ENT LLC DBA WEST MAIN GAS	577 WEST MAIN ST
388406	JAYKOURA ENTERPRISES INC	125 WEST MAIN ST
137318	CUMBERLAND FARMS INC	395 WEST MAIN ST
397060	NORTH STREET AUTOMOTIVE INC	228-240 NORTH ST
392310	DRAKE PETROLEUM CO INC DBA XTRA MART	326 WEST MAIN ST

EPA Facilities

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EPA facilities are defined as Toxic Release Inventory (TRI) facilities. TRI facilities use and/or release over a certain threshold of toxic chemicals to the environment. There are 777 individual chemicals and 33 chemical categories covered by the TRI program. **There are no facilities that are mapped as a TRI facility within the DGA.**

Road Infrastructure

Road infrastructure includes one MassDOT road. **There are no roadways under MassDOT's jurisdiction within the DGA.**

MBTA Bus and Rapid Transit

MBTA data includes all MBTA bus routes, stops, commuter rails, commuter rail stations, parking lots, and rapid transit stops. **There are no MBTA facilities within the DGA.**

Other Transportation Infrastructure

Other transportation infrastructure includes airports, freight yards, water taxis, railroad tracks, and ferry routes. There are no freight yards, water taxis, ferry routes, railroad tracks, or airports within one mile of the Project Site.

Regional Transit Agencies

There are five stops on the Cape Cod Regional Transit Agency (RTA) in the DGA. None of these will be impacted by the proposed project.

Energy Generation and Supply

The Energy Generation and Supply layer includes nuclear power plants, power plants, and transmission lines from MassGIS and the United States Geological Survey (USGS) databases. **There are no energy generation and supply facilities within one mile of the Project Site.**

10.4.3 Climate Adaptation (RMAT)

The RMAT Tool provides the proposed Project with information about sea level rise/storm surge, heat, and extreme precipitation impacts.

In accordance with EEA regulations, Proponents should consult the standard output report generated from the RMAT tool, which is required as an attachment to the ENF/EENF. Proponents should identify in the EIR whether the RMAT Tool indicates a "High" risk rating for sea level rise/storm surge or extreme precipitation (urban or riverine flooding) as applied to the Project location. A "High" risk rating for these parameters could be an indicator of elevated climate risks for EJ populations that immediately surround the project site (meaning all EJ populations located in whole or in part within the project boundaries). The risk rating for the "extreme heat" parameter should not be used as a definitive indicator of elevated climate risks.

Separate RMAT reports were generated for the Straightway and Hyannisport Complexes, since the locations differ due to the significant distance (~2000 feet) and elevation (~20 feet) between the sites. See Appendix G, RMAT Report. These differences led to slight changes in the risk factors for each site. The

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risk factors rated as “High” identified for the Project were sea level rise/storm surge and flooding caused by extreme precipitation.

Only the Hyannisport Complex was found to be at high risk due to sea level rise/storm surge. Design considerations incorporated RMAT recommendations, resulting in the construction of the proposed wells and pump stations at an elevation of 18 feet above mean sea level.

Both the Straightway and Hyannisport Complexes were found to be at high risk of flooding due to extreme precipitation. As a result, the stormwater management systems are designed to follow recommendations generated by the RMAT tool, to the extent practicable.

Refer to Appendix G for the RMAT Tool Report.

10.5 ENVIRONMENTAL JUSTICE POPULATION IMPACTS – ANALYSIS OF PROJECT IMPACTS TO DETERMINE DISPROPORTIONATE ADVERSE EFFECTS

A proponent is asked to describe the Nature and Severity of all short-term and long-term Project impacts and both magnitude and duration. The text below shows the section of the Protocol with detailed information.

- A proponent should analyze whether the nature and severity of project impacts will materially exacerbate any existing unfair or inequitable environmental or public health burden impacting the EJ population. In assessing severity of an impact, a proponent should consider both magnitude and duration.

In addition, while MEPA review thresholds at 301 CMR 11.03 provide a guide for a discussion of impacts, a proponent shall not limit the discussion to impacts that meet or exceed MEPA review thresholds, and, instead, shall address all short-term and long-term impacts associated with the proposed project, including construction period activities.

10.5.1 Public Health Impacts

All Public Health impacts of the Project listed in Section 6.2, Public Health Impacts, have the potential to affect EJ populations. EJ populations will benefit from a water system with increased quality and reliability, they may experience small traffic impacts for short-term project work within the roadway, and they may experience low levels of increased noise or air pollution during project construction. The project will mitigate all of these impacts to the extent possible with the public health mitigation measures listed in Section 8.2, Public Health Impact Mitigation.

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10.5.2 Comparative Impact on EJ versus non-EJ Populations

The MEPA protocol specifies that a comparison between EJ and Non-EJ Populations should be drawn to quantify adverse and disproportionate impacts. In reviewing adverse impacts on the EJ population, a proponent should also analyze whether the impacts on the EJ population are greater or less than those on non-EJ populations. The purpose of this analysis is to assess whether the proposed project is adding impacts to an already burdened area in a "targeted" way that is disproportionate when compared to non-EJ populations. While a proponent should generally compare EJ and non-EJ populations within the project site, a comparable area outside the project site could be chosen—for instance, if the EJ population itself is located outside the boundaries of the project site (but within the Project's designated geographic area) or if the Project is located entirely within an EJ population such that a comparison with non-EJ populations within the project site is not possible. In some cases, it may be appropriate to compare similar prior projects undertaken by the Proponent in non-EJ populations to explain why the area containing the EJ population was chosen for the Project at hand and whether alternative locations outside the EJ population were considered. If a comparable area is selected outside the project site, a proponent should provide a clear justification for why the area is viewed to be "comparable" or "similarly situated" such that a comparison with the applicable EJ population is reasonable. A proponent should conclude that the Project will have a disproportionate adverse effect on the EJ population, if the adverse impacts of the Project are materially greater on EJ populations than on non-EJ populations in the comparison area. If so, a proponent must provide an explanation of whether the Proponent has considered practical alternatives to reduce or mitigate the impacts on EJ populations, and if so, what, if any, of such alternatives or mitigation were incorporated into the Project.

The proposed Project does not result in targeted disproportionate effects to the EJ block groups within the DGA. When compared to the non-EJ communities in the surrounding area – an appropriate comparable population due to proximity, geography, and shared infrastructure – it is seen that:

- Pollution: While there are several existing MassDEP-regulated facilities in the EJ areas, these facilities are compliant with regulations, do not present a risk, and do not occur in numbers that indicate a targeted approach to locating such facilities. Refer to Section 10.4.2, Potential Sources of Pollution for additional details.
- Traffic: The project is located off Straightway and Smith Street. Both streets are two-lane roadways in residential areas. Due to the residential nature of the local area, the traffic is expected to be low. The project does not exceed any MEPA review thresholds for traffic generation, nor does it require any state permits related to state-controlled roadways. In the short term, local communities, including EJ communities, may see small traffic disturbances and noise associated with construction related activities. To minimize disruption to the residents and the users of the municipal right-of-way during road opening activities, the proponent will comply with the Town of Barnstable noise ordinance and coordinate with the Town of Barnstable Police Department to manage vehicular and pedestrian traffic during road opening activities.

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- Stormwater: While the Project will increase stormwater runoff by increasing the impervious area, it is not expected to impact local populations. At present, existing stormwater infrastructure at both Complexes is minimal. Rainfall that is not captured by existing stormwater infrastructure flows overland to low-lying areas. The proposed project will greatly increase the capacity of the stormwater management systems to adhere to recommendations generated by the RMAT tool that account for rainfall events of increased severity expected as a result of climate change.
- Noise: Noise impacts of the Project are not expected to have a disproportionate impact on EJ populations as the project site borders both EJ and non-EJ populations and all populations will be subject to similar levels of construction noise.

10.6 PROJECT BENEFIT & ENVIRONMENTAL BENEFITS

Project proponents also must consider the benefits that a proposed project would bring to the EJ population, as described below.

In addition to analyzing adverse impacts, a proponent should analyze any project benefits that improve environmental conditions or the public health of the EJ population, or otherwise reduce the potential for unfair or inequitable effects on the EJ population. Emphasis should be given to project benefits that are intended to reduce any existing environmental burdens or public health consequences or intended to mitigate project impacts that specifically affect the identified EJ populations. A proponent should also analyze whether the project will provide "Environmental Benefits" for the identified EJ population, so as to result in a more equitable distribution of energy and environmental benefits and environmental burdens in accordance with "Environmental Justice Principles", as defined in 301 CMR 11.02.

The Project is not expected to directly or indirectly cause damage to the environment which would affect the identified EJ populations. There will be temporary impacts associated with construction including construction traffic and noise. The Project does not exceed any MEPA thresholds for a mandatory EIR, relative to the thresholds for wastewater (301 CMR 11.03(5)), air emissions (11.03(8)), and solid and hazardous waste (11.03(9)).

The Project is expected to provide benefits to the EJ populations located within one mile of the Project Site. As discussed in Section 1.3, the Project will improve the reliability, water quality, and resiliency of the Town of Barnstable's HWS. The system is critical to the public health of a year-round population, including EJ populations.

Analysis of Project Impacts to Determine Climate Change Effects

The EJ Analysis Protocol specifies the following analysis should take place in relation to whether the Project will exacerbate the effects of climate change on the EJ populations. The text from the Protocol is included below.

Unless the assessment in Part II shows the absence of any "unfair or inequitable" environmental burden or related public health consequence borne by the identified EJ population as compared to the general population, a proponent must further analyze, in addition to the analysis in Part III if applicable, whether the proposed project will increase or reduce the effects of climate change on the EJ population. In conducting this assessment, a proponent should consider the following:

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- Whether the Project is likely to exacerbate the climate risks shown in the RMAT tool in a manner that affects the identified EJ population; and
- Whether the GHG emissions associated with the Project are likely to affect EJ populations that use or occupy the Project

The Project is expected to have overall positive environmental and public health impacts. Short-term disruptions of traffic, noise, and work within wetlands boundaries are expected to lead to the long-term positive result of a clean, reliable drinking water system that is more resilient to projected climate risks. Refer to the GHG Analysis in Appendix K for more information.

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Figure 1 - Site Location



Figure 2 - Site Plan



Figure 3 - Project Area Land Use





Straightway Complex



Straightway Complex, Existing GAC Filters



Straightway Complex, Existing Straightway Treatment Facility



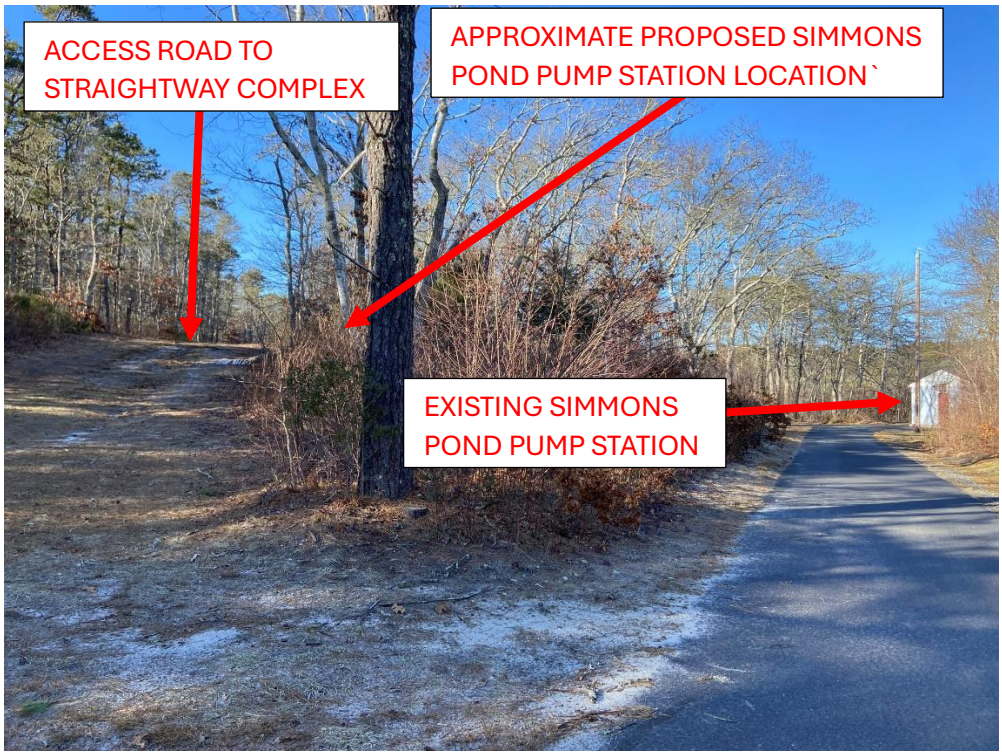
Hyanisport Complex, Hyannisport Existing Treatment Facility



Hyannisport Complex, Existing Simmons Pond Pump Station

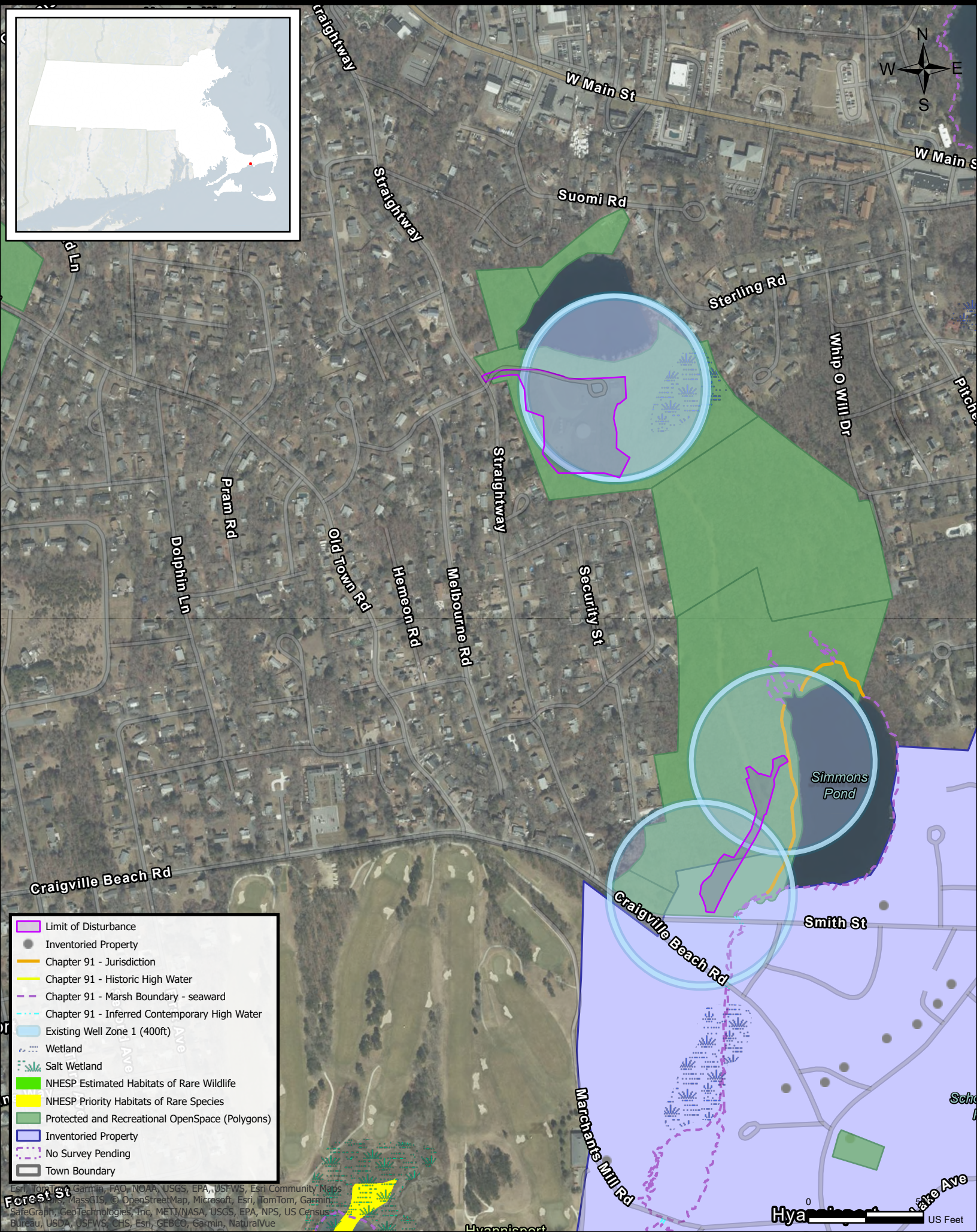


Hyannisport Complex, Existing Hyannisport Treatment Facility

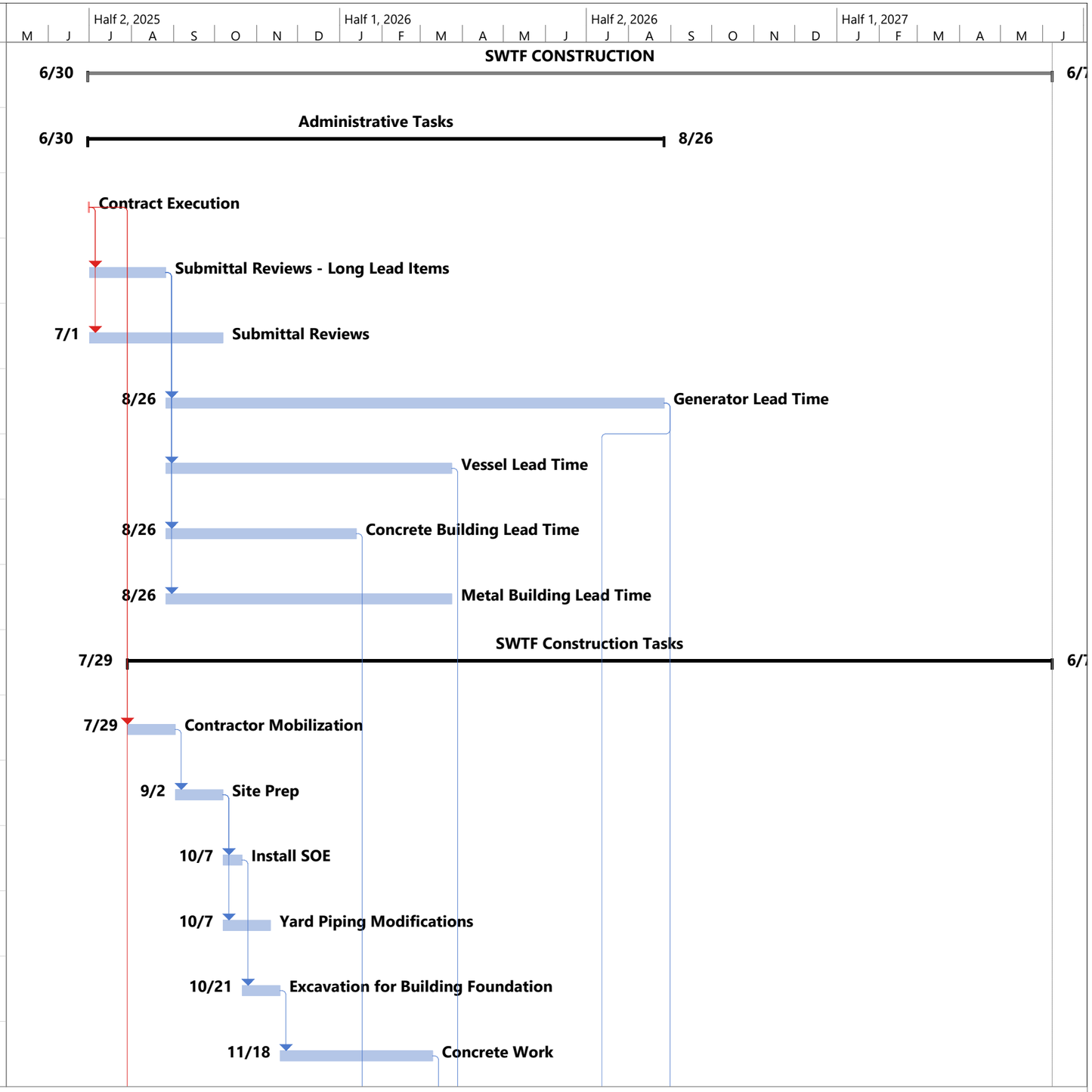


Hyannisport Complex, Existing Simmons Pond Pump Station

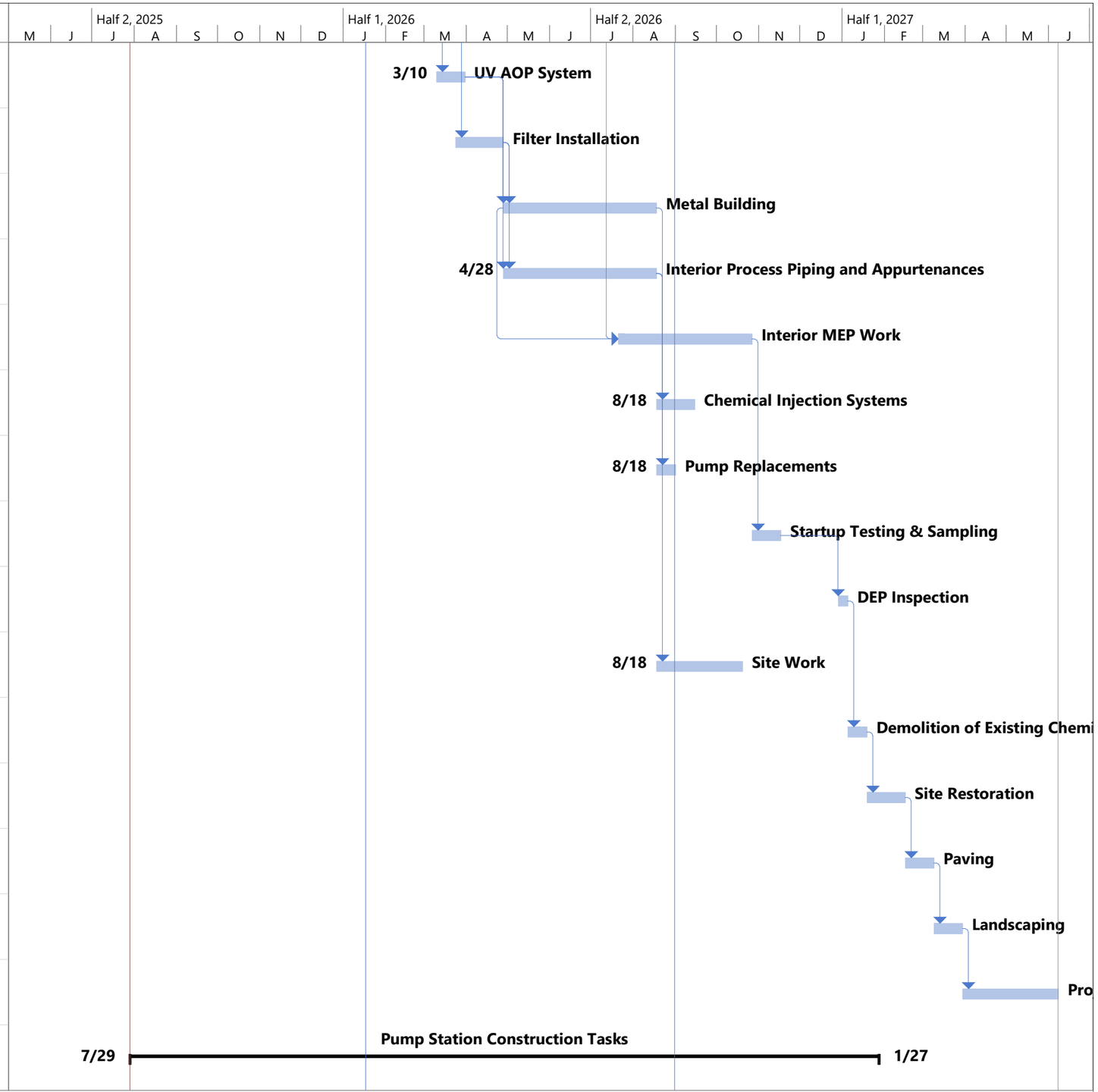
Figure 5 - Environmental Constraints



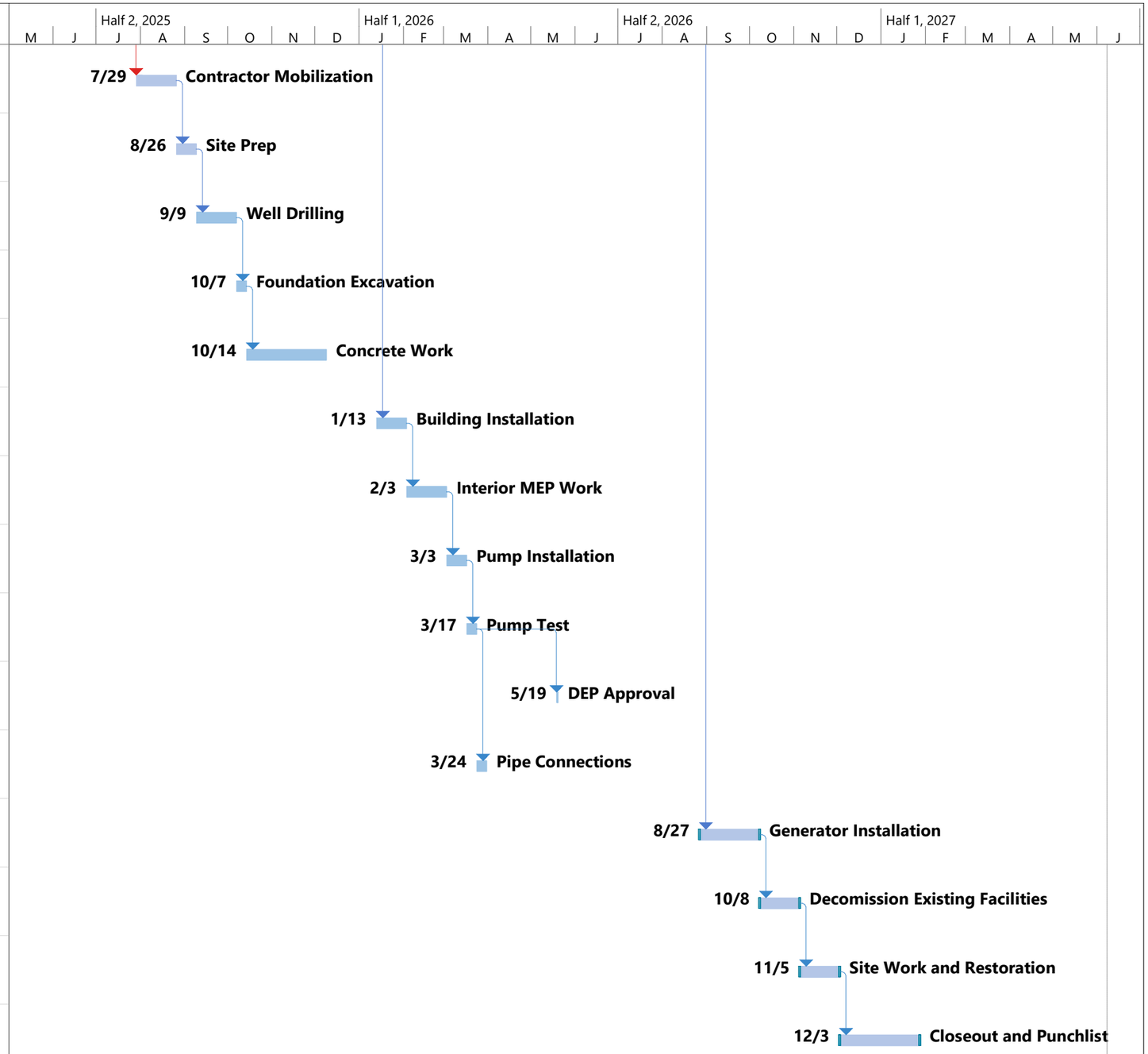
ID	Name	Start	Finish	Duration
0	**SWTF CONSTRUCTION**	**Mon 6/30/25**	**Mon 6/7/27**	**506 days**
1	**Administrative Tasks**	**Mon 6/30/25**	**Wed 8/26/26**	**303 days**
2	Contract Execution	Mon 6/30/25	Mon 6/30/25	1 day
3	Submittal Reviews - Long Lead Items	Tue 7/1/25	Mon 8/25/25	40 days
4	Submittal Reviews	Tue 7/1/25	Mon 10/6/25	70 days
5	Generator Lead Time	Tue 8/26/25	Wed 8/26/26	262 days
6	Vessel Lead Time	Tue 8/26/25	Mon 3/23/26	150 days
7	Concrete Building Lead Time	Tue 8/26/25	Mon 1/12/26	100 days
8	Metal Building Lead Time	Tue 8/26/25	Mon 3/23/26	150 days
9	**SWTF Construction Tasks**	**Tue 7/29/25**	**Mon 6/7/27**	**485 days**
10	Contractor Mobilization	Tue 7/29/25	Mon 9/1/25	25 days
11	Site Prep	Tue 9/2/25	Mon 10/6/25	25 days
12	Install SOE	Tue 10/7/25	Mon 10/20/25	10 days
13	Yard Piping Modifications	Tue 10/7/25	Mon 11/10/25	25 days
14	Excavation for Building Foundation	Tue 10/21/25	Mon 11/17/25	20 days
15	Concrete Work	Tue 11/18/25	Mon 3/9/26	80 days



ID	Name	Start	Finish	Duration
16	UV AOP System	Tue 3/10/26	Mon 3/30/26	15 days
17	Filter Installation	Tue 3/24/26	Mon 4/27/26	25 days
18	Metal Building	Tue 4/28/26	Mon 8/17/26	80 days
19	Interior Process Piping and Appurtenances	Tue 4/28/26	Mon 8/17/26	80 days
20	Interior MEP Work	Tue 7/21/26	Mon 10/26/26	70 days
21	Chemical Injection Systems	Tue 8/18/26	Mon 9/14/26	20 days
22	Pump Replacements	Tue 8/18/26	Mon 8/31/26	10 days
23	Startup Testing & Sampling	Tue 10/27/26	Mon 11/16/26	15 days
24	DEP Inspection	Tue 12/29/26	Mon 1/4/27	5 days
25	Site Work	Tue 8/18/26	Mon 10/19/26	45 days
26	Demolition of Existing Chemical Treatment	Tue 1/5/27	Mon 1/18/27	10 days
27	Site Restoration	Tue 1/19/27	Mon 2/15/27	20 days
28	Paving	Tue 2/16/27	Mon 3/8/27	15 days
29	Landscaping	Tue 3/9/27	Mon 3/29/27	15 days
30	Project Closeout & Punchlist Items	Tue 3/30/27	Mon 6/7/27	50 days
31	**Pump Station Construction Tasks**	**Tue 7/29/25**	**Wed 1/27/27**	**392 days**



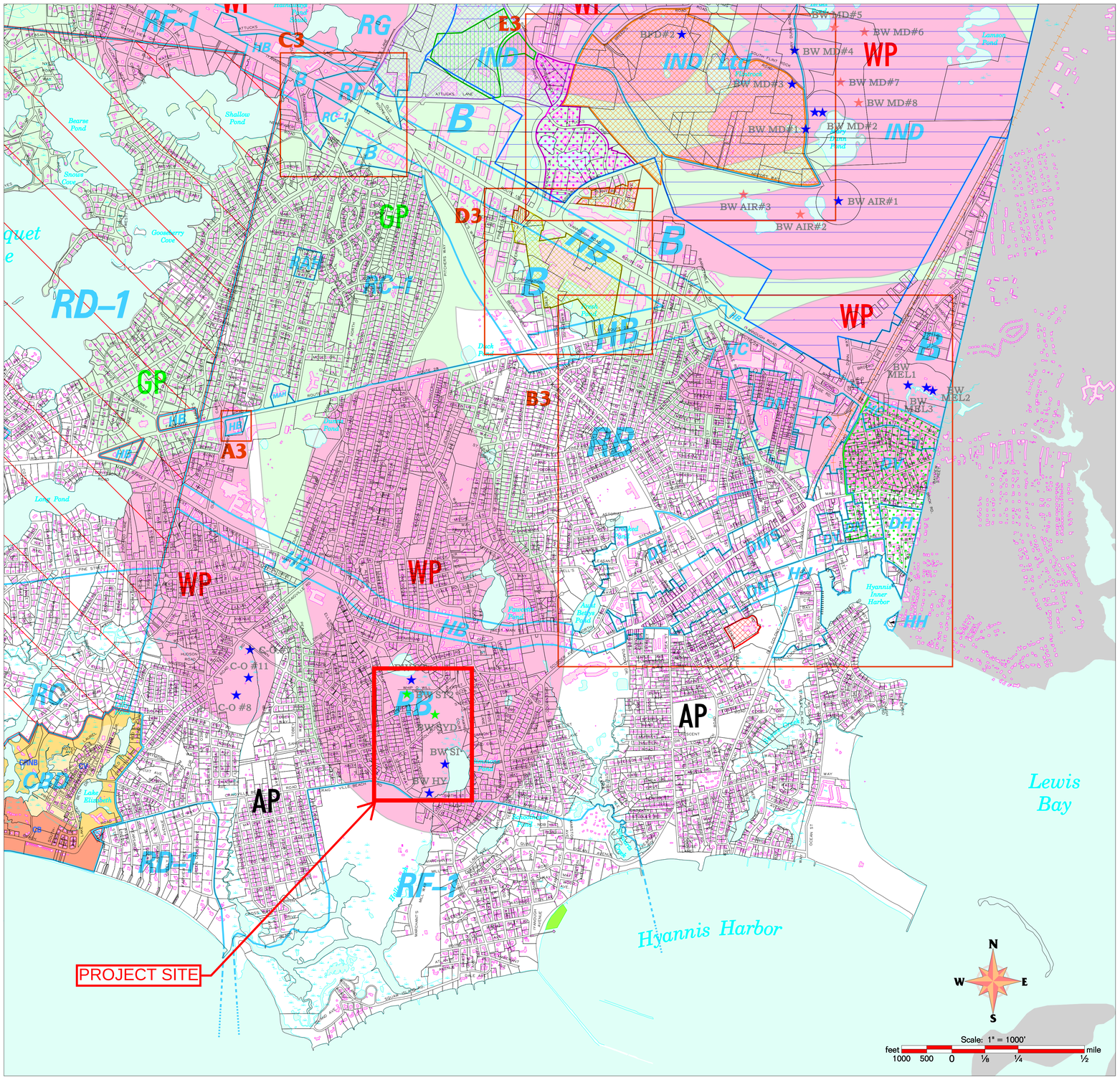
ID	Name	Start	Finish	Duration
32	Contractor Mobilization	Tue 7/29/25	Mon 8/25/25	20 days
33	Site Prep	Tue 8/26/25	Mon 9/8/25	10 days
34	Well Drilling	Tue 9/9/25	Mon 10/6/25	20 days
35	Foundation Excavation	Tue 10/7/25	Mon 10/13/25	5 days
36	Concrete Work	Tue 10/14/25	Mon 12/8/25	40 days
37	Building Installation	Tue 1/13/26	Mon 2/2/26	15 days
38	Interior MEP Work	Tue 2/3/26	Mon 3/2/26	20 days
39	Pump Installation	Tue 3/3/26	Mon 3/16/26	10 days
40	Pump Test	Tue 3/17/26	Mon 3/23/26	5 days
41	DEP Approval	Tue 5/19/26	Tue 5/19/26	1 day
42	Pipe Connections	Tue 3/24/26	Mon 3/30/26	5 days
43	Generator Installation	Thu 8/27/26	Wed 10/7/26	30 days
44	Decomission Existing Facilities	Thu 10/8/26	Wed 11/4/26	20 days
45	Site Work and Restoration	Thu 11/5/26	Wed 12/2/26	20 days
46	Closeout and Punchlist	Thu 12/3/26	Wed 1/27/27	40 days



ZONING MAP of the TOWN OF BARNSTABLE, MASSACHUSETTS

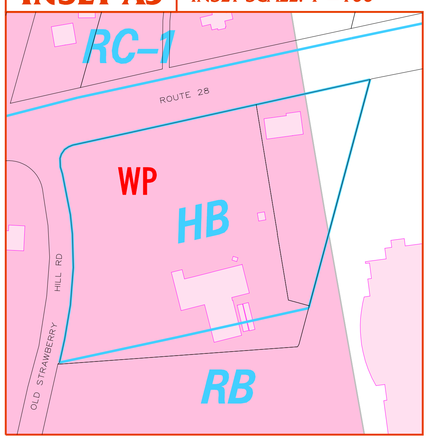
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HYANNIS - SHEET 3 OF 7



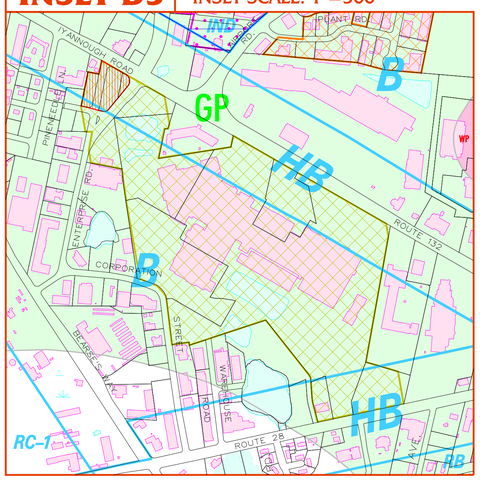
INSET A3

INSET SCALE: 1"=100'



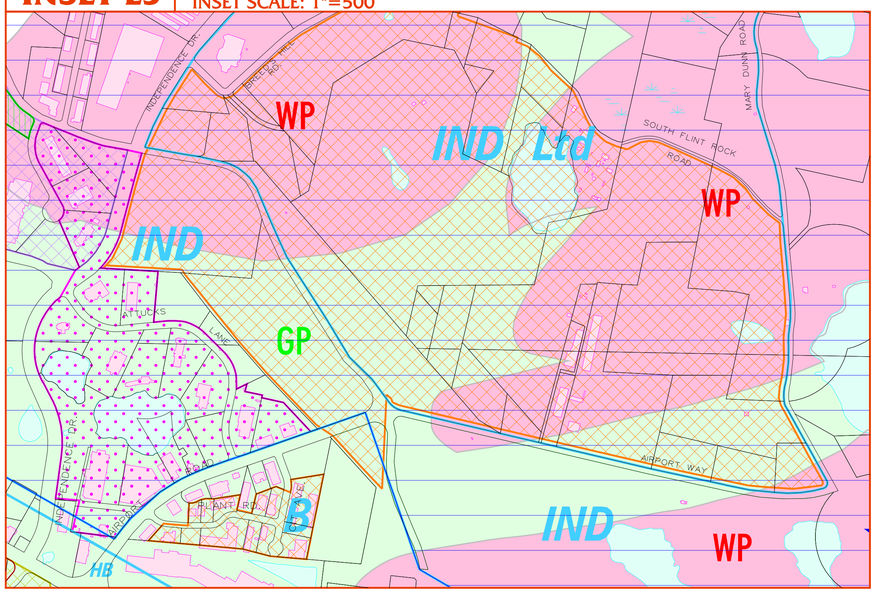
INSET D3

INSET SCALE: 1"=500'



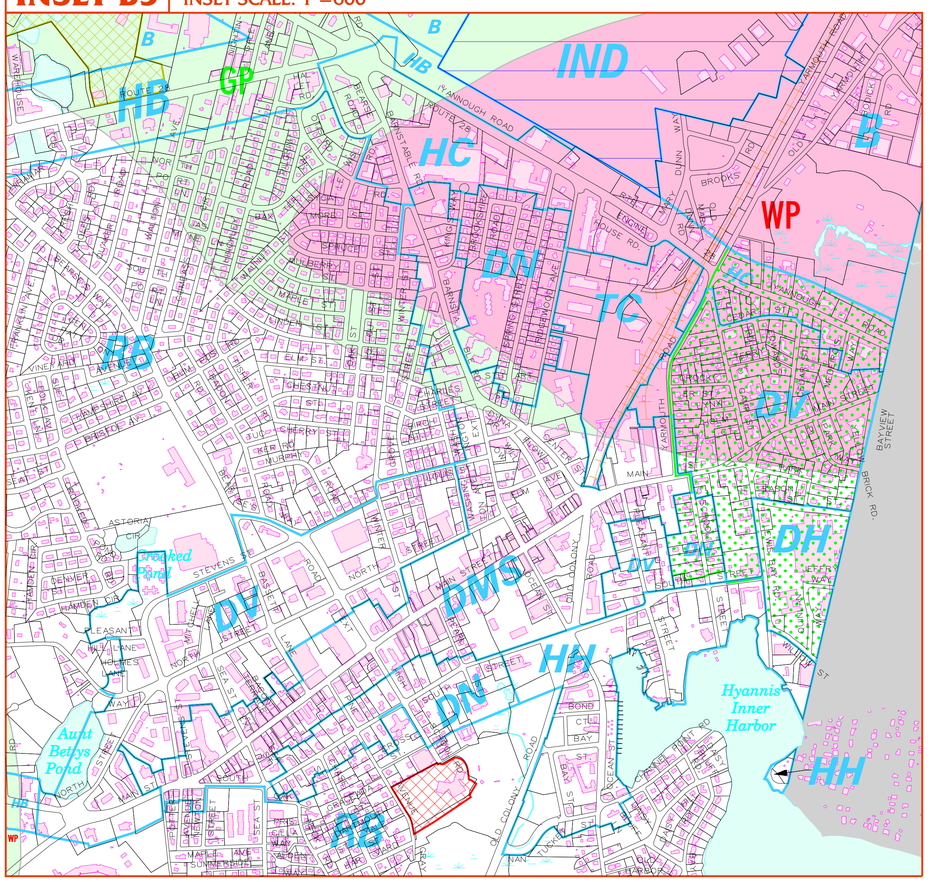
INSET E3

INSET SCALE: 1"=500'



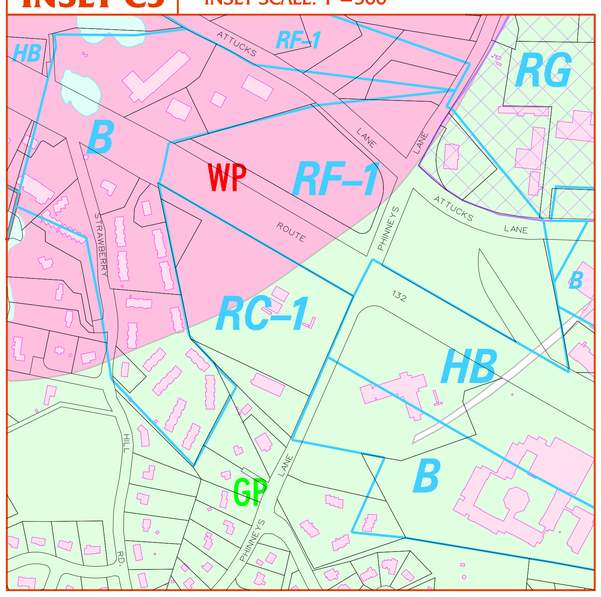
INSET B3

INSET SCALE: 1"=600'



INSET C3

INSET SCALE: 1"=300'



Map Legend

HB	Zoning District
WP	Wellhead Protection Overlay District
GP	Groundwater Protection Overlay District
AP	Aquifer Protection Overlay District
	Adult Use Overlay District All other areas not identified as Wellhead or Groundwater Protection Overlay Districts
	Dock and Pier Overlay District
	Former Grade 5 School Planned Unit Development Overlay District
	Medical Services Overlay District
	Mixed-Use Sub Zone of the Medical Services Overlay District
	Resource Protection Overlay District
	Shopping Center Redevelopment Overlay District
	Drive Through Restaurant Sub Zone of the Shopping Center Redevelopment Overlay Dist.
	Senior Continuing Care Retirement Community - SCCRCOD 2008-1
	Recreational Shellfish Area and Shellfish Relay Area Dock & Pier Overlay District
	Ground Mounted Solar Photovoltaic Overlay District
	Medical Marijuana Overlay District
	Registered Recreational Marijuana Cultivators, Research Facilities, and Testing Laboratories Overlay District
CV	Craigville Village Neighborhood Overlay
LBSB	Long / Short Beach Neighborhood Overlay
CB	Craigville Beach Neighborhood Overlay
CRNB	Centerville River North Bank Neighborhood Overlay
★ C-O #12	Existing Public Well Site
★ C-O #18	Proven Future Public Well Site
★ C-O #20	Proposed Future Public Well Site
	Parcel Lines (FY 2022)
	Buildings
	Railroad Track
	Town Boundary Line
	Marsh Area
	Stream / Edge of Water

SEE TEXT OF ZONING ORDINANCE FOR COMPLETE INFORMATION ON BULK REGULATIONS.

Where a zoning district boundary is located at the edge of a water body, that zone that applies to the land shall apply to structures and uses such as piers and commercial boating operations to the extent of the territorial jurisdiction of the town.

Where zoning district boundaries are located along the edge of a roadway and a distance is shown from such point to another zoning boundary, such distance and points shall be from the edge of the road layout. The ultimate location of such point shall be determined by survey as the line shown on this map is considered an approximation.

TOWN OF BARNSTABLE G.I.S. UNIT FILE: hyanzone.dgn A.N.M. 3-21-2023

Figure 8 - FEMA Flood Zone Map

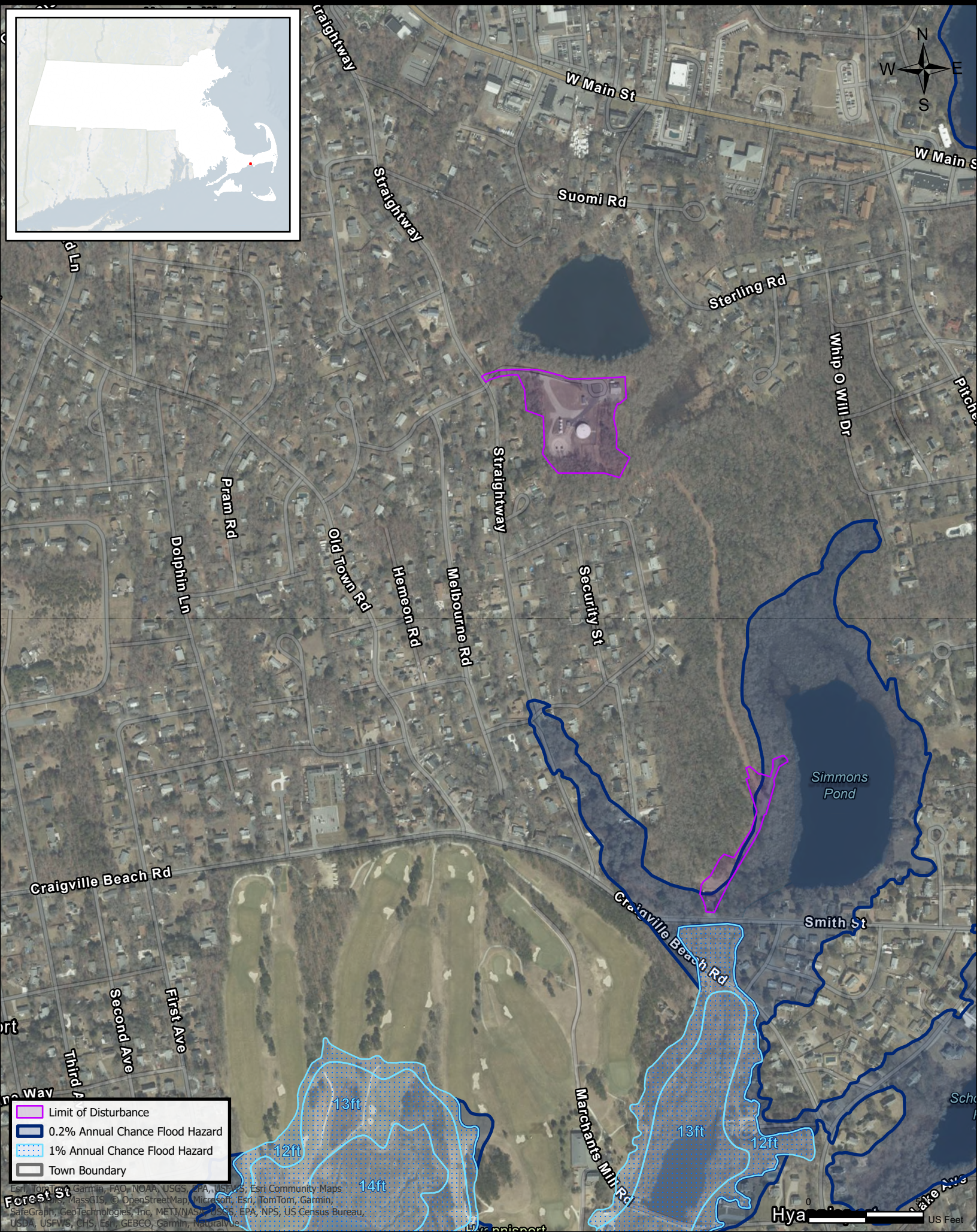
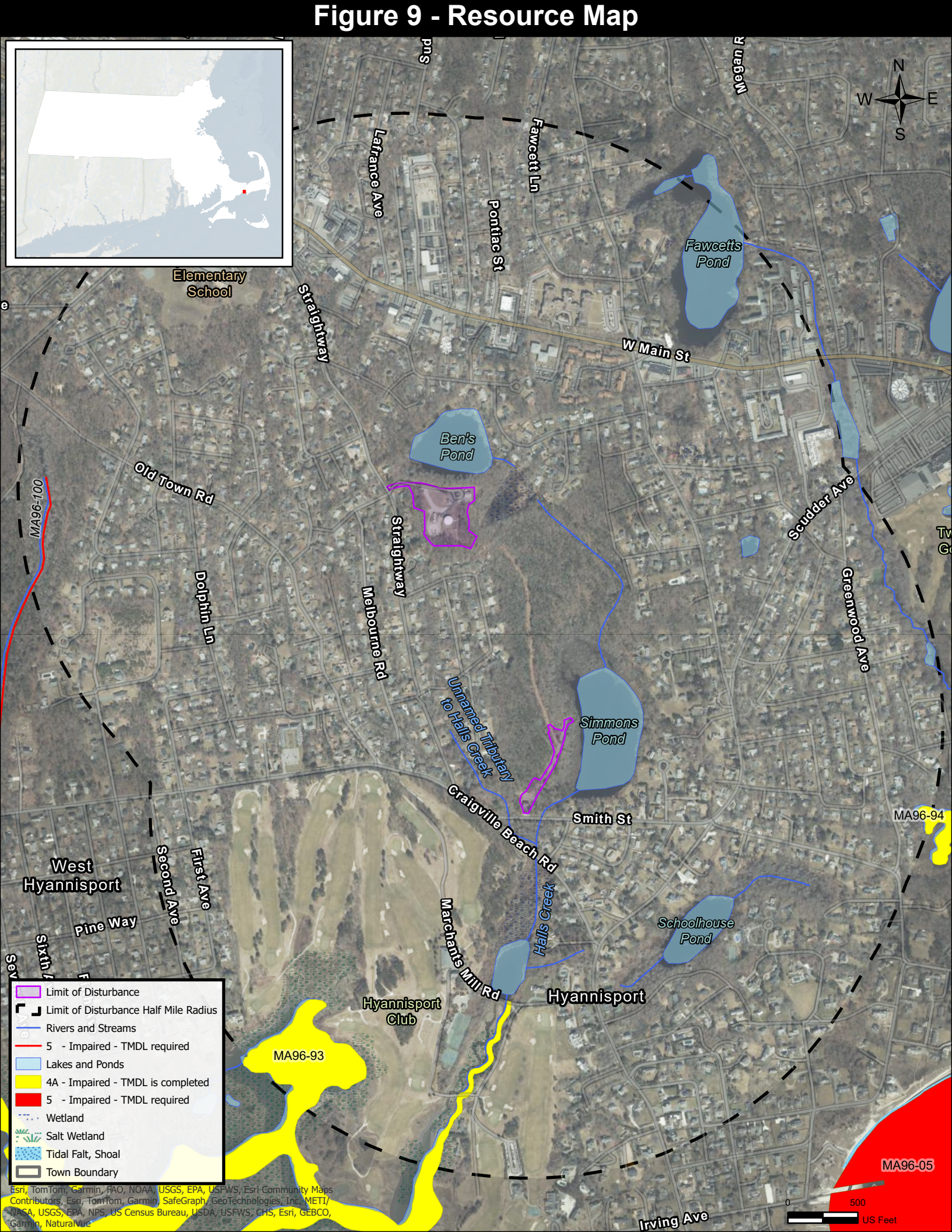


Figure 9 - Resource Map



Map coordinate system: North American Datum of 1983 (NAD83),
Massachusetts State Plane Coordinate System, Mainland Zone, meters.

NEW HAMPSHIRE

AMESBURY
SALISBURY
NEWBURYPORT
NEWBURY
ROWLEY
IPSWICH
ROCKPORT
ESSEX
GLOUCESTER
MANCHESTER
DANVERS
BEVERLY
PEABODY
SALEM
MARBLEHEAD
LYNN
SWAMPSCOTT
SAUGUS
NAHANT
REVERE
EVERETT
CHELSEA
WINTHROP
BOSTON
HULL
QUINCY
MILTON
COHASSET
HINGHAM
BRAINTREE
WEYMOUTH
SCITUATE
NORWELL
HANOVER
MARSHFIELD
PEMBROKE
DUXBURY
KINGSTON
PLYMOUTH
PROVINCETOWN
TRURO
WELLFLEET
EASTHAM
ORLEANS
BREWSTER
DENNIS
HARWICH
CHATHAM
YARMOUTH
BARNSTABLE
SANDWICH
BOURNE
MASHPEE
FALMOUTH
WAREHAM
MARION
MATTAPOISETT
FAIRHAVEN
NEW BEDFORD
ACUSHNET
FALL RIVER
SOMERSET
SWANSEA
FREETOWN
DARTMOUTH
WESTPORT
SEEKONK
REHOBOTH
DIGHTON
BERKLEY
RHODE ISLAND
GOSNOLD
TISBURY
OAK BLUFFS
WEST TISBURY
EDGARTOWN
CHILMARK
AQUINNAH
NANTUCKET

BIGELOW BIGHT
GULF OF MAINE
STELLWAGEN BANK
NATIONAL MARINE SANCTUARY
MASSACHUSETTS BAY
CAPE COD BAY
BUZZARDS BAY
VINEYARD SOUND
NANTUCKET SOUND
RHODE ISLAND SOUND

PROJECT LOCATION

MASSACHUSETTS OFFICE OF COASTAL ZONE MANAGEMENT

Coastal Zone Boundary

CZM Regions:
- North Shore
- Boston Harbor
- South Shore
- Cape Cod and Islands
- South Coastal

- Above -15m
- -15m to -25m
- -25m to -40m
- -40m to -90m
- -90m to -200m
- Below -200m

The Massachusetts Coastal Zone

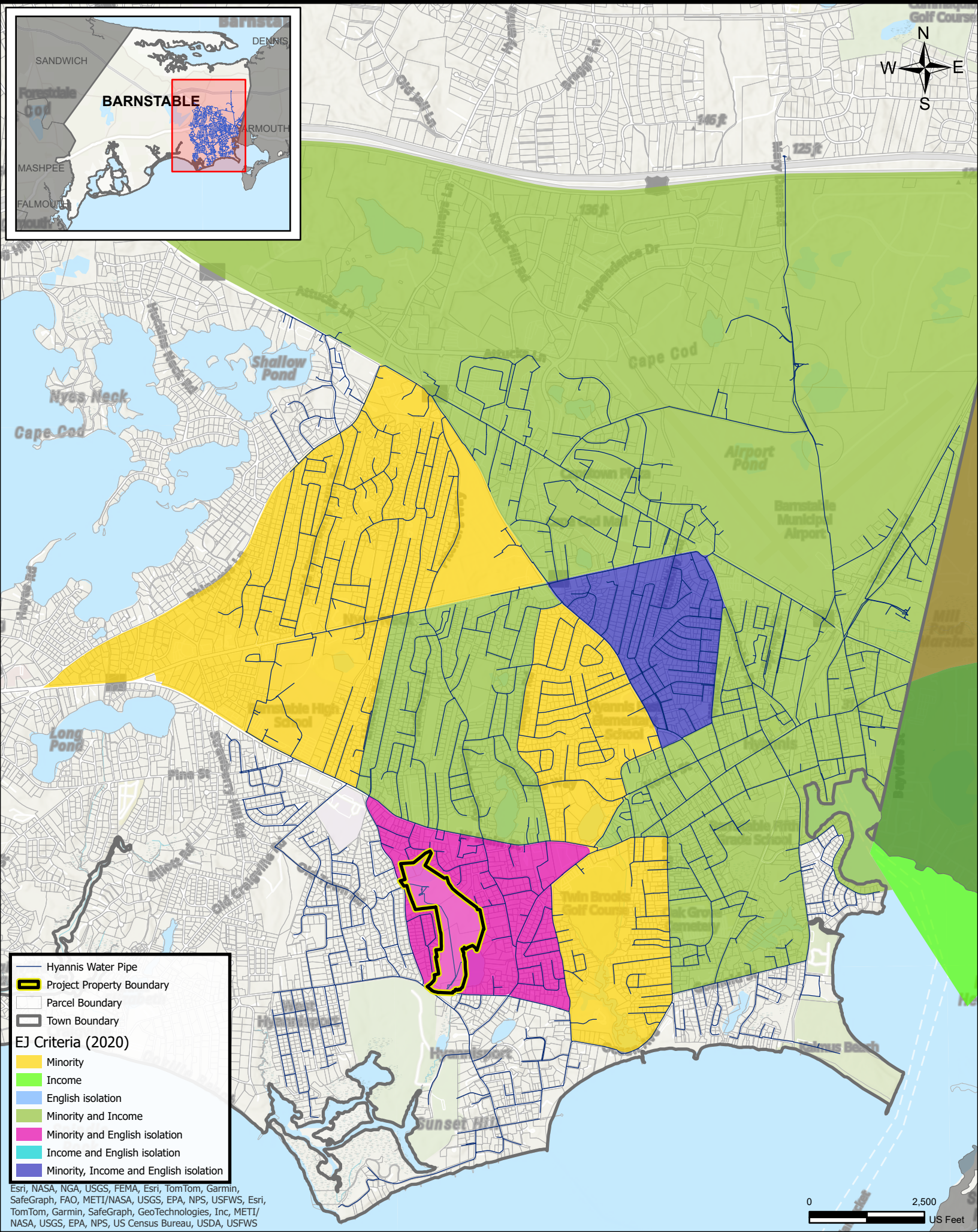
www.mass.gov/czm/mapping/czboundary.htm

0 5 10 20 Miles

0 5 10 20 Kilometers

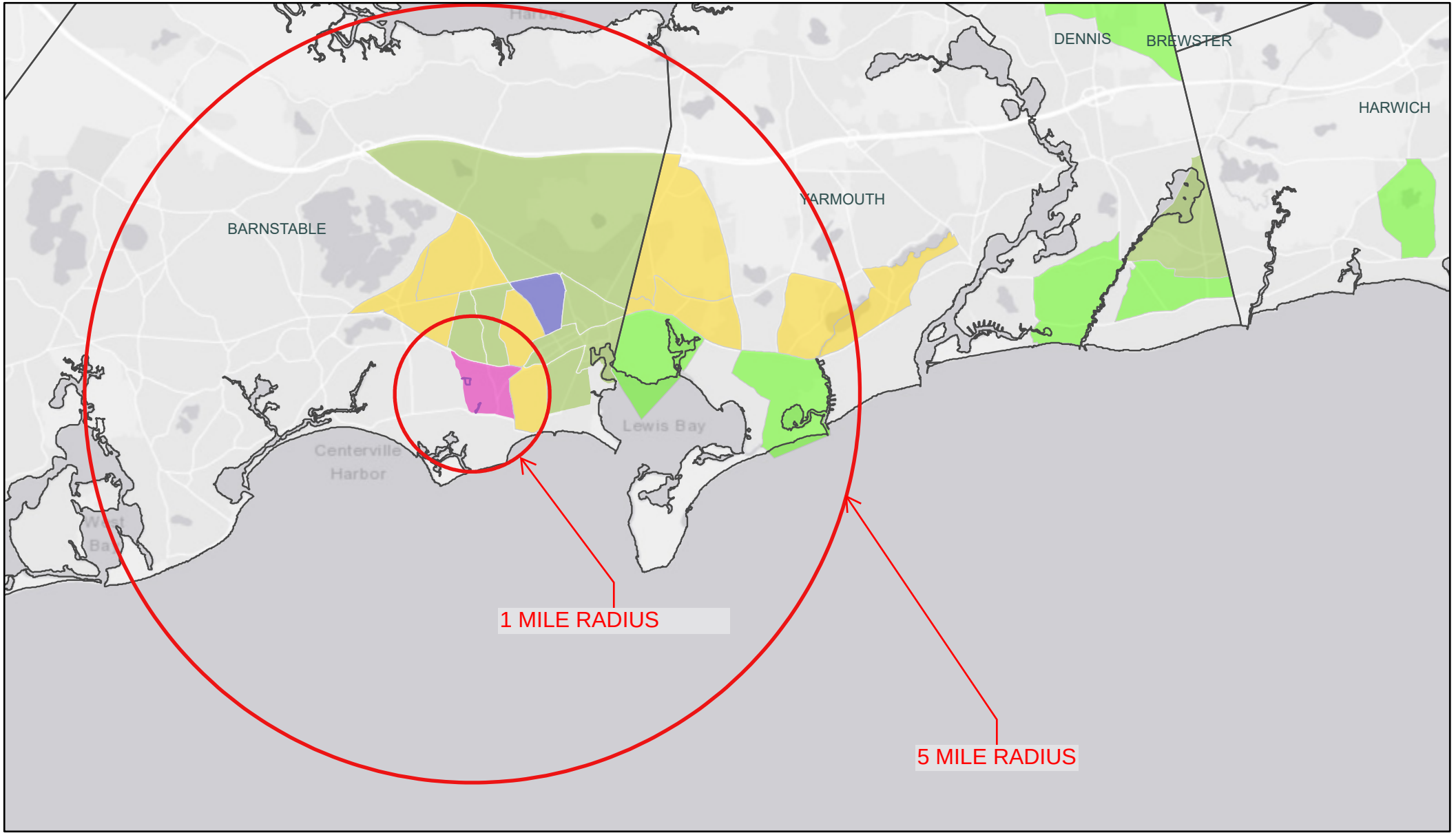
Revised January 2014

Figure 11 - Hyannis Water System with EJ Populations



Esri, NASA, NGA, USGS, FEMA, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS

Figure 12 - EJ Map



7/10/2024, 7:26:43 PM

Override 1
Project Limit of Disturbance
MA Municipalities
MA 2020 Environmental Justice Block Groups
Minority: the block group minority population is >= 40%, or the block group minority population is >= 25% and the median household income of the municipality the block group is in is < 150% of the Massachusetts median household income
Income: at least 25% of households have a median household income 65% or less than the state median household income
Minority and Income
Minority and English isolation
Minority, Income and English isolation

1:144,448

0 0.75 1.5 3 mi

0 1.5 3 6 km

MassGIS, Esri, HERE, Garmin, USGS, EPA, NPS

MassGIS, Esri, HERE, Garmin, USGS, EPA, NPS | MassGIS, MassDOT - Highway Division, MassDEP, MWRA | EEA GIS |

APPENDIX A

CIRCULATION LIST

MEPA Distribution List		
Agency	**Email Address**	**Address**
Massachusetts Environmental Policy Act (MEPA) Office	MEPA@mass.gov	**MEPA Office** 100 Cambridge Street, Suite 900 Boston, MA 02114
Department of Environmental Protection, Boston Office	helena.boccadoro@mass.gov	**Commissioner's Office** One Winter Street Boston, MA 02108
Department of Environmental Protection, Appropriate Regional Office and to each program from which a permit will be sought	george.zoto@mass.gov jonathan.hobill@mass.gov	**DEP/Southeastern Regional Office** Attn: MEPA Coordinator 20 Riverside Drive Lakeville, MA 02347
Massachusetts Department of Transportation - Boston	MassDOTPPDU@dot.state.ma.us	**Public/Private Development Unit** 10 Park Plaza, Suite #4150 Boston, MA 02116
Massachusetts Department of Transportation – District Office	Cindy.McConarty@dot.state.ma.us	**District #5** Attn: MEPA Coordinator 1000 County Street Taunton, MA 02780
Massachusetts Historical Commissoin	Mail a hard copy of the filing to MHC	**MA Archives Building** 220 Morrissey Boulevard Boston MA, 02111
Cape Cod Commission (CCC)	ksenatori@capecodcommission.org regulatory@capecodcommission.org	**Cape Cod Commission** 3225 Main St Barnstable, MA 02630
Town Council	cynthia.lovell@town.barnstable.ma.us	**Barnstable Town Council** 367 Main Street Hyannis, MA 02601
Barnstable Planning Board	james.kupfer@town.barnstable.ma.us james.kupfer@town.barnstable.ma.us karen.pina@town.barnstable.ma.us	**Planning and Development, 3rd Floor** 367 Main Street Hyannis, MA 02601
Barnstable Conservation Commission	conservation@town.barnstable.ma.us	**Conservation Commission** 230 South Street Hyannis, MA 02601
Barnstable Board of Health	health@town.barnstable.ma.us	**Board of Health** 200 Main Street Hyannis, MA 02601
MEPA Environmental Justice Director	MEPA-EJ@mass.gov	**MEPA Office** Attn: EEA EJ Director 100 Cambridge Street, Suite 900 Boston, MA 02144
Coastal Zone Management Office	sean.duffey@mass.gov patrice.bordonaro@mass.gov	**Coastal Zone Management** Attn: Project Review Coordinator 100 Cambridge Street, Suite 900 Boston, MA 02144

MEPA Distribution List (cont.)		
Agency	**Email Address**	**Address**
Energy Facilities Siting Board	andrew.greene@mass.gov smitha.divakar@mass.gov	**Energy Facilities Siting Board** Attn: MEPA Coordinator One South Station Boston, MA 02110
Department of Energy Resources	paul.ormond@mass.gov	**Department of Energy Resources** Attn: MEPA Coordinator 100 Cambridge Street, 10th floor Boston, MA 02114

APPENDIX B

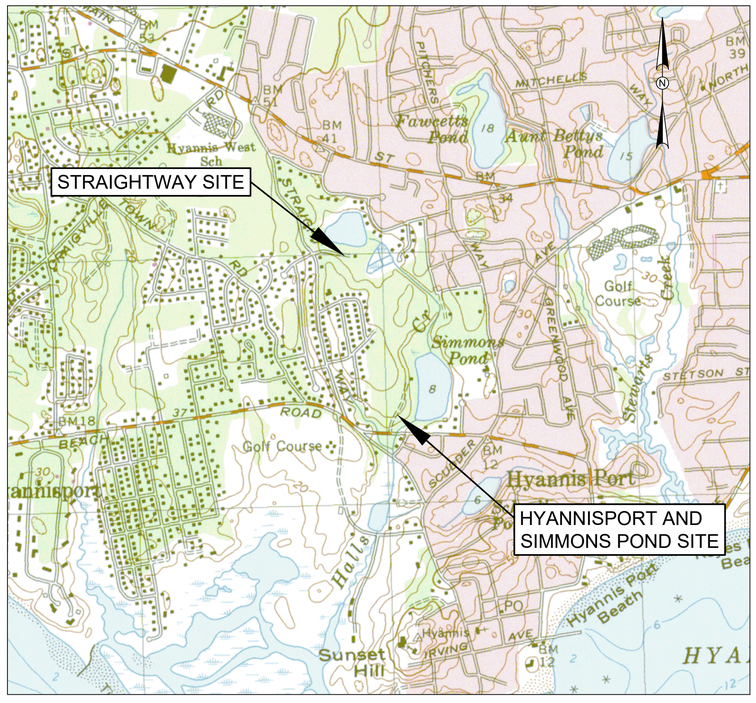
PRELIMINARY DESIGN DRAWINGS

TOWN OF BARNSTABLE, MASSACHUSETTS
STRAIGHTWAY WATER TREATMENT FACILITY

DWSRF-16849
CONTRACT NO. XX-XX-XX

JUNE 2024

HYANNIS WATER SYSTEM
BARNSTABLE DEPARTMENT OF PUBLIC WORKS - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601



LOCUS PLAN
SCALE: 1" = 1000'

PROJECT MILESTONES / REVISIONS

DATE	TYPE	DESCRIPTION
6/10/2024		30% DESIGN SUBMITTAL

KLEINFELDER
Bright People. Right Solutions.

NOT FOR CONSTRUCTION

CAD FILE: G:_clients\Barnstable MA\24002062.001A - W.Barnstable MA - Straightway Design\04 - Design Phase\09 - CAD\Production Drawings\0-COVER.dwg, 0-COVER, 6/10/2024 8:29 AM, BY: mckenna dunn

SHEET NUMBER	SHEET TITLE
G-000	COVER
G-001	SHEET INDEX
G-002	GENERAL NOTES
~~C-001~~	~~KEY PLAN & LEGEND~~
~~C-101~~	~~STRAIGHTWAY SITE PLAN - EXISTING CONDITIONS~~
~~C-102~~	~~STRAIGHTWAY SITE PLAN~~
~~C-201~~	~~HYNNISPORT AND SIMMONS POND SITE PLAN - EXISTING CONDITIONS~~
~~C-202~~	~~HYNNISPORT AND SIMMONS POND SITE PLAN~~
~~C-501~~	~~CIVIL DETAILS~~
M-001	PROCESS FLOW DIAGRAM I
M-002	PROCESS FLOW DIAGRAM II
M-101	STRAIGHTWAY WTF FIRST FLOOR PLAN
M-102	STRAIGHTWAY WTF BASEMENT PLAN
M-103	STRAIGHTWAY WTF PIPE SECTIONS I
M-104	STRAIGHTWAY WTF PIPE SECTIONS II
M-105	STRAIGHTWAY WTF PIPE SECTIONS III
M-106	BOOSTER PUMP STATION DEMOLITION AND MODIFICATION PLAN
M-107	EXISTING STRAIGHTWAY WTF DEMOLITION AND MODIFICATION PLAN
M-201	HYANNISORT AND SIMMONS POND PUMP STATIONS PLAN AND SECTIONS
M-501	PROCESS DETAILS
S-001	STRUCTURAL GENERAL NOTES I
S-002	STRUCUTRAL GENERAL NOTES II
S-003	STRUCUTRAL GENERAL NOTES & ABBREVIATIONS
S-101	STRAIGHWAY WTF BUILDING FOUNDATION PLAN
S-102	STRAIGHTWAY WTF BUILDING FOUNDATION SECTIONS
S-201	HYANNISPORT & SIMMONS POND BUILDINGS FOUNDATIONS & BUILDING SECTIONS
A-001	ARCHITECTURAL GENERAL NOTES, LEGEND, AND ABBREVIATIONS
A-002	STRAIGHTWAY WTF CODE SUMMARY
A-101	STRAIGHTWAY WTF BUILDING FLOOR PLAN
A-102	STRAIGHTWAY WTF BUILDING ELEVATIONS
A-103	STRAIGHTWAY WTF BUILDING SECTIONS
A-104	STRAIGHTWAY WTF BUILDING WALL SECTION & DETAILS
A-201	HYANNISPORT & SIMMONS POND PUMP STATIONS - PLANS, ELEVATIONS, AND SECTIONS
E-001	ELECTRICAL LEGEND
E-002	ELECTRICAL GENERAL NOTES
E-003	ELECTRICAL ONE LINE DIAGRAM
E-004	ELECTRICAL ONE LINE DIAGRAM
E-005	ELECTRICAL ONE LINE DIAGRAM
E-006	ELECTRICAL ONE LINE DIAGRAM
E-007	ELECTRICAL ONE LINE DIAGRAM
E-008	ELECTRICAL ONE LINE DIAGRAM
E-009	ELECTRICAL STRAIGHTWAY SITE PLAN
E-010	ELECTRICAL HYANNIS & SIMMONS WELL STATIONS SITE PLANS

SEE UPDATED C-SHEETS AT END OF SET

SHEET NUMBER	SHEET TITLE
E-100	ELECTRICAL WTP PLAN
E-101	ELECTRICAL STRAIGHTWAY WELL STATION PLANS
E-102	ELECTRICAL HYANNISPORT WELL STATION PLAN
E-103	ELECTRICAL SIMMONS WELL STATION PLAN
FP001	FIRE PROTECTION LEGEND AND GENERAL NOTES
FP101	FIRE PROTECTION LOWER LEVEL PLAN
FP102	FIRE PROTECTION UPPER LEVEL PLAN
H001	HVAC LEGEND
H002	HVAC GENERAL NOTES
H101	HVAC WTP LOWER LEVEL PLAN
H102	HVAC WTP UPPER LEVEL PLAN
H103	HVAC HYANNISPORT PLAN
H104	HVAC SIMMONS PLAN
P001	PLUMBING LEGEND AND GENERAL NOTES
P101	PLUMBING LOWER LEVEL PLAN
P102	PLUMBING UPPER LEVEL PLAN
P103	PLUMBING HYANNISORT PLAN

UPDATED C-SHEETS

C-501	KEY PLAN & LEGEND
C1-111	STRAIGHTWAY SITE PLAN EXISTING CONDITIONS
C1-112	STRAIGHTWAY SITE PREPARATION PLAN
C1-113	STRAIGHTWAY SITE PLAN
C1-114	STRAIGHTWAY GRADING PLAN
C1-115	STRAIGHTWAY UTILITIES PLAN
C1-116	STRAIGHTWAY SEWER PLAN
C1-151	STRAIGHTWAY SEWER DETAILS
C2-111	HYANNISPORT-SIMMONS POND EXISTING CONDITIONS
C2-112	HYANNISPORT-SIMMONS POND SITE PREPARATION PLAN
C2-113	HYANNISPORT-SIMMONS POND SITE PLAN
C2-114	HYANNISPORT-SIMMONS POND GRADING PLAN
C2-115	HYANNISPORT-SIMMONS POND UTILITIES PLAN
C2-116	HYANNISPORT-SIMMONS POND SEWER PLAN

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Phone: 617-497-7800
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REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

ORIGINAL DRAWING SIZE IS 22 x 34

SHEET INDEX

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	06/10/2024
CURRENT REVISION	
DESIGNED BY	TB
DRAWN BY	MD
CHECKED BY	TB
APPROVED BY	MT

G-001

SHEET 2 of 60

CAD FILE: G:\...clients\Barnstable MA\24003062.001A - W-Barnstable MA - Straightway Design\04 - Design Phase\08 - CAD\Production Drawings\G-SHEET INDEX.dwg LAYOUT: G-001 PLOTTED: 6/10/2024 12:17 PM BY: mckenna dunn

GENERAL NOTES:

1. PRIOR TO BIDDING THE PROJECT, THE CONTRACTOR IS ENCOURAGED VISIT THE SITE TO VERIFY EXISTING CONDITIONS.
2. BASE MAP INFORMATION WAS PREPARED BY CHESS ENGINEERING, LLC DATED MAY 23, 2024. THE COORDINATES OF THE SURVEY ARE IN FEET AND ARE BASED UPON THE NORTH AMERICAN DATUM OF 1983 MASSACHUSETTS STATE PLANE (NAD '83 MASSACHUSETTS STATE PLANE, MAINLAND ZONE). THE ELEVATIONS OF THE SURVEYS ARE IN FEET AND REFER TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD '88).
3. FOR TEMPORARY BENCH MARKS:

   SEE SHEET C-101:
   TBM: WESTERLY HYDRANT FLANGE BOLT. ELEV. = 24.36'
   TBM: TOP OF CONCRETE BASE. ELEV. = 31.77'
   TBM: TOP OF CONCRETE PAD. ELEV. = 32.49'
   SEE SHEET C-201:
   TBM: SOUTH-EASTERLY HYDRANT FLANGE BOLT. ELEV. = 17.77'
   TBM: SOUTH-EASTERLY HYDRANT FLANGE BOLT. ELEV. = 13.61'
4. THE DATA ACCUMULATION AND BOUNDARY SURVEY DEPICTED HEREON WERE OBTAINED BY A FIELD SURVEY BETWEEN NOVEMBER 28 AND DECEMBER 6, 2023 BY CHESS ENGINEERING, LLC.
5. THIS PLAN AND SURVEY WERE PREPARED USING CONVENTIONAL & RTK SURVEY METHODS. A LEICA MS60 TOTAL STATION WAS USED HAVING A MINIMAL AT ACCURACY OF 1" AND 1 PPM. A LEICA GS-18 GNSS RECEIVER WAS UTILIZED THROUGHOUT THE PROJECT AREA FOR REDUNDANT MEASUREMENTS BETWEEN NOVEMBER 27-30, 2023 AND ADDITIONALLY BETWEEN FEBRUARY 26-27, 2024 TO CONFIRM PREVIOUS MEASUREMENTS.
6. THE WETLANDS WERE DELINEATED ON NOVEMBER 29, 2023 BY LUCAS ENVIRONMENTAL.
7. THE CONTRACTOR SHALL CALL THE DIG-SAFE CENTER AT 1-888-344-7233 A MINIMUM OF 72 HOURS PRIOR TO ANY EXCAVATION TO LOCATE UNDERGROUND UTILITIES IN THE FIELD AND NOTIFY UTILITIES OF CONSTRUCTION.
8. INFORMATION SHOWN ON THE DRAWINGS RELATING TO MATERIALS, CONDITIONS AND/OR LOCATIONS OF EXISTING STRUCTURES AND UTILITIES HAS BEEN COMPILED FROM AVAILABLE INFORMATION INCLUDING FIELD SURVEY, AERIAL PHOTOGRAPHY, RECORD MAPS AND DRAWINGS, AND UTILITY RECORD DRAWINGS AND IS NOT GUARANTEED CORRECT OR COMPLETE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXISTING CONDITIONS AND DIMENSIONS INCLUDING THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO BEGINNING CONSTRUCTION. LOCATIONS AND DEPTHS OF CRITICAL UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR IN THE FIELD BY TEST PITS AS APPROVED BY THE ENGINEER. ANY DAMAGE TO UTILITIES CAUSED BY THE CONTRACTOR SHALL BE THE CONTRACTOR'S RESPONSIBILITY, AND COSTS FOR THE REPAIR OR REPLACEMENT OF SUCH DAMAGED UTILITIES SHALL BE BORNE BY THE CONTRACTOR.
9. ACCORDING TO FEMA FIRM (FLOOD INSURANCE RATE MAP) COMMUNITY PANEL 250001; REVISION DATED 7/16/2014, THE APPROXIMATE 100-YEAR FLOODPLAIN ELEVATION ON THE SITE IS 12 FEET.

WORK OF GENERAL CONTRACTOR:

1. THE GENERAL CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS REQUIRED TO COMPLETE THE STRAIGHTWAY WATER TREATMENT FACILITY, COMPLETE AND READY FOR OPERATION AS INDICATED ON THE DRAWINGS AND SPECIFICATIONS, INCLUDING ALL CONTRACT DOCUMENTS.
2. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF SUBCONTRACTORS' WORK WITH EACH OTHER AND WITH THE WORK OF THE GENERAL CONTRACTOR.
3. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE OVERALL CONSTRUCTION SEQUENCE.
4. THE GENERAL CONTRACTOR SHALL NOT STORE EQUIPMENT OR STOCKPILE MATERIAL WITHIN WETLAND BUFFER ZONES.
5. SOME PIPE/EQUIPMENT CONNECTIONS MAY REQUIRE TRANSITION FITTING OR OTHER FITTINGS NOT SHOWN ON DRAWINGS, THE CONTRACTOR SHALL PROVIDE ADEQUATE FITTING TO MAKE COMPLETE CONNECTION.
6. WHERE BURIED DUCTILE IRON PIPE LEAVES/ENTERS A BUILDING OR STRUCTURE, THE GENERAL CONTRACTOR SHALL PROVIDE MULTIPLE MECHANICAL JOINT BELLS.
7. PROPOSED FIELD MODIFICATION, REVISIONS AND ADDITIONS TO THE DESIGN DRAWINGS MUST BE APPROVED BY THE ENGINEER, IN WRITING, BEFORE WORK BEGINS. ANY REQUEST TO DEVIATE FROM THE ENGINEER'S SPECIFIED DETAILS ON THE DESIGN DRAWINGS BY THE CONTRACTOR MUST BE SUBMITTED IN WRITING TO THE ENGINEER FOR APPROVAL.
8. GENERAL CONTRACTOR AND SUBCONTRACTORS SHALL VISIT THE PROJECT SITE AND OBSERVE CONDITIONS FOR THE PROPOSED CONSTRUCTION. ANY DISCREPANCY BETWEEN THE DESIGN DRAWINGS AND ACTUAL SITE CONDITIONS MUST BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ENGINEER, IN WRITING, FOR RESOLUTION PRIOR TO COMMENCEMENT OF THE WORK.
9. THE CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS, ELEVATIONS AND DIMENSIONS PRIOR TO FABRICATING NEW WORK THAT WILL BE CONNECTED TO EXISTING CONSTRUCTION.
10. ALL ITEMS OF CONSTRUCTION MUST BE IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS APPLICABLE TO THE PROJECT.
11. THE CONTRACTOR IS RESPONSIBLE FOR SEGREGATING WORK AREAS FROM THE GENERAL PUBLIC USING TEMPORARY FENCES, SIGNS, CONES, CAUTION TAPE, ETC.
12. THE CONTRACTOR'S BID FOR THIS PROJECT MUST INCLUDE ALL LABOR, MOBILIZATION, PERMITTING, MATERIALS, TEMPORARY PROTECTION, ETC. NO ADDITIONAL COSTS WILL BE SUBMITTED TO THE ENGINEER IN ORDER TO COMPLETE THE INTENT OF THE WORK AS INDICATED ON THE DESIGN DRAWINGS.
13. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING WATER AND ELECTRICITY REQUIRED TO PERFORM THE WORK. SUBMIT PROPOSED MEANS AND METHODS TO THE ENGINEER FOR REVIEW.
14. ALL DIMENSIONS AND QUANTITIES MUST BE DETERMINED OR VERIFIED BY THE CONTRACTOR. QUANTITIES TO BE CARRIED UNDER THE BASE BID WORK HAVE BEEN INDICATED ON THE CONTRACT DRAWINGS. THE CONTRACT DRAWINGS HAVE BEEN COMPILED FROM VARIOUS SOURCES AND MAY NOT REFLECT THE ACTUAL CONDITION AT THE MOMENT OF CONSTRUCTION. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS AND MAKE ALL INVESTIGATIONS NECESSARY TO INSTALL THE PROPOSED WORK.
15. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR AND THEIR SUBCONTRACTORS TO REVIEW ALL DRAWINGS, PROJECT MANUAL, ADDENDA ETC. IN ORDER TO ASSURE THE COORDINATION OF ALL WORK AFFECTING EACH TRADE. FAILURE TO REVIEW AND COORDINATE ALL CONTRACTOR DOCUMENTS BY THE GENERAL WITH ALL THE SUBCONTRACTORS FOR APPLICABLE ITEMS OF THE WORK SHALL NOT RELIEVE THE RESPONSIBLE PARTY FROM PERFORMING ALL WORK SO REQUIRED AS PART OF THE CONTRACT.
16. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR AND THEIR SUBCONTRACTORS FOLLOWING THE REVIEW OF ALL THE DRAWINGS, PROJECT MANUAL, ADDENDA, ETC. TO INFORM THE ENGINEER OF ANY DISCREPANCIES IN THE DOCUMENTS AND TO OBTAIN CLARIFICATION ON ALL ITEMS AFFECTING CONSTRUCTION COST PRIOR TO THE SUBMISSION OF THE BID.

SOIL EROSION AND SEDIMENT CONTROL NOTES:

1. APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED PRIOR TO SOIL DISTURBANCE. MEASURES SHALL BE TAKEN TO CONTROL EROSION WITHIN THE PROJECT AREA. SEDIMENT IN RUNOFF WATER SHALL BE TRAPPED AND RETAINED WITHIN THE PROJECT AREA. WETLAND AREAS AND SURFACE WATERS SHALL BE PROTECTED FROM SEDIMENT.
2. CONTRACTOR SHALL MINIMIZE TOTAL AREA OF DISTURBANCE AND PROTECT NATURAL FEATURES AND SOIL.
3. INSTALL AND MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND/OR IN ACCORDANCE WITH ALL PERMIT REQUIREMENTS, THE MORE STRINGENT REQUIREMENT SHALL APPLY. CONTRACTOR SHALL INSTALL EROSION AND SEDIMENTATION CONTROLS IN ACCORDANCE WITH SPECIFICATION SECTION 01568 AND DETAILS PROVIDED ON SHEET C-101 THROUGH C-502.
4. CONTRACTOR TO COMPLY WITH APPLICABLE FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS INCLUDING WASTE DISPOSAL.
5. CONTRACTOR SHALL PROPERLY MANAGE ON-SITE CONSTRUCTION AND WASTE MATERIALS.
6. CONTRACTOR SHALL IMPLEMENT APPROPRIATE DUST CONTROL MEASURES AT THE SITE.
7. STOCKPILE SIDE SLOPES SHALL NOT BE GREATER THAN 1:1. ALL STOCKPILES SHALL BE SURROUNDED BY SEDIMENT CONTROLS.
8. A VEHICLE TRACKING PAD OR OTHER APPROVED STABILIZATION METHOD SHALL BE CONSTRUCTED AT ALL ENTRANCE/EXIT POINTS OF THE SITE TO PREVENT SOIL CARRIED ONTO ROADWAYS AND OFF THE SITE. CONTRACTOR SHALL FURNISH A MECHANICAL SWEEPER ON SITE FOR THE PURPOSE OF SWEEPING ALL PAVED AREAS ON A DAILY BASIS OR AS REQUIRED TO PREVENT SOIL TRACKING ON ROADWAYS.
9. ALL PREVIOUSLY DISTURBED LAND SHALL BE STABILIZED BY APPROVED METHODS WITHIN 14 DAYS IF LEFT UNDISTURBED. THIS INCLUDES STOCKPILES, CONSTRUCTION ENTRANCES, GRADED AREAS AND OTHER CONSTRUCTION ACTIVITY RELATED CLEARING
10. PERMANENT SEEDING SHALL BE UNDERTAKEN IN THE SPRING FROM APRIL 15 THROUGH JUNE 1, AND IN LATE SUMMER AND EARLY FALL FROM AUGUST 15 THROUGH OCTOBER 15. DURING THE PEAK SUMMER MONTHS AND IN THE FALL AFTER OCTOBER 15, WHEN SEEDING IS FOUND TO BE IMPRACTICAL, APPROPRIATE TEMPORARY STABILIZATION SHALL BE APPLIED. PERMANENT SEEDING MAY BE UNDERTAKEN DURING THE SUMMER IF PLANS PROVIDE FOR ADEQUATE MULCHING AND WATERING.
11. IF WORK IS HALTED OVER WINTER MONTHS THE CONTRACTOR SHALL BE RESPONSIBLE FOR STABILIZING THE AREA THROUGH GROUNDCOVER PRACTICES.

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REVISIONS

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SCALE VERIFICATION

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0 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

ORIGINAL DRAWING SIZE IS 22 x 34

GENERAL NOTES

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED 3 MAY A.D. 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

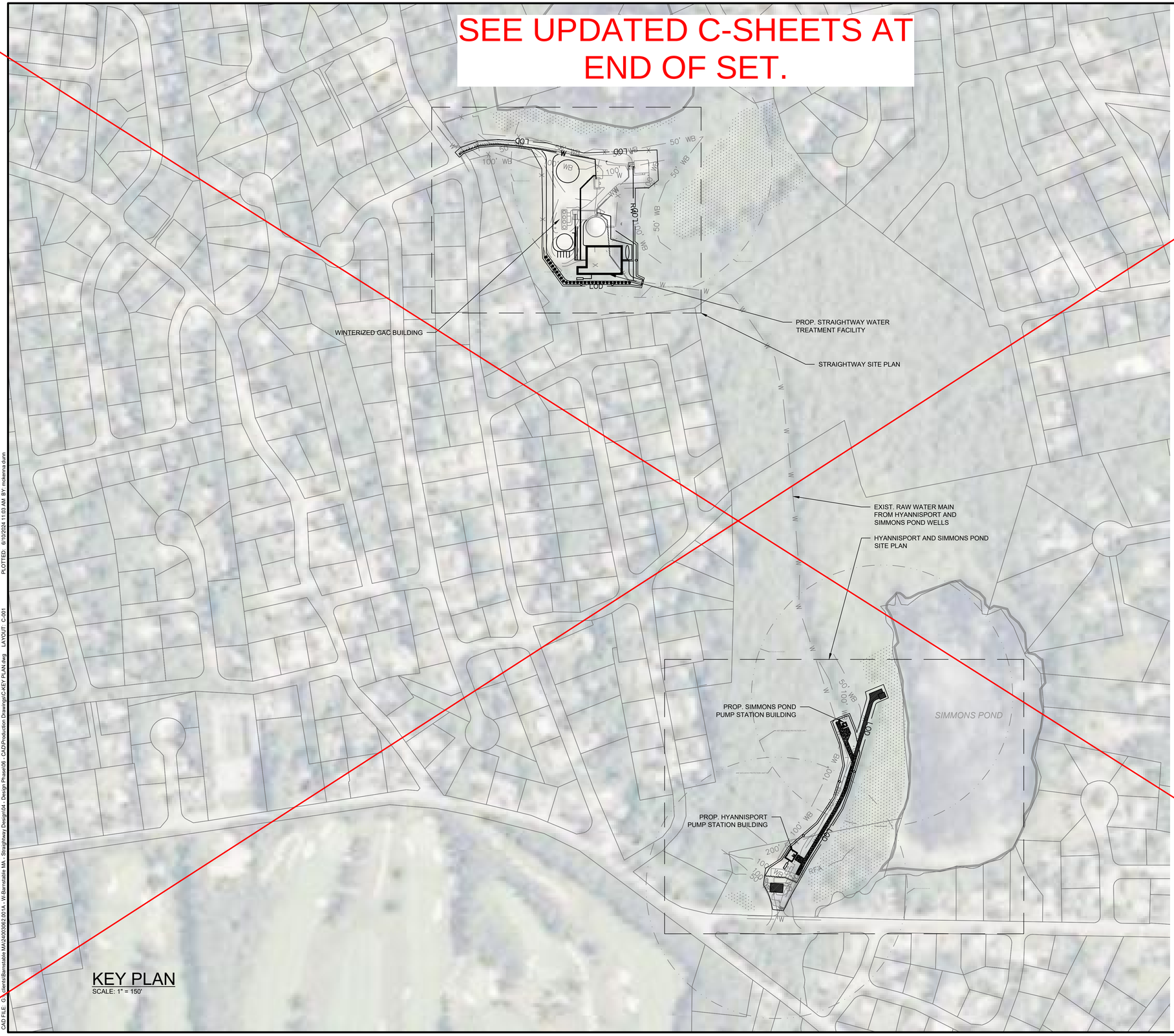
PROJECT NO.	24003062.001A
ISSUE DATE	06/10/2024
CURRENT REVISION	-
DESIGNED BY	TB
DRAWN BY	MD
CHECKED BY	TB
APPROVED BY	MT

G-002

SHEET 3 of 60

CAD FILE: G:\...clients\Barnstable MA\24003062.001A - W Barnstable MA - Straightway Design\04 - Design Phase\06 - CAD\Production Drawings\G-GENERAL NOTES.dwg LAYOUT: G-002 PLOTTED: 6/10/2024 10:32 AM BY: mckenna dunn

SEE UPDATED C-SHEETS AT END OF SET.



KEY PLAN
SCALE: 1" = 150'

EXISTING LEGEND

- MINOR CONTOUR
- MAJOR CONTOUR
- SPOT ELEVATION
- 100-YR FLOOD ZONE
- RECORD WATER LINE
- ABANDONED/REMOVED WATER LINE
- HYDRANT
- WATER GATE
- WATER WELL
- STANDPIPE
- ELECTRIC LINE
- OVERHEAD WIRES
- UTILITY POLE
- GUY WIRE
- TRANSFORMER
- ELECTRIC MANHOLE
- RECORD GAS LINES
- GAS METER
- WETLAND LIMIT
- WETLAND FLAG
- WETLAND EDGE
- 100' WETLAND BUFFER
- 50' WETLAND BUFFER
- SOIL PROBE
- CHAINLINK FENCE
- TREELINE
- DRAIN LINE
- DRAIN MANHOLE
- SEWER LINE
- SEWER MANHOLE
- CHAIN LINK FENCE
- CONCRETE PAD
- DUCTILE IRON
- EDGE OF PAVEMENT
- EDGE OF PAVEMENT LINE
- EDGE OF WATER

PROPOSED LEGEND

- RAW WATER LINE
- WATER LINE
- PROPOSED WATER GATE
- CHAIN LINK FENCE
- PROPOSED TREELINE
- DRAIN LINE
- SEWER LINE
- VEHICULAR ACCESS GATE
- EXTENT OF CRUSHED STONE ACCESS DRIVE
- EXTENT OF ASPHALT/STRUCTURE REMOVAL
- PROPOSED BUILDING
- EXTENT OF STORMWATER FEATURE

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SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

0 150 300 450

SCALE: 1" = 150' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

KEY PLAN & LEGNED

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	24002062.001A
ISSUE DATE	06/10/2024
CURRENT REVISION	-
DESIGNED BY	TB
DRAWN BY	MD/MPS
CHECKED BY	TB/GAA
APPROVED BY	GAA

C-001

SHEET 4 of 60

PLOTTED: 6/10/2024 11:03 AM BY: mckenna dunn
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SEE UPDATED C-SHEETS AT END OF SET.

ENS POND

STRAIGHTWAY WELL BUILDING

BOOSTER PUMP STATION

WATER STORAGE TANK

WINTERIZED GAC BUILDING

CHLORINE BUILDING

LAGOON

B-1

B-2

B-3

B-4 OW

B-5

B-6

B-8 OW

B-7

GRAVEL

STRAIGHTWAY FACILITY BUILDING

WATER STORAGE TANK

EXISTING 6" DI

STRAIGHTWAY SITE PLAN - EXISTING CONDITIONS

SCALE: 1" = 30'

NOT FOR CONSTRUCTION

PLOTTED: 6/10/2024 11:09 AM BY: mdenna dunn

CAD FILE: G:_data\Barnstable MA\24003062.001A - W.Barnstable MA - Straightway Design\04 - Design Phase\09 - CAD\Production Drawings\C-SITE PLAN-STWY-ALTS.dwg LAYOUT: EXISTING CONDITIONS

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SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

0 30 60 90

SCALE: 1" = 30' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

STRAIGHTWAY SITE PLAN - EXISTING CONDITIONS

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

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APPROVED BY	GAA

C-101

SHEET 5 of 60

SEE UPDATED C-SHEETS AT END OF SET.

PROP. 16" WATER MAIN

PROP. STORMWATER MANAGEMENT AREA

POTABLE WATER SUPPLY

FIRE SERVICE LINE

BACKWASH SUPPLY

CHEMICAL INJECTION BUILDING TO BE DEMOLISHED

FINISHED WATER TO CONTACT TANK

EXIST. 10" AC WATER MAIN TO BE REMOVED AND DISPOSED

CUT AND CAP EXISTING 8" PIPE

CUT AND CAP EXISTING 8" PIPE

12" RAW WATER MAIN

WINTERIZED GAC BUILDING

PROP. PAVEMENT

EXISTING MAIN TO BE REMOVED AND DISPOSED

250' REPLACEMENT WELL RADIUS

PROP. STORMWATER MANAGEMENT AREA

12" RAW WATER MAIN

PROP. STORMWATER MANAGEMENT AREA

ARBORVITAE VEGETATIVE SCREENING

PROP. ACCESS GATE

8" BACKWASH WASTE

8" POST-GAC WATER

8" PRE-GAC WATER

PARKING

PROP. TIGHT TANK

PROP. STRAIGHTWAY WATER TREATMENT FACILITY

STRAIGHTWAY SITE PLAN

SCALE: 1" = 30'

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0 30 60 90

SCALE: 1" = 30' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

STRAIGHTWAY SITE PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

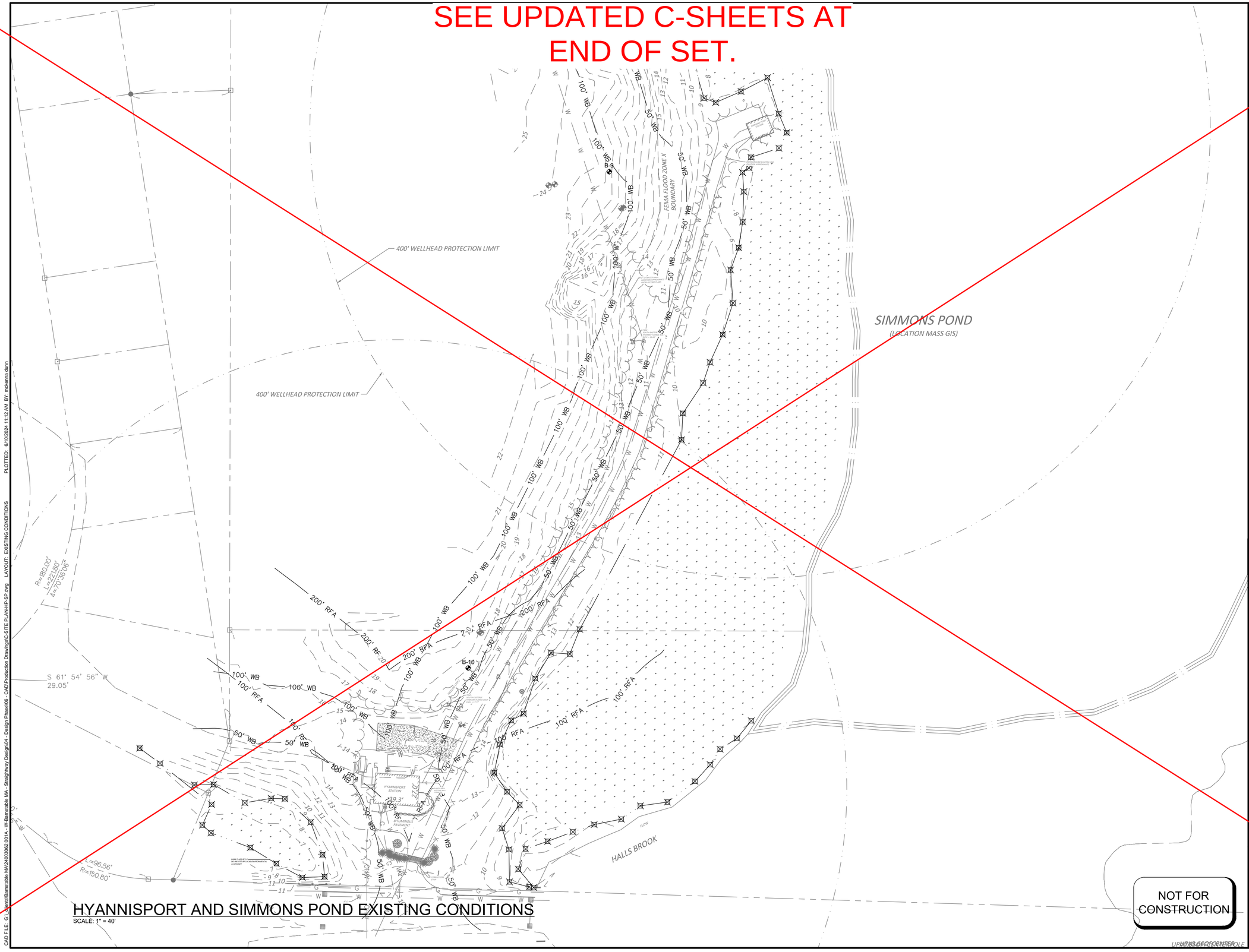
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APPROVED BY	GAA

C-102

SHEET 6 of 60

CAD FILE: G:\Clients\Barnstable MA\24003062.001A - Straightway Design\04 - Design Phase\06 - CAD\Production Drawings\C-SITE PLAN-STWY-ALT3.dwg LAYOUT: C-SITE-ALT1 PLOTTED: 6/10/2024 11:09 AM BY: mckenna dunn

SEE UPDATED C-SHEETS AT END OF SET.



HYANNISPORT AND SIMMONS POND EXISTING CONDITIONS

SCALE: 1" = 40'

NOT FOR CONSTRUCTION

UPDATED C-SHEETS AT END OF SET.

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SCALE VERIFICATION

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0 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

0 40 80 120

SCALE: 1" = 40' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

HYANNISPORT AND SIMMONS POND SITE PLAN - EXISTING CONDITIONS

STRAIGHTWAY WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

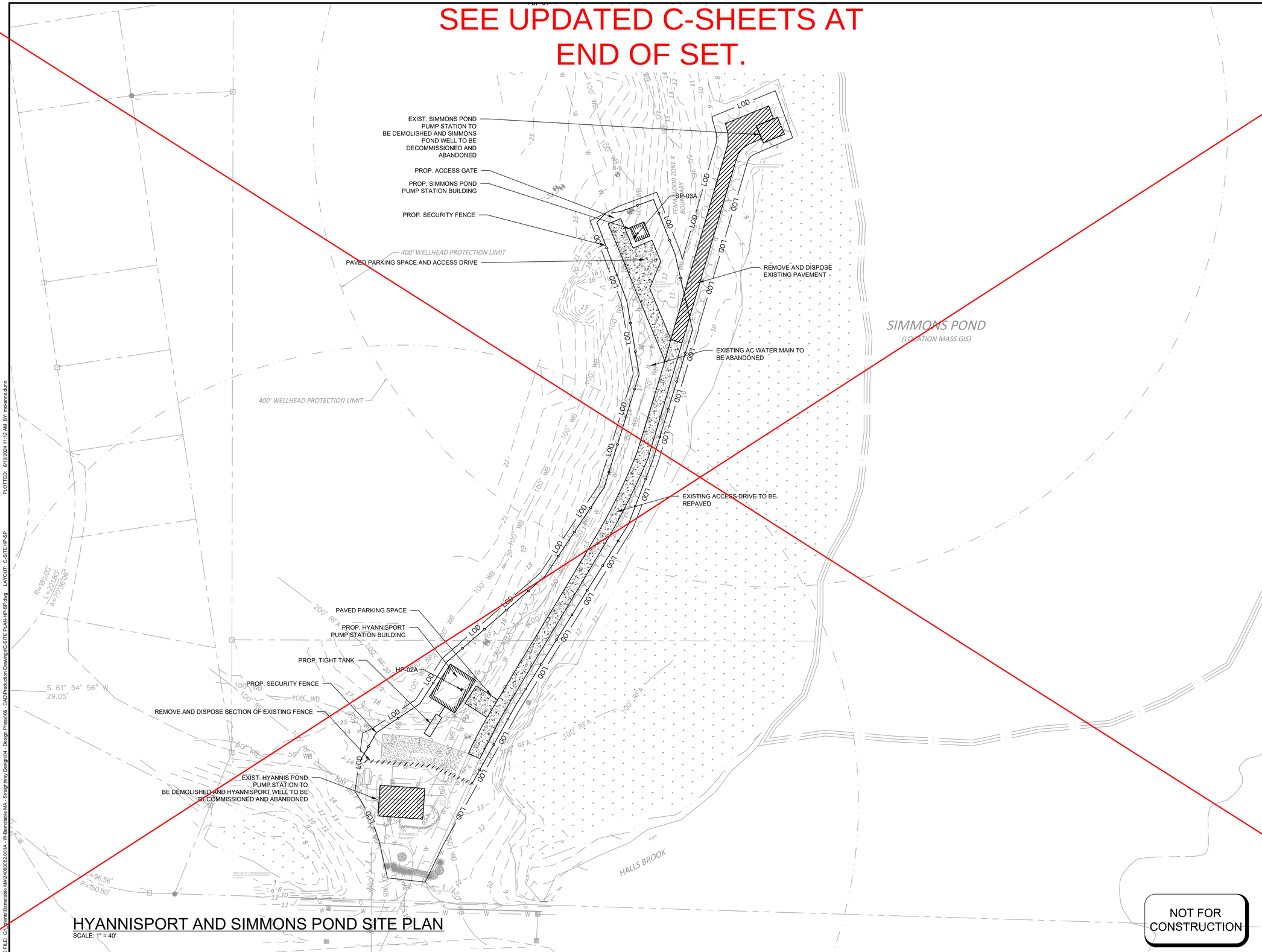
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CHECKED BY	TB/GAA
APPROVED BY	GAA

C-201

SHEET 7 of 60

SEE UPDATED C-SHEETS AT END OF SET.



HYANNISPORT AND SIMMONS POND SITE PLAN

SCALE: 1" = 40'

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HYANNISPORT AND SIMMONS POND SITE PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
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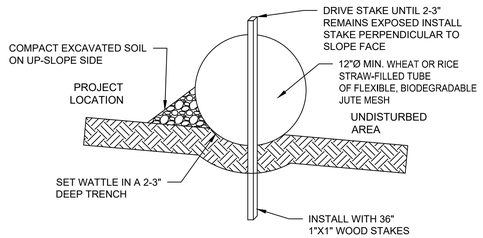
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APPROVED BY	GAA

C-202

SHEET 8 of 60

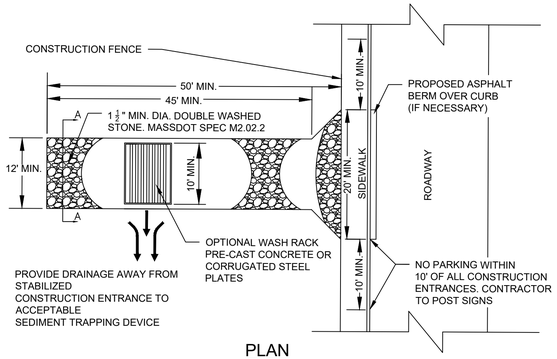
CAD FILE: G:\Clients\Barnstable MA\24003062.001A - W-Barnstable MA - Straightway Design\04 - Design Phase\08 - CAD\Production Drawings\C-SITE PLAN-HP-SP.dwg LAYOUT: C-SITE HP-SP PLOTTED: 6/10/2024 11:12 AM BY: mckenna dunn

SLOPE STEEPNESS	MAXIMUM LENGTH (FT)
2:1	25
3:1	50
4:1	75
5:1 OR FLATTER	100

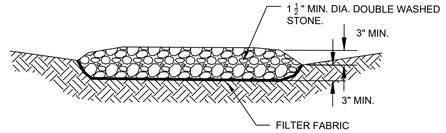


NOTES:
1. BEGIN AT THE LOCATION WHERE THE WATTLE IS TO BE INSTALLED BY EXCAVATING A 2-3" DEEP X 9" WIDE TRENCH ALONG THE CONTOUR OF THE SLOPE. EXCAVATED SOIL SHALL BE PLACED UP-SLOPE FROM THE ANCHOR TRENCH.
2. PLACE THE WATTLE IN THE TRENCH SO THAT IT CONTOURS TO THE SOIL SURFACE. COMPACT THE SOIL FROM THE EXCAVATED TRENCH AGAINST THE WATTLE ON THE UP-HILL SIDE. ADJACENT WATTLES SHOULD TIGHTLY ABUT.
3. SECURE THE WATTLE WITH 36" STAKES EVERY 3-4' WITH A STAKE ON EACH END. STAKES SHALL BE DRIVEN THROUGH THE MIDDLE OF THE WATTLES LEAVING AT LEAST SAMPLE LINE 2-3" OF STAKE EXTENDING ABOVE. THE WATTLE STAKES SHALL BE DRIVEN PERPENDICULAR TO SLOPE FACE.
4. MAX. DRAINAGE AREA ≤ 0.25 ACRES/100 LINEAR FEET.

STRAW WATTLE DETAIL
SCALE: N.T.S.

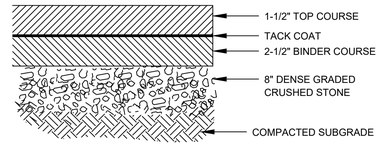


PLAN
NOT TO SCALE

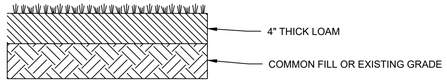


SECTION A-A

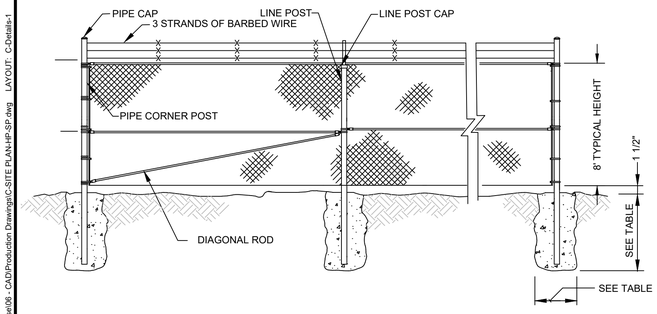
STABILIZED VEHICLE CONSTRUCTION EXIT
SCALE: N.T.S.



BITUMINOUS CONCRETE PAVEMENT ROAD SURFACE
N.T.S.



TYPICAL LOAM AND SEED SECTION
N.T.S.

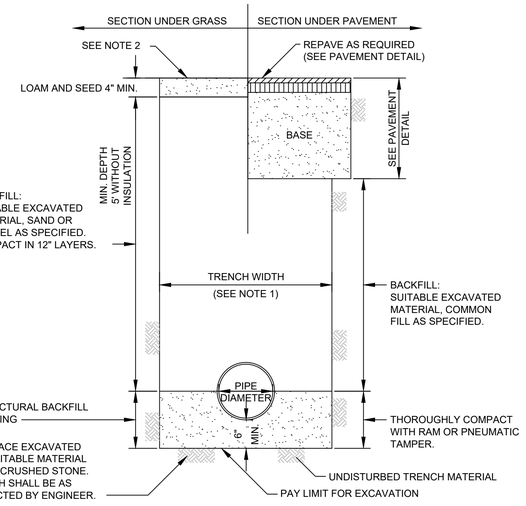


POST SETTING REQUIREMENT			
TYPE OF POST	HOLE DIA. AT TOP*	HOLE DEPTH	POST EMBEDMENT
LINE	9"	38"	36"
TERMINAL	12"	38"	36"

*MIN. HOLE DIAMETER IN SOFT OR LOOSE SOIL SHALL BE 18"

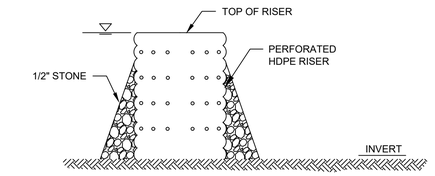
NOTES:
1. POST SPACING: LINE POSTS SHALL BE EVENLY SPACED, CENTER TO CENTER.
2. BARBED WIRE ARM WHERE REQUIRED SHALL BE PER SPECIFICATION SECTION 02444 - CHAIN LINK FENCE AND GATES.
3. POST FOOTING SHALL HAVE A 1" CROWN FINISH.
4. CONTRACTOR SHALL SUBMIT A COMPLETE SHOP DRAWING OF PROPOSED FENCE AND GATE TO ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.

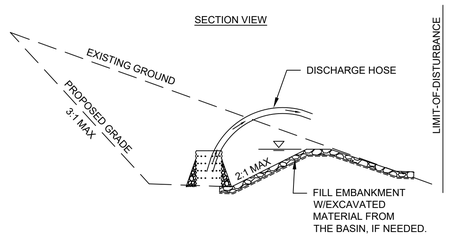
CHAIN LINK FENCE
SCALE: N.T.S.



NOTES:
1. IN TRENCH DIMENSIONS SHALL BE AS FOLLOWS:
   (a) FOR PIPE LESS THAN OR EQUAL TO 12 INCHES IN DIAMETER, ALLOWABLE TRENCH WIDTH AT PLANE 12 INCHES ABOVE PIPE SHALL BE NO MORE THAN 36 INCHES.
   (b) FOR PIPE GREATER THAN 12 INCHES IN DIAMETER THE ALLOWABLE TRENCH WIDTH SHALL BE EQUAL TO THE PIPE OUTSIDE DIAMETER PLUS 24 INCHES.
2. WHERE NO GRASS OCCURS, MATCH EXISTING MATERIALS AND DEPTHS. PLACE A MINIMUM OF 6" OF GRAVEL.
3. BEDDING SHALL BE WRAPPED WITH FILTER FABRIC IN LOCATIONS WHERE EXISTING SOIL IS CONSIDERED UNSUITABLE BY THE ENGINEER.

TYPICAL UTILITY TRENCH
SCALE: N.T.S.





LONGITUDINAL SECTION

NOTES:
1. TRAP CAPACITY: TEMPORARY SEDIMENT TRAP 134 CY/CONTRIBUTING ACRE AND 50% OF THIS VOLUME SHALL BE WET STORAGE.
2. TOTAL MIN. STORAGE VOLUME = 1* X CONTRIBUTING AREA.
3. SEDIMENT SHALL BE REMOVED WHEN THE BASIN IS 1/2 FULL AT A MINIMUM.
4. THE BASIN SHALL REMAIN IN PLACE UNTIL THE SITE HAS BEEN STABILIZED WITH BUILDINGS, PAVEMENT, OR ESTABLISHED VEGETATION, AS APPLICABLE.

TEMPORARY SEDIMENT TRAP (TYP.)
SCALE: N.T.S.

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ORIGINAL DRAWING SIZE IS 22 x 34

CIVIL DETAILS

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

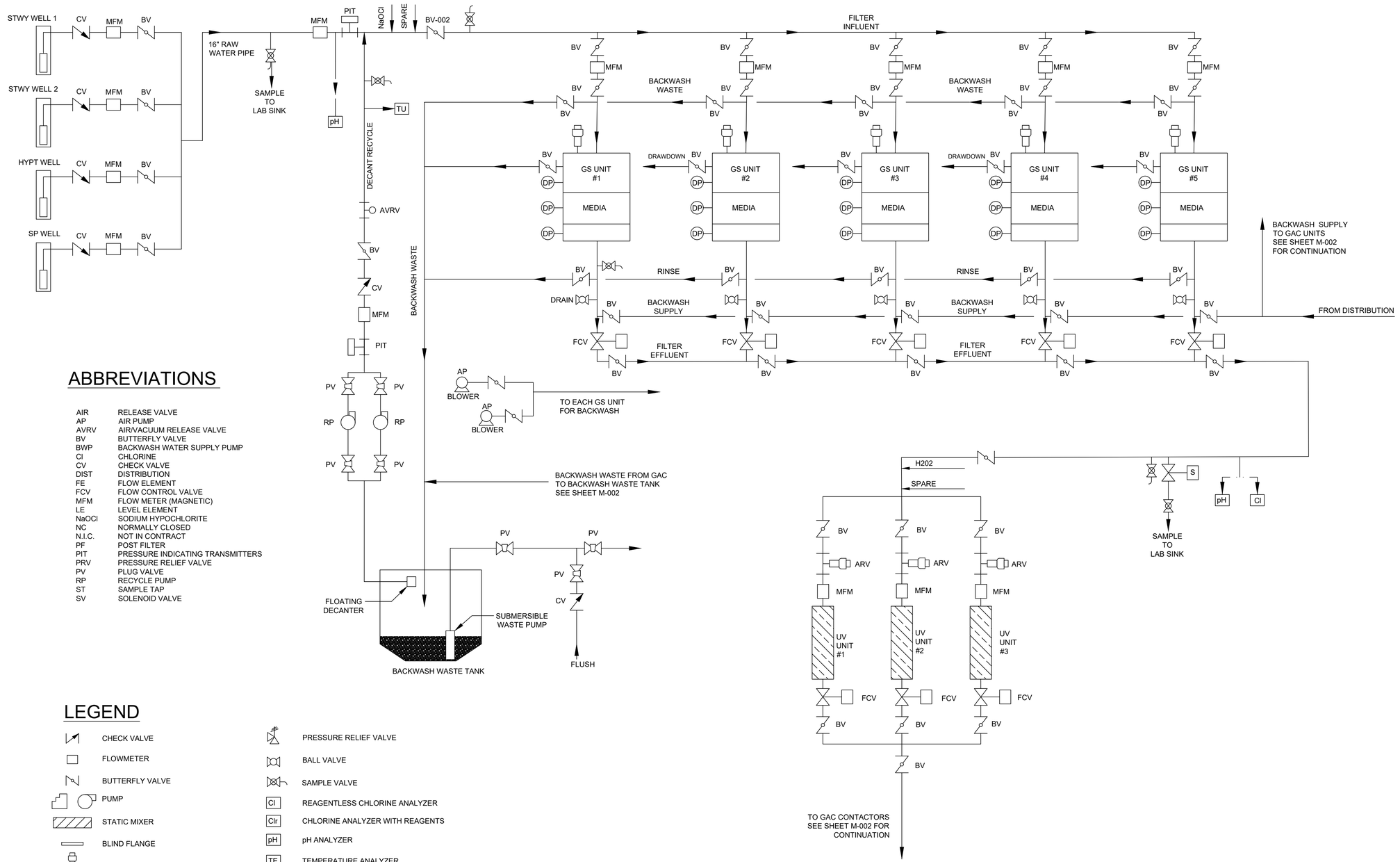
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DESIGNED BY	TB
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CHECKED BY	TB/GAA
APPROVED BY	GAA

C-501

SHEET 9 of 60

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ABBREVIATIONS

AIR	RELEASE VALVE
AP	AIR PUMP
AVRV	AIR/VACUUM RELEASE VALVE
BV	BUTTERFLY VALVE
BWP	BACKWASH WATER SUPPLY PUMP
Cl	CHLORINE
CV	CHECK VALVE
DIST	DISTRIBUTION
FE	FLOW ELEMENT
FCV	FLOW CONTROL VALVE
MFM	FLOW METER (MAGNETIC)
LE	LEVEL ELEMENT
NaOCl	SODIUM HYPOCHLORITE
NC	NORMALLY CLOSED
N.I.C.	NOT IN CONTRACT
PF	POST FILTER
PIT	PRESSURE INDICATING TRANSMITTERS
PRV	PRESSURE RELIEF VALVE
PV	PLUG VALVE
RP	RECYCLE PUMP
ST	SAMPLE TAP
SV	SOLENOID VALVE

LEGEND

- CHECK VALVE
- FLOWMETER
- BUTTERFLY VALVE
- PUMP
- STATIC MIXER
- BLIND FLANGE
- AIR RELEASE VALVE
- DIFFERENTIAL PRESSURE GAUGE
- MONITOR WASTE FLOW
- AIR/VACUUM RELEASE VALVE
- FLOW CONTROL VAVLE
- BLOWER
- PRESSURE RELIEF VALVE
- BALL VALVE
- SAMPLE VALVE
- REAGENTLESS CHLORINE ANALYZER
- CHLORINE ANALYZER WITH REAGENTS
- pH ANALYZER
- TEMPERATURE ANALYZER
- TURBIDITY ANALYZER
- SOLENOID VALVE
- FILTER MANUFACTURER TO SUPPLY
- PRESSURE INDICATING TRANSMITTER
- PLUG VALVE

PROCESS FLOW DIAGRAM I

SCALE: N.T.S.

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PROCESS FLOW DIAGRAM I

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

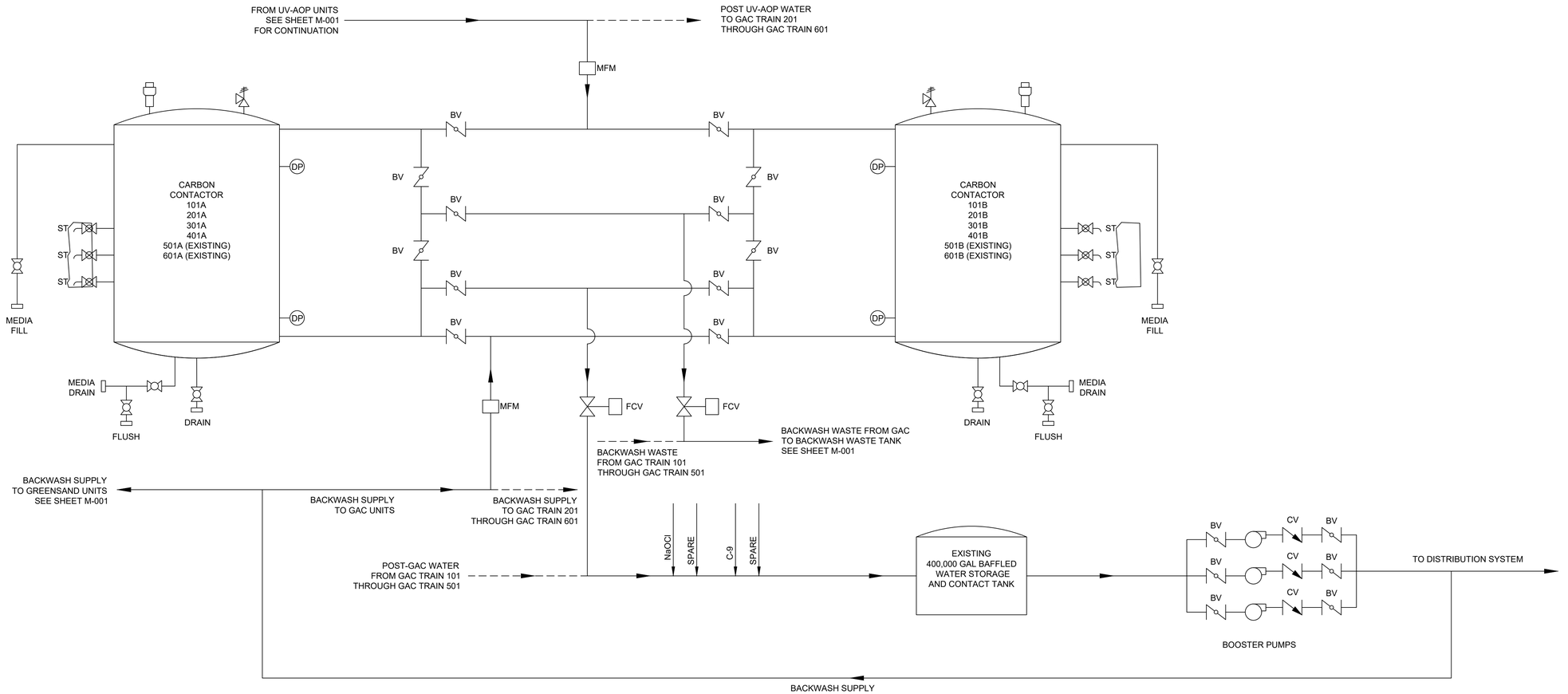
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M-001

SHEET 10 of 60

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PROCESS FLOW DIAGRAM II

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PROCESS FLOW DIAGRAM II

STRAIGHTWAY
WATER TREATMENT FACILITY

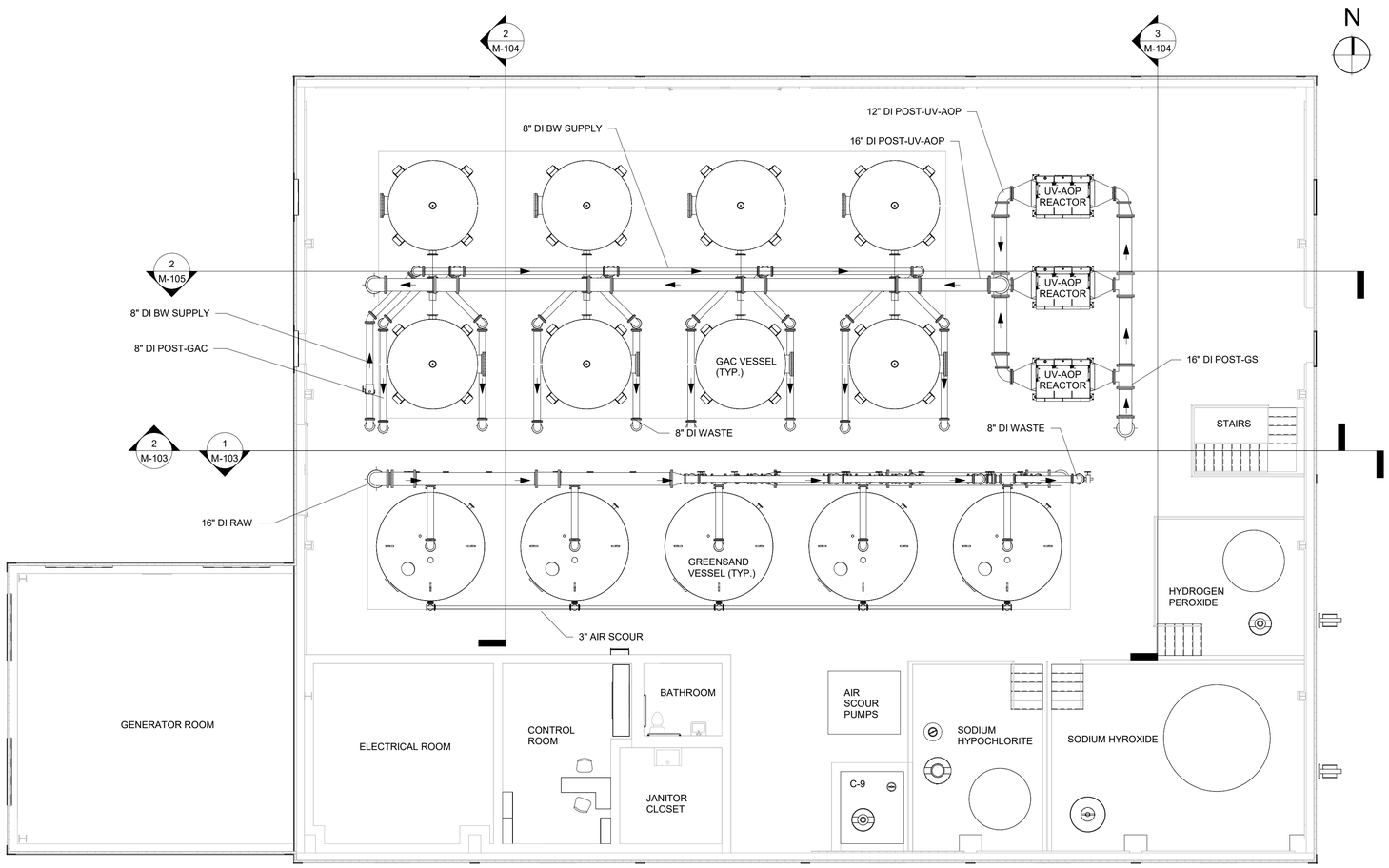
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HYANNIS, MA 02601

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M-002

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FIRST FLOOR PLAN
SCALE: 1/8" = 1'-0"

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STRAIGHTWAY WTF FIRST FLOOR PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

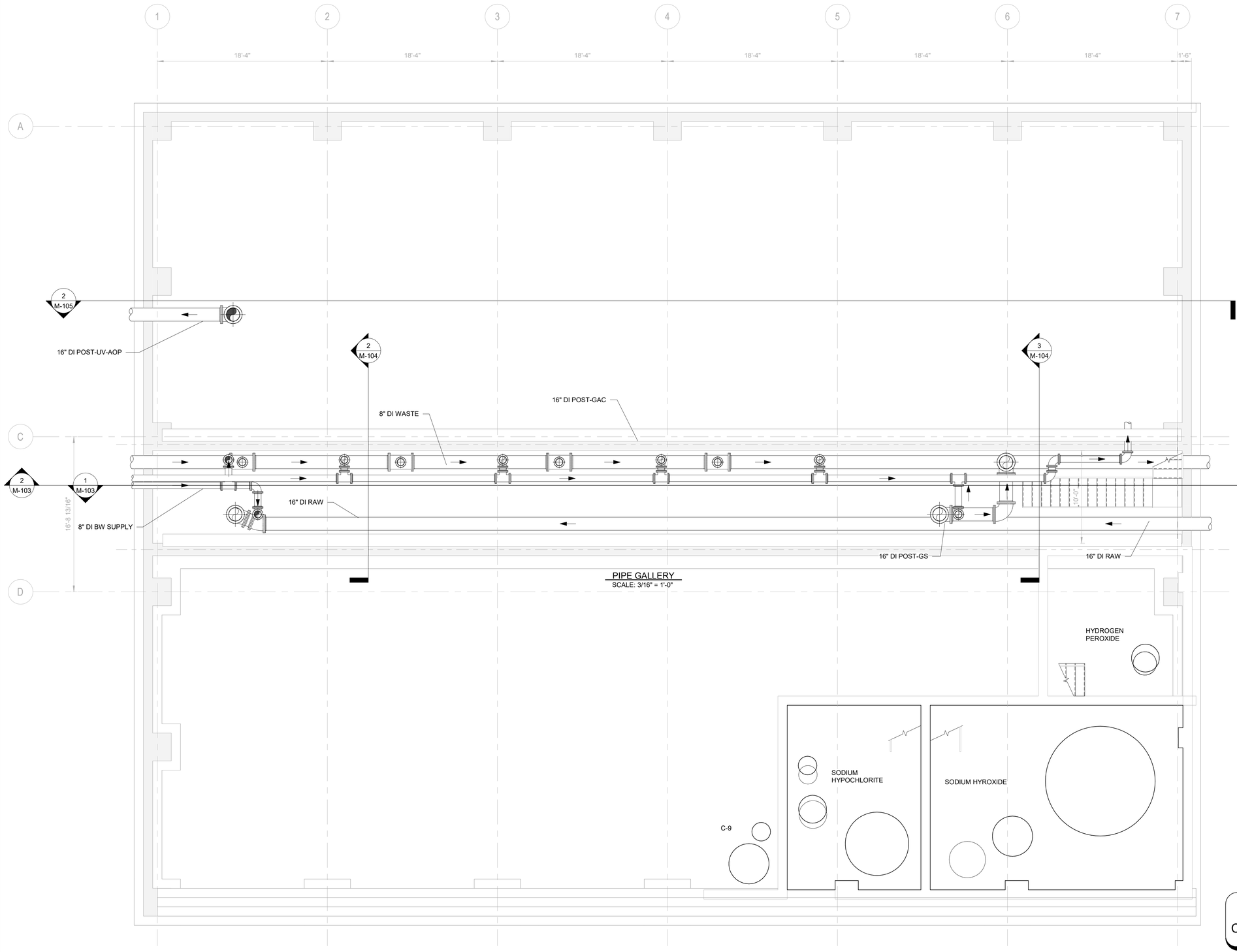
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M-101

SHEET 12 of 60

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STRAIGHTWAY WTF BASEMENT PLAN

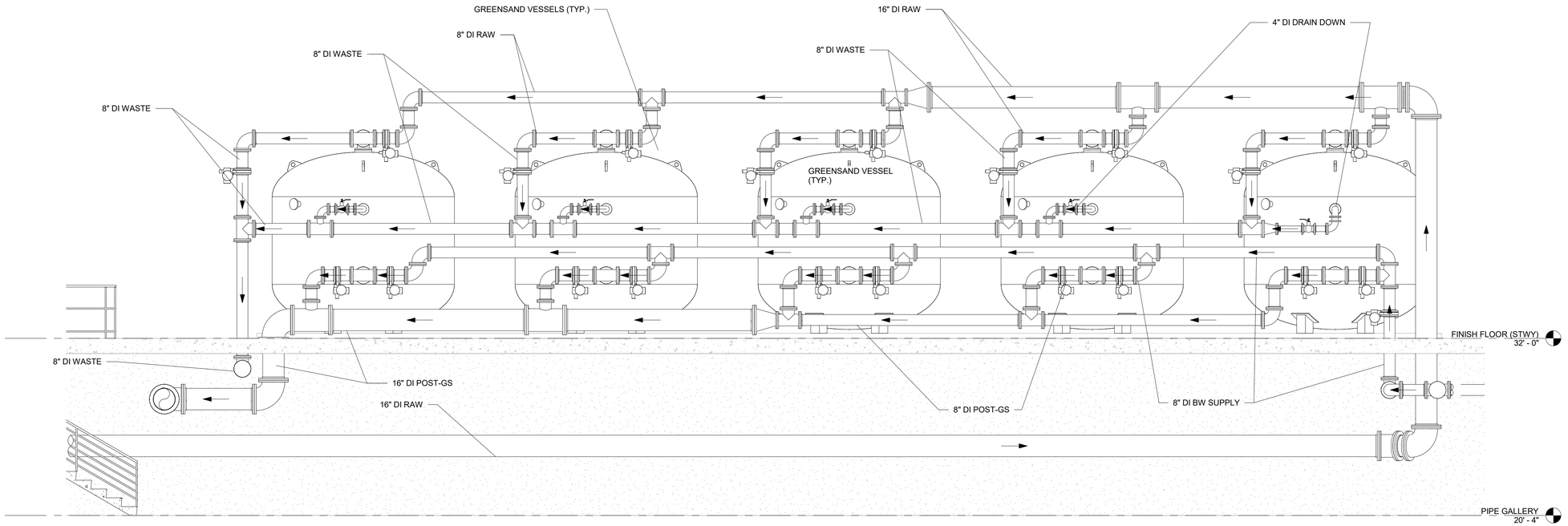
STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

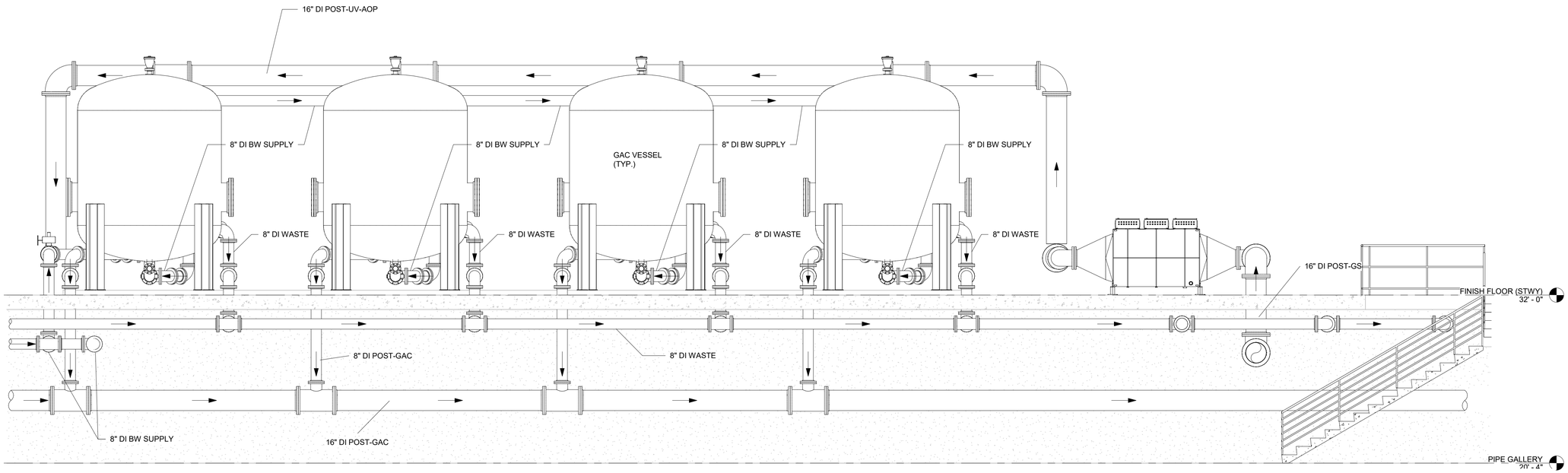
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M-102



1 M-101 SECTION 1
SCALE: 1/4" = 1'-0"



2 M-101 SECTION 2
SCALE: 1/4" = 1'-0"

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STRAIGHTWAY WTF PIPE SECTIONS I

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 ISSUED & MAY A. 1685

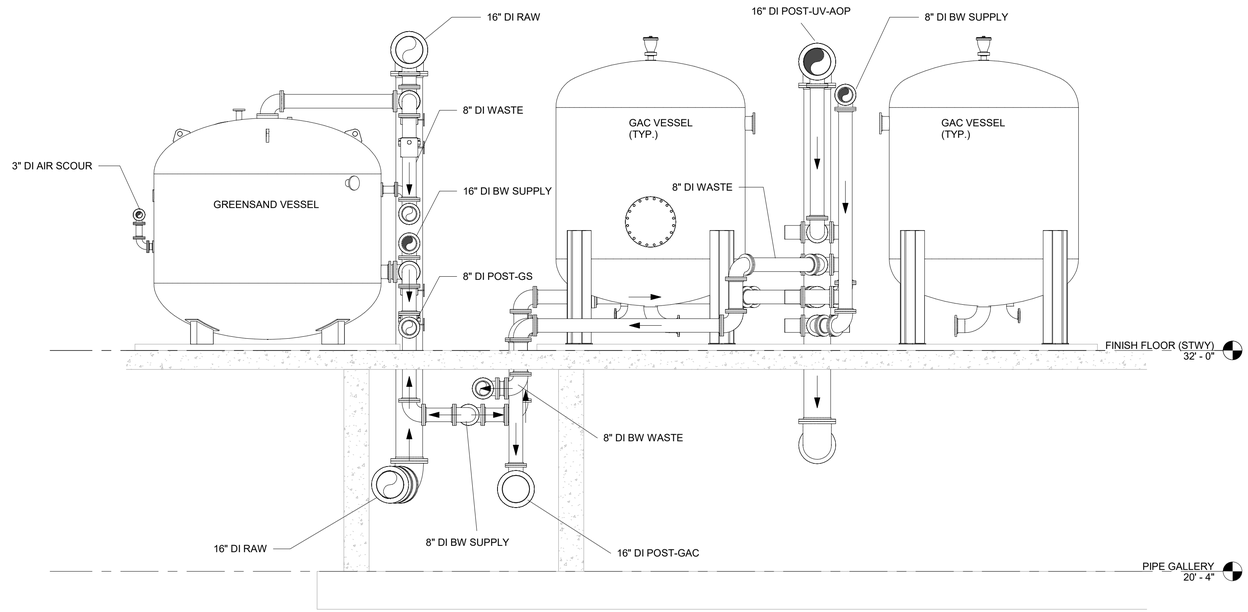
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BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

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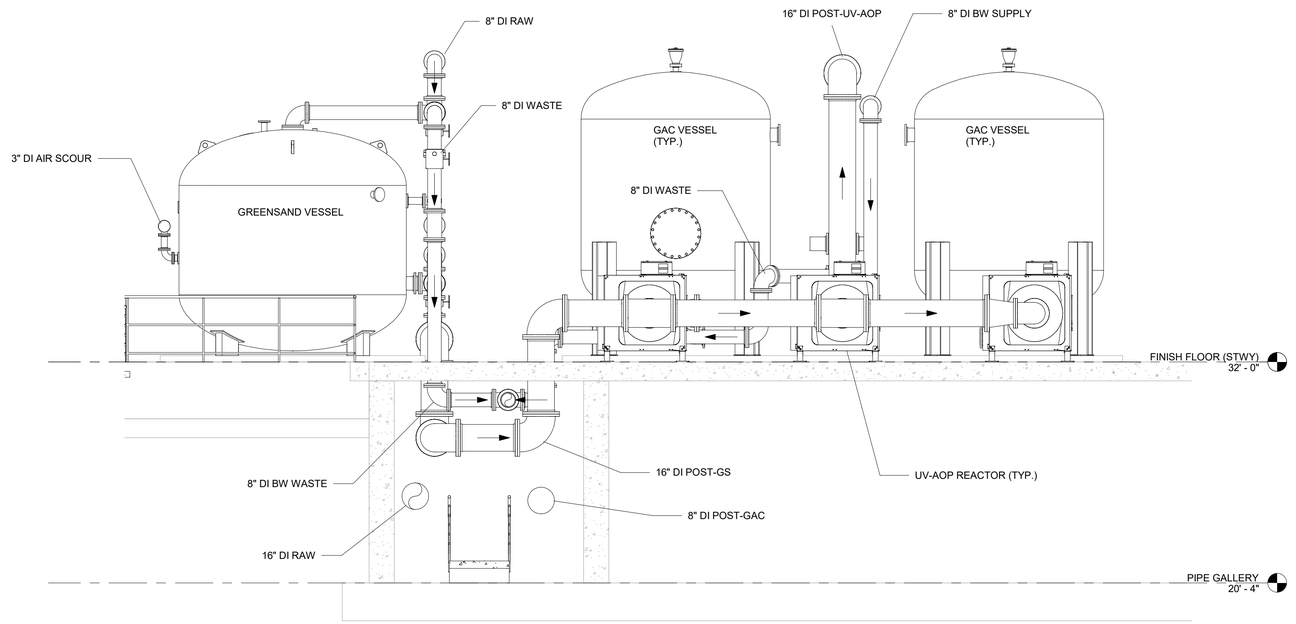
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M-103

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2 M-101 SECTION 3
SCALE: 1/4" = 1'-0"



3 M-101 SECTION 4
SCALE: 1/4" = 1'-0"

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STRAIGHTWAY WTF PIPE SECTIONS II

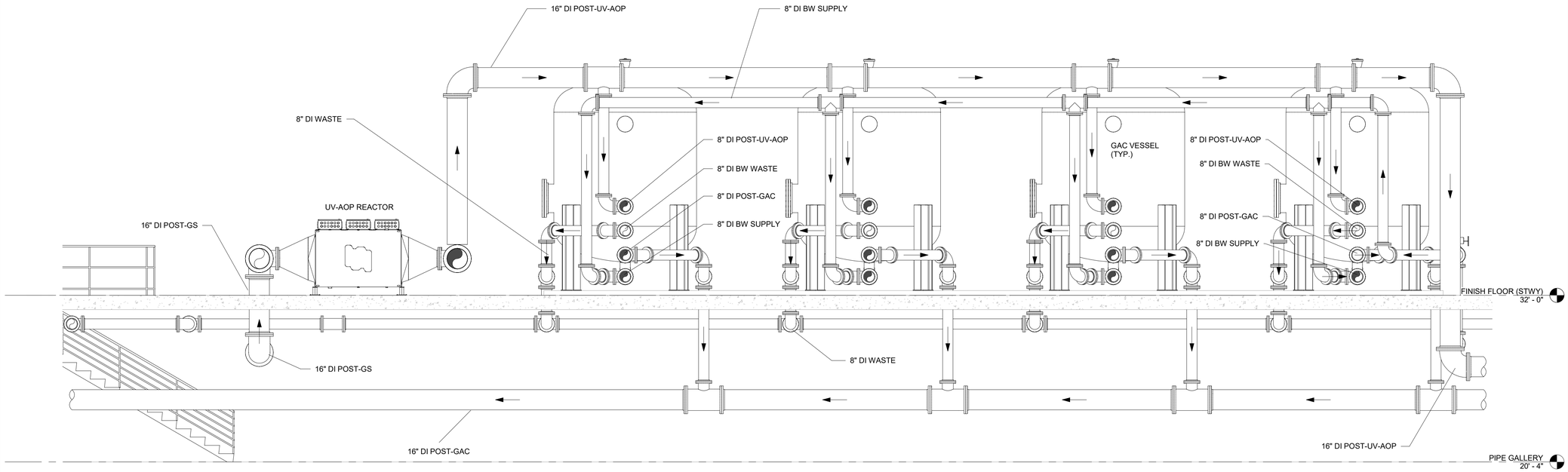
STRAIGHTWAY
WATER TREATMENT FACILITY

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STRAIGHTWAY WTF PIPE SECTIONS III

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE, MASS. 1639 INCORPORATED MAY 4, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

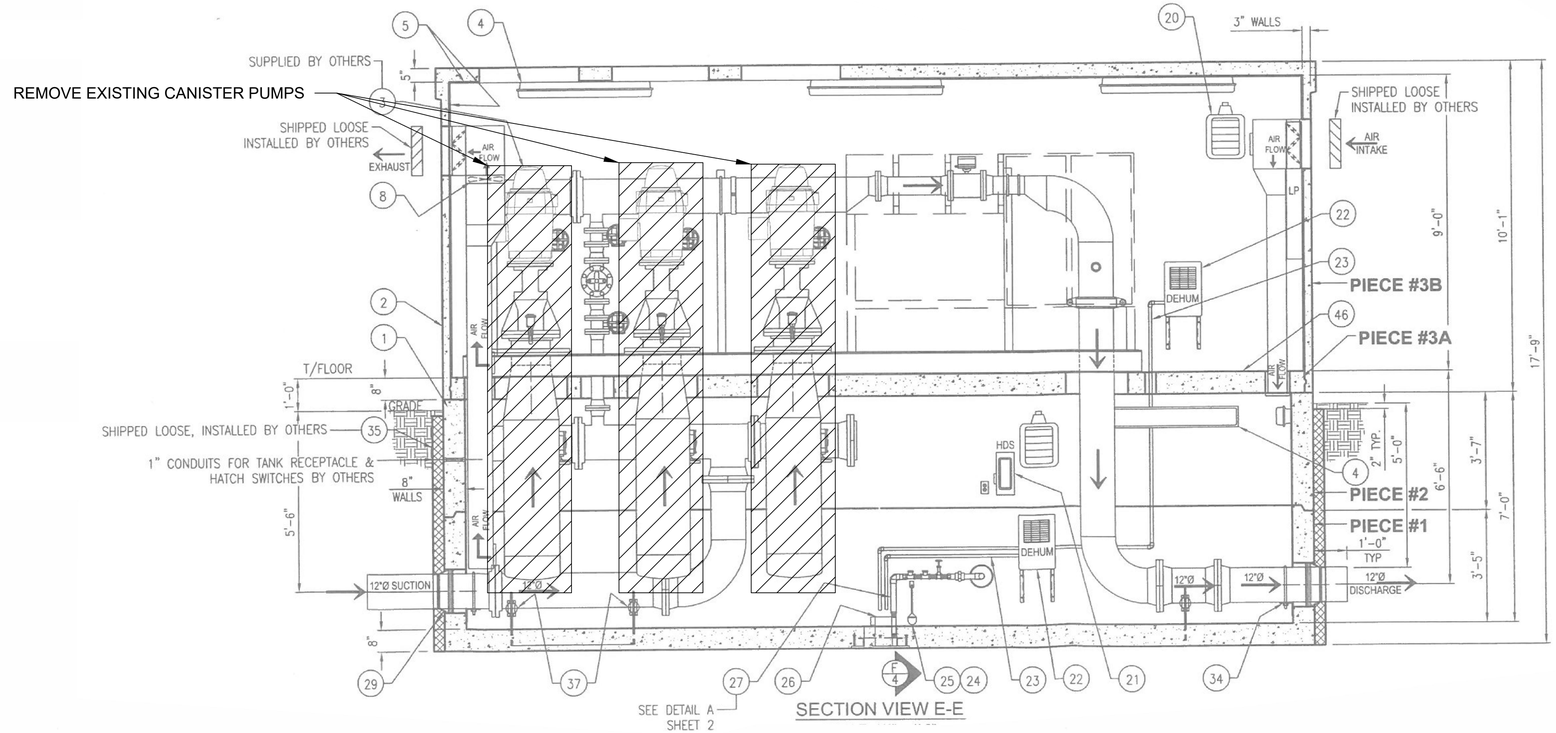
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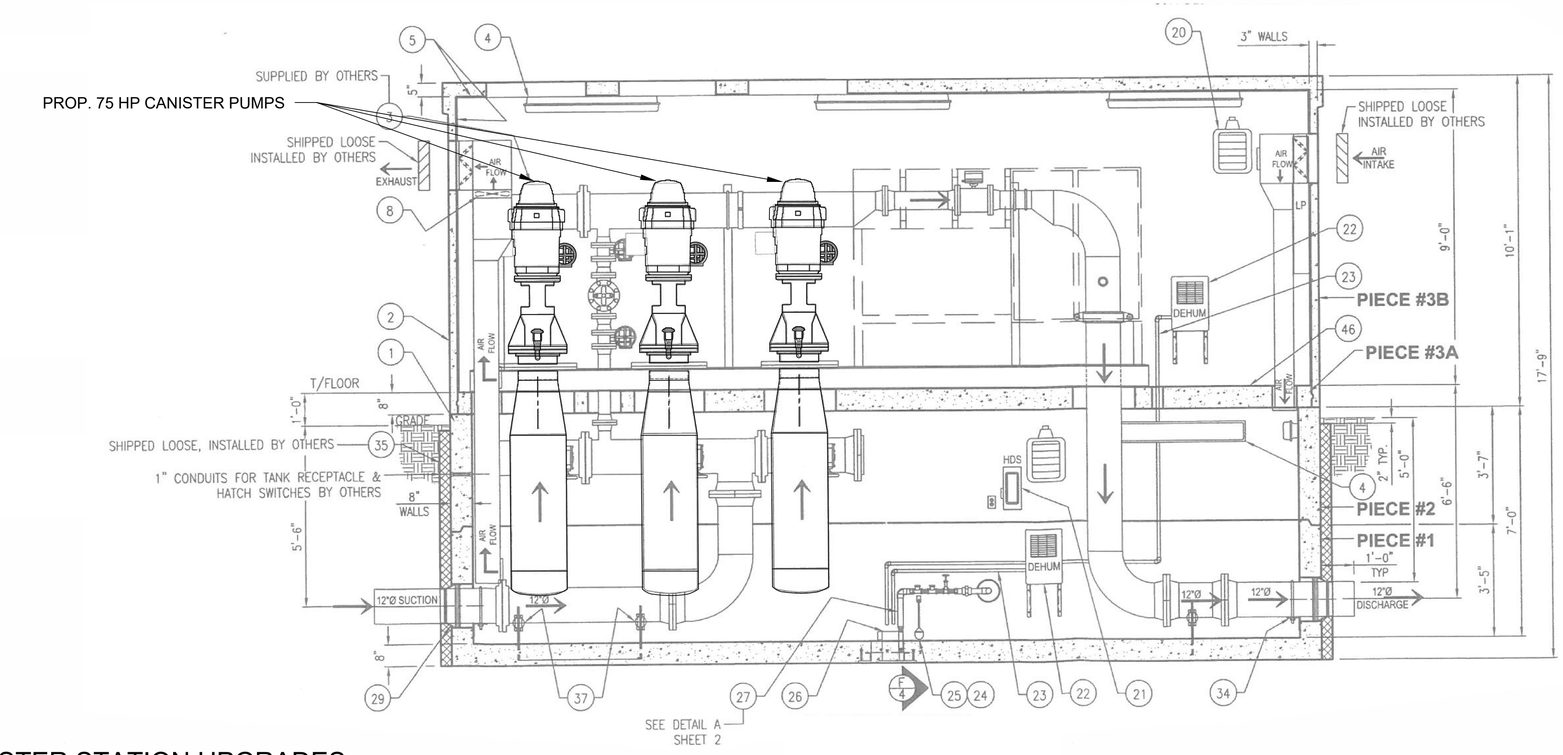
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BOOSTER STATION DEMOLITION PLAN

SCALE: NTS



BOOSTER STATION UPGRADES

SCALE: NTS

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BOOSTER PUMP STATION

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

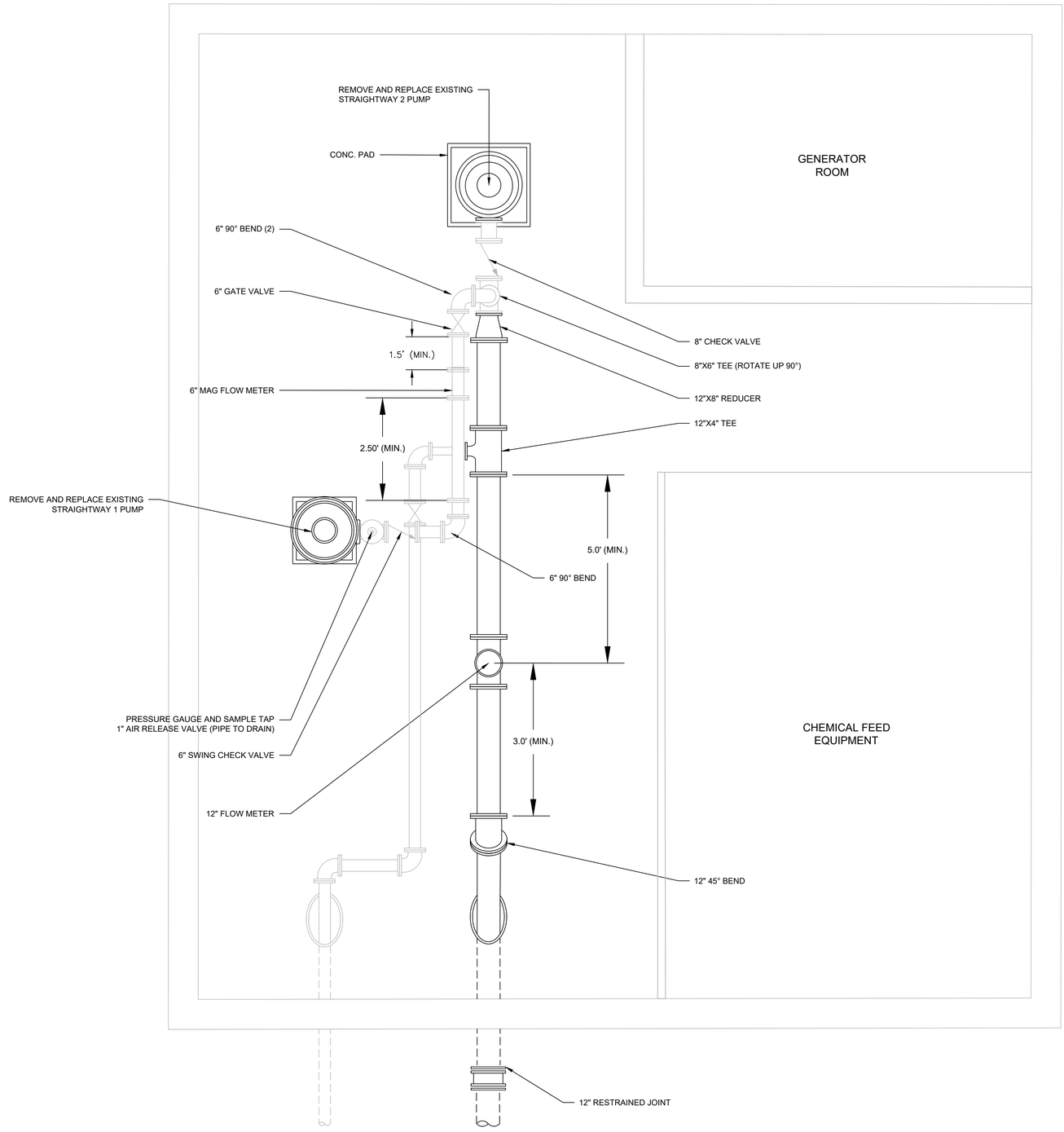
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PLAN
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SCALE: 1" = 32' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

EXISTING STRAIGHTWAY WTF DEMOLITION AND MODIFICATION PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED AUGUST 8 MAY 4 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

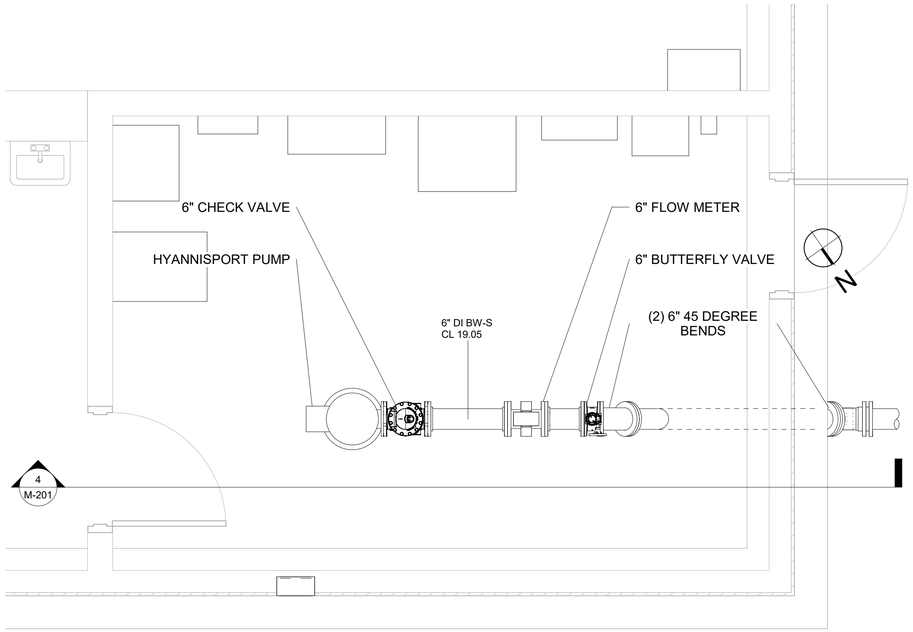
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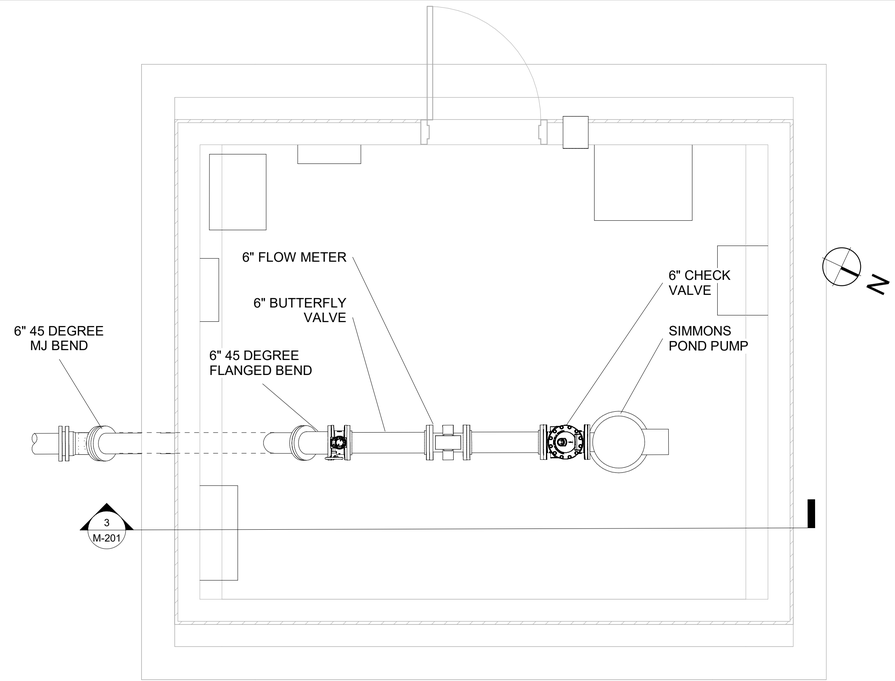
M-107

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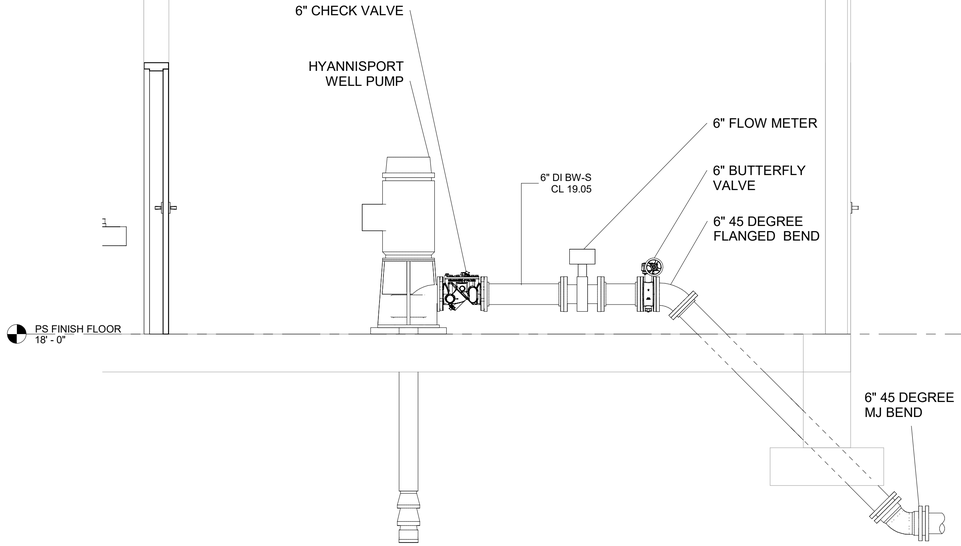
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CAD FILE: G:\...clients\Barnstable MA\24000062.001A - W-Barnstable MA - Straightway Design\04 - Design Phase\08 - CAD\Production Drawings\M-STWY-WELLS.dwg LAYOUT: M-107



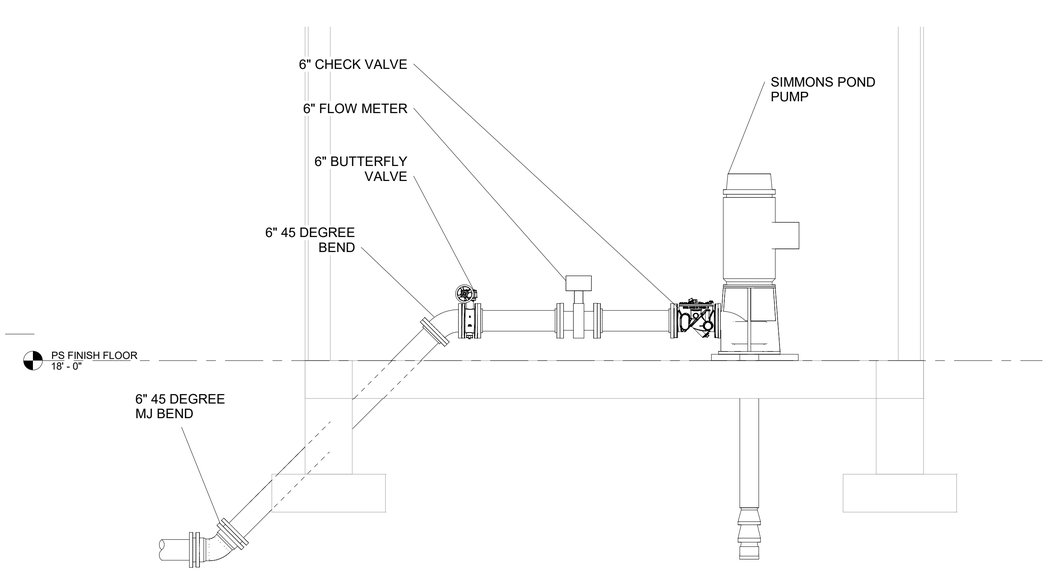
HYANNISPORT PUMP STATION PLAN
SCALE: 1/2" = 1'-0"



SIMMONS POND PUMP STATION PLAN
SCALE: 1/2" = 1'-0"



4 HYANNISPORT PUMP STATION SECTION
SCALE: 1/2" = 1'-0"



3 SIMMONS POND PUMP STATION SECTION VIEW
SCALE: 1/2" = 1'-0"

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KLEINFELDER
Bright People. Right Solutions.
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Boston, MA 02108
Phone: 617-497-7800
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REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

ORIGINAL DRAWING SIZE IS 22 x 34

HYANNISORT AND SIMMONS POND PUMP STATIONS PLAN AND SECTIONS

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

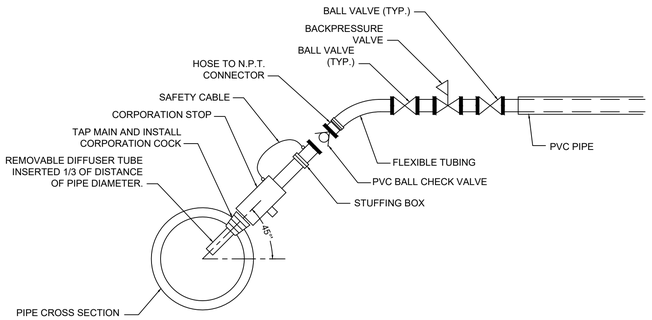
30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	6/10/2024
CURRENT REVISION	
DESIGNED BY	MR
DRAWN BY	MR
CHECKED BY	TB
APPROVED BY	MT

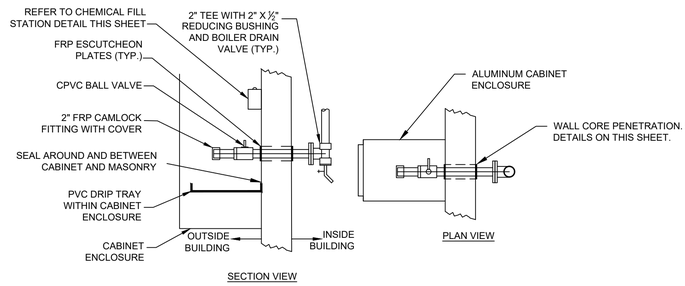
M-201

SHEET 19 of 60

PLOTTED: 6/10/2024 10:50:11 AM
Autodesk Docs://24003062.001A - W.Barnstable MA Straightway Design T1_2/Barnstable_Process_2023_Central.rvt

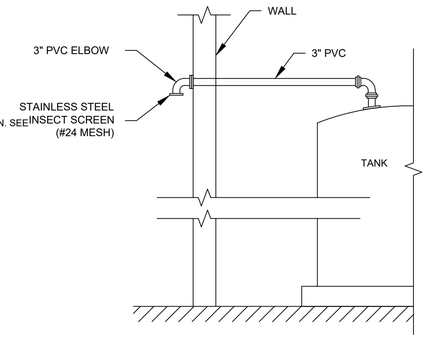


CHEMICAL INJECTION TAP DETAIL
SCALE: N.T.S.

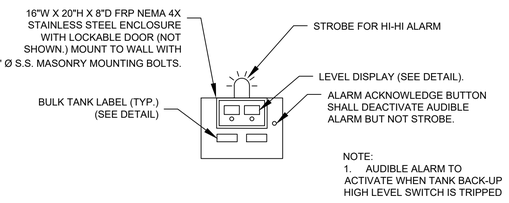


NOTES:
1. ONLY ONE FILL LINE SHALL BE INSTALLED FOR EACH CHEMICAL

CHEMICAL FILL LINE DETAILS
SCALE: N.T.S.

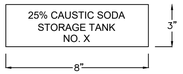


CHEMICAL TANK VENT
SCALE: N.T.S.



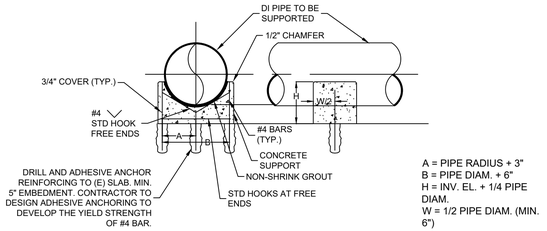
NOTE:
1. AUDIBLE ALARM TO ACTIVATE WHEN TANK BACK-UP HIGH LEVEL SWITCH IS TRIPPED

CHEMICAL FILL STATION DETAIL
SCALE: N.T.S.



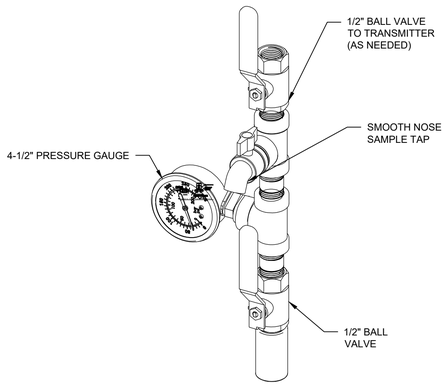
NOTES:
1. "X" SHALL BE REPLACED BY CORRESPONDING TANK NUMBER.
2. 25% CAUSTIC SODA SHALL BE REPLACED WITH APPROPRIATE CHEMICAL NAME AND STRENGTH. COORDINATE WITH ENGINEER.

BULK TANK LABEL DETAIL
SCALE: N.T.S.

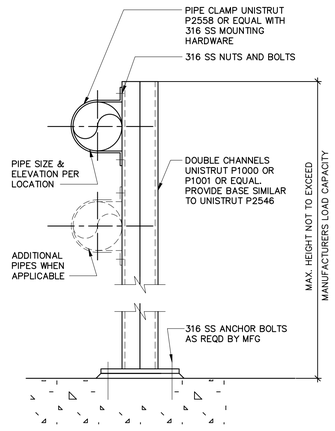


A = PIPE RADIUS + 3"
B = PIPE DIAM. + 6"
H = INV. EL. + 1/4 PIPE DIAM.
W = 1/2 PIPE DIAM. (MIN. 6")

CONCRETE PIPE SUPPORT DETAIL
SCALE: N.T.S.



PRESSURE/SAMPLE TAP DETAIL
SCALE: N.T.S.



METALLIC PIPE SUPPORT DETAIL
SCALE: N.T.S.

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WATER TREATMENT FACILITY

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30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	06/10/2024
CURRENT REVISION	-
DESIGNED BY	TB
DRAWN BY	MD
CHECKED BY	TB
APPROVED BY	MT

M-501

SHEET 20 of 60

CAD FILE: G:_clients\Barnstable MA\24003062.001A - W.Barnstable MA - Straightway Design\04 - Design Phase\08 - CAD\Production Drawings\M-DETAILS.dwg LAYOUT: M-501 PLOTTED: 6/10/2024 11:25 AM BY: mckenna dunn

A. GENERAL NOTES

1. ALL WORK MUST CONFORM TO THE REQUIREMENTS OF THE MASSACHUSETTS STATE BUILDING CODE 9TH EDITION.

2. PROPOSED FIELD MODIFICATION, REVISIONS AND ADDITIONS TO THE DESIGN DRAWING MUST BE APPROVED BY THE ENGINEER, IN WRITING, BEFORE WORK BEGINS. ANY REQUEST TO DEVIATE FROM THE ENGINEER'S SPECIFIED DETAILS ON THE DESIGN DRAWING BY THE CONTRACTOR MUST BE SUBMITTED IN WRITING TO THE ENGINEER FOR APPROVAL.

3. CONTRACTOR MUST PROVIDE ALL MATERIAL, LABOR, EQUIPMENT, CONSUMABLES, AND ALL OTHER ITEMS REQUIRED TO COMPLETE THE WORK AS SPECIFIED ON THE DESIGN DRAWINGS, PROJECT SPECIFICATIONS, AND AS NECESSARY TO COMPLETE THE WORK.

4. CONTRACTOR MUST VISIT THE PROJECT SITE AND OBSERVE CONDITIONS FOR THE PROPOSED CONSTRUCTION. ANY DISCREPANCY BETWEEN THE DESIGN DRAWINGS AND ACTUAL SITE CONDITIONS MUST BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ENGINEER, IN WRITING, FOR RESOLUTION PRIOR TO COMMENCEMENT OF THE WORK.

5. COMPLETED SHOP DRAWINGS FOR ALL WORK MUST BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO THE START OF FABRICATION AND CONSTRUCTION ACTIVITIES.

6. UNLESS NOTED OTHERWISE ON THE DESIGN DRAWINGS, ALL DESIGN, MATERIALS, FABRICATION, TESTING, AND CONSTRUCTION MUST COMPLY WITH THE FOLLOWING NOTES, REFERENCED CODES, SPECIFICATIONS AND STANDARDS. SHOULD THESE NOTES, CODES, SPECIFICATIONS OR STANDARDS CONFLICT, THE STRICTEST PROVISION MUST GOVERN UNTIL WRITTEN CLARIFICATION IS PROVIDED TO THE CONTRACTOR.

7. THE STRUCTURAL DRAWINGS MUST BE USED IN CONJUNCTION WITH ALL OTHER DESIGN DRAWINGS AND SPECIFICATIONS. REFER TO PROCESS EQUIPMENT, ARCHITECTURAL, CIVIL, MECHANICAL, HVAC, PLUMBING, ELECTRICAL, AND FIRE PROTECTION DRAWINGS FOR LOCATIONS, DIMENSIONS, AND DETAILS OF OPENINGS, SLEEVES, EMBEDMENTS, AND EQUIPMENT INSERTS, PADS, CURBS, DEPRESSIONS, ANCHOR BOLTS, EXTERIOR GRADING AND OTHER PROJECT REQUIREMENTS NOT SPECIFIED ON STRUCTURAL DRAWINGS.

8. THE CONTRACTOR SHALL OBTAIN HISTORICAL DRAWINGS, REPORTS, AND SPECIFICATIONS OF THE EXISTING STRUCTURES CONSTRUCTION FROM THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IN THE FIELD THE ACCURACY OF ALL RELEVANT INFORMATION SPECIFIED ON THE HISTORIC DOCUMENTS, INCLUDING BUT NOT LIMITED, TO STRUCTURAL SUBSTRUCTURE AND SUPERSTRUCTURE CONDITIONS AND THE EXISTENCE OF OVERHEAD, BURIED AND/OR EMBEDDED UTILITIES. THE CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS, ELEVATIONS AND DIMENSIONS PRIOR TO FABRICATING NEW WORK THAT WILL BE CONNECTED TO EXISTING CONSTRUCTION.

B. PROTECTION OF EXISTING STRUCTURES NOTES

1. EXISTING STRUCTURES, CONDUITS, UTILITY LINES AND OTHER UTILITIES MUST BE IDENTIFIED BY THE OWNER AND CONTRACTOR AND CLEARLY MARKED ON-SITE PRIOR TO INITIATING CONSTRUCTION. IN THE EVENT THAT ANY UNMARKED OR UNKNOWN STRUCTURE/UTILITY ARE UNCOVERED BY THE CONTRACTOR, WORK MUST HALT AND THE CONTRACTOR MUST REPORT ITS FINDINGS TO THE OWNER'S SITE REPRESENTATIVE FOR INSTRUCTIONS BEFORE PROCEEDING FURTHER. THE EXISTING STRUCTURES AND UTILITIES WHICH ARE ADJACENT TO THE SITE AND THOSE TO REMAIN WITHIN THE LIMITS OF THE WORK MUST BE PROTECTED AGAINST DAMAGE. THE CONTRACTOR WILL BE FULLY RESPONSIBLE IN THE EVENT OF REMOVAL OF OR DAMAGE TO ANY EXISTING OBJECTS BY THE CONTRACTOR'S PERSONNEL WHICH ARE INTENDED BY THE OWNER TO REMAIN IN PLACE.

2. CONTRACTOR SHALL PROVIDE ALL SHORING, BRACING, SHEETING, ETC. REQUIRED FOR SAFETY AND PROPER EXECUTION OF THE WORK.

3. CONTRACTOR IS SOLELY RESPONSIBLE TO PREPARE SHOP DRAWINGS FOR BRACING OF STRUCTURE DURING CONSTRUCTION ENSURING MEMBERS DESIGNED AND STAMPED/SEALED BY A REGISTERED PROFESSIONAL ENGINEER (REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS) AND SUBMIT THEM TO THE ENGINEER FOR RECORD.

4. THE CONTRACTOR SHALL PROVIDE STAMPED/SIGNED CALCULATIONS, PLANS AND DETAILS FOR THE TEMPORARY SUPPORT OF NEW AND EXISTING CONSTRUCTION TO REMAIN PREPARED BY AN ENGINEER LICENSED TO PRACTICE IN THE COMMONWEALTH OF MASSACHUSETTS.

C. DESIGN CRITERIA NOTES

1. STRUCTURES ARE DESIGNED IN ACCORDANCE WITH THE MASSACHUSETTS STATE BUILDING CODE 9TH EDITION.

2. DEAD LOAD:
WEIGHT OF BUILDING COMPONENTS SPECIFIED ON THE DRAWINGS
MEP AND FP ..... 10 PSF

3. LIVE LOAD:
STAIR AND EXITWAYS ..... 100 PSF
SIDEWALKS AND DRIVEWAYS ..... 250 PSF
LIGHT STORAGE ..... 125 PSF
HEAVY STORAGE ..... 250 PSF
FLOOR PLATES AND GRATING ..... 100 PSF
WALKWAYS AND ELEVATED PLATFORMS ..... 60 PSF
MECHANICAL ROOM ..... 150 PSF

4. ROOF LIVE LOAD:
MAINTENANCE: ..... 20 PSF

5. SNOW LOAD:
GROUND SNOW ..... P_g = 30 PSF
FLAT-ROOF SNOW ..... P_f = 28 PSF
EXPOSURE FACTOR ..... C_e =
THERMAL FACTOR ..... C_t =
IMPORTANCE FACTOR ..... I_s =
SLOPE FACTOR ..... C_s =
DRIFT SURCHARGE ..... P_d =
DRIFT WIDTH ..... W =

6. WIND LOAD:
RISK CATEGORY III
ULTIMATE WIND SPEED ..... V_{ULT} = 124 MPH
NOMINAL WIND SPEED ..... V_{asd} = 96 MPH
EXPOSURE CATEGORY C
DIRECTIONALITY FACTOR ..... K_d = 0.85
GUST EFFECT FACTOR ..... G = 0.85
TOPOGRAPHIC FACTOR ..... K_{zt} = 1.00
INTERNAL PRESSURE COEFFICIENT ..... GC_{pi} = ±0.18

7. SEISMIC LOAD:
RISK CATEGORY III
IMPORTANCE FACTOR ..... I_E = 1.25
SITE CLASSIFICATION C
SEISMIC DESIGN CATEGORY ..... B
RESPONSE MODIFICATION FACTOR ..... R =
DESIGN SPECTRAL RESPONSES ..... S_s = 0.236
S_{D1} = 0.054
S_{DS} = 0.205
S_{D1} = 0.054
SEISMIC FORCE RESISTING SYSTEM ..... SYSTEM NOT SPECIFICALLY DETAILED FOR SEISMIC RESISTANCE
SEISMIC FORCE RESISTING SYSTEM ..... CS =
ANALYSIS PROCEDURE ..... EQUIVALENT LATERAL FORCE

C. DESIGN CRITERIA NOTES (CONT.)

8. FLOOD:
DESIGN CLASS .....
LOWEST FLOOR ELEVATION .....
DRY FLOODPROOFED ELEVATION .....

9. RAIN:
INTENSITY ..... i = 9 3/4"/HR

D. STRUCTURAL STEEL NOTES

1. DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL AND MISCELLANEOUS STEEL MUST BE IN ACCORDANCE WITH THE CURRENT EDITION OF THE FOLLOWING CODES & STANDARDS:
a. MASSACHUSETTS STATE BUILDING CODE 9TH EDITION
b. SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS (ANSI/AISC 360)
c. CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES (AISC 303)
d. SPECIFICATION FOR STRUCTURAL JOINT USING HIGH-STRENGTH BOLTS (RCSC)
e. STRUCTURAL WELDING CODE – STEEL (AWS D1.1)
f. STRUCTURAL WELDING CODE – ALUMINUM (AWS D1.2)
g. STRUCTURAL WELDING CODE – SHEET STEEL (AWS D1.3)
h. STRUCTURAL WELDING CODE – STAINLESS STEEL (AWS D1.6)
i. PROJECT SPECIFICATIONS
j. OSHA STANDARDS 1910 & 1926
k. DETAILING FOR STEEL CONSTRUCTION, 3RD EDITION (AISC)

2. ALL STRUCTURAL AND MISCELLANEOUS STEEL MUST BE NEW CONFORMING TO THE FOLLOWING SPECIFICATIONS AND STANDARDS UNLESS NOTED OTHERWISE ON THE DESIGN DRAWINGS:
a. WIDE FLANGE & WT ..... ASTM A992
b. CHANNELS & ANGLES ..... ASTM A36
c. HSS ..... ASTM A500, GRADE B
d. STEEL PIPE ..... ASTM A53, GRADE B
e. STEEL PLATE ..... ASTM A36
f. HIGH-STRENGTH BOLTS ..... ASTM F3125, GRADE A325-N
g. COMMON BOLTS ..... ASTM A307
h. NUTS ..... ASTM A563
i. WASHERS ..... ASTM F436
j. LOAD INDICATING WASHERS ..... ASTM F959
k. ANCHOR BOLTS .....ASTM F1554, GRADE 55

3. THE CONTRACTOR MUST FIELD VERIFY EXISTING CONDITIONS, ELEVATIONS AND DIMENSIONS PRIOR TO FABRICATING NEW WORK THAT WILL BE CONNECTED TO EXISTING CONSTRUCTION.

4. CONTRACTOR IS RESPONSIBLE FOR STRUCTURAL STABILITY UNTIL ERECTION IS COMPLETE AND FINAL CONNECTION SECURED. CONTRACTOR MUST PROVIDE TEMPORARY BRACING OF STRUCTURAL FRAMING TO MAINTAIN STABILITY UNTIL PERMANENT BRACING, MOMENT CONNECTIONS AND FLOOR DECKS (DIAPHRAGMS) ARE INSTALLED.

5. ALL STRUCTURAL AND MISCELLANEOUS STEEL, UNLESS NOTED OTHERWISE, MUST BE HOT-DIPPED GALVANIZED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS. MONORAIL BEAMS MUST BE SHOP COATED SAFETY YELLOW, #389074, BASED ON FEDERAL STANDARD 595B COLORS WITH OSHA STRIPING. CAPACITY OF MONORAIL BEAMS MUST BE STENCILED IN 3" MIN. LETTERS (BLACK) ON EACH SIDE OF WEB IN A CLEARLY VISIBLE LOCATION.

6. WELDING MUST BE PERFORMED IN ACCORDANCE WITH THE APPLICABLE STRUCTURAL WELDING CODE (AWS). ALL WELDING MUST BE PERFORMED BY CERTIFIED WELDERS. WELDED CONNECTION MUST BE MADE UTILIZING E70XX ELECTRODES UNLESS NOTED OTHERWISE.

7. ALL BUTT WELDS AND GROOVE WELDS MUST BE COMPLETE JOINT PENETRATION WELDS (CJP). FILLET WELDS MUST BE ¼" MINIMUM UNLESS NOTED OTHERWISE.

8. STEEL SURFACES TO BE WELDED MUST BE CLEAN AND FREE FROM OIL, SCALE, SLAG, GREASE, AND OTHER FOREIGN MATERIAL WHICH IS DETRIMENTAL TO WELDING. WHEN WELDING TO EXISTING STRUCTURAL STEEL, MATERIALS MUST BE REMOVED PER THE REQUIREMENTS OF SSPC SP-11 A MINIM OF 4" FROM THE SURFACE TO BE WELDED.

9. BEARING ENDS OF ALL COLUMNS AND STIFFENERS MUST BE FINISHED TO BEAR.

10. GUSSET AND STIFFENER PLATES MUST BE ⅜" THICK MINIMUM UNLESS NOTED OTHERWISE.

11. ALL ASSEMBLY, TIGHTENING AND INSPECTION FOR HIGH-STRENGTH BOLTS MUST BE IN ACCORDANCE WITH THE AISC SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS (RCSC). TIGHTENING OF STRUCTURAL CONNECTIONS MUST BE DONE BY TURN-OF-NUT METHOD OR UTILIZING TORQUED-CONTROLLED (TC) BOLTS. ALL BOLTS FOR END CONNECTIONS OF BEAMS AND BRACING MUST BE FULLY TENSIONED IN ACCORDANCE WITH RCSC.

12. UNLESS NOTED OTHERWISE, FIELD CONNECTIONS MUST BE BEARING-TYPE BOLT CONNECTIONS USING ASTM F3125, GRADE A325 GALVANIZED HIGH-STRENGTH BOLTS. BOLT DIAMETER MUST BE ¾" DIAMETER, MINIMUM, IN STANDARD HOLES.

13. UNLESS NOTED OTHERWISE, SECONDARY CONNECTIONS (GIRTS, STAIR STRINGERS, LADDERS AND HANDRAILS) MAY BE MADE USING ⅝" DIAMETER ASTM A307 BOLTS WITH COMPATIBLE NUTS AND WASHERS.

14. ALL GRADE A325 BOLTS ARE TO BE INSTALLED FULLY PRE-TENSIONED AND INSTALLED WITH LOAD INDICATOR WASHERS (SQUIRTER TYPE) AND HARDENED F436 WASHER IN ACCORDANCE WITH TABLE 8.1 OF RCSC.

15. THE CONTRACTOR, OR DESIGNATED REPRESENTATIVE, MUST DESIGN AND PROVIDE FINAL STRUCTURAL CONNECTIONS FOR THE FOLLOWING INSTANCES:

A. FRAMED BEAM END CONNECTION NOT SPECIFICALLY DETAILED ON THE DESIGN DRAWINGS
B. RAILING AND RAILING CONNECTIONS TO STRUCTURAL MEMBERS
C. STAIRS AND STAIR CONNECTION TO STRUCTURAL MEMBERS
D. ALUMINUM, LADDERS AND SUPPORTS
E. COLD-FORMED METAL FRAMING.

ALL CONTRACTOR RESPONSIBLE DESIGNS MUST BE PERFORMED BY A PROFESSIONAL STRUCTURAL ENGINEER LICENSED IN THE STATE HAVING AUTHORITY OF THE PROJECT. SUBMITTED CALCULATIONS AND APPLICABLE DRAWING MUST BE SIGNED-AND-SEALED BY THE STRUCTURAL ENGINEER.

16. ALL DESIGN LOADS SPECIFIED IN THE DESIGN DRAWING ARE ALLOWABLE STRENGTH DESIGN (ASD) UNLESS NOTED OTHERWISE.

17. BEAM END CONNECTIONS MUST BE STANDARD FRAMED BEAM CONNECTIONS AS SHOWN IN THE AISC STEEL CONSTRUCTION MANUAL. THE CONNECTIONS MUST BE DESIGNED TO CARRY THE FOLLOWING CONCURRENT LOADS (SHEAR AND AXIAL):
a. SHEAR LOAD: THE SHEAR LOAD FOR BEAM END CONNECTION MUST BE EQUAL TO ONE-HALF OF THE ALLOWABLE UNIFORM LOADS FOR BEAMS LATERALLY SUPPORTED AS TABULATED IN PART 3 OF THE AISC MANUAL FOR STEEL CONSTRUCTION UNLESS NOTED OTHERWISE. WHERE A HIGHER OR LOWER SHEAR LOAD CAPACITY IS REQUIRED, IT IS SPECIFIED ON THE DESIGN DRAWING.
b. AXIAL LOAD: THE END CONNECTIONS OF THE BEAMS MUST BE DESIGNED FOR THE AXIAL TRANSFER FORCE (TF) IN COMBINATION WITH THE SHEAR LOAD. FOR TENSION TRANSFER FORCES, THE CONNECTION ANGLE AND BOLTS MUST SPECIFICALLY BE VERIFIED FOR PRYING ACTION. CONNECTION OF ALL GIRDERS TO COLUMNS MUST USE A MINIMUM ½" THICK CONNECTION ANGLES.

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D. STRUCTURAL STEEL NOTES (CONT.)

18. MOMENT CONNECTIONS (MC) MUST DEVELOP THE FULL CAPACITY OF THE WEAKER SECTION OF THE CONNECTED MEMBERS UNLESS NOTED OTHERWISE OF SPECIFIED VALUES ARE PROVIDED. CONNECTION MUST BE DESIGNED TO INCLUDE CONCURRENT LOADS.

19. MOMENT SPLICES (MS) MUST DEVELOP THE FULL CAPACITY OF THE SPLICED MEMBER SECTION.

20. STRUCTURAL BRACING CONNECTIONS MUST BE DESIGNED FOR LOADS SPECIFIED ON THE DESIGN DRAWINGS AND MUST BE MADE WITH A MINIMUM OF 2 BOLTS IN DOUBLE SHEAR OR 4 BOLTS IN SINGLE SHEAR UNLESS NOTED OTHERWISE.

21. WORK POINT ELEVATIONS FOR VERTICAL BRACING MUST BE LOCATED AT THE CENTERLINE OF THE BEAMS OR COLUMNS THEY CONNECT TO UNLESS NOTED OTHERWISE.

22. CONNECTION DESIGN FORCES SPECIFIED ON THE DESIGN DRAWINGS ARE IN KIPS AND FOOT-KIPS. NO REDUCTION IN FORCE OR ALLOWABLE STRESS INCREASE IS TO BE USED IN CONNECTION DESIGN. SHEAR AND AXIAL CONNECTION DESIGN MUST CONSIDER BOTH FORCES ACTING AT THE SAME TIME. PRYING FORCES MUST BE CONSIDERED FOR ALL TENSION AXIAL FORCES.

23. UNLESS SPECIFIED ON THE DESIGN DRAWINGS, HIGH STRENGTH BOLTED JOINTS MUST BE BEARING TYPE CONNECTIONS WITH BOLTS THREADS INCLUDED IN THE SHEAR PLANE (N-TYPE), EXPECT THAT JOINTS SUBJECTED TO SIGNIFICANT STRESS REVERSAL (+/- LOADS) OR SEVER STRESS FLUCTUATIONS SHALL BE SLIP-CRITICAL TYPE CONNECTIONS. ALL HORIZONTAL AND VERTICAL TRUSS MEMBERS WHICH HAVE BOLTED CONNECTIONS MUST HAVE FULLY TENSIONED CONNECTIONS. LOCATIONS WHERE SLOPE CRITICAL CONNECTIONS ARE REQUIRED WILL BE SPECIFIED ON THE DESIGN DRAWINGS.

24. DIAGONAL HORIZONTAL BRACING CONNECTIONS WHERE FORCES ARE NOT SPECIFIED ON THE DESIGN DRAWINGS MUST BE DESIGNED FOR A MINIMUM OF 15 KIP AXIAL LOAD (TENSION AND COMPRESSION). VERTICAL BRACING CONNECTIONS WHERE FORCES ARE NOT SPECIFIED ON THE DESIGN DRAWINGS MUST BE DESIGNED FOR A MINIMUM OF 15 KIP AXIAL LOAD (TENSION AND COMPRESSION).

25. CONNECTIONS FOR POST AND HANGERS MUST BE DESIGNED FOR NOT LESS THAN 10 KIP (TENSION AND COMPRESSION) AXIAL LOAD.

26. BOLTS IN SLOTTED CONNECTIONS, WHERE MOVEMENT IS REQUIRED, MUST BE SNUGGED AND THE NUT TACK WELDED TO THE BOLT OR THE THREADS UPSET.

27. CONNECTION BOLTING SHOWN ON THE STANDARD DETAIL DRAWINGS IS FOR ILLUSTRATIVE PURPOSES ONLY.

MINIMUM NUMBER OF BOLT ROWS FOR FRAMED BEAM CONNECTIONS ARE AS FOLLOWS, UNLESS NOTED OTHERWISE:

MEMBER DEPTH	NO. ROWS (MIN.)
8	2
10	2
12	3
14	3
16	4
18	5
21	6
24	6
36	10

E. CAST-IN-PLACE CONCRETE NOTES

1. ALL CONCRETE WORK AND MATERIALS MUST BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND THE CURRENT EDITION OF THE FOLLOWING STANDARDS:
a. MASSACHUSETTS STATE BUILDING CODE 9TH EDITION
b. GUIDE TO MASS CONCRETE (ACI 207)
c. SPECIFICATIONS FOR STRUCTURAL CONCRETE (ACI 301)
d. HOT WEATHER CONCRETE REQUIREMENTS (ACI 305)
e. COLD WEATHER CONCRETE REQUIREMENTS (ACI 306)
f. BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE (ACI 318)
g. BUILDING CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES (ACI 350)
h. RECOMMENDED PRACTICE FOR PLACING REINFORCING STEEL (CRSI)
i. STRUCTURAL WELDING CODE – REINFORCING STEEL (AWS D1.4)
j. PROJECT SPECIFICATIONS
k. OSHA STANDARDS 1910 & 1926
l. ACI DETAILING MANUAL (SP-66)

2. SHOP DRAWINGS, SHOWING ALL FABRICATION DIMENSIONS AND LOCATIONS FOR PLACING OF THE REINFORCING STEEL AND ACCESSORIES, MUST BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO ANY FABRICATION.

3. REINFORCING BARS MUST BE FABRICATED IN ACCORDANCE WITH THE STANDARD FABRICATED TOLERANCES SPECIFIED IN ACI 315, CHAPTER 4.

4. NO ALUMINUM EMBEDMENT IN THE CONCRETE IS PERMITTED.

5. ALL EXPOSED CONCRETE EDGES MUST HAVE A ¾" X ¾", 45° CHAMFER UNLESS NOTED OTHERWISE.

6. ALL PERMANENTLY EXPOSED VERTICAL AND HORIZONTAL CONCRETE SURFACES MUST BE TREATED OR SEALED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND CONCRETE FINISH REQUIREMENTS.

7. UNLESS NOTED OTHERWISE STEEL REINFORCEMENT MUST CONFORM TO THE FOLLOWING STANDARDS:
a. REINFORCING STEEL MUST BE DEFORMED BILLET STEEL CONFORMING TO ASTM A615, GRADE 60.
b. WELDABLE REINFORCING STEEL MUST BE DEFORMED BILLET STEEL CONFORMING TO ASTM A706, GRADE 60.
c. EPOXY COATED REINFORCING STEEL MUST BE DEFORMED BILLET STEEL CONFORMING TO ASTM A775, GRADE 60.
d. WELD WIRE FABRIC (MESH) MUST CONFORM TO ASTM A185 AND MUST BE PROVIDED IN FLAT SHEETS (ROLLS NOT PERMITTED).
e. UNLESS NOTED OTHERWISE ON THE DESIGN DRAWINGS ALL REINFORCING STEEL IS UNCOATED (PLAIN) DEFORMED BARS.
f. ALL REINFORCING STEEL AND EMBEDMENTS SECURELY IN PLACE PRIOR TO PLACING CONCRETE. PROVIDE SUPPORTS TO MAINTAIN THE POSITION OF REINFORCEMENT WITHIN SPECIFIED TOLERANCES DURING ALL CONSTRUCTION ACTIVITIES. WET "STICKING" DOWELS, ANCHORS, ETC. INTO CONCRETE IS NOT PERMITTED.
g. REINFORCING STEEL MUST BE DETAILED AND FABRICATED IN ACCORDANCE WITH ACI 315 "DETAILS AND DETAILING CONCRETE REINFORCEMENT".
h. UNDIMENSIONED HOOKS AT ENDS OF REINFORCEMENT AND STIRRUPS MUST BE STANDARD HOOKS IN ACCORDANCE WITH ACI 318 UNLESS NOTED OTHERWISE.
i. REINFORCING STEEL MUST BE SPLICED AS SPECIFIED ON THE DESIGN DRAWINGS OR AS APPROVED, IN WRITING, BY THE ENGINEER. WHEN SPLICE LENGTHS ARE NOT SPECIFIED ON THE DESIGN DRAWINGS THEY MUST BE THE MINIMUM LENGTHS DEFINED IN THE "TENSION LAP SPLICE LENGTH" TABLE. SPLICES NOT DEFINED ON THE DESIGN DRAWINGS MUST BE LAPPED IN ACCORDANCE WITH THE PROVISIONS OF ACI 318 FOR CLASS B SPLICES.
j. REINFORCING STEEL MUST BE CONTINUOUS THROUGH ALL CONSTRUCTION JOINTS, CORNERS, AND INTERSECTIONS UNLESS NOTED OTHERWISE. REINFORCING STEEL MUST NOT BE CONTINUOUS THROUGH SLAB-ON-GRADE CONTROL JOINTS. REINFORCING STEEL MUST BE LAPPED AT NECESSARY SPLICES OR HOOKED AT DISCONTINUOUS END WITH ACI 318 STANDARD HOOKS UNLESS NOTED OTHERWISE.
k. FIELD WELDING OF CROSSING BARS BY TACK WELDING IS STRICTLY PROHIBITED.
l. ALL REINFORCING STEEL MUST BE FREE FROM LOSE RUST, SCALE OR ANY FOREIGN MATERIAL PRIOR TO PLACING ANY CONCRETE.

[E. CAST-IN-PLACE CONCRETE NOTES CONT. ON NEXT SHEET]

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REVISIONS

REV	DESCRIPTION	DSN	CHK	DATE
		DWN	APP	

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

ORIGINAL DRAWING SIZE IS 22 x 34

STRUCTURAL GENERAL NOTES I

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED MAY 4, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	06/10/2024
CURRENT REVISION	
DESIGNED BY	DF
DRAWN BY	JFC
CHECKED BY	Checker
APPROVED BY	Approver

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E. CAST-IN-PLACE CONCRETE NOTES (CONT.)

8. PROVIDE ADDITIONAL REINFORCEMENT ALONG EACH SIDE OF OPENINGS AS SPECIFIED IN THE STANDARD DETAILS UNLESS NOTED OTHERWISE.

9. MECHANICAL REINFORCEMENT SPLICES SHALL BE PERMITTED SUBJECT TO THE CONTRACTOR PROPOSED LOCATIONS AND APPROVAL, IN WRITING, BY THE ENGINEER. IN ALL ENGINEER APPROVED INSTANCES, MECHANICAL SPLICES MUST DEVELOP AT A MINIMUM OF 125 PERCENT OF THE SPECIFIED YIELD STRENGTH OF THE REINFORCING BAR.

10. MINIMUM CONCRETE PROTECTIVE COVERING FOR REINFORCEMENT SHALL BE AS FOLLOW, UNLESS NOTED OTHERWISE:
   a. CONCRETE CAST AGAINST EARTH (NOT FORMED) ..... 3"
   b. CONCRETE EXPOSED TO EARTH OR WEATHER ..... 2"
   c. CONCRETE NOT EXPOSED TO EARTH OF WEATHER ..... 1 1/2"
   d. CONCRETE OVER OR IN-CONTACT WITH LIQUID ..... 2"

11. UNLESS NOTED OTHERWISE CONSTRUCTION, EXPANSION, AND CONTROL JOINTS MUST CONFORM TO THE FOLLOWING STANDARDS:
   a. HORIZONTAL CONSTRUCTION JOINTS ARE PERMITTED ONLY WHERE SPECIFIED ON THE DESIGN DRAWINGS. ALL OTHERS DEEMED NECESSARY, BY THE CONTRACTOR, MUST BE APPROVED, IN WRITING, BY THE ENGINEER.
   b. THE LOCATION OF VERTICAL CONSTRUCTION JOINTS MUST BE APPROVED, IN WRITING, BY THE ENGINEER. CONSTRUCTION JOINTS MUST BE ROUGHENED TO ¼" AMPLITUDE IN ACCORDANCE WITH ICRI CSP STANDARDS.
   c. UNLESS NOTED OTHERWISE, PLACE VERTICAL CONTROL JOINTS IN RETAINING WALLS AT 20'-0" O.C. (MAX.), ¾" DEEP, V-CHAMFERED ON BOTH FACES. CONSTRUCTION JOINTS MUST COINCIDE WITH CONTROL JOINTS.
   d. THE DESIGNATION "C.J." INDICATES A CONSTRUCTION JOINT BETWEEN SUCCESSIVE CONCRETE PLACEMENTS.

12. A MINIMUM OF 72 HOURS MUST ELAPSE BETWEEN ADJACENT CONCRETE PLACEMENTS.

13. UNLESS NOTED OTHERWISE EMBEDDED ITEMS MUST CONFORM TO THE FOLLOWING STANDARDS:
   a. CONCRETE WORK MUST BE COORDINATED WITH ALL PROCESS, EQUIPMENT, WATERPROOFING, ARCHITECTURAL, MECHANICAL, HVAC, FIRE PROTECTION, CIVIL, PLUMBING, ELECTRICAL WORK AND VENDOR'S DRAWINGS FOR EMBEDDED ITEMS NOT SPECIFIED ON THE DESIGN DRAWINGS. THE CONTRACTOR IS FULLY RESPONSIBLE FOR COORDINATING AND PLACING ALL EMBEDDED ITEMS SPECIFIED ON THE DRAWINGS OR REQUIRED BY VARIOUS TRADES.
   b. PRIOR TO PLACEMENT OF ANY CONCRETE, ALL DESIGN DRAWINGS MUST BE REVIEWED TO ENSURE THAT ALL EMBEDDED ITEM ARE PROPERLY PLACED AND ANCHORED. THE CONTRACTOR MUST VERIFY INSTALLATION AND LOCATIONS OF ALL EMBEDDED ITEMS INCLUDING, BUT NOT NECESSARILY LIMITED TO, INSERTS, ANCHOR BOLTS, ANCHOR RODS, DOWELS, BLOCKOUTS, SLEEVES, EMBEDDED PIPING AND CONDUIT PRIOR TO CONCRETE PLACEMENT.
   c. ALL EMBEDDED PLATES MUST BE FLUSH WITH FINISH SURFACE OF CONCRETE.
   d. WATERSTOPS MUST BE OF SIZE AND TYPE AS SPECIFIED ON THE DESIGN DRAWINGS AND IN THE PROJECT SPECIFICATIONS AND MUST BE CONNECTED TO PROVIDE A CONTINUOUS WATERTIGHT SEAL.

14. CONCRETE FLOOR AND ROOF SLOPES MUST BE AN INTEGRAL PART OF FRAMED SLABS. SEPARATE CONCRETE FILL OR TOPPING SLABS ARE NOT PERMITTED UNLESS NOTED OTHERWISE ON THE DESIGN DRAWINGS.

15. CONCRETE SURFACES SPECIFIED TO BE ROUGHENED MUST BE ROUGHENED TO ¼" AMPLITUDE IN ACCORDANCE WITH ICRI CSP STANDARDS.

16. CONCRETE SLABS AND BEAMS MUST BE PLACED MONOLITHICALLY UNLESS NOTED OTHERWISE.

17. AIR-ENTRAIN ALL CONCRETE, EXCEPT FOR INTERIOR SLABS AND SLAB-ON-GRADE.

18. ALL CONCRETE MUST HAVE TYPE II PORTLAND CEMENT CONFORMING TO ASTM C150.

19. ALL CONCRETE MUST BE NOMINAL WEIGHT AND HAVE THE FOLLOWING MINIMUM STRENGTH UNLESS NOTED OTHERWISE:
   a. LEAN CONCRETE FOR FILL__1000 PSI @ 28 DAYS
   b. SPREAD FOOTING AND FOUNDATION WALLS_4500 PSI @ 28 DAYS
   c. SLAB-ON-GRADE 4500 PSI @ 28 DAYS
   d. HOUSEKEEPING PADS 4500 PSI @ 28 DAYS
   e. LIQUID CONTAINMENT STRUCTURES_5000 PSI @ 28 DAYS

20. ADHESIVE ANCHORING SYSTEM FOR DRILLED-IN REINFORCING BARS MAY BE PERMITTED SUBJECT TO THE APPROVAL, IN WRITING, BY THE ENGINEER. WHEN APPLICATION IS APPROVED, THE ANCHORING SYSTEM MUST BE DESIGNED BY A PROFESSIONAL STRUCTURAL ENGINEER REGISTERED IN THE STATE HAVING AUTHORITY OF THE PROJECT. THE ANCHORING SYSTEM MUST CONFORM TO THE REQUIREMENTS OF ICC-ES AC308 AND BE DESIGNED ACCORDING TO THE METHODS OUTLINES THEREIN AND BE CAPABLE DEVELOPING THE FULL YIELD STRENGTH OF THE BAR BASED ON THE RESULTS OF UNCONFINED PULL-OUT TESTING.

F. POST-INSTALLED ANCHORS

1. THE CONTRACTOR MUST BE RESPONSIBLE TO POSITION AND INSTALL ALL POST-INSTALLED ANCHOR BOLTS TO THE LOCATIONS AND ELEVATIONS SPECIFIED ON THE DESIGN DRAWINGS, IN ACCORDANCE WITH THE REQUIREMENTS AND TOLERANCES OF THE PROJECT SPECIFICATION AND MANUFACTURER RECOMMENDATIONS. POST-INSTALLED ANCHORS MUST BE INSTALLED ONLY IN HARDENED, CURE CONCRETE THAT IS 28 DAYS OR OLDER.

2. DRILLED-IN ADHESIVE ANCHOR SYSTEM MUST BE HILTI HIT-RE 500V3, DIAMETER AND ANCHOR MATERIAL AS SPECIFIED ON THE DESIGN DRAWINGS, COMPLETED WITH THREADED ROD, NUT AND WASHER AS MANUFACTURED BY HILTI, INC., OR EQUAL AS APPROVED, IN WRITING, BY THE ENGINEER. ANCHORS MUST BE INSTALLED IN PROPERLY PREPARED AND CLEANED DRY HOLES, FREE OF STANDING WATER, MOISTURE, ETC. IN STRICT ACCORDANCE WITH MANUFACTURERS REQUIREMENTS.

G. CAST-IN-PLACE ANCHOR BOLTS & EMBEDMENTS

1. THE CONTRACTOR IS RESPONSIBLE TO POSITION AND INSTALL ALL ANCHOR BOLTS AND EMBEDMENTS TO THE LOCATIONS AND ELEVATIONS SPECIFIED ON THE DESIGN DRAWINGS AND IN ACCORDANCE WITH THE REQUIREMENTS AND TOLERANCES OF THE PROJECT SPECIFICATIONS. ALL ANCHOR BOLTS AND EMBEDMENTS MUST BE RIGIDLY SECURED AND PROTECTED IN PLACE TO PREVENT MOVEMENT OR DAMAGE DURING CONCRETE PLACEMENT OPERATIONS WITH TEMPLATES. RIGID TEMPLATES MUST REMAIN IN PLACE A MINIMUM OF 24 HOURS AFTER CONCRETE PLACEMENT HAS CEASED.

2. THE CONTRACTOR IS RESPONSIBLE TO PROTECT ALL ANCHOR BOLTS AND EMBEDMENTS FROM DAMAGE OR RUST DURING SHIPMENT AND STORAGE.

3. ANCHOR BOLTS MUST BE SHOP FABRICATED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS TO THE MATERIALS, DIAMETERS AND DIMENSIONS SPECIFIED ON THE DESIGN DRAWINGS. ANCHOR BOLTS MUST BE COMPLETE WITH WASHERS AND HEAVY HEX NUTS. ALL ANCHOR BOLT ASSEMBLIES MUST BE TAGGED WITH MARK NUMBER, INCLUDING STEEL MATERIAL GRADE IDENTIFICATION.

4. STRUCTURAL STEEL EMBEDMENT PLATES, BARS, SHAPES, AND ASSEMBLIES MUST BE FABRICATED IN ACCORDANCE WITH THE PROJECT SPECIFICATION MATERIALS AS SPECIFIED ON THE DESIGN DRAWINGS AND MUST CONFORM TO THE REQUIREMENTS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC). ALL EMBEDMENT ASSEMBLIES MUST BE TAGGED WITH MARK NUMBER.

5. ANCHOR BOLT ASSEMBLIES AND STEEL EMBEDMENTS MUST BE HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A123 AND ASTM A153, AS APPLICABLE.

H. TEMPORARY SHORING NOTES:

1. THE CONTRACTOR MUST PROVIDE TEMPORARY STRUCTURAL SHORING SUPPORT. ALL MEANS AND METHODS TO ACCOMPLISH THE REPAIR WORK IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR. SUBMIT PROPOSED MEANS AND METHODS TO THE OWNER AND ENGINEER FOR REVIEW.

2. THE CONTRACTOR MUST SUBMIT SHOP DRAWINGS TO THE ENGINEER PRIOR TO THE PERFORMANCE OF ANY WORK SHOWING THE LOCATION, SIZE, DIMENSIONS, CAPACITY, DETAIL, WEIGHT, EQUIPMENT, ETC. OF ALL SUPPORTING MEMBERS AS WELL AS A TIME SCHEDULE AND SEQUENCE OF WORK INDICATING WHEN ALL THE PERTINENT ITEMS OF WORK WILL BE PERFORMED.

3. WHEN REQUIRED BY MGL 250 CMR, CHAPTER 5, THE CONTRACTOR MUST SUBMIT DESIGN CALCULATIONS, SIGNED-AND-SEALED BY A REGISTERED PROFESSIONAL ENGINEER IN THE COMMONWEALTH OF MASSACHUSETTS, TO THE ENGINEER FOR REVIEW PRIOR TO, OR INCLUSIVE WITH, SHOP DRAWINGS AS AN INSTRUMENT OF PROFESSIONAL PRATICE.

4. NO CONSTRUCTION WORK WILL COMMENCE UNTIL THE ENGINEER HAS REVIEWED THE SHORING SHOP DRAWINGS AND DESIGN CALCULATIONS, IF REQURIED.

5. CONTRACTOR MUST PROVIDE ADEQUATE LATERAL BRACING. ALL SHORING MUST BE CONTINUOUS THROUGH ALL LEVELS AND/OR SOLIDLY BLOCKED BETWEEN LEVELS. ALL SHORES MUST BE CARRIED DOWN TO FIRM BEARING MATERIAL AND THE LOAD MUST BE ADEQUATELY SPREAD OUT IF SUPPORTED ON THE EXISTING SLAB-ON-GRADE (I.E. GROUND LEVEL).

6. THE CONTRACTOR SHALL JACK ANY FLOORING OR FRAMING TO A TRUE AND LEVEL PLANE. ANY DEFICIENCIES OR DAMAGE AS A RESULT OF SHORING OR JACKING SHALL BE THE CONTRACTOR'S RESPONSIBILITY AND MUST BE RESTORED TO THE ORIGINAL CONDITION AT NO ADDITIONAL COST TO THE OWNER.

I. DEMOLITION NOTES:

1. NO DEMOLITION WORK SHALL PROCEED UNTIL A PLAN HAS BEEN SUBMITTED TO AND APPROVED BY THE OWNER AND ENGINEER DETAILING THE METHODS AND EQUIPMENT TO BE USED TO DEMOLISH AND/OR SURFACE PREPARE STRUCTURES AND FEATURES.

2. ALL DEMOLISHED MATERIALS AND DEBRIS MUST BE LEGALLY DISPOSED OF OFF SITE IN A MANNER SATISFACTORY TO THE OWNER AND CURRENT DEP/EPA OF MASSACHUSETTS REQUIREMENTS. SUBMIT A CERTIFICATE OF DUMPING TO THE OWNER FOR RECORD, IF REQUESTED BY THE OWNER.

3. TEMPORARY SHORING MUST BE PROVIDED DURING ALL REPAIR PHASES OF CONSTRUCTION. REFER TO TEMPORARY SHORING NOTES.

4. DEMOLITION MUST COMPLY WITH GOVERNING COMMONWEALTH OF MASSACHUSETTS EPA NOTIFICATION REGULATIONS BEFORE STARTING SELECTIVE DEMOLITION. CONTRACTOR MUST COMPLY WITH HAULING AND DISPOSAL REGULATIONS OF AUTHORITIES HAVING JURISDICTION.

5. THE OWNER MAY OCCUPY PORTIONS OF THE BUILDING IMMEDIATELY ADJACENT TO SELECTIVE DEMOLITION AREAS. CONDUCT SELECTIVE DEMOLITION SO THAT OWNERS'S OPERATIONS WILL NOT BE DISRUPTED. PROVIDE NOT LESS THAN 72 HOURS NOTICE TO OWNER OF ACTIVITIES (IF ANY) THAT MAY AFFECT THEIR OPERATIONS.

6. PROTECT AND/OR RELOCATE EXISTING UTILITIES WITHIN THE WORK AREA THAT MAY BE DAMAGED DURING THE DEMOLITION WORK. PROVIDE TEMPORARY SERVICE UNTIL AFFECTED UTILITIES ARE RESTORED, IF NECESSARY. INSTALL TEMPORARY PROTECTION AND OTHER SAFETY REQUIREMENTS PRIOR TO STARTING DEMOLITION. CONTRACTOR MUST ADEQUATELY SHIELD THE WORK AREA TO PREVENT DEBRIS RESULTING FROM DEMOLITION OPERATION FROM TRAVELING BEYOND THE BOUNDARIES OF THE WORK AREA.

7. A TRIAL AREA WILL BE DESIGNATED BY THE ENGINEER TO DEMONSTRATE THAT EQUIPMENT, PERSONNEL AND METHODS OF OPERATION ARE CAPABLE OF PRODUCING RESULTS SATISFACTORY TO THE ENGINEER. THE TRIAL AREA SHALL CONSIST OF TWO (2) SECTIONS OF APPROXIMATELY FOUR (4) SQUARE FEET EACH. THE CONTRACTOR MUST SUBMIT TEST RESULTS TO THE ENGINEER FOR APPROVAL PRIOR TO CONTINUING WITH THE WORK. ALL DETERIORATED CONCRETE MUST BE REMOVED.

8. CONCRETE REMOVAL MUST BE PERFORMED WITH ENGINEER APPROVED EQUIPMENT. EQUIPMENT MUST BE CAPABLE OF REMOVING EXISTING COATINGS, PREVIOUS FAILED REPAIRS AND DEFICIENT CONCRETE UNTIL SOUND CONCRETE IS REACHED. IN NO INSTANCE CAN DEMOLITION EQUIPMENT BE USED THAT WILL VIBRATE THE EXISTING CAST-IN-PLACE CONCRETE SLAB CONSTRUCTION.

9. DEMOLITION CONTRACTOR MUST SUPPLY ALL NECESSARY EQUIPMENT, PARTS AND MANPOWER TO MAINTAIN PRE-ESTABLISHED PRODUCTION RATES AND ASSURE ADHERENCE TO CONSTRUCTION SCHEDULE. CONTRACTOR MUST MAINTAIN, ON THE JOB SITE, AN INVENTORY OF COMMON WEAR PARTS AND REPLACEMENT ACCESSORIES FOR EQUIPMENT ADEQUATE TO ENSURE THAT ROUTINE MAINTENANCE TASKS CAN BE PERFORMED WITHOUT DELAY TO THE DEMOLITION SCHEDULE. ALL EQUIPMENT MUST OPERATE AT A NOISE LEVEL OF LESS THAN 90 DECIBELS AT A DISTANCE OF 50 FEET FROM EITHER THE POWER UNIT OR HEAD.

10. REMOVE THE DETERIORATED CONCRETE AND DELETERIOUS MATERIALS USING DEMOLITION, AS DEMONSTRATED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER IN THE DEMOLITION TEST CUT AREA. MAINTAIN THE QUALITY OF CONCRETE SUBSTRATE REMOVAL AS DEMONSTRATED IN THE TEST AREA THROUGHOUT THE PROJECT. DEMOLITION MUST CONTINUE UNTIL ALL UNSOUND AND DELAMINATED CONCRETE HAS BEEN REMOVED.

11. IN AREAS NOT DESIGNATED OR REQUIRING FULL-DEPTH REPAIR/REPLACEMENT, THE CONTRACTOR MUST TAKE ALL PRECAUTIONS TO AVOID FULL-DEPTH "BLOW-THROUGH" DURING THE DEMOLITION PROCESS. FULL DEPTH "BLOW-THROUGH" MUST BE COMPLETELY REPAIRED BY THE CONTRACTOR, AS DIRECTED BY THE ENGINEER, AT NO ADDITIONAL COST TO THE OWNER.

12. SURVEY THE CONDITION OF THE SITE TO DETERMINE WHETHER REMOVING ANY ELEMENT MIGHT RESULT IN UNDESIRABLE DAMAGE OF ANY PORTION OF ADJACENT FACILITIES DURING SELECTIVE DEMOLITION AND/OR IF HAZARDOUS MATERIALS ARE PRESENT WITHIN THE EXTENTS OF THE WORK. NOTIFY THE ENGINEER IF FOUND, PRIOR TO INITIATING THE WORK.

13. USE WATER MIST AND OTHER SUITABLE METHODS TO LIMIT THE SPREAD OF DUST AND DIRT. CONTRACTOR MUST COMPLY WITH COMMONWEALTH OF MASSACHUSETTS ENVIRONMENTAL PROTECTION REGULATIONS.

14. CLEAN ADJACENT STRUCTURES AND IMPROVEMENTS OF DUST, DIRT, AND DEBRIS CAUSED BY DEMOLITION OPERATIONS. RETURN ADJACENT AREAS TO CONDITION EXISTING BEFORE START OF DEMOLITION.

15. DEMOLISH AND REMOVE EXISTING CONSTRUCTION ONLY TO THE EXTENT REQUIRED BY NEW CONSTRUCTION AND AS INDICATED. CONTRACTOR TO BE RESPONSIBLE FOR ANY CUTTING AND PATCHING THAT IS REQUIRED.

16. PROMPTLY DISPOSE OF DEMOLISHED MATERIALS. ACCUMULATION OF DEMOLISHED MATERIALS ON-SITE IS NOT PERMITTED AT ANY TIME.

17. THE CONTRACTOR MUST COORDINATE AND PERFORM A COMPLETE PRE-CONDITION STUDY OF THE STRUCTURES, COMPONENTS, AND SURROUNDING SITE COMPONENTS. THE PRE-CONDITION STUDY MUST INCLUDE VISUAL OBSERVATIONS, COMPREHENSIVE COMPILING OF PRE-DEMOLITION DEFECTS AND CONDITIONS, HAZARDOUS MATERIALS, AND DIGITAL PHOTOGRAPHY. SUBMIT THE DATED PRE-CONDITION SURVEY DOCUMENTATION TO THE OWNER AND ENGINEER A MINIMUM OF THREE (3) WEEKS PRIOR TO INITIATING DEMOLITION PROCEDURES.

NOT FOR CONSTRUCTION

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IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

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STRUCTURAL GENERAL NOTES II

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCULCO MVY & LIBO

HYANNIS WATER SYSTEM
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CURRENT REVISION	
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APPROVED BY	Approver

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L. MISCELLANEOUS METALS

1. ALUMINUM CONSTRUCTION TO CONFORM TO ALLOY 6061-T6. DETAIL AND FABRICATE IN CONFORMANCE WITH THE LATEST ALUMINUM ASSOCIATION SPECIFICATIONS FOR STRUCTURES OF ALUMINUM.

2. DETAILING, FABRICATION AND ERECTION OF STRUCTURAL ALUMINUM SHALL COMPLY WITH ALL APPLICABLE OSHA REGULATIONS.

3. DESIGN IS IN ACCORDANCE WITH AISC ASD 335-89, "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS- ALLOWABLE STRESS DESIGN AND PLASTIC DESIGN", AND THE INTERNATIONAL BUILDING CODE 2009.

4. STEEL CONSTRUCTION SHALL COMPLY WITH AISC 303-05, "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES".

5. WELDING OF STEEL SHALL COMPLY WITH AWS D1.1, "STRUCTURAL WELDING CODE-STEEL".

6. WELDING OF ALUMINUM SHALL CONFORM TO THE STRUCTURAL WELDING CODE, AWS D1.2. WELDING SHALL BE BY THE METAL INERT GAS (MIG) OR THE TUNGSTEN INERT GAS (TIG) PROCESS USING 5356 FILLER ALLOY.

7. FIELD WELDING OF STRUCTURAL MEMBERS IS NOT PERMITTED UNLESS SPECIFICALLY INDICATED.

8. SHOP CONNECTIONS MAY BE BOLTED OR WELDED UNLESS THE CONNECTION METHOD IS INDICATED.

9. FIELD CONNECTIONS SHALL BE BOLTED UNLESS WELDING IS INDICATED.

10. PROVIDE ASTM F593 TYPE 316 STAINLESS STEEL BOLTS FOR BOLTED ALUMINUM CONNECTIONS. PROVIDE DRILLED HOLES 1/16" LARGER THAN THE BOLT DIAMETER UNLESS OTHERWISE INDICATED. PROVIDE ASTM F594 STAINLESS STEEL NUTS WITH STAINLESS STEEL WASHERS IN BOTH OUTER PLIES.

11. SIMPLY SUPPORTED BEAM-TO-COLUMN AND BEAM-TO-BEAM CONNECTIONS SHALL BE MADE WITH DOUBLE ANGLES IN CONFORMANCE WITH THE AISC MANUAL UNLESS OTHERWISE INDICATED.

12. PROVIDE TEMPORARY BRACING AND STAYS DURING ERECTION TO RESIST VERTICAL AND LATERAL LOADS UNTIL MEMBERS ARE PERMANENTLY FASTENED.

13. USE NON-SHRINK, NON-METALLIC GROUT AS INDICATED AND SPECIFIED UNDER BASE AND BEARING PLATES.

14. PROVIDE ALUMINUM RAILING WHERE INDICATED.

15. PROVIDED MOUNTINGS FOR REMOVABLE ALUMINUM RAILING AROUND OPENINGS WHERE INDICATED, COMPLETE WITH CAPS.

16. BOLTED STEEL CONNECTIONS SHALL COMPLY WITH RSCS, "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS". BOLTS SHALL BE ASTM A325 TYPE I, HEAVY-HEX.

17. STEEL W-SHAPES SHALL CONFORM TO ASTM A992 (50 KSI YIELD STRENGTH). STEEL CHANNELS SHALL CONFORM TO EITHER ASTM A36 OR ASTM A572 GRADE 50. OTHER STEEL SHAPES, PLATES AND BARS SHALL CONFORM TO ASTM A36.

18. WELDING ELECTRODES SHALL COMPLY WITH AWS REQUIREMENTS, WITH A TENSILE STRENGTH LEVEL OF 70 KSI.

19. ANCHOR BOLTS SHALL BE OF THE SIZES INDICATED, THREADED, HEADED, AND MADE OF ASTM F1554 GRADE 36 STEEL.

20. PAINT ALUMINUM IN CONTACT WITH CONCRETE WITH ASPHALTIC PAINT OR PROVIDE SHEET NEOPRENE BARRIER.

21. PROVIDE DISSIMILAR METAL PROTECTION AT LOCATIONS WHERE DISSIMILAR METALS ARE IN CONTACT. PROTECT WITH A MINIMUM 4-MIL DRY THICKNESS COAT OF ZINC CHROMATE PRIMER ON THE ALUMINUM SURFACES AND A MINIMUM 2-MIL DRY THICKNESS COAT OF ALL-METAL PRIMER FOLLOWED BY ONE COAT OF MINIMUM 3-MIL DRY THICKNESS ALUMINUM PAINT TO THE DISSIMILAR METAL.

STRUCTURAL ABBREVIATIONS

ADD'L.	ADDITIONAL
A.F.F.	ABOVE FINISHED FLOOR
ALT.	ALTERNATE
A.B.	ANCHOR BOLT
&	AND
L	ANGLE
APPROX.	APPROXIMATE(LY)
ARCH.	ARCHITECT(URAL)
@	AT
BSMT.	BASEMENT
B. PL.	BASE PLATE
BM.	BEAM
BRG.	BEARING
BTWN.	BETWEEN
BLK(G).	BLOCK(ING)
BD.	BOARD
BOT.	BOTTOM
B.C.X.	BOTTOM CHORD EXTENSION
B.O.	BOTTOM OF
B.O.F.	BOTTOM OF FOOTING
B.N.	BOUNDARY NAILING
BLDG.	BUILDING
BRKT.	BRACKET
CAMB.	CAMBER
CANT.	CANTILEVER
C.I.P.	CAST-IN-PLACE
℄ or CL.	CENTER LINE
C.C.D.	CITY CONSTRUCTION DIRECTIVE
CLR.	CLEAR(ANCE)
C.F.	COLD FORMED
COL.	COLUMN
CONC.	CONCRETE
CMU	CONCRETE MASONRY UNIT
CONN.	CONNECT(ION)
CONSTR.	CONSTRUCTION
C.J.	CONSTRUCTION JOINT
CONT.	CONTINUE or CONTINUOUS
COORD.	COORDINATE
C.Y.	CUBIC YARD
DP.	DEEP
° or DEG.	DEGREE
DEMO.	DEMOL(ISH)(ITION)
DEPRESS.	DEPRESS(ED)(ION)
DIAG.	DIAGONAL
Ø or DIA.	DIAMETER
DBL.	DOUBLE
DWL(S.)	DOWEL(S)
DN.	DOWN
DWG.	DRAWING
EA.	EACH
E.E.	EACH END
E.F.	EACH FACE
E.G.	FOR EXAMPLE
E.S.	EACH SIDE
E.W.	EACH WAY
E	EAST
E.O.D.	EDGE OF DECK
E.O.S.	EDGE OF SLAB
E.N.	EDGE NAILING
EL.	ELEVATION
EMBED.	EMBEDMENT or EMBEDDED
EQ.	EQUAL
EQUIP.	EQUIPMENT
EQUIV.	EQUIVALENT
EST	ESTIMATE
EXIST. or (E)	EXISTING
EXP.	EXPANSION
E.J.	EXPANSION JOINT
EXT.	EXTERIOR
FAB.	FABRICATOR or FABRICATION
F.O.C.	FACE OF CONCRETE
F.O.M.	FACE OF MASONRY
F.O.S.	FACE OF STUD
F.O.W.	FACE OF WALL
F.S.	FAR SIDE
FRP.	FIBER REINFORCED PLASTIC
FIN.	FINISHED
F.F.	FINISHED FLOOR
FIN. GR.	FINISHED GRADE
F.P.	FIRE PROOF(ING) or PROTECTION
FLG.	FLANGE
F.D.	FLOOR DRAIN
FT.	FOOT or FEET
FTG.	FOOTING
F.S.	FOOTING STEP
FNDN.	FOUNDATION
F.W.C.J.	FOUNDATION WALL CONTROL JOINT
GALV.	GALVANIZE(D)
GA.	GAUGE, GAGE
GEN.	GENERAL
G.C.	GENERAL CONTRACT(OR)
G.L.	GLUE LAMINATED
GR.	GRADE
GRD.	GROUND
H.S.A.	HEADED STUD ANCHORS
HGT.	HEIGHT
H.P.	HIGH POINT
HSS	HOLLOW STRUCTURAL SECTIONS
HK.	HOOK(ED)
HORIZ.	HORIZONTAL
H.E.F.	HORIZONTAL EACH FACE
HDG	HOT-DIP GALVANIZE
IN	INCH(ES)
INFO.	INFORMATION
I.D.	INSIDE DIAMETER
I.F.	INSIDE FACE
INT.	INTERIOR
I.J.	ISOLATION JOINT
INV.	INVERT
JT.	JOINT
JST.	JOIST
K	KIPS
K.O.	KNOCKOUT
L.B.	LAG BOLT
LVL	LAMINATED VENEER LUMBER
L.F.	LINEAR FOOT
L.I.	LINEAR INCH
L.W.	LIGHTWEIGHT
L.L.	LIVE LOAD
LG.	LONG
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
L.S.H.	LONG SLOTTED HORIZONTAL
L.S.V.	LONG SLOTTED VERTICAL
L.W.	LONG WAY
L.P.	LOW POINT
MFR.	MANUFACTURE(R) (D)
MAS.	MASONRY
MAX.	MAXIMUM
MECH.	MECHANICAL
M.E.P.	MECHANICAL/ELECTRICAL/PLUMBING
MEZZ.	MEZZANINE
MID.	MIDDLE
M.O.	MASONRY OPENING
M.W.C.J.	MASONRY WALL CONTROL JOINT
MTL.	METAL
MIN.	MINIMUM
MISC.	MISCELLANEOUS
N.S.	NEAR SIDE
N.S.N.M.	NO SHRINK NON METALLIC
N	NORTH
N/A	NOT APPLICABLE
N.I.C.	NOT IN CONTRACT
N.T.S.	NOT TO SCALE
# or NO.	NUMBER
O.C.	ON CENTER
OPNG.	OPENING
OPP.	OPPOSITE
O.H.	OPPOSITE HAND
O.S.B.	ORIENTED STRAND BOARD
O.D.	OUTSIDE DIAMETER
O.F.	OUTSIDE FACE
OH.	OVERHEAD
PARA.	PARALLEL
PART.	PARTITION
PVMT.	PAVEMENT
PEN.	PENETRATION
d	PENNY, NAIL
PERIM.	PERIMETER
PERP.	PERPENDICULAR
Pc.	PIECE
ℙ or PL.	PLATE
±	PLUS OR MINUS
PW.	PLYWOOD
PT.	POINT
PVC.	POLYVINYL CHLORIDE
LB(S).	POUND(S)
P.S.F.	POUNDS PER SQUARE FOOT
P.S.I.	POUNDS PER SQUARE INCH
P.A.F.	POWER ACTUATED FASTENERS
P.C.	PRECAST CONCRETE
P.J.F.	PREFORMED JOINT FILLER
P.T.	PRESSURE TREATED
R or RAD.	RADIUS
REF.	REFERENCE
REINF.	REINFORCE(D) (ING)
REQ'MTS.	REQUIREMENTS
REQ'D.	REQUIRED
RET.	RETAINING
REV.	REVIS(E) (ION)
R.D.	ROOF DRAIN
REG.	ROOFING
R.O.	ROUGH OPENING
RBL.	RUBBLE
S.C.C.J.	SAWCUT CONTROL JOINT
SECT.	SECTION
S.CONN.	SHEAR CONNECTOR
SW.	SHEARWALL
S.W.	SHORT WAY
SIM.	SIMILAR
S.O.G.	SLAB-ON-GRADE
S.C.	SLIP CRITICAL
S	SOUTH
SP(S).	SPACE(S)
SPEC.	SPECIFICATION
SQ.	SQUARE
S.F.	SQUARE FOOT or FEET
S.I.	SQUARE INCH(ES)
STD.	STANDARD
S.S.	STAINLESS STEEL
STL.	STEEL
STIFF.	STIFFENER
STRUCT.	STRUCTUR(E) (AL)
SYM.	SYMMETR(Y) (ICAL)
TEMP.	TEMPORARY or TEMPERATURE
THK.	THICK(EN) (ENED) (NESS)
THRU	THROUGH
T.J.	TIE JOIST
TOL.	TOLERANCE
T.&G.	TONGUE AND GROOVE
T.C.J.	TOOLED CONTROL JOINT
T&B	TOP AND BOTTOM
T.C.X.	TOP CHORD EXTENSION
T.O.	TOP OF
T.O.C.	TOP OF CONCRETE
T.O.S.	TOP OF STEEL
T.O.W.	TOP OF WALL
TOT.	TOTAL
T	TREAD or TON
TYP.	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE
V.I.F.	VERIFY IN FIELD
VERT.	VERTICAL
V.E.F.	VERTICAL EACH FACE
W.S.C.J.	WATERSTOPPED CONSTRUCTION JOINT
WT.	WEIGHT
W	WEST
W.	WIDE
WF	WIDE FLANGE
W.W.F.	WELDED WIRE FABRIC
W/	WITH
W/O	WITH OUT
W.P.	WORKING POINT
WD.	WOOD

NOT FOR CONSTRUCTION

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REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

ORIGINAL DRAWING SIZE IS 22 x 34

STRUCTURAL GENERAL NOTES & ABBREVIATIONS

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED MAY 4, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

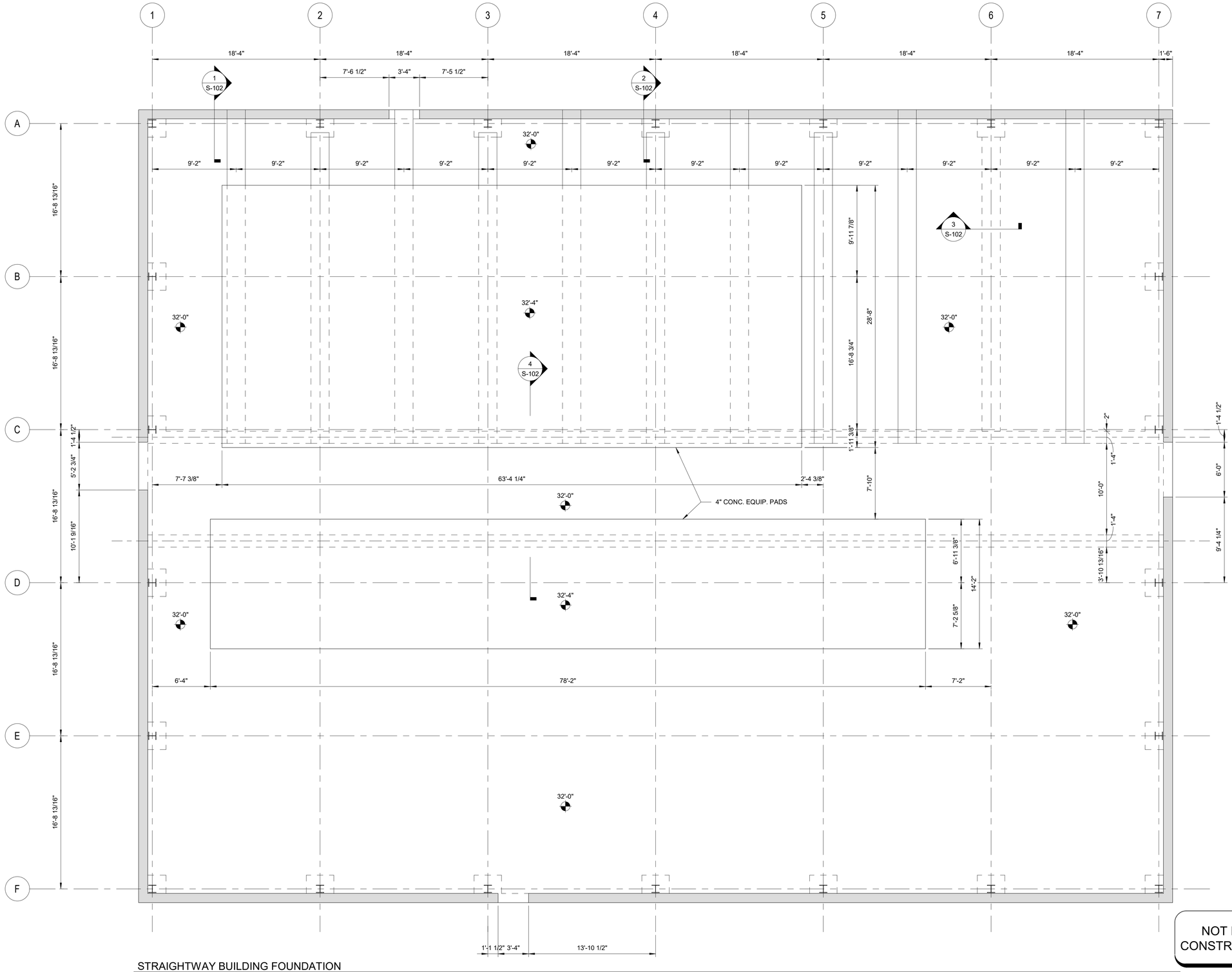
30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	06/10/2024
CURRENT REVISION	
DESIGNED BY	DF
DRAWN BY	JFC
CHECKED BY	Checker
APPROVED BY	Approver

S-003

SHEET 23 of 60

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STRAIGHTWAY BUILDING FOUNDATION

SCALE: 3/16" = 1'-0"

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STRAIGHTWAY WTF BUILDING FOUNDATION PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

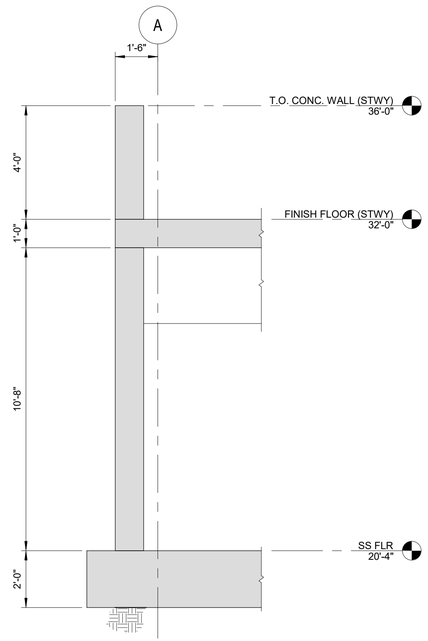
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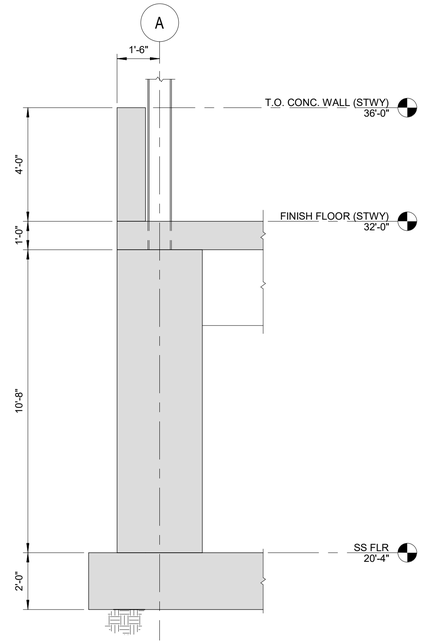
S-101

SHEET 24 of 60

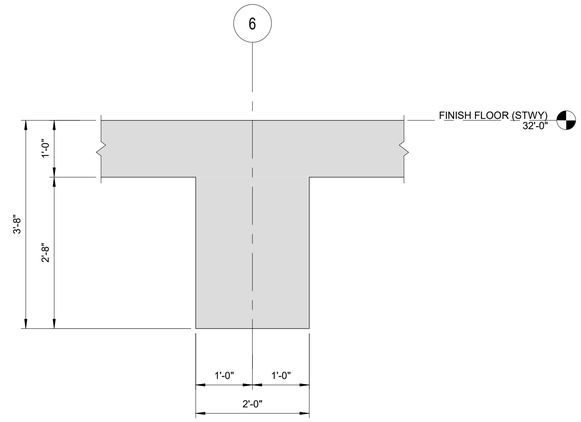
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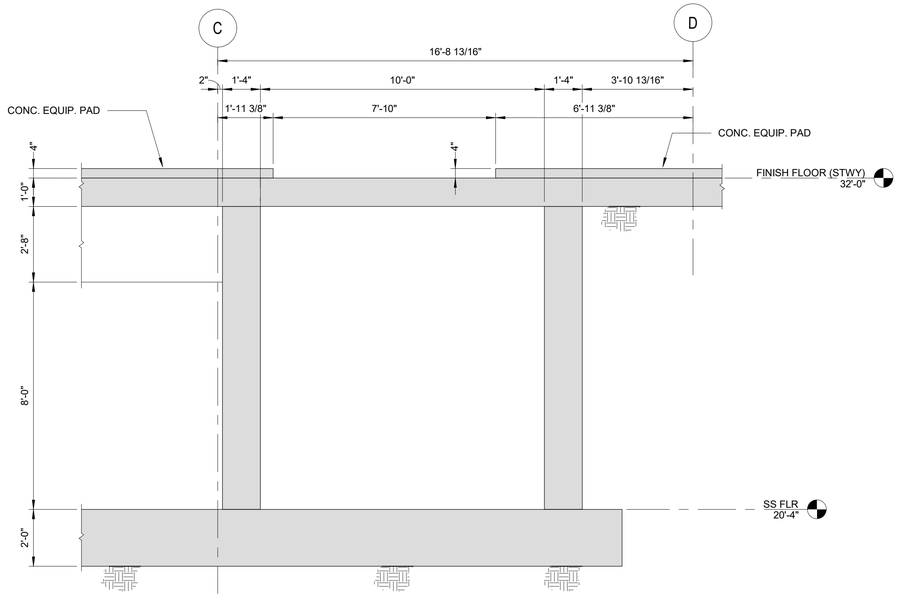
1 S-101 SECTION
SCALE: 3/8" = 1'-0"



2 S-101 SECTION
SCALE: 3/8" = 1'-0"



3 S-101 SECTION
SCALE: 3/4" = 1'-0"



4 S-101 SECTION
SCALE: 3/8" = 1'-0"

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ORIGINAL DRAWING SIZE IS 22 x 34

STRAIGHTWAY WTF BUILDING SECTIONS

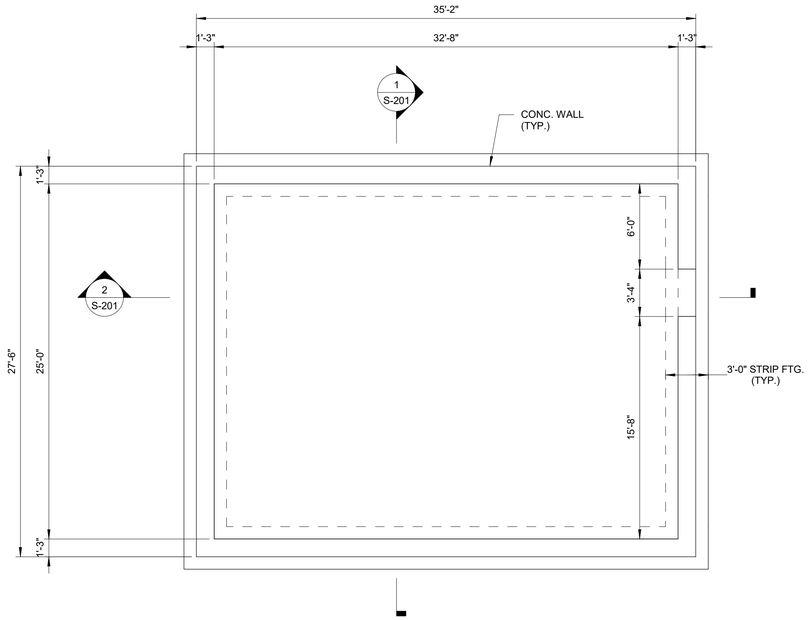
STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

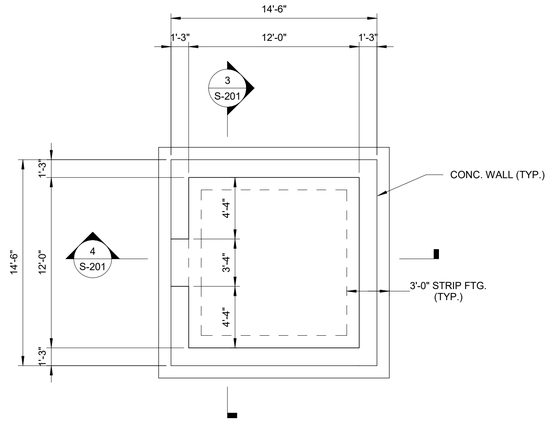
PROJECT NO.	24003062.001A
ISSUE DATE	06/10/2024
CURRENT REVISION	
DESIGNED BY	DF
DRAWN BY	JFC
CHECKED BY	Checker
APPROVED BY	Approver

S-102



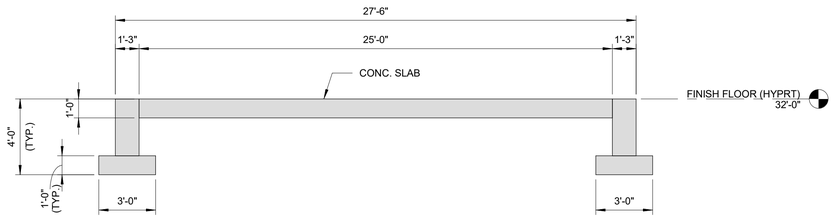
HYANNISPORT BUILDING FOUNDATION

SCALE: 3/16" = 1'-0"



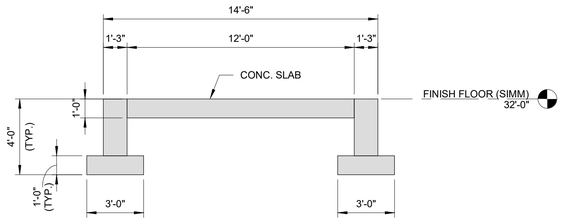
SIMMONS BUILDING FOUNDATION

SCALE: 3/16" = 1'-0"



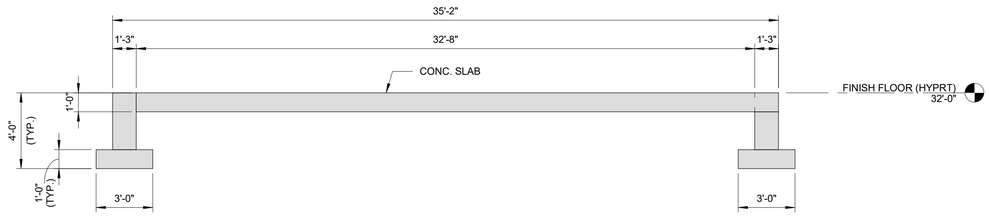
1 S-201 SECTION

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



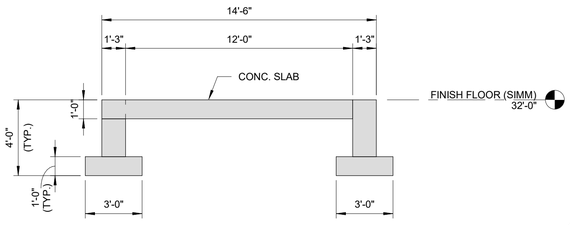
3 S-201 SECTION

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



2 S-201 SECTION

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



4 S-201 SECTION

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

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ORIGINAL DRAWING SIZE IS 22 x 34

HYANNISPORT & SIMMONS BUILDINGS FOUNDATIONS & BUILDING SECTIONS

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	06/10/2024
CURRENT REVISION	
DESIGNED BY	Designer
DRAWN BY	Author
CHECKED BY	Checker
APPROVED BY	Approver

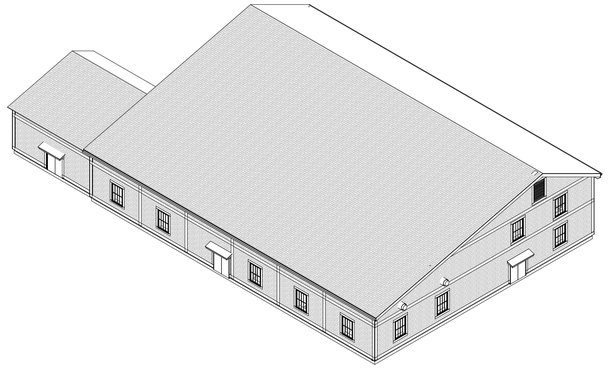
S-201

SHEET 26 of 60

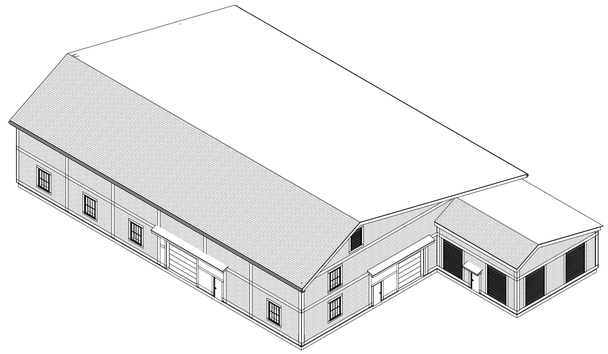
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ABBREVIATIONS

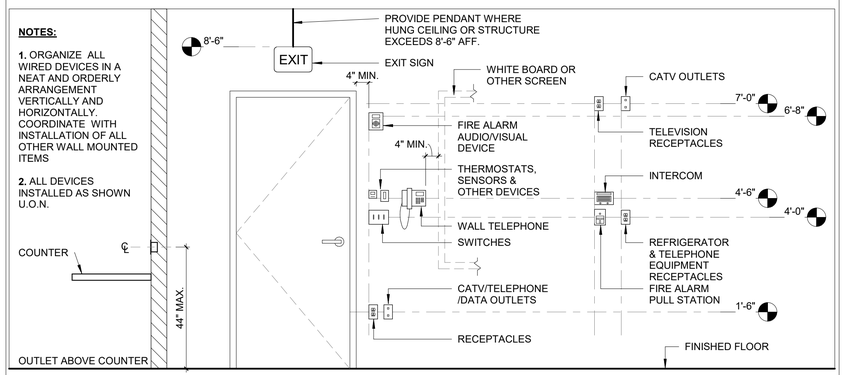
&	And	FV	Field Verify	QT	Quarry Tile
@	At	FWC	Fabric Wall Covering	QTY	Quantity
A/E	Architect / Engineer				
AB	Anchor Bolt	G	Gas	R	Radius or (Stair) Risers
AC	Air Conditioning	GA	Gauge	RAD	Radiator
ACT	Acoustic Ceiling Tile	GALV	Galvanized	RCP	Reflected Ceiling Plan
ACP	Acoustic Ceiling Panel	GB	Grab Bar	RD	Roof Drain
AD	Access Door	GC	General Contractor	REC	Recessed
ADH	Adhesive	GEN	Generator	REF	Reference
ADJ	Adjustable	GL	Glass	REFR	Refrigerator
ADJC	Adjacent	GLMU	Glass Masonry Unit	REINF	Reinforcing
AFF	Above Finished Floor	GND	Ground	REM	Removeable
AH	Air Handler	GR	Grade	REQD	Required
AL	Aluminum	GRL	Grille	REQMTS	Requirements
ALT	Alternate	GRTG	Grating	RESIL	Resilient
ANOD	Anodized	GSKT	Gasket	RFI	Rigid Foam Insualtion
APP	Approximately	GT	Grout	RFG	Roofing
ARCH	Architectural	GVL	Gravel	RH	Right Hand
ASPH	Asphalt	GWB	Gypsum Wall Board	RM	Room
				RO	Rough Opening
BD	Board	HB	Hose Bibb	RV	Roof Vent
BETW	Between	HC	Handicapped		
BIT	Bituminous	HDW	Hardware	S	South
BLDG	Building	HGT	Height	SAFB	Sound Attenuation Fiber Blanket
BLKG	Blocking	HM	Hollow Metal	SC	Sealed Concrete
BM	Beam	HMD	Hollow Metal Door	SCHED	Schedule
BO	By Others	HNDRL	Handrail	SCR	Screw
BOT	Bottom	HO	Hold Open	SCRN	Screen
BP	Building Paper	HORIZ	Horizontal	SD	Soap Dispenser
BR	Brass	HP	High Point	SECT	Section
BRZ	Bronze	HR	Hour	SF	Square Foot
BU	Built Up	HVAC	Heat, Ventilation & Air Conditioning	SGL	Single
				SHT	Sheet
C	Course	ID	Inside Diameter	SHTHG	Sheathing
C	Center Line	IF	Inside Face	SHV	Shelving
CAB	Cabinet	IN	Inch or Inches	SIM	Similar
CEM	Cement	INSUL	Insulation	SK	Sink
CG	Corner Guard	INT	Interior	SM	Sheet Metal
CPT	Carpet			SP	Spray Particle Paint
CHAN	Channel	JAN	Janitor	SPEC	Specifications
CHBD	Chalkboard	JNT	Joint	SQ	Square
CHFR	Chamfer			SS / ST STL	Stainless Steel
CHR	Chrome	KD	Knocked Down	STD	Standard
CI	Cast Iron	KIT	Kitchen	STL	Steel
CJ	Control Joint			STOR	Storage
CL	Closet	L	Left	STR	Structural
CLG	Ceiling	LF	Linear Foot	SUSP	Suspended
CLR	Clearance	LG	Length	SVF	Sheet Vinyl Flooring
CMPST	Composite	LAD	Ladder	SYM	Symbol
CMU	Concrete Masonry Unit	LAM	Laminate	SYMM	Symmetrical
CNTR	Counter	LAV	Lavatory	SYS	System
COL	Column	LB	Pound	S4S	Surface Four Sides
COMP	Compressible	LBL	Label		
CONC	Concrete	LCC	Lead Coated Copper	T	Treads (Stairs)
CONN	Connection	LH	Left Hand	T&G	Tongue and Groove
CONSTR	Construction	LHR	Left Hand Reverse	TB	Tobble Bolt
CONT	Continuous	LIN	Linear	TBD	To Be Determined
CONTR	Contractor	LKR	Locker	TDO	Thermoset Decorative Overlay (Melamine)
COP	Copper	LNTL	Lintel	TEMP	Tempered / Temporary
CORR	Corridor	LONG	Longitudinal	TEL	Telephone
CT	Ceramic Tile	LP	Low Point	TERR	Terrazzo
CW	Curtain Wall	LT	Light	THK	Thick
		LTWT	Lightweight	THRES	Threshold
Ø	Diameter	LTG	Lighting	THRU	Through
DBL	Double	LVR	Louver	T&G	Tongue and Groove
DEMO	Demolition			T.O.	Top Of
DIA	Diameter	MAINT	Maintenance	TOC	Top Of Concrete
DIV	Division	MANF	Manufacturer	TOM	Top Of Masonry
DIM	Dimension	MAS	Masonry	TOS	Top Of Steel
DMPF	Dampproofing	MATL	Material	TOW	Top Of Wall
DN	Down	MAX	Maximum	TRANS	Translucent
DOP	Door Opening	MDO	Medium Density Overlay	TYP	Typical
DR	Door	MECH	Mechanical		
DS	Downspout	MED	Medium	UL	Underwriters Laboratory
DSP	Dry Standpipe	MEMB	Membrane	UNFIN	Unfinished
DTL	Detail	MF	Metal Flashing	UNO / UON	Unless Otherwise Noted
DWG	Drawing	MFR	Manufacturer	UR	Urinal
		MH	Manhole	UV	Unit Ventilator
E	East	MIN	Minimum		
EA	Each	MIR	Mirror	VB	Vapor Barrier or Vinyl Base
EB	Expansion Bolt	MISC	Miscellaneous	VT / VCT	Vinyl Composition Tile
EF	Exhaust Fan	MLDG	Molding	VEN	Veneer
EJ	Expansion Joint	MO	Masonry Opening	VER	Verify
EL	Elevation	MS	Metal Stud	VERT	Vertical
ELEC	Electrical	MTD	Mounted	VEST	Vestibule
ENGR	Engineer	MTL	Metal	VIF	Verify In Field
ENTR	Entrance	MTR	Mortar	VNR	Veneer
EP	Electrical Panel	MULL	Mullion	VR	Vapor Retarder
EQ	Equal	MVBL	Movable	VWC	Vinyl Wall Covering
EQUIP	Equipment				
ESB	Exterior Soffit Board	N	North	W	West
ESMT	Easement	NA	Not Applicable	WC	Water Closet
ETR	Existing to Remain	NAT	Natural	WD	Wood
EWC	Electric Water Cooler	NIC	Not In Contract	W/	With
EX / EXST	Existing	NO	Number	W/O	Without
EXC	Excavate	NOM	Nominal	WGL	Wired Glass
EXH	Exhaust	NTS	Not To Scale	WLD	Welded
EXP	Expansion			WP	Working Point
EXT	Exterior	OA	Overall	WT	Weight
		OC	On Center	WTH	Width
FCO	Floor Clean Out	OD	Outside Diameter	WTRPRF	Waterproofing
FD	Floor Drain	OF	Outside Face	WWF	Welded Wire Fabric
FDN	Foundation	OFF	Office		
FE	Fire Extinguisher	OH	Overhead		
FEC	Fire Extinguisher Cabinet	OPNG	Opening		
FF	Fabric Flashing	OPHD	Opposite Hand		
FGL	Fiberglass	OPP	Opposite		
FHC	Fire Hose Cabinet				
FHY	Fire Hydrant	P&S	Power & Signal		
FIN	Finished	PAR	Parallel		
FL	Floor	PART	Partition		
FLUOR	Fluorescent	PC	Precast		
FOC	Face of Concrete	PERF	Perforated		
FOF	Face of Finish	PERP	Perpendicular		
FOM	Face of Masonry	PL	Plate		
FR	Fire Resistant	PLAM	Plastic Laminate		
FPRF	Fireproofing	PM	Pressed Metal		
FRP	Fiber Reinforced Plastic	PNL	Panel		
FS	Full Size	PRMT	Perimeter		
FT	Foot or Feet	PT	Pressure Treated		
FTG	Footing	PTD	Painted		
FTR	Fin Tube Radiation	PVG	Paving		
FURN	Furniture	PWD	Plywood		
FURR	Furring				



AXONOMETRIC - SOUTH EAST CORNER (STRIAGHTWAY)
SCALE: NTS



AXONOMETRIC - NORTH WEST CORNER (STRAIGHTWAY)
SCALE: NTS



MOUNTING HEIGHT, TYP. Copy 1
SCALE: 1/2" = 1'-0"

GENERAL NOTES

1. ALL WORK TO BE NEW U.O.N.
2. ALL WORK SHALL COMPLY WITH FEDERAL, STATE, AND LOCAL BUILDING REGULATIONS.
3. ANY CONFLICTS BETWEEN SITE CONDITIONS AND DRAWINGS SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE OWNER AND ARCHITECT/DESIGNER.
4. ALL DOORS TO BE A MINIMUM OF 4" FROM NEAREST PERPENDICULAR PARTITION, U.O.N.
5. REVIEW LAYOUTS FOR PARTITIONS IN FIELD WITH THE OWNER AND ARCHITECT/DESIGNER PRIOR TO START OF CONSTRUCTION.
6. COORDINATE BLOCKING REQUIREMENTS AND LOCATIONS WITH ELEVATIONS AND DETAILS. ALL WOOD BLOCKING TO BE FIRE RETARDANT TREATED.
7. ALIGN CENTERLINES OF ALL WALL-MOUNTED FIRE EXTINGUISHERS AND MEP/FP DEVICES ON WALLS IN THE SAME LOCATION.
8. DISCLAIMER: MANUFACTURERS REFERENCES ARE INTENDED TO ESTABLISH COLOR AND FINISH ONLY AND ARE NOT INTENDED TO LIMIT SELECTIONS FROM OTHER MANUFACTURERS. WHEN ALTERNATE SELECTIONS ARE SUBMITTED, SUBMITTAL SHALL INCLUDE MATERIALS LISTED FOR COMPARISON.
9. DIMENSIONS:
   - A. ALL DIMENSIONS ARE TO FINISHED FACE OF WALL U.O.N.
   - B. DRAWINGS ARE NOT TO BE SCALED; VERIFY ANY MISSING OR CONFLICTING WRITTEN DIMENSIONS WITH THE ARCHITECT/ DESIGNER PRIOR TO CONSTRUCTION.
   - C. NOTIFY ARCHITECT OF CONDITIONS WHERE CLEAR OR CRITICAL DIMENSIONS ARE DESIGNATED BUT CANNOT BE MET OR WHERE CORRIDOR/AISLE WIDTH CANNOT MEET THE MINIMUM REQUIREMENTS (3'-8" U.O.N.)
   - D. MAINTAIN FINISH FLOOR BASE ELEVATION THROUGHOUT THE CONTRACT AREA SUCH THAT ALL DIMENSIONS INDICATED AS ABOVE FINISH FLOOR ARE AT THE SAME ELEVATION.

MATERIALS LEGEND

ALUMINUM	EARTH	SAND, CEMENT, GROUT
BATT INSULATION	GRATE	SHINGLE
BRICK	GRAVEL	SMOKE SEALANT
CERAMIC TILE	GWB	SPRAYED FIREPROOFING
CMU	PARTICLE BOARD	STEEL
COMMPRESSIBLE FILLER	PLYWOOD	WOOD
CONCRETE	RIGID INSULATION	

SYMBOLS LEGEND

0	COLUMN GRID LINE	11	WALL TAG
℄	CENTER LINE	11	WINDOW TAG
20	TOILET ACCESSORY TAG		
1 / A101	DETAIL MARKER		
101	DOOR TAG		
SIM 1 / A101	SECTION MARKER		
N	NORTH ARROW		
Room name 101 150 SF	ROOM IDENTIFICATION		

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SCALE VERIFICATION

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ORIGINAL DRAWING SIZE IS 22 x 34

ARCHITECTURAL GENERAL NOTES, LEGENDS & ABBREVIATIONS

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	06/10/2024
CURRENT REVISION	
DESIGNED BY	EAB
DRAWN BY	JH
CHECKED BY	RB
APPROVED BY	-

A-001

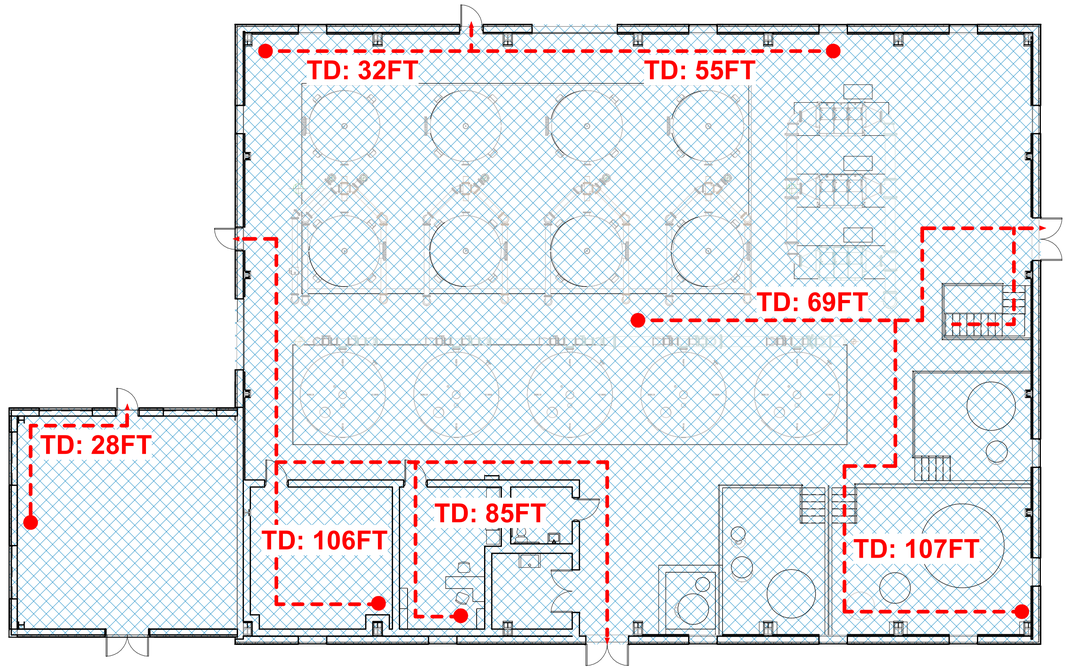
SHEET 27 of 60

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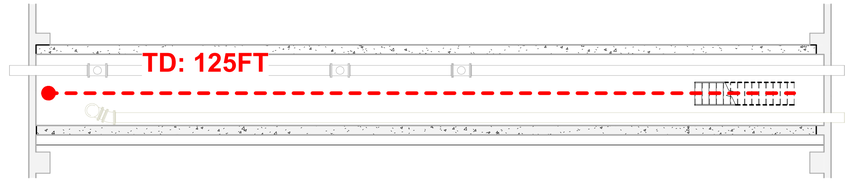
CODE SUMMARY: STRAIGHTWAY WATER TREATMENT FACILITY

OVERALL BUILDING AREA: 10,931 SF OVERALL BUILDING VOLUME: 275,884 CF

SECTION NO.	DESCRIPTION	PROVIDED
CHAPTER 3	USE AND OCCUPANCY SECTION 302.1 OCCUPANCY CLASSIFICATION	HIGH-HAZARD (SECTION 307): GROUP H-4 HEALTH HAZARD CORROSIVES AND TOXIC MATERIALS REFER TO TABLE CHEMICAL STORED ON SITE FOR STORAGE OF TOXIC AND HIGHLY TOXIC MATERIALS: HYDROGEN PEROXIDE, SODIUM HYDROCHLORITE, SODIUM HYDROXIDE, ZINC ORTHOPHOSPHATE
	SECTION 307.1 MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING PHYSICAL HAZARD	OXIDIZER: HYDROGEN PEROXIDE QUANTITIES ARE LIMITED TO AN ACCEPTABLE QUANTITY--BELOW ALLOWABLE QUANTITY
CHAPTER 4	SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY SECTION 415.3 AUTOMATIC FIRE DETECTION SYSTEMS GROUP H OCCUPANCIES SHALL BE PROVIDED WITH AN AUTOMATIC FIRE DETECTION SYSTEM IN ACCORDANCE WITH SECTION 907.2	COMPLIES
	SECTION 415.4 AUTOMATIC SPRINKLER SYSTEM GROUP H OCCUPANCIES SHALL BE EQUIPPED THROUGHOUT WITH AN AUTOMATIC SPRINKLER SYSTEM IN ACCORDANCE WITH SECTION 903.2.5	COMPLIES
CHAPTER 5	GENERAL BUILDING HEIGHTS AND AREAS SECTION 505.3 EQUIPMENT PLATFORMS EQUIPMENT PLATFORMS IN BUILDINGS SHALL NOT BE CONSIDERED AS A PORTION OF THE FLOOR BELOW. EQUIPMENT PLATFORMS AND THE LADDER PROVIDING ACCESS TO AN EQUIPMENT SHALL NOT SERVE AS PART OF THE MEANS OF EGRESS FROM THE BUILDING.	COMPLIES
	SECTION 505.3.3 EQUIPMENT PLATFORM GUARDS EQUIPMENT PLATFORMS SHALL HAVE GUARDS	COMPLIES
	CONSTRUCTION TYPE: V-B	COMPLIES:
	TABLE 504.3 ALLOWABLE BUILDING HEIGHT IN FEET ABOVE GRADE PLANE 60 FEET (SPRINKLER)	33' - 4" (SPRINKLER)
	TABLE 504.4 ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE 3 STORY (SPRINKLER)	1 STORY (SPRINKLER)
	TABLE 506.2 ALLOWABLE AREA FACTOR IN SQUARE FEET 26,000 SQ FT (SPRINKLER)	10,931 SQ FT (SPRINKLER)
CHAPTER 6	TYPES OF CONSTRUCTION TABLE 601 FIRE RESISTANCE RATE REQUIREMENTS FOR BUILDING ELEMENTS (HOURS) CONSTRUCTION TYPE: V-B PRIMARY STRUCTURAL FRAME 0 HOURS BEARING WALLS EXTERIOR 0 HOURS INTERIOR 0 HOURS NON-BEARING WALLS AND PARTITIONS EXTERIOR 0 HOURS INTERIOR 0 HOURS FLOOR CONSTRUCTION AND SECONDARY MEMBERS 0 HOURS ROOF CONSTRUCTION AND SECONDARY MEMBERS 0 HOURS	COMPLIES
CHAPTER 8	INTERIOR FINISHES SECTION 803.1.1 INTERIOR WALL AND CEILING FINISH MATERIALS TESTED IN ACCORDANCE WITH NFPA 286 INTERIOR WALL AND CEILING FINISH MATERIALS SHALL BE CLASSIFIED IN ACCORDANCE WITH NFPA 286 AND SECTION 803.1.1.1. MATERIALS SHALL BE CONSIDERED TO COMPLY WITH REQUIREMENTS OF CLASS A. SECTION 803.1.2 INTERIOR WALL AND CEILING FINISH MATERIALS TESTED IN ACCORDANCE WITH ASTM E84 OR UL723 INTERIOR WALL AND CEILING FINISH MATERIALS TESTED IN ACCORDANCE WITH ASTM E84 OR UL723 CLASS A = FLAME SPREAD INDEX 0-25; SMOKE-DEVELOPED INDEX 0-450	COMPLIES
CHAPTER 9	FIRE PROTECTION AND LIFE SAFETY SYSTEMS SECTION 903.2.5 GROUP H AN AUTOMATIC SPRINKLER SYSTEM SHALL BE INSTALLED IN GROUP H OCCUPANCIES	COMPLIES
CHAPTER 10	MEANS OF EGRESS SECTION 1004: OCCUPANT LOAD LOCATION / FUNCTION OF SPACE / SQFT / O.L FACTOR INDUSTRIAL 1/100 GROSS GAC 8,679 SF ELECTRICAL 400 SF TOILET 260 SF JANITOR 70 SF CONTROL 121 SF GENERATOR 1,008 SF	CALCULATED OCCUPANCY LOAD INDUSTRIAL (TOTAL SF) / (O.L. FACTOR) = OCCUPANTS (10,538 SF) / (100 GROSS) = 106 OCCUPANTS
	SECTION 1005.3.2: OTHER EGRESS COMPONENTS THE CAPACITY, IN INCHES, OF MEANS OF EGRESS COMPONENTS OTHER THAN STAIRWAYS SHALL BE CALCULATED BY MULTIPLYING THE OCCUPANT LOAD SERVED BY SUCH COMPONENTS BY A MEANS OF EGRESS FACTOR OF 0.2 INCHES PER OCCUPANT	COMPLIES
	TABLE 1006.2.1: SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY OCCUPANT LOAD PER STORY: 10 MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (SPRINKLER): 75 FEET	COMPLIES NOTE: PIPE GALLERY SERVICE ZONE TREATED AS "NON OCCUPIED" SERVICE SPACE
	TABLE 1006.3.3: MINIMUM NUMBER OF EXITS OR ACCESS TO EXITS PER STORY OCCUPANT LOAD PER STORY: 1-500 MINIMUM NUMBER OF EXITS OR ACCESS TO EXITS FROM STORY: 2	COMPLIES
	TABLE 1017.2: EXIT ACCESS TRAVEL DISTANCE GROUP H-4: 175 FEET (SPRINKLER)	COMPLIES
CHAPTER 26	PLASTIC SECTION 2613.3 FIBER-REINFORCED POLYMER: INTERIOR FINISHES FIBER-REINFORCED POLYMER USED AS INTERIOR FINISHES, DECORATIVE MATERIALS OR TRIM COMPLY WITH CHAPTER 8: INTERIOR FINISHES	COMPLIES



1 STRAIGHTWAY FLOOR PLAN - CLASSIFICATION/TRAVEL DISTANCE
SCALE: 3/32" = 1'-0"



2 PIPE GALLERY SERVICE ZONE - CLASSIFICATION/TRAVEL DISTANCE
SCALE: 3/32" = 1'-0"

LEGEND

- TRAVEL DISTANCE
- USE GROUP H-4

APPLICABLE CODE STANDARDS AND REGULATIONS

BUILDING	2015 INTERNATIONAL BUILDING CODE (IBC) 780 CMR - MASSACHUSETTS STATE BUILDING CODE 9TH EDITION, WHICH IS AN AMENDED VERSION OF THE 2015 IBC
FIRE PROTECTION	527 CMR - BOARD OF FIRE PREVENTION REGULATIONS
PLUMBING	248 CMR - BOARD OF STATE EXAMINERS OF PLUMBERS AND GAS FITTERS
ELECTRICAL	527 CMR 12.00 - MASSACHUSETTS ELECTRICAL CODE, WHICH IS AN AMENDED VERSION OF THE 2017 EDITION OF NFPA 70, NATIONAL ELECTRICAL CODE
MECHANICAL	2015 INTERNATIONAL MECHANICAL CODE (IMC) 271 CMR SHALL APPLY TO ALL SHEET METAL WORK
ENERGY	780 CMR 13.00 - ENERGY EFFICIENCY, WHICH AMENDS 2015 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
ACCESSIBILITY	521 CMR - ARCHITECTURAL ACCESS BOARD (AAB) RULES & REGULATIONS
OTHER	VARIOUS NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) CODES AND STANDARDS AS REFERENCED BY THE CODES LISTED ABOVE

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2021 INTERNATIONAL ENERGY CONSERVATION CODE

SECTION NO.	DESCRIPTION	CONTRACTOR TO PROVIDE, U. N. O.
CHAPTER 4	COMMERCIAL ENERGY EFFICIENCY TABLE C402.1.3: OPAQUE THERMAL ENVELOPE REQUIREMENTS (R-VALUE) ZONE 5A ROOF ATTIC: R-49 WALLS, ABOVE GRADE METAL FRAMED: R-13 + R-10CI WALLS, BELOW GRADE BELOW GRADE WALL: R-7.5CI FLOORS, SLAB ON GRADE UNHEATED SLAB: R-15 FOR 24" BELOW	COMPLIES

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STRAIGHTWAY WTF CODE SUMMARY

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

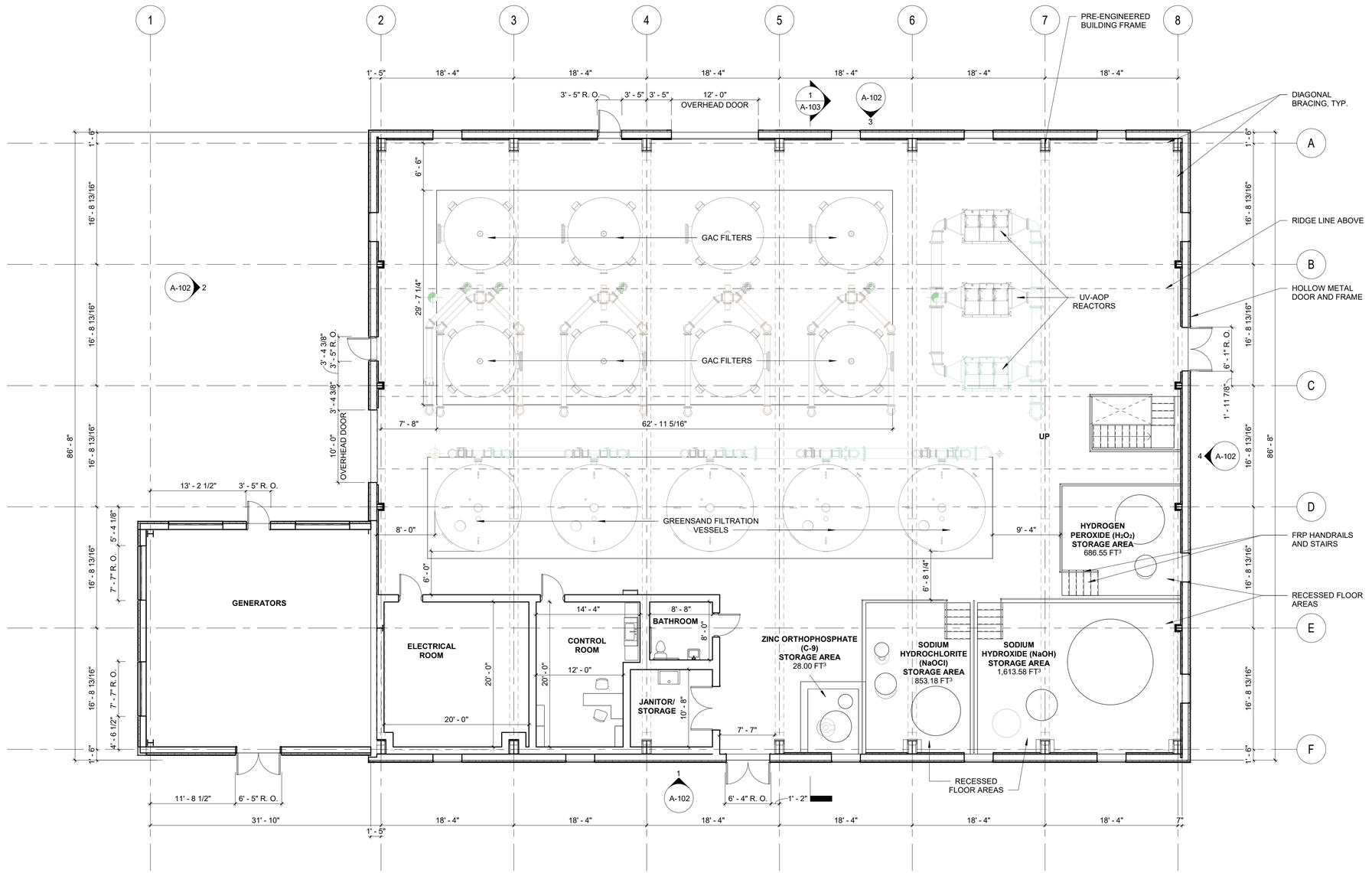
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CHECKED BY	RB
APPROVED BY	-

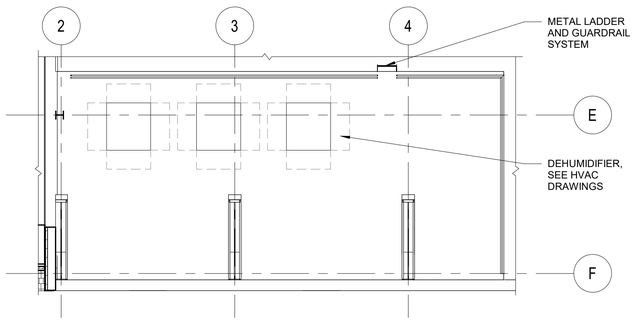
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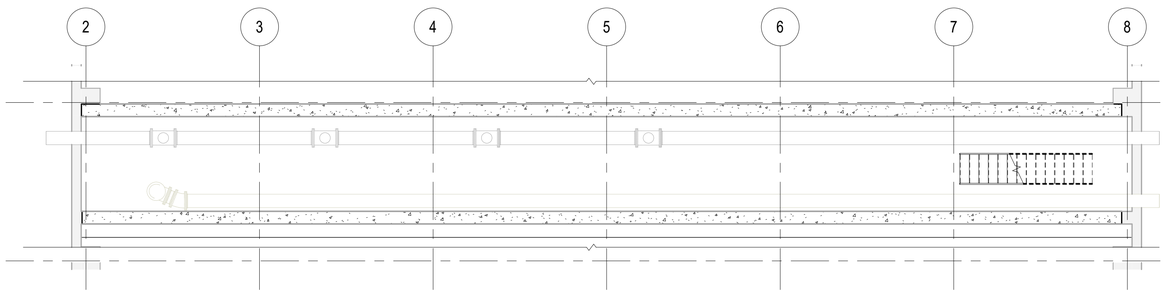
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1 STRAIGHTWAY - FLOOR PLAN
SCALE: 1/8" = 1'-0"



3 EQUIPMENT PLATFORM - FLOOR PLAN
SCALE: 1/8" = 1'-0"



2 PIPE GALLERY SERVICE ZONE - FLOOR PLAN
SCALE: 1/8" = 1'-0"

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STRAIGHTWAY WTF BUILDING FLOOR PLANS

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED 3 MAY A.D. 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

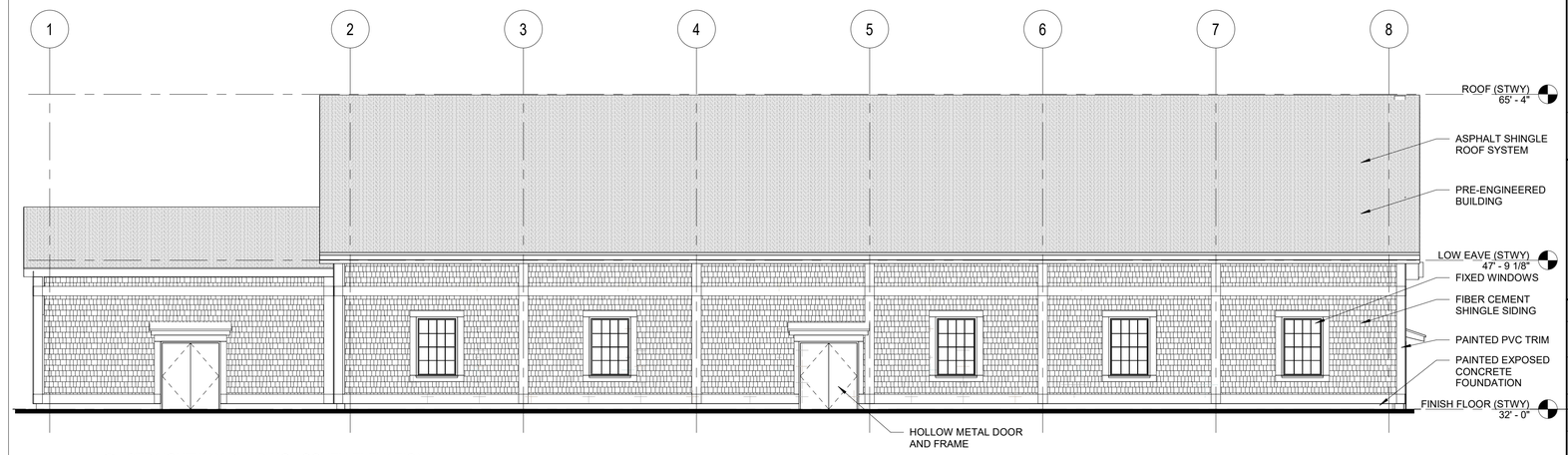
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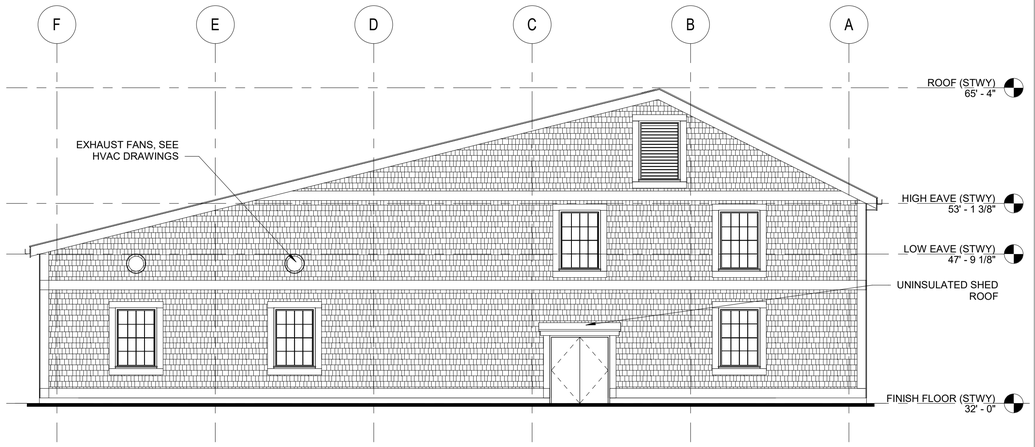
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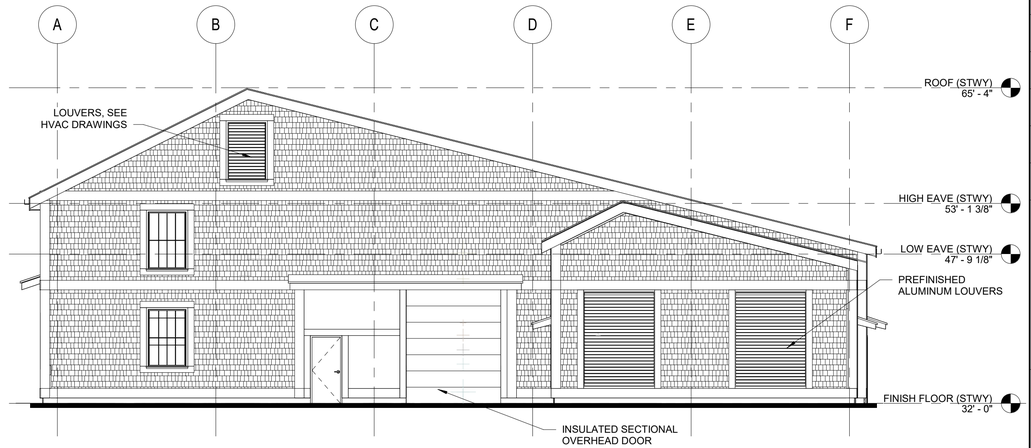
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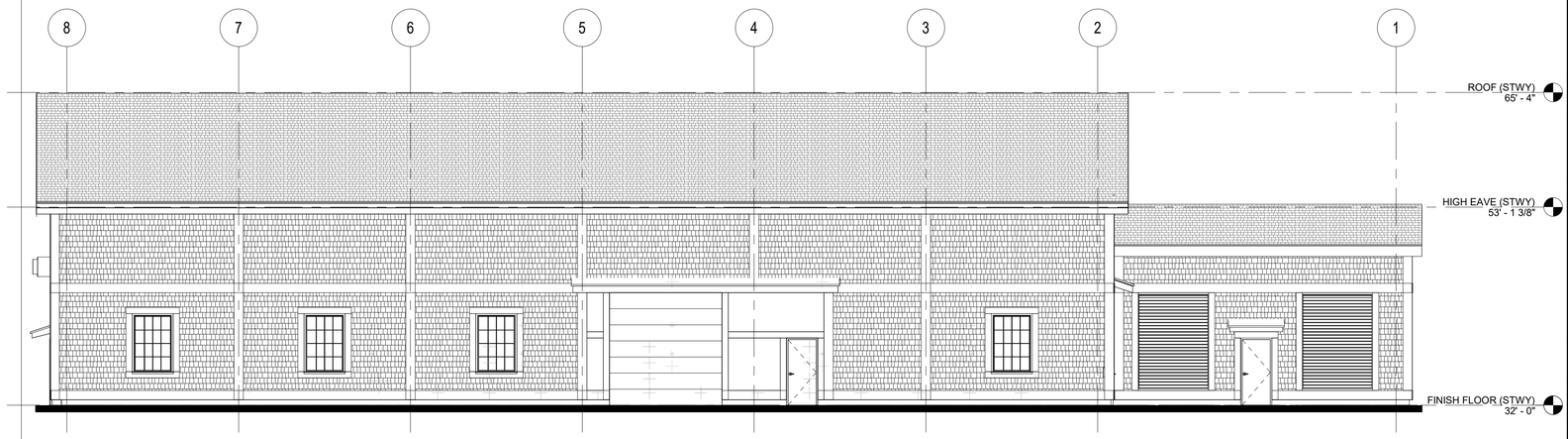
1 STRAIGHTWAY BUILDING - SOUTH ELEVATION
SCALE: 1/8" = 1'-0"



4 STRAIGHTWAY BUILDING - EAST ELEVATION
SCALE: 1/8" = 1'-0"



2 STRAIGHTWAY BUILDING - WEST ELEVATION
SCALE: 1/8" = 1'-0"



3 STRAIGHTWAY BUILDING - NORTH ELEVATION
SCALE: 1/8" = 1'-0"

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STRAIGHTWAY WTF BUILDING ELEVATIONS

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

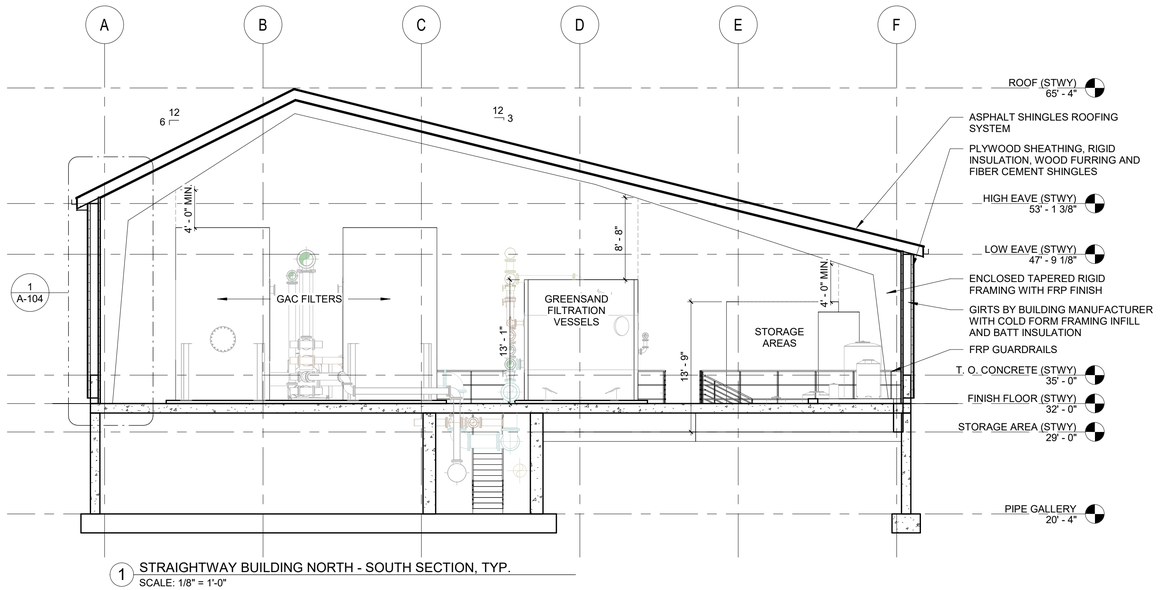
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CHECKED BY	RB
APPROVED BY	--

A-102

SHEET 30 of 60

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1 STRAIGHTWAY BUILDING NORTH - SOUTH SECTION, TYP.
SCALE: 1/8" = 1'-0"

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STRAIGHTWAY WTF BUILDING SECTION

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
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HYANNIS, MA 02601

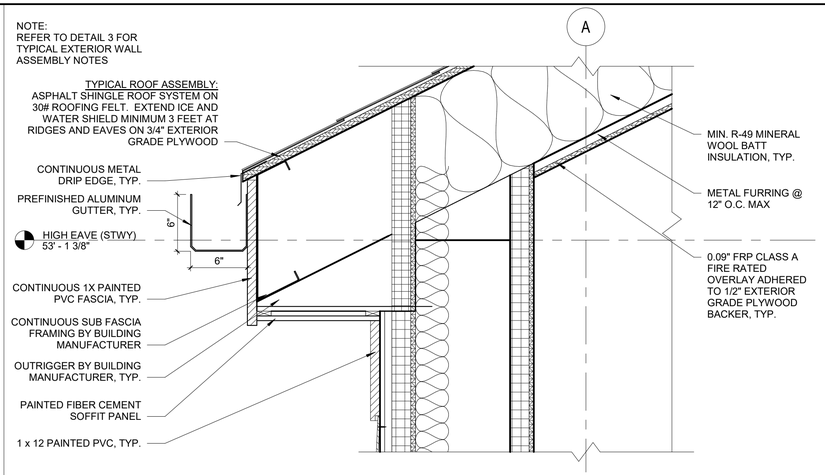
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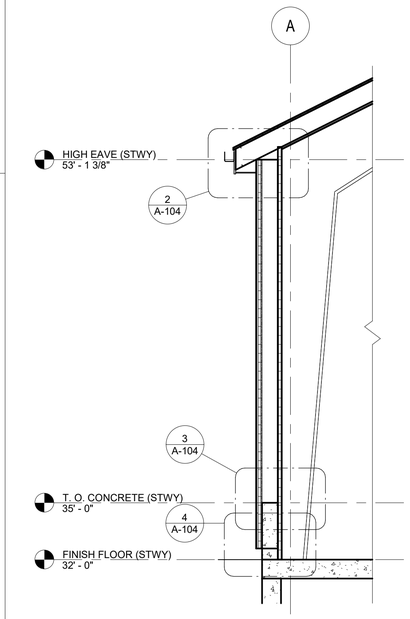
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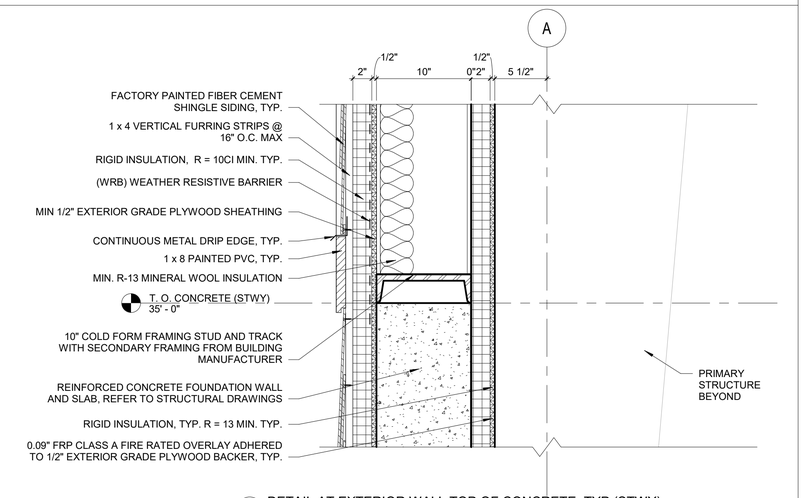
NOTE:
REFER TO DETAIL 3 FOR TYPICAL EXTERIOR WALL ASSEMBLY NOTES



2 DETAIL AT EXTERIOR WALL EAVE, TYP. (STWY)
SCALE: 1 1/2" = 1'-0"

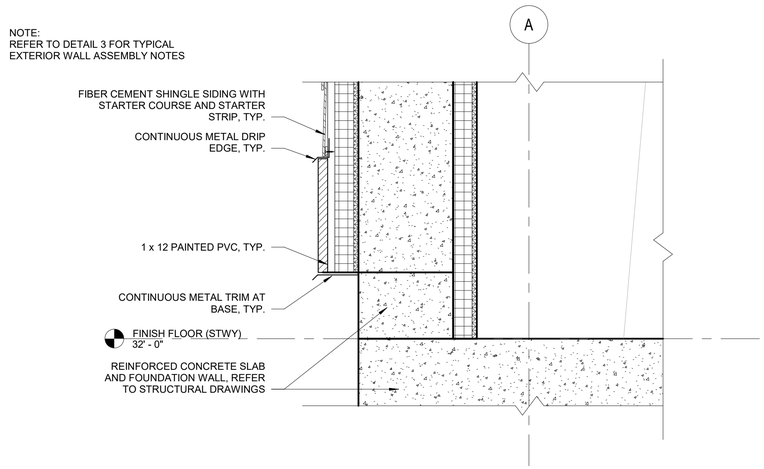


1 SECTION AT TYPICAL WALL
SCALE: 1/4" = 1'-0"



3 DETAIL AT EXTERIOR WALL TOP OF CONCRETE, TYP (STWY)
SCALE: 1 1/2" = 1'-0"

NOTE:
REFER TO DETAIL 3 FOR TYPICAL EXTERIOR WALL ASSEMBLY NOTES



4 DETAIL AT EXTERIOR WALL SLAB, TYP. (STWY)
SCALE: 1 1/2" = 1'-0"

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STRAIGHTWAY WTF BUILDING WALL SECTION & DETAILS

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

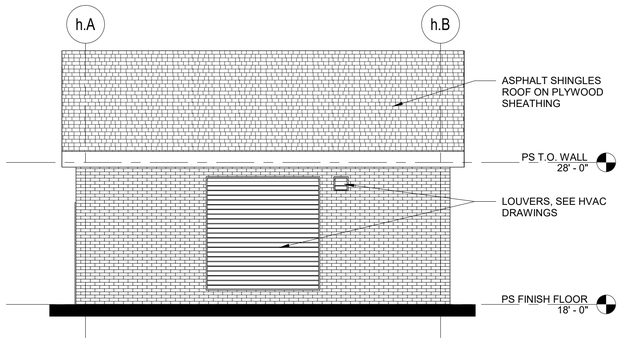
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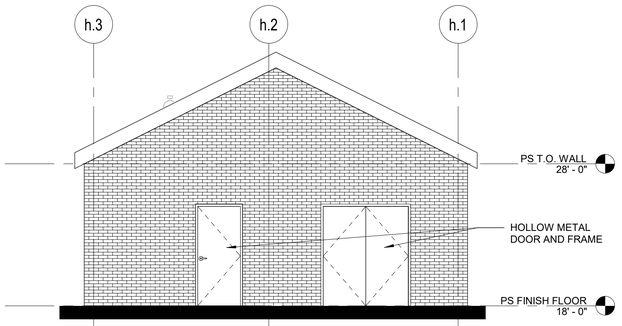
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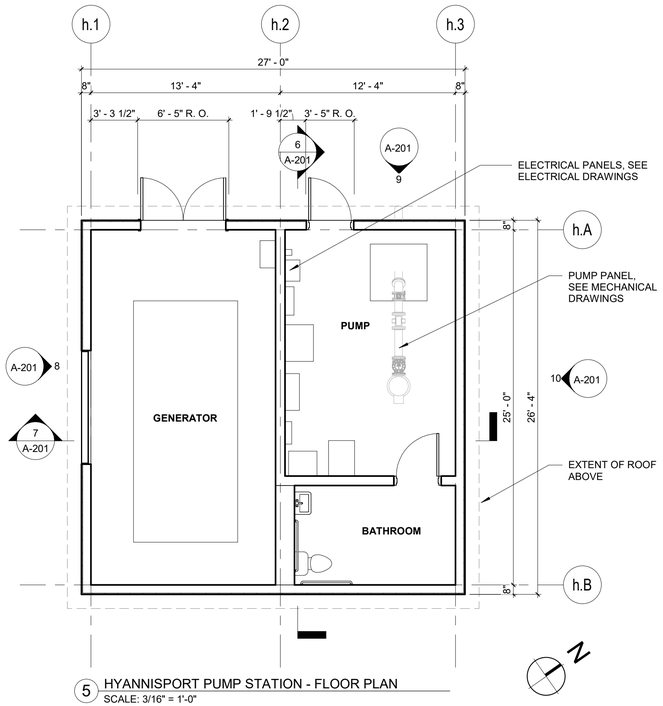
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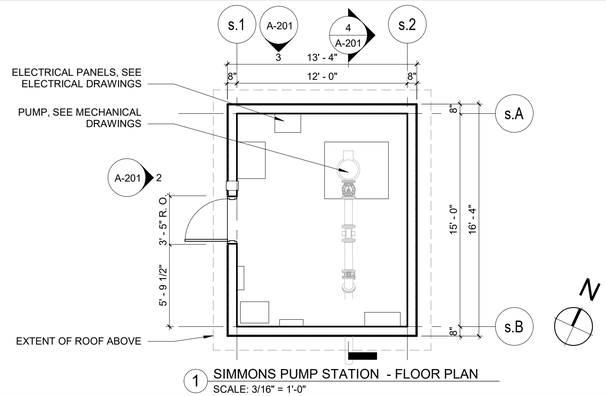
8 HYANNISPORT PUMP STATION - WEST ELEVATION
SCALE: 3/16" = 1'-0"



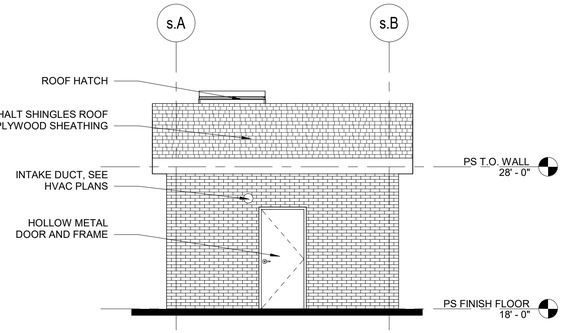
9 HYANNISPORT PUMP STATION - NORH ELEVATION
SCALE: 3/16" = 1'-0"



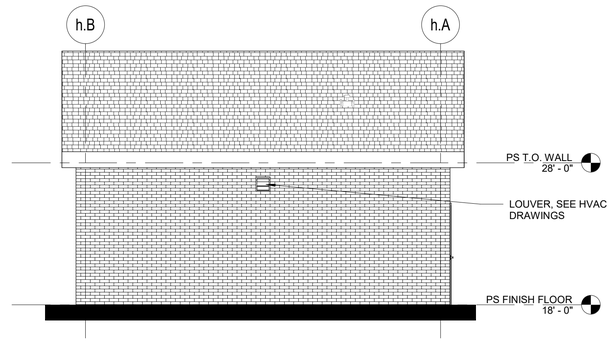
5 HYANNISPORT PUMP STATION - FLOOR PLAN
SCALE: 3/16" = 1'-0"



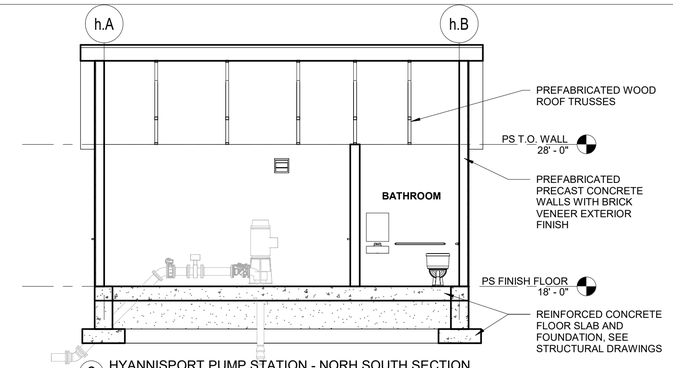
1 SIMMONS PUMP STATION - FLOOR PLAN
SCALE: 3/16" = 1'-0"



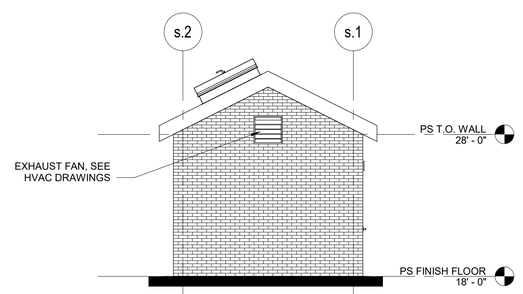
2 SIMMONS PUMP STATION - WEST ELEVATION
SCALE: 3/16" = 1'-0"



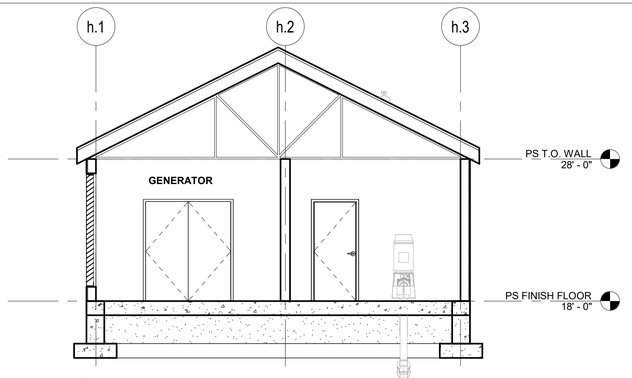
10 HYANNISPORT PUMP STATION - EAST ELEVATION
SCALE: 3/16" = 1'-0"



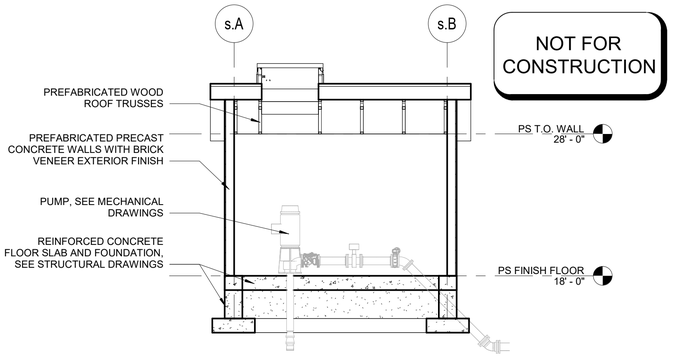
6 HYANNISPORT PUMP STATION - NORH SOUTH SECTION
SCALE: 3/16" = 1'-0"



3 SIMMONS PUMP STATION - NORTH ELEVATION
SCALE: 3/16" = 1'-0"



7 HYANNISPORT PUMP STATION - EAST WEST SECTION
SCALE: 3/16" = 1'-0"



4 SIMMONS PUMP STATION - NORTH SOUTH SECTION
SCALE: 3/16" = 1'-0"

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HYANNISPORT & SIMMONS POND PUMP STATIONS - PLANS, ELEVATIONS & SECTIONS

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	06/10/2024
CURRENT REVISION	
DESIGNED BY	EAB
DRAWN BY	JH
CHECKED BY	RB
APPROVED BY	--

A-201

SHEET 33 of 60

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Autodesk Docs://24003062.001A - W-Barnstable MA Straightway Design T1_2/Barnstable_Arch_GAC Shelter_2023 Central.rvt

ELECTRICAL SYMBOLS

F1 / 1 a	LINEAR LIGHTING FIXTURES "F1" INDICATES FIXTURE TYPE – TYPICAL FOR ALL FIXTURES "1" INDICATES CIRCUIT NUMBER – TYPICAL FOR ALL FIXTURE "a" INDICATES THE SWITCH CONTROL – TYPICAL FOR ALL FIXTURES
	WALL MOUNTED LIGHTING FIXTURE.
	SURFACE OR PENDANT MOUNTED FIXTURE.
	EMERGENCY EXIT SIGN
	EMERGENCY LIGHTING BATTERY UNIT WITH TWO LIGHT HEADS
	REMOTE EMERGENCY LIGHTING UNIT WITH TWO LIGHTING HEADS PROVIDE 3/4", 2#10, 1#10GND TO NEAREST THE EMEGENCY LIGHTING BATTERY UNIT
S_a	SINGLE POLE SWITCH 120V, 20A "a" INDICATES THE SWITCH CONTROL
S_2	2–POLE SWITCH 120V, 20A 1 POLE FOR ROOM LIGHT FIXTURES, 1–POLE FOR EXHAUST FAN CONTROL
S_{3a}	3–WAY SWITCH 120V, 20A "a" INDICATES THE SWITCH CONTROL
S_{4a}	4–WAY SWITCH 120V, 20A "a" INDICATES THE SWITCH CONTROL
S^{BG}	BREAK GLASSS STATION
TC	DIGITAL TIME CLOCK SWITCH
TM	MECHANICAL TIMER SWITCH
OC	WALL MOUNTED DUAL TECHNOLOGY OCCUPANCY SENSOR/SWITCH
S	LOW VOLTAGE SWITCH
PM	COMBINATION PHOTOCELL/MOTION DETECTOR SENSOR
OC	CEILING MOUNTED DUAL TECHNOLOGY OCCUPANCY SENSOR
GF_1	DUPLEX RECEPTACLE, WEATHER–RESISTANT 120V, 20A WITH WEATHERPROOF COVER, "GF" INDICATES GROUND FAULT TYPE "1" INDICATES CIRCUIT NUMBER – TYPICAL FOR ALL RECEPTACLES
	DUPLEX RECEPTACLE 120V, 20A
WP	(2) DUPLEX (QUAD) RECEPTACLES, 120V, 20A "WP" INDICATES WITH WEATHERPROOF COVER
TL	SIMPLEX RECEPTACLE, WEATHER–RESISTANT 120V, 20A WITH WEATHERPROOF COVER "TL" INDICATES TWIST LOCK TYPE
30	UNFUSED DISCONNECT SWITCH, "30" INDICATES 30 AMP RATING, PROVIDE 3–POLE, UNLESS OTHERWISE INDICATED.
F 20	FUSED DISCONNECT SWITCH, "20" INDICATES 20 AMP FUSE RATING, PROVIDE 3–POLE UNLESS OTHERWISE INDICATED.
	3–PHASE RECEPTACLE
MCP / FVNR	WALL MOUNTED COMBINATION MOTOR STARTER WITH MOTOR CIRCUIT PROTECTOR, "FVNR" INDICATES TYPE OF MOTOR STARTER
MCP / FVNR	MOTOR STARTER WITH MOTOR CIRCUIT PROTECTOR, "FVNR" INDICATES TYPE OF MOTOR STARTER
	MOTOR CONTACTOR
VFD	ENCLOSED VARIABLE FREQUENCY DRIVE
Sm	MANUAL MOTOR STARTER 120V, 20A
J	JUNCTION BOX
HH	NON–UTILITY POLYMER CONCRETE HAND HOLE
AR1	ALARM RELAY, "AR1" REFERS TO RELAY NAME DESIGNATION
CR1	CONTROL RELAY, "CR1" REFERS TO RELAY NAME DESIGNATION
M	MOTOR START RELAY
TR1	TIMING RELAY, "TR1" REFERS TO RELAY NAME DESIGNATION

ELECTRICAL SYMBOLS

	NORMALY OPEN RELAY CONTACT
	NORMALLY CLOSED RELAY CONTACT
	OPERATOR PUSH BUTTON NORMALLY OPEN CONTACT
	OPERATOR PUSH BUTTON NORMALLY CLOSED CONTACT
	PRESSURE SWITCH – CLOSES ON HIGH PRESSURE
	PRESSURE SWITCH – CLOSES ON LOW PRESSURE
	UNDERGROUND CONDUIT DUCT BANK
LP1(1)	HOMERUN DESIGNATION TO PANEL LP1 CIRCUIT #1, WITH THE FOLOWING CONDUIT/WIRES UNLESS OTHERWISE NOTED: • 3/4"C WITH 2#12, 1#12GND FOR 20AMP SINGLE PHASE CIRCUITS AND ELECTRIC UNIT HEATER THERMOSTAT CONTROL • 3/4"C WITH 3#12, 1#12GND FOR 20AMP THREE PHASE CIRCUITS. • 3/4"C WITH 2#10, 1#10GND FOR 30AMP SINGLE PHASE CIRCUITS. • 3/4"C WITH 3#10, 1#10GND FOR 30AMP THREE PHASE CIRCUITS. • 3/4"C WITH 2#8, 1#10GND FOR 40AMP & 50AMP SINGLE PHASE CIRCUITS. • 3/4"C WITH 3#8, 1#10GND FOR 40AMP & 50AMP THREE PHASE CIRCUITS.
	EYS TYPE CONDUIT SEAL
SPD	SURGE PROTECTION DEVICE
	UTILITY POLE
E	UTILITY HANDHOLE, "E" REPRESENTS ELECTRICAL HANDHOLE, "C" REPRESENT COMMUNICATION HANDHOLE
20 / 100 / GFCI	MOLDED CASE CIRCUIT BREAKER, 3–POLE UNLESS OTHERWISE INDICATED, "20" INDICATES TRIP AMPERE RATING, "100" INDCATES FRAME SIZE, "GFCI" INDICATES CIRCUIT BREAKER TO HAVE GROUND FAULT CIRCUIT INTERRUPT
	DRY TYPE TRANSFORMER
	3/4"ø X 10'–0" COPPER CLAD GROUND ROD
	BUILDING GROUNDING SYSTEM
10	MOTOR, "10" INDICATES HORSEPOWER RATING
XX	CABLE/CONDUIT DESIGNATION, "XX" REFERS CABLE CONDUIT REFERENCE, REFER TO CABLE/CONDUIT AND DUCT/CABLE SCHEDULES.
OS–XXXX / YYY	OPERATOR STATION (SUPPLIED BY DIV. 16 UNO), "XXXX" REFERS TO TAGNAME ID, "YYY" REFERS TO THE TYPE OF OPERATOR STATION
XX–XXXX	UNLESS OTHERWISE NOTED INSTRUMENATION OR PROCESS EQUIPMENT (SUPPLIED BY OTHER DIVISIONS) "XX–XXXX" REFERS TO TAGNAME ID
E	GENERATOR EMERGENCY STOP
0	OCCUPIED/UNOCCUPIED SELECTOR SWITCH. (SUPPLIED BY DIV. 16)
T	THERMOSTAT (SUPPLIED BY DIV. 15)
M	MOTOR OPERATED DAMPER (SUPPLIED BY DIV. 15)
S	MANUAL WALL SWITCH (BY DIV. 15)
S	REFRIGERANT SENSOR (BY DIV. 15)
MPCP	METERING PUMP CONTROL PANEL (SUPPLIED BY DIV. 11)
CFS–XXX	CHEMICAL FILL STATION (SUPPLIED BY DIV. 13)
ISBP	INTRINSICALLY SAFE BARRIER PANEL (SUPPLIED BY DIV. 13)
F / XKW	ELECTRIC UNIT HEATER, "X" INDICATES UNIT ELECTRIC COIL RATING (SUPPLIED BY DIV. 15)
XXX / 1 / P11–LP (21)	EQUIPMENT CIRCUIT NUMBER DESIGNATION TO PANEL LP1–LP CIRCUIT #21,

FIRE ALARM / SECURITY SYSTEM SYMBOLS

F	MANUAL FIRE ALARM STATION
F	FIRE ALARM AUDIO/VISUAL DEVICE
F V	FIRE ALARM VISUAL ONLY DEVICE
FH	FIRE ALARM BEACON
S	SMOKE DETECTOR
S_D	DUCT SMOKE DETECTOR
	REMOTE TEST STATION AND ALARM FOR DUCT SMOKE DETECTOR
H	HEAT DETECTOR, COMBINATION RATE–OF–RISE AND FIXED TEMPERATURE
C	CARBON MONOXIDE DETECTOR
M	INPUT MONITORING MODULE
C	RELAY CONTROL MODULE
FACP	FIRE–SECURITY ALARM CONTROL PANEL
FAA	FIRE ALARM ANNUNCIATOR PANEL
DACT	CELLUAR DIGITAL ALARM COMMUNICATOR TRANSMITTER
	MASTER BOX
K	KEY DEPOSITORY – KNOX BOX
FS	FLOW SWITCH
TS	TAMPER SWITCH
B	24V ELECTRIC SPRINKLER BELL, PROVIDED BY FIRE PROTECTION FSB, PROVIDE AND MOUNT IN WEATHERPROOF BACKBOX
DS	MAGNETIC DOOR SWITCH
KP	KEY PAD
SH	SECURITY ALARM CONTROL PANEL

TELE/DATA & CCTV SYMBOLS

1T 2D	WALL MOUNTED DATA OUTLET, 2D INDICATES (2) CAT6 TERMINAL DATA CONNECTORS, 1T INDICATES (1) CAT6 TERMINAL TELEPHONE CONNECTOR
CCTV	CLOSED CIRCUIT TELEVISION CAMERA
DVRS	DIGITAL VIDEO RECORDING SERVER
POES	POWER OVER ETHERNET SWITCH
UPS	UNINTERRUPTIBLE POWER SUPPLY

CHEMICAL ALARM SYSTEM SYMBOLS

C	MANUAL CHEMICAL ALARM STATION
C	CHEMICAL ALARM AUDIO/VISUAL DEVICE
CACP	CHEMICAL ALARM CONTROL PANEL

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ELECTRICAL LEGEND

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	20233667.002A
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CHECKED BY	MC
APPROVED BY	Approve-

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SHEET 34 of 60

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GENERAL NOTES

1. GENERAL CONTRACTOR TO PROVIDE CONCRETE MOUNTING AND HOUSEKEEPING PADS ON ALL FLOOR OR GRADE MOUNTED ELECTRICAL EQUIPMENT, THE FOLLOWING EQUIPMENT IS THE MINIMUM REQUIREMENT FOR HOUSEKEEPING PADS. ADDITIONAL PADS MAYBE REQUIRED BASED ON THE ELECTRICAL CONTRACTORS MOUNTING METHODS, ELECTRICAL CONTRACTOR SHALL COORDINATE WITH GENERAL CONTRACTOR FOR ALL HOUSEKEEPING PAD SIZES AND LOCATIONS.
   1.1. DRY TYPE TRANSFORMERS
2. ALL CONDUIT AND EQUIPMENT SHALL BE INSTALLED AND GROUNDED IN ACCORDANCE WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE AND APPLICABLE LOCAL CODES.
3. BONDING JUMPERS, CONDUIT CLAMPS AND POINTS OF ATTACHMENT ARE NOT SHOWN ON DRAWINGS. SIZE BONDING JUMPERS IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE. THE POINTS OF ATTACHMENT OF THE GROUND CLAMPS SHALL BE ACCESSIBLE LOCATIONS.
4. EQUIPMENT & CONDUIT INSTALLATIONS ARE SHOWN DIAGRAMMATICALLY ONLY AND SHALL BE INSTALLED IN A MANNER TO PREVENT CONFLICTS WITH EQUIPMENT AND STRUCTURAL CONDITIONS. EXPOSED CONDUITS SHALL BE INSTALLED PARALLEL TO BEAMS AND WALLS.
5. CONDUITS SHALL BE TERMINATED SO AS TO PERMIT NEAT CONNECTIONS TO MOTORS AND OTHER EQUIPMENT.
6. NO CONDUIT SMALLER THAN 3/4" PIPE SIZE NOR WIRE SMALLER THAN NO. 12 A.W.G. SHALL BE USED UNLESS OTHERWISE NOTED.
7. RECEPTACLES AND SWITCHES SHALL BE MOUNTED 45" ABOVE FINISHED FLOOR.
8. THE WIRING AND BLOCK DIAGRAMS, QUANTITY AND SIZE OF WIRES AND CONDUIT REPRESENT A SUGGESTED ARRANGEMENT BASED UPON SELECTED STANDARD COMPONENTS OF ELECTRICAL AND PROCESS EQUIPMENT. MODIFICATIONS ACCEPTABLE TO THE ENGINEER MAY BE MADE BY THE CONTRACTOR TO ACCOMMODATE EQUIPMENT ACTUALLY PURCHASED. THE BASIC SEQUENCE AND METHOD OF CONTROL MUST BE MAINTAINED AS INDICATED ON THE DRAWINGS AND/OR SPECIFICATIONS.

DEMOLITION NOTES

1. UNLESS OTHERWISE NOTED, ALL EXISTING ELECTRICAL SYSTEMS (POWER, LIGHTING, LOW VOLTAGE, CONTROLS, ETC) AND ASSOCIATED EQUIPMENT INDICATED WITH HATCH MARKS IS TO BE DEMOLISHED. DISCONNECT AND DE-ENERGIZE THE EQUIPMENT. REMOVE THE EQUIPMENT TO BE DEMOLISHED OR SALVAGED PER SECTION 02050. ALL CONTROL DEVICES, CONDUIT, CABLING, BOXES, SUPPORTS, ETC, ASSOCIATED WITH THE DEMOLISHED EQUIPMENT SHALL BE REMOVED. THE CONDUIT AND CABLING SHALL BE REMOVED BACK TO SOURCE.
2. NO DEVICE OR EQUIPMENT INDICATED FOR DEMOLITION WILL BE REUSED OR SALVAGED UNLESS SPECIFICALLY NOTED AS SUCH. ALL EQUIPMENT REMOVED SHALL BE REMOVED FROM SITE AND PROPERLY DISPOSED OF, PRIOR TO REMOVAL OF EQUIPMENT COORDINATE WITH OWNER FOR ANY EQUIPMENT THE OWNER WILL KEEP.
3. EXISTING EQUIPMENT INDICATED ON THE DEMOLITION PLANS ARE BASED ON SITE OBSERVATIONS AND IT IS NOT THE INTENTION OF THESE DRAWINGS TO SHOW ALL EQUIPMENT AND MATERIALS TO BE DISCONNECTED AND/OR REMOVED.
4. ALL UNDERGROUND CONDUIT SHALL BE CUT BELOW GRADE, CAPPED AND BACKFILLED WITH DIRT TO MATCH GRADE. ALL CONDUIT STUBBING UP FROM CONCRETE SLAB SHALL BE CUT AND CAPPED AND SLAB LEVEL. ALL WIRING SHALL BE REMOVED COMPLETELY.

ABBREVIATIONS

(2)1"C, 3#8, #10GND	2, 1-INCH CONDUITS EACH CONDUIT CONTAINING 3-#8 AWG WIRES AND 1-#10 GROUND CONDUCTOR
3/4" CE	EMPTY CONDUIT. NUMERAL DENOTES SIZE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AR	ALARM RELAY
ATS	AUTOMATIC TRANSFER SWITCH
CR	CONTROL RELAY
CP	CONTROL PANEL
DRG. DWG.	DRAWING
EAN	EXCEPT AS NOTED
EC	ELECTRICAL CONTRACTOR
ETM	ELAPSED TIME METER
FE	FLOW ELEMENT
FIT	FLOW INDICATOR TRANSMITTER
FS	FLOW SWITCH
FT	FLOW TRANSMITTER
FVNR	FULL VOLTAGE NON-REVERSING
GND, GRD	GROUNDING CONDUCTOR (EQUIPMENT)
HOA	HAND-OFF-AUTOMATIC
HH	HANDHOLE
J OR JB	JUNCTION BOX
JPB	JOG PUSHBUTTON
LE	LEVEL ELEMENT
LIT	LEVEL INDICATOR TRANSMITTER
LL	LOW LEVEL
LS	LEVEL SWITCH
LT	LEVEL TRANSMITTER
MC	MOTOR CONTROLLER (STARTER)
MCC	MOTOR CONTROL CENTER
MH	MANHOLE
MFR	MANUFACTURER
MS	MOTION OR MOISTURE SENSOR
NTS	NOT TO SCALE
OEM	ORIGINAL EQUIOPMENT MANUFACTURE SUPPLIED
OH	OVERHEAD
OL	MOTOR OVERLOAD HEATER
OS	OPERATOR STATION
PB	PUSHBUTTON CONTROL STATION MOMENTARY CONTACT TYPE, STOP START
PBE	PUSHBUTTON CONTROL STATION MAINTAINED EMERGENCY STOP TYPE, TWIST TO RELEASE
PBL	PUSHBUTTON CONTROL STATION MOMENTARY TYPE WITH LOCK-OUT DEVICE, STOP-START
PBM	PUSHBUTTON CONTROL STATION MAINTAINED CONTACT TYPE, STOP START
PIT	PRESSURE INDICATOR TRANSMITTER
PL	PUSHBUTTON CONTROL STATION MOMENTARY TYPE WITH LOCK-OUT DEVICE, STOP
RGS	RIGID GALVANIZED STEEL
RVNR	REDUCED VOLTAGE NON-REVERSING
SPD	SURGE SUPPRESSOR DEVICE
SOV	SOLENOID VALVE
S/S	SOFT STARTER
TB	TERMINAL BOX
TD	MOTOR TEMPERATURE DETECTOR
TR	TIMING RELAY
TS	TEMPERATURE SWITCH
TSP	TWISTED SHEILDED PAIR
TSTW	TWO SPEED TWO WINDING
TYP	TYPICAL
UG	UNDERGROUND
UNO	UNLESS OTHERWISE NOTED
VFD	VARIABLE FREQUENCY DRIVE
WP	WATER PROOF
WHM	WATT HOUR UTILITY METER
XFMR	TRANSFORMER

POWER CABLE/CONDUIT SCHEDULE

SYMBOL	CONDUIT SIZE*	CONDUCTORS*	GND*
P22	3/4"	(2)#12	(1)#12
P23	3/4"	(3)#12	(1)#12
P26	3/4"	(6)#12	(1)#12
P32	3/4"	(2)#10	(1)#10
P33	3/4"	(3)#10	(1)#10
P53	3/4"	(3)#8	(1)#10
P54	3/4"	(4)#8	(1)#10
P63	1"	(3)#6	(1)#8
P64	1"	(4)#6	(1)#8
P83	1 1/4"	(3)#4	(1)#8
P84	1 1/4"	(4)#4	(1)#8
P103	1 1/2"	(3)#3	(1)#6
P104	1 1/2"	(4)#3	(1)#6
P113	1 1/2"	(3)#2	(1)#6
P114	1 1/2"	(4)#2	(1)#6
P133	2"	(3)#1	(1)#6
P134	2"	(4)#1	(1)#6
P153	2"	(3)#1/0	(1)#6
P154	2"	(4)#1/0	(1)#6
P173	2 1/2"	(3)#2/0	(1)#6
P174	2 1/2"	(4)#2/0	(1)#6
P203	2 1/2"	(3)#3/0	(1)#4
P204	2 1/2"	(4)#3/0	(1)#4
P233	3"	(3)#4/0	(1)#4
P234	3"	(4)#4/0	(1)#4
P253	3"	(3)250KCMIL	(1)#4
P254	3"	(4)250KCMIL	(1)#4
P404	4"	(4)500KCMIL	(1)#3
P604	(2)3"	(8)350KCMIL	(2)#2/0
P1604	(4)4"	(16)600KCMIL	(4)#4/0

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ELECTRICAL GENERAL NOTES

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 BOSTON MAY 6, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

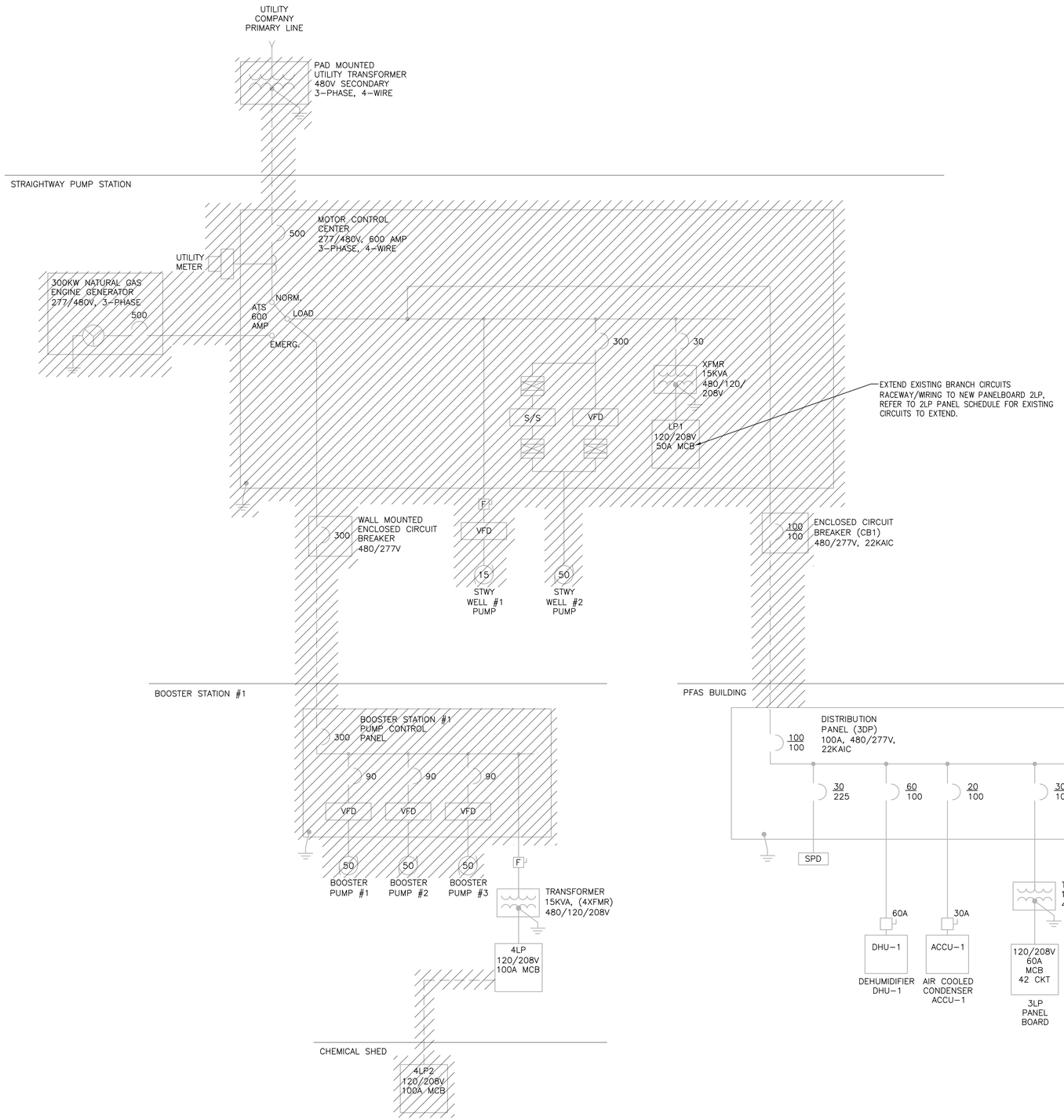
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STRAIGHTWAY PUMP STATION, BOOSTER STATION, AND PFAS BUILDING ONE LINE DIAGRAM

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ELECTRICAL ONE LINE DIAGRAM

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WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

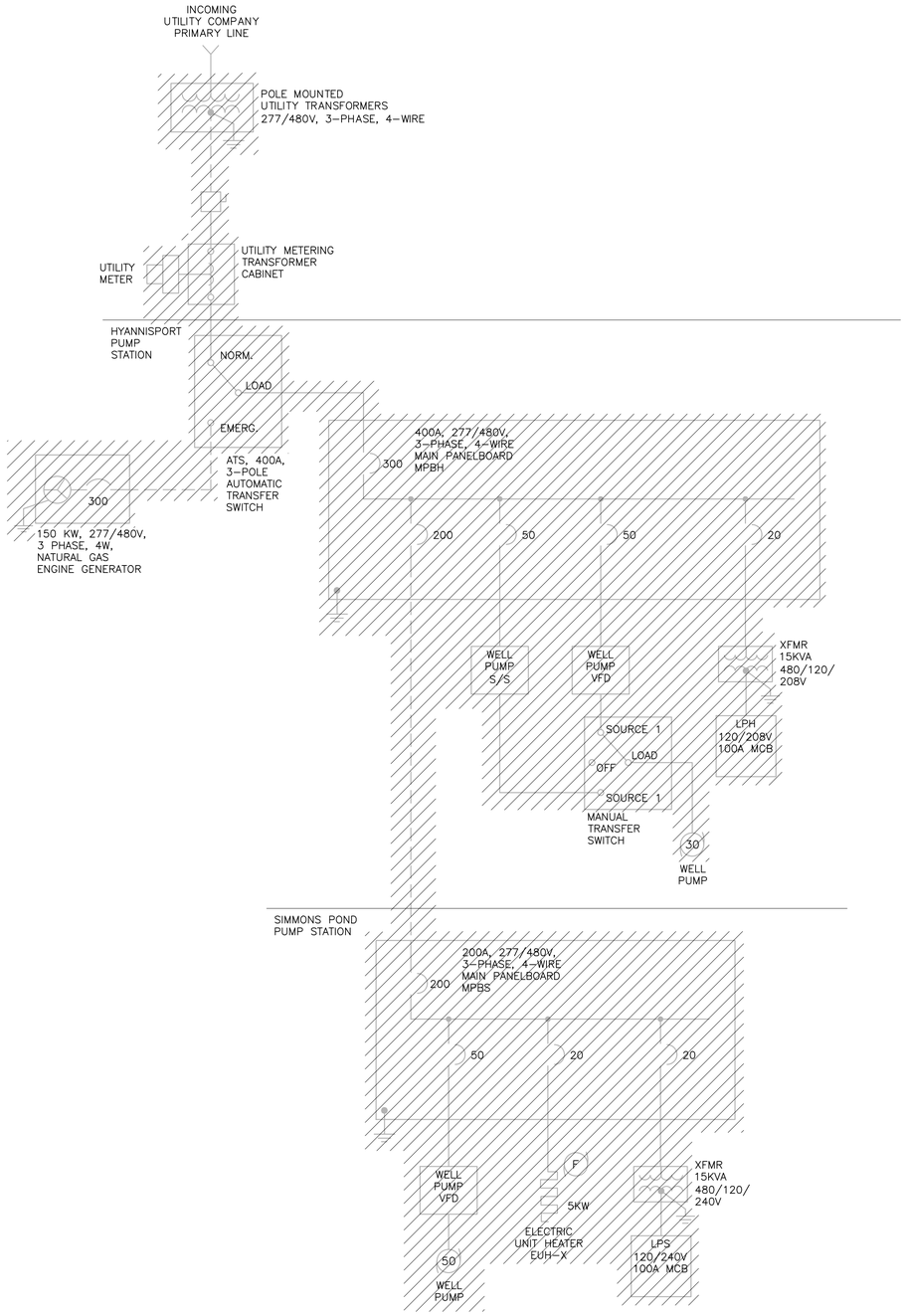
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HYANNISPORT AND SIMMONS POND PUMP STATIONS DEMOLITION ONE LINE DIAGRAM

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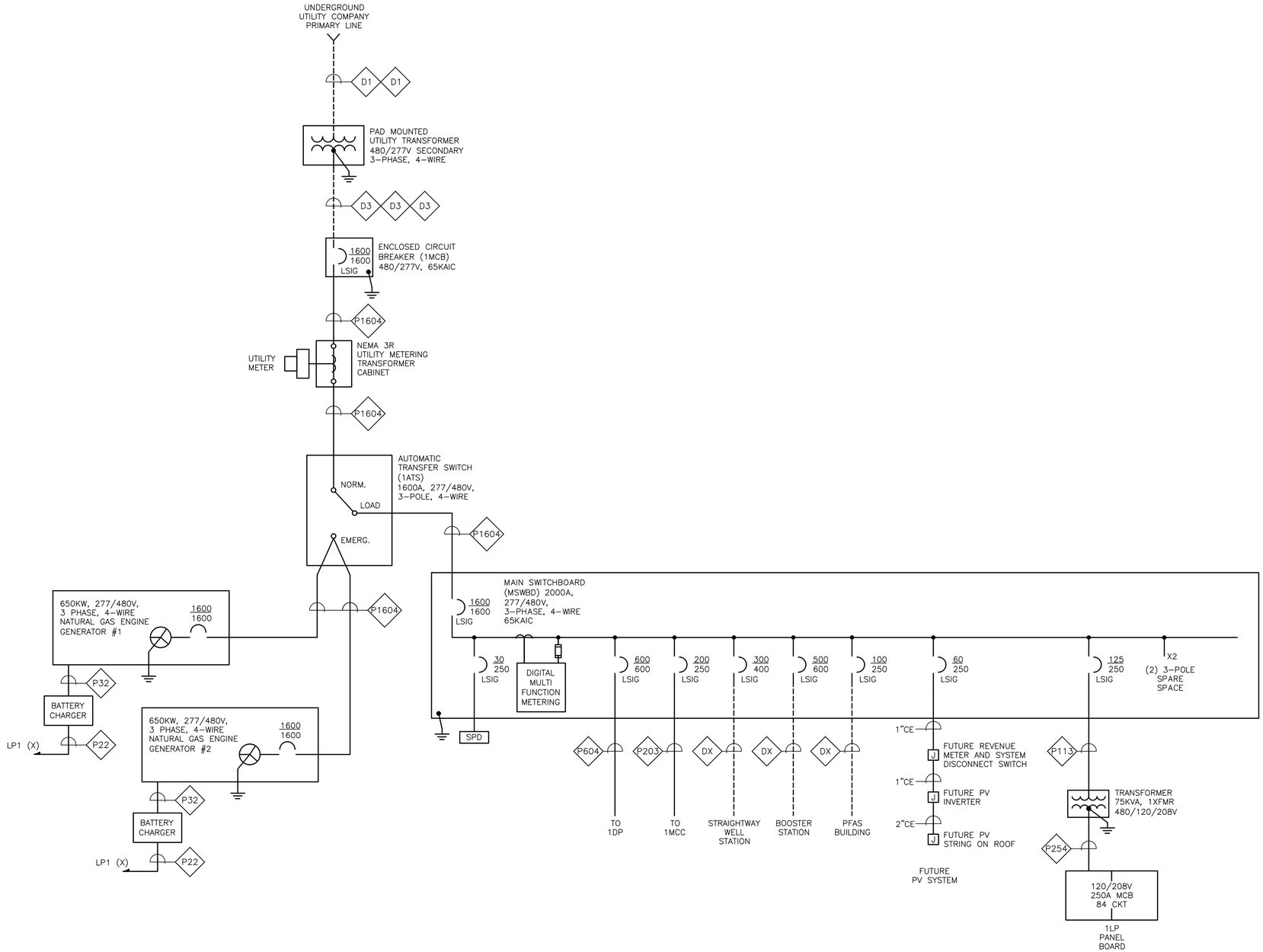
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WTP ONE LINE DIAGRAM - MSWBD

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Braintree, Massachusetts 02184
617 221-9220
web: www.sar.com

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

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ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL ONE LINE DIAGRAM

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED MAY 4, 1685

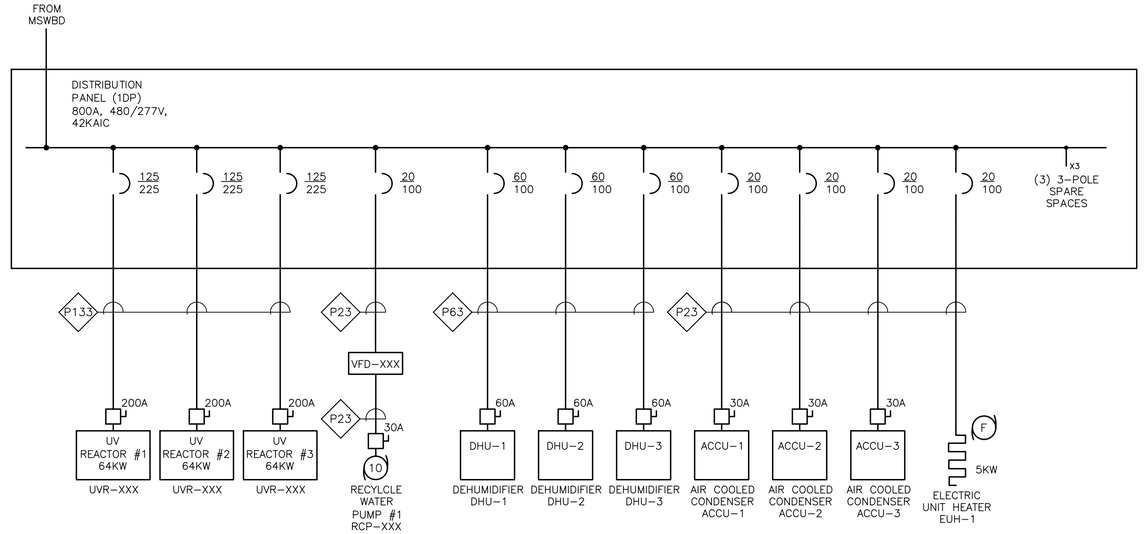
HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	20233667.002A
ISSUE DATE	05/31/2024
CURRENT REVISION	
DESIGNED BY	MC
DRAWN BY	RLB
CHECKED BY	MC
APPROVED BY	Approve-

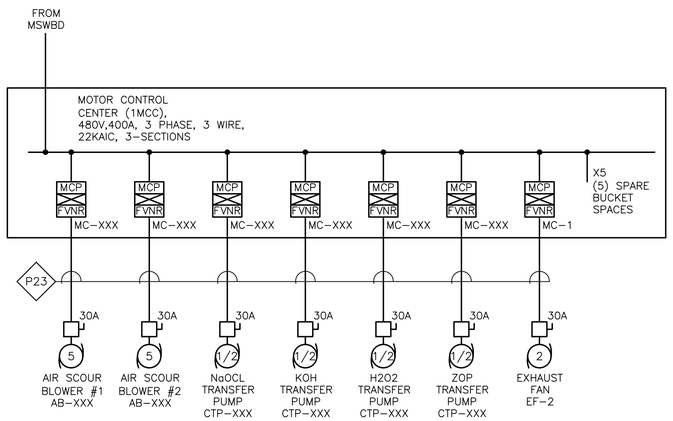
E-005

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WTP ONE LINE DIAGRAM - DP1

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WTP ONE LINE DIAGRAM - MCC1

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ELECTRICAL ONE LINE DIAGRAM

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED MAY 4, 1685

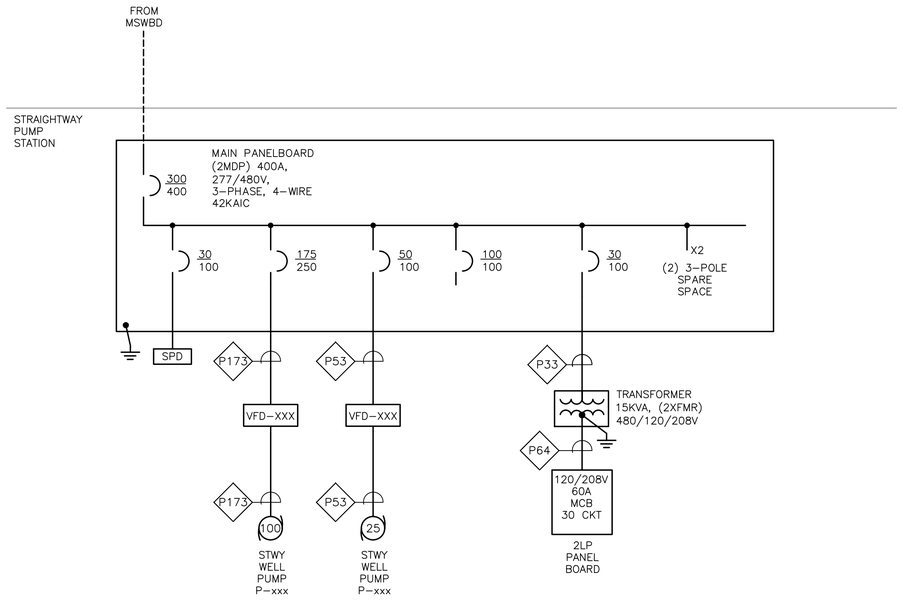
HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

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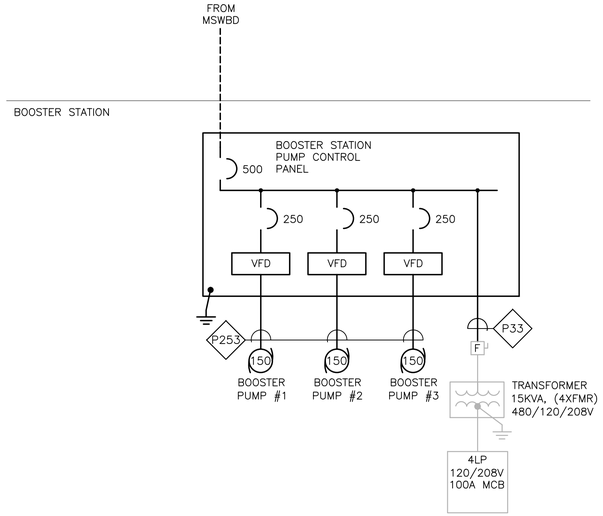
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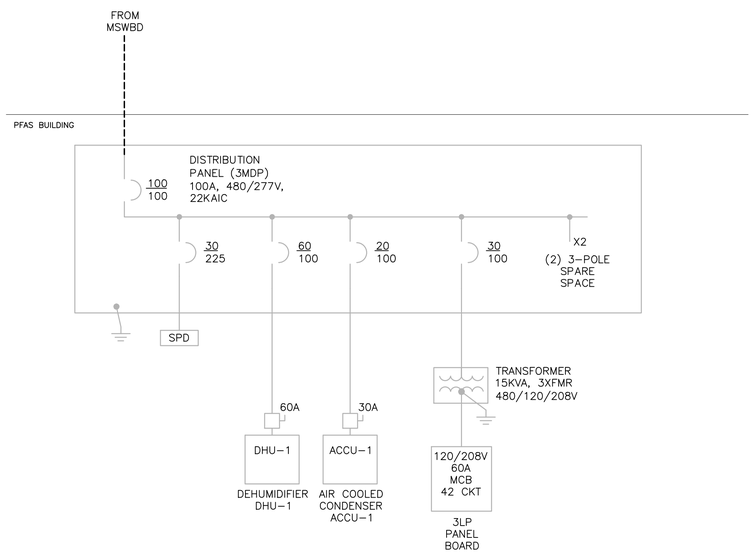
STRAIGHTWAY PUMP STATION ONE LINE DIAGRAM

NOT TO SCALE



BOOSTER STATION ONE LINE DIAGRAM

NOT TO SCALE



PFAS BUILDING ONE LINE DIAGRAM

NOT TO SCALE

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ELECTRICAL ONE LINE DIAGRAM

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

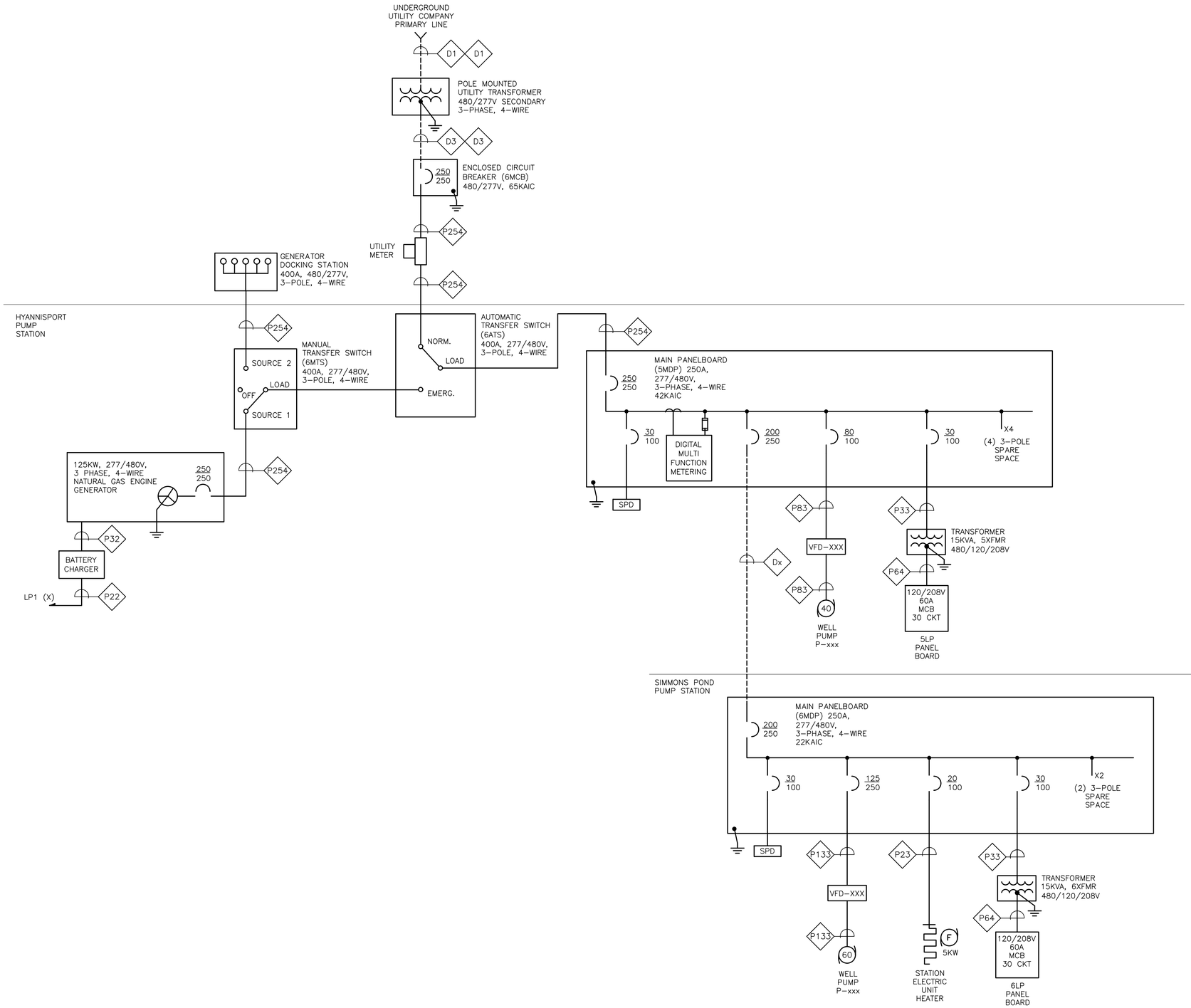
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ISSUE DATE	05/31/2024
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E-007

SHEET 40 of 60

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HYANNISPORT AND SIMMONS POND PUMP STATIONS ONE LINE DIAGRAM

NOT TO SCALE

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ELECTRICAL ONE LINE DIAGRAM

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 SERVES & MAY BE HEARD

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

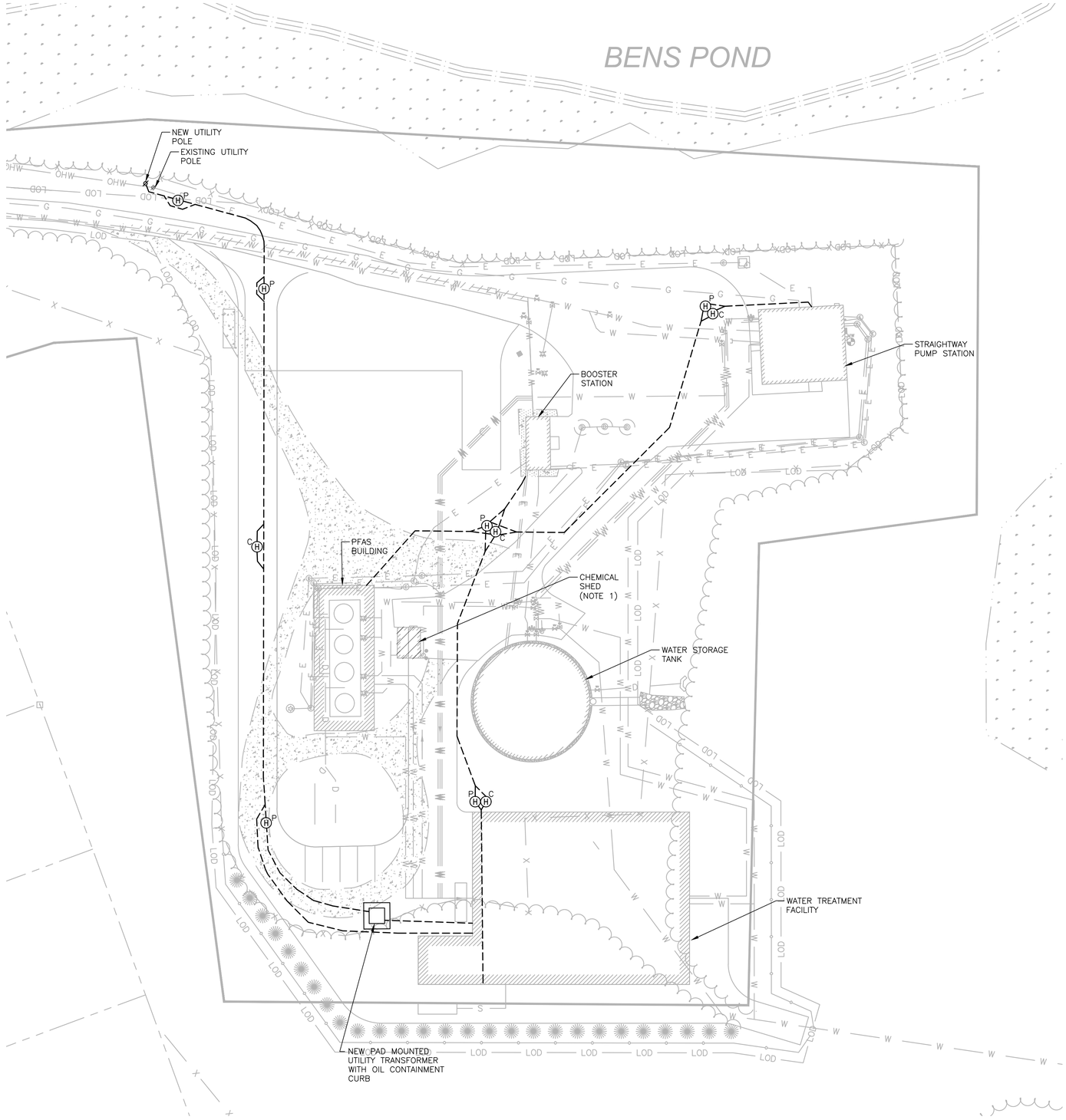
30% PRELIMINARY DESIGN

PROJECT NO.	20233667.002A
ISSUE DATE	05/31/2024
CURRENT REVISION	
DESIGNED BY	MC
DRAWN BY	RLB
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APPROVED BY	Approve-

E-008

SHEET 41 of 60

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STRAIGHTWAY SITE PLAN

1"=30'-0"

NOTES:

1. DISCONNECT POWER TO BUILDING AND MAKE SAFE FOR DEMOLITION.

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ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL STRAIGHTWAY SITE PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED MAY 4, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	20233667.002A
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DRAWN BY	RLB
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APPROVED BY	Approve-

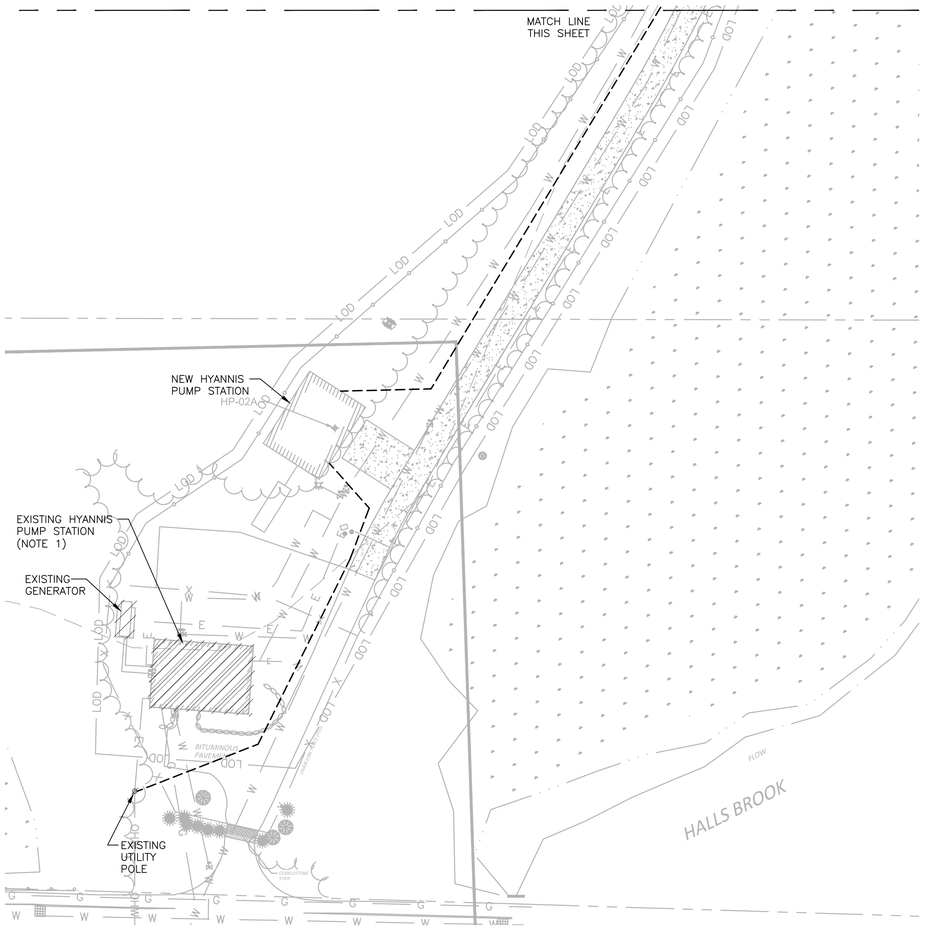
E-009

SHEET 42 of 60

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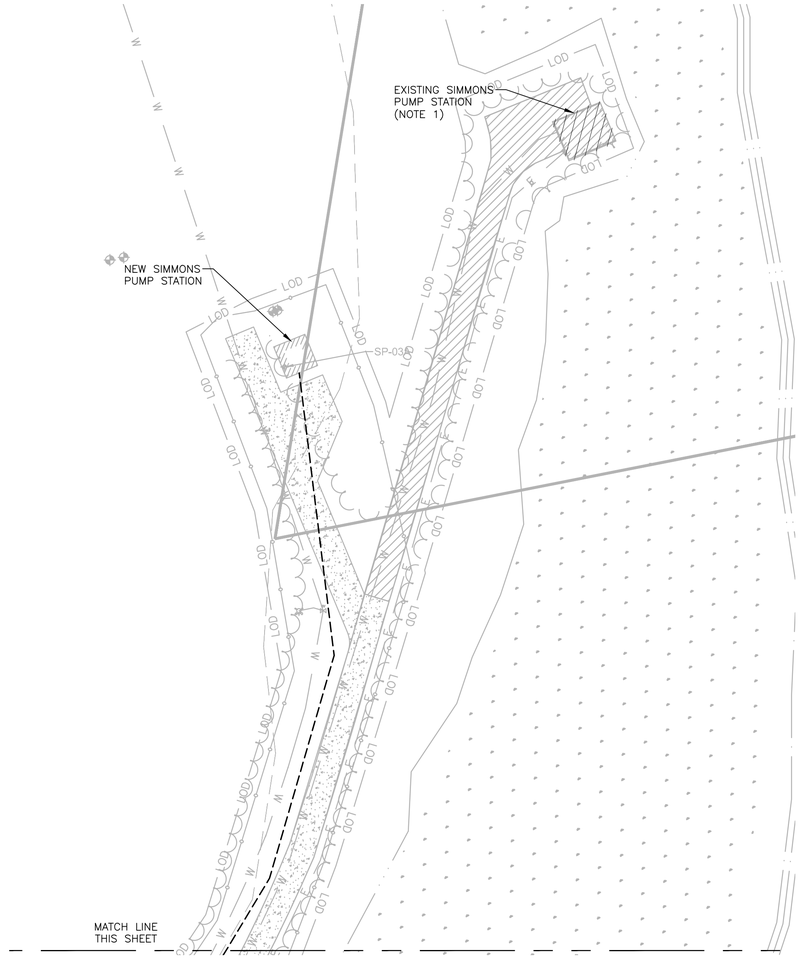
NOTES:

1. DISCONNECT POWER TO BUILDING AND MAKE SAFE FOR DEMOLITION.



HYANNISPORT WELL STATION SITE PLAN

1"=30'-0"



SIMMONS POND WELL STATION SITE PLAN

1"=30'-0"

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ELECTRICAL HYANNIS & SIMMONS WELL STATIONS SITE PLANS

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

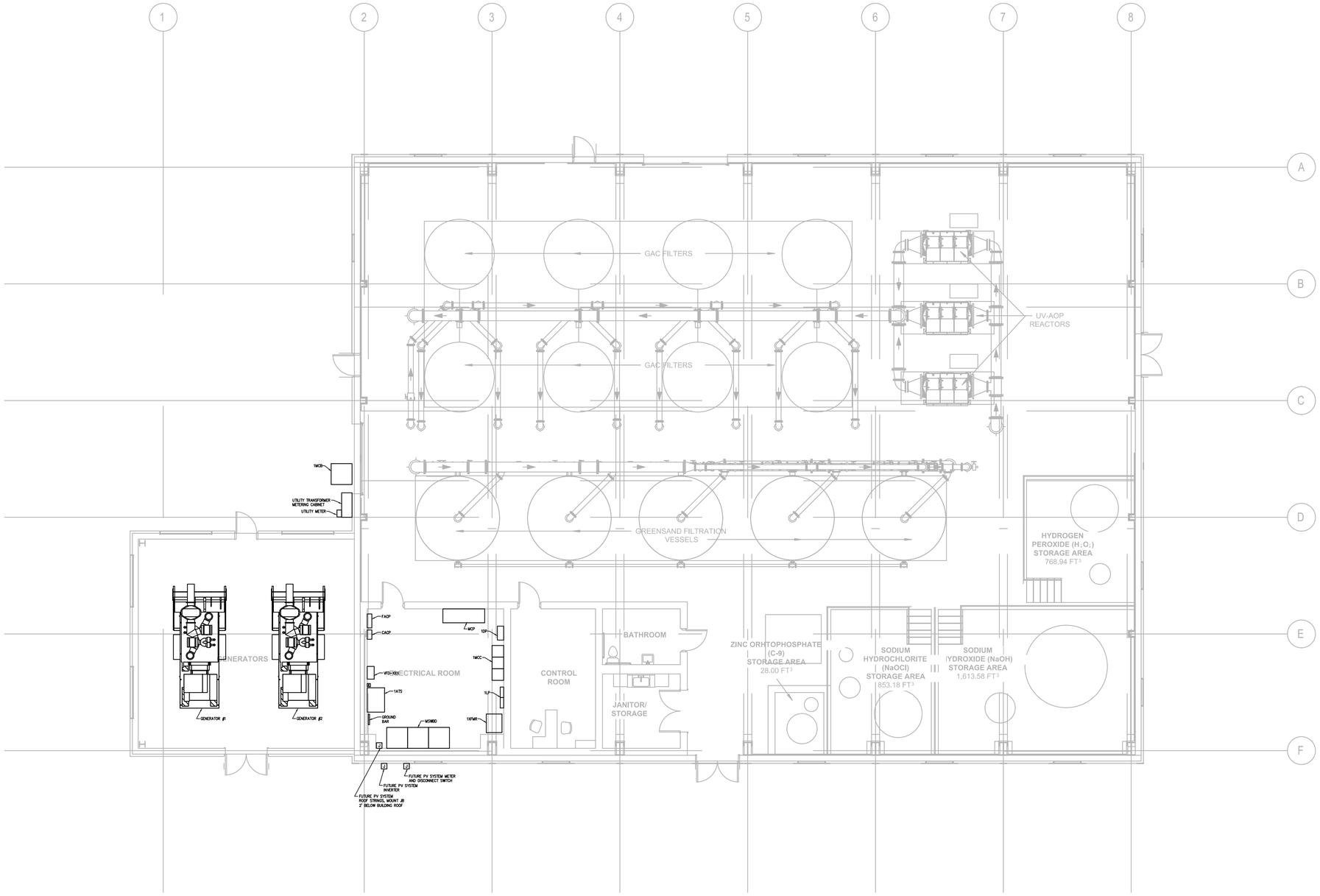
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PROJECT NO.	20233667.002A
ISSUE DATE	05/31/2024
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ELECTRICAL WTP PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED MAY 4, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

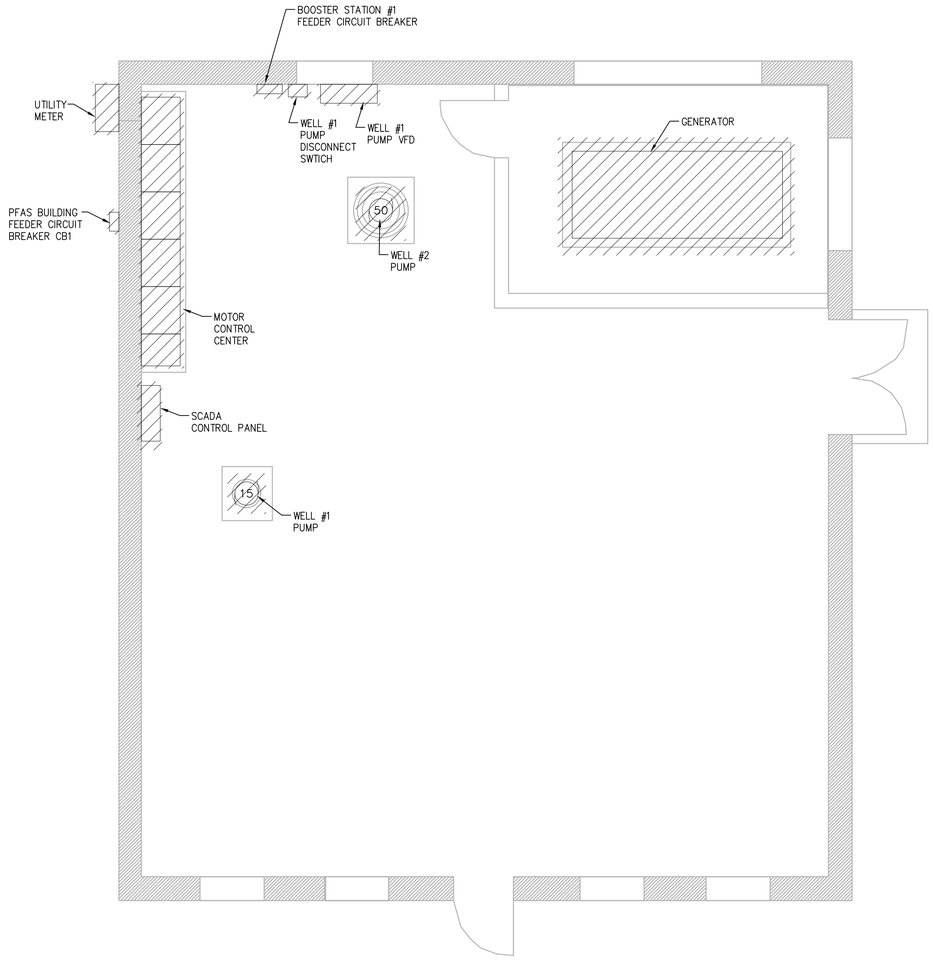
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APPROVED BY	Approve -

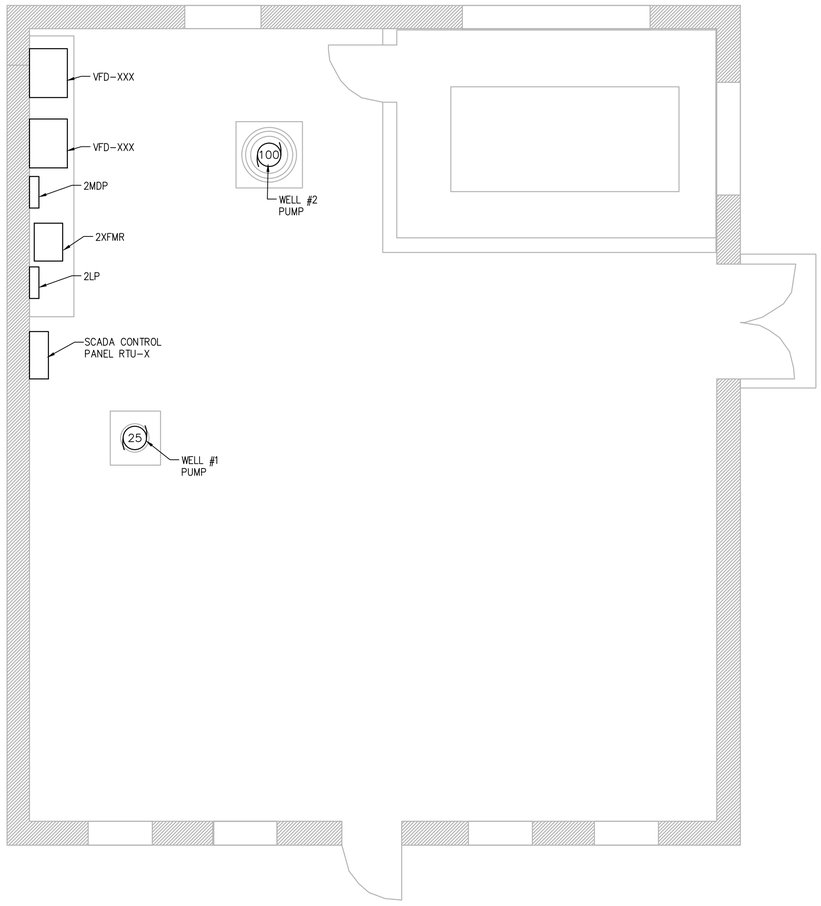
E-100

SHEET 44 of 60

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1 STRAIGHTWAY WELL STATION DEMOLITION PLAN
SCALE: 1/4" = 1'-0"



2 STRAIGHTWAY WELL STATION NEW WORK PLAN
SCALE: 1/4" = 1'-0"

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ELECTRICAL STRAIGHTWAY
WELL STATION PLANS

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

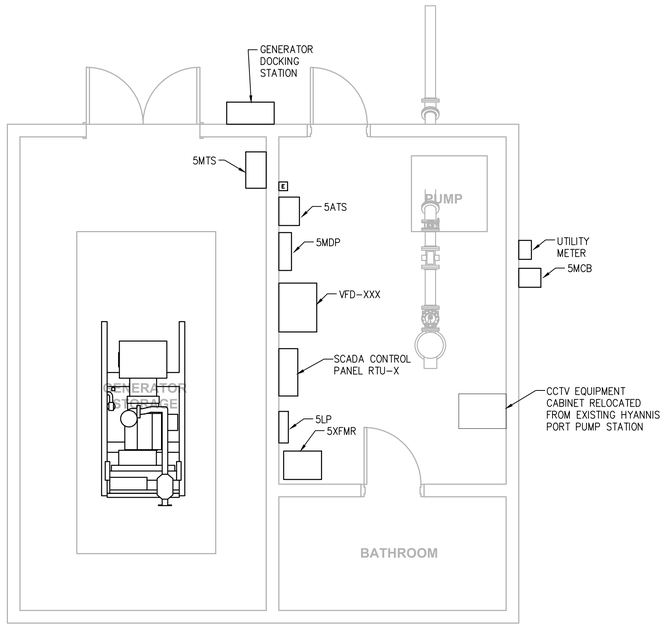
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SHEET 45 of 60

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1 HYANNISPORT WELL STATION NEW WORK PLAN
SCALE: 1/4" = 1'-0"

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ELECTRICAL HYANNISPORT
WELL STATION PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 BOROUGH OF MAY 6, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

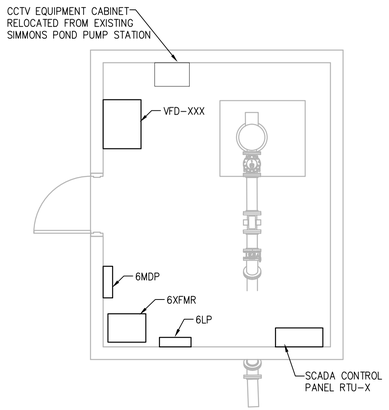
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PROJECT NO.	20233667.002A
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APPROVED BY	Approve-

E-102

SHEET 46 of 60

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1 SIMMONS WELL STATION NEW WORK PLAN
SCALE: 1/4" = 1'-0"

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ELECTRICAL SIMMONS WELL STATION PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED MAY 4, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

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FIRE PROTECTION NOTES

1. THE WORK COVERED CONSISTS OF FURNISHING ALL LABOR AND MATERIALS NECESSARY TO INSTALL, COMPLETE AND READY FOR CONTINUOUS OPERATION, THE FIRE PROTECTION SYSTEMS, APPARATUS AND EQUIPMENT FOR THIS PROJECT.
2. ALL EQUIPMENT AND MATERIALS FURNISHED UNDER THE FIRE PROTECTION SUB-CONTRACT, LABOR AND TESTING PERFORMED HEREIN SHALL BE IN COMPLETE ACCORDANCE WITH THE STATE BUILDING CODE, ALL LOCAL CODES AND REGULATIONS, NATIONAL FIRE PROTECTION ASSOCIATION, INSURANCE REGULATIONS AND REQUIREMENTS GOVERNING SUCH WORK.
3. ANY AND ALL PERMITS REQUIRED FOR INSTALLATION OF ANY MATERIAL SHALL BE OBTAINED AS PART OF THE WORK OF THE SPECIFICATION, INCLUDING ALL FEES OR EXPENSES INCURRED.
4. IT IS THE INTENT OF THESE DOCUMENTS THAT THE ENTIRE BUILDING BE 100% SPRINKLED, INCLUDING ELECTRIC ROOMS.
5. PROVIDE A COMPLETE HYDRAULICALLY CALCULATED SPRINKLER SYSTEM THROUGHOUT THE BUILDING. ALL WORK SHALL BE IN STRICT CONFORMANCE WITH NFPA 13 (2013) AND INCLUDING ALL RULES AND REGULATIONS OF THE LOCAL FIRE DEPARTMENT.
6. SPRINKLERS, PIPING AND THEIR LAYOUT SHOWN ON THE DRAWINGS ARE SCHEMATIC AND ARE SHOWN ON THE DRAWINGS ONLY AS A GUIDE AND AID TO THE CONTRACTOR IN PREPARATION OF THE FABRICATION DRAWINGS. THE SPRINKLERS, PIPING AND THEIR LAYOUT ARE NOT INTENDED TO SHOW EVERY OFFSET AND FITTING. ADDITIONAL OFFSETS AND FITTINGS WILL BE REQUIRED TO BE INSTALLED WHEN COORDINATING WITH ALL TRADES TO AVOID WHERE CONFLICTS MAY OCCUR THAT MAY NOT BE INDICATED ON THE DRAWINGS, SUCH AS, BUT NOT LIMITED TO: BEAMS, COLUMNS, DUCTWORK, LIGHTING, OR PIPING. MODIFICATION TO THE SPRINKLER SPACING WILL BE ALLOWED AT NO COST TO THE PROJECT SUBJECT TO ARCHITECT'S/ENGINEER'S APPROVAL AND CONTINUED COMPLIANCE WITH NFPA 13 (2013).
7. THE FIRE PROTECTION CONTRACTOR SHALL PREPARE WORKING DRAWINGS OF THE SPRINKLER WORK AND OBTAIN APPROVALS FROM THE LOCAL FIRE DEPARTMENT PRIOR TO INSTALLATION.
8. ROUTING OF SPRINKLER MAINS, BRANCHES AND SPRINKLERS SHALL BE THOROUGHLY COORDINATED WITH OTHER TRADES AND THE BUILDING STRUCTURE PRIOR TO SUBMISSION OF COORDINATED SHOP DRAWINGS.
9. SPRINKLERS IN AREAS WITH NO FINISHED CEILING SHALL BE UPRIGHT TYPE, LOCATED AS HIGH AS POSSIBLE. SPRINKLERS SUBJECT TO POTENTIAL PHYSICAL DAMAGE SHALL BE INSTALLED WITH LISTED PROTECTIVE CAGES.
10. SPRINKLERS INSTALLED BELOW SLOPED CEILINGS OR ROOFS, SHALL BE INSTALLED IN STRICT ACCORDANCE TO NFPA 13 (2013) AND SPRINKLER MANUFACTURER'S INSTALLATION LISTING.
11. SPRINKLERS IN AREAS WITH FINISHED CEILING SHALL BE CONCEALED TYPE WITH FACTORY PAINTED COVER PLATES. COVER PLATE COLORS SHALL BE COORDINATED WITH ARCHITECT FOR FINAL APPROVAL OF THE COLOR SELECTION.
12. SPRINKLERS SHALL BE LOCATED ABOVE AND BELOW ALL DUCTWORK GREATER THAN 4'-0" IN WIDTH.
13. MISCELLANEOUS DISCREPANCIES OR OMISSIONS WHICH MIGHT APPEAR ON THE DRAWINGS OR IN THE SPECIFICATIONS WILL NOT RELIEVE THE FIRE PROTECTION SUB-CONTRACTOR OF CODE COMPLIANCE.
14. SPRINKLER PIPING SHALL NOT BE INSTALLED TO PASS OVER ELECTRIC PANELS. PROVIDE SHEET METAL PROTECTIVE SHIELDS OVER ELECTRIC PANELS.
15. SPRINKLERS SHALL BE INSTALLED BELOW ALL STAIRWELL LANDINGS.
16. BACKFLOW PREVENTION DEVICES SHALL BE PROVIDED WITH A HOSE VALVE TEST HEADER ASSEMBLY PIPED TO EXTERIOR OR OTHER ACCEPTED MEANS THAT ALLOWS FOR FULL FLOW TESTING OF SYSTEM DEMAND IN ACCORDANCE WITH NFPA 13 (2013).
17. REFER TO DESIGN NARRATIVE FOR SPRINKLER DENSITY AND AREA OF APPLICATION.
18. IN EXISTING AUTOMATIC SPRINKLER SYSTEMS, REPRESENTATIVE SAMPLES OF SPRINKLERS THROUGHOUT THE BUILDING SHALL BE TESTED AND REPLACED AS REQUIRED IN ACCORDANCE WITH NFPA 25 (2011).

FIRE PROTECTION DESIGN CRITERIA

1. FIRE SUPPRESSION CRITERIA

   A. THE FIRE PROTECTION CONTRACTOR SHALL MAKE PROVISIONS FOR OBTAINING UPDATED HYDRANT FLOW TEST INFORMATION FOR THIS PROJECT. ANY FLOW TEST INFORMATION NOTED IN THE CONTRACT DOCUMENTS ARE CONSIDERED PRELIMINARY. A NEW FLOW TEST SHALL BE REQUIRED AT THIS CONTRACTOR'S EXPENSE.

   B. THE FOLLOWING SPRINKLER DESIGN DENSITIES SHALL BE USED FOR SPRINKLER SYSTEM PIPE SIZING:

LIGHT HAZARD OCCUPANCIES (COMMON AREAS, OFFICES, CORRIDORS, AND BATHROOMS)

DESIGNED FOR 0.10 GPM OVER THE MOST REMOTE 1500 SQUARE FEET.
MAXIMUM SPACING OF 225 SQUARE FEET PER SPRINKLER, UNLESS NOTED OTHERWISE.

INCLUDE 100 GPM FOR INSIDE HOSE STREAM ALLOWANCE AS PART OF THE CALCULATION.
MAXIMUM VELOCITIES SHALL NOT EXCEED 20 FEET PER SECOND.

ORDINARY HAZARD OCCUPANCIES GROUP 1 (STORAGE)

DESIGNED FOR 0.15 GPM OVER THE MOST REMOTE 1500 SQUARE FEET.
MAXIMUM SPACING OF 130 SQUARE FEET PER SPRINKLER, UNLESS NOTED OTHERWISE.

INCLUDE 250 GPM FOR INSIDE HOSE STREAM ALLOWANCE AS PART OF THE CALCULATION.
MAXIMUM VELOCITIES SHALL NOT EXCEED 20 FEET PER SECOND.

ORDINARY HAZARD OCCUPANCIES GROUP 2 (MECHANICAL ROOMS AND STAGE)

DESIGNED FOR 0.20 GPM OVER THE MOST REMOTE 1500 SQUARE FEET.
MAXIMUM SPACING OF 130 SQUARE FEET PER SPRINKLER, UNLESS NOTED OTHERWISE.

INCLUDE 250 GPM FOR INSIDE HOSE STREAM ALLOWANCE AS PART OF THE CALCULATION.
MAXIMUM VELOCITIES SHALL NOT EXCEED 20 FEET PER SECOND.

C. FIRE PROTECTION SIGNALING SYSTEMS CONTROL EQUIPMENT AND ANNUNCIATOR PANEL ARE SHOWN ON THE ELECTRICAL DRAWINGS.

D. THE SPRINKLER LAYOUT SHOWN ON THESE DRAWINGS SHALL BE HYDRAULICALLY CALCULATED. THE RESULTS OF THE HYDRAULIC CALCULATION SHALL SHOW THAT THERE IS SUFFICIENT PRESSURE TO OPERATE THE REQUIRED NUMBER OF SPRINKLERS AT THE MOST REMOTE DESIGN AREAS. PIPE SIZES AND NODE LOCATIONS HAVE BEEN SHOWN ON THE DRAWINGS TO INDICATE DESIGN INTENT.

E. THE SPRINKLER CONTRACTOR SHALL FOLLOW THE DESIGN CRITERIA INDICATED ON THE DRAWINGS, BUT WILL BE ALLOWED TO VARY THE PIPE SIZES TO ALLOW FOR COORDINATION AND MINOR CHANGES IN THE PREPARATION.

2. SEQUENCE OF OPERATION

   A. WET SPRINKLER SYSTEM

   THE WET PIPE SYSTEM EMPLOYS AUTOMATIC (CLOSED FUSIBLE LINK) SPRINKLERS ATTACHED TO PIPING CONTAINING WATER UNDER PRESSURE AT ALL TIMES. WHEN A FIRE OCCURS, INDIVIDUAL SPRINKLERS ARE ACTIVATED BY HEAT AND WATER FLOWS IMMEDIATELY. THE FLOW OF WATER RAISES THE ALARM CHECK VALVE CLAPPER FROM ITS SEAT. THIS ALLOWS WATER TO ENTER THE ALARM LINE. THE FLOW SWITCH ON THE ALARM LINE ACTIVATES A LOCAL AUDIBLE ALARM PROVIDING AN ELECTRIC SIGNAL, WHICH IS SENT TO THE FIRE ALARM CONTROL PANEL, THIS SIGNAL IS FORWARDED TO THE LOCAL FIRE DEPARTMENT. A FIRE DEPARTMENT CONNECTION IS CONNECTED TO THE SUPPLY SIDE OF THE SYSTEM FOR USE BY THE LOCAL FIRE DEPARTMENT PUMPER TRUCK.

3. TESTING CRITERIA FOR FINAL ACCEPTANCE

   A. APPROVAL OF SPRINKLER SYSTEM

   THE INSTALLING SPRINKLER CONTRACTOR SHALL:

   a. NOTIFY THE AUTHORITY HAVING JURISDICTION AND OWNER'S REPRESENTATIVE OF THE TIME AND DATE TESTING WILL BE PERFORMED.
   b. PERFORM ALL REQUIRED ACCEPTANCE REQUIREMENTS LISTED IN NFPA 13 (2013) HYDROSTATIC TESTS.
   c. COMPLETE AND SIGN THE APPROPRIATE CONTRACTOR'S MATERIAL AND TEST CERTIFICATES.

   B. COMPLETE AS-BUILT DRAWINGS AS SPECIFIED.

FIRE PROTECTION LEGEND

SYMBOL	ABBREVIATION	DESCRIPTION
		NEW WORK PIPING (INDICATED AS HEAVY LINE)
F	F	FIRE SERVICE BELOW GRADE OR BURIED
F	F	FIRE SERVICE MAIN
WS	WS	WET SPRINKLER PIPE
SD	SD	SPRINKLER DRAIN
FDC	FDC	FIRE DEPARTMENT CONNECTION PIPE
		PIPE TEE LOOKING UP
		PIPE TEE LOOKING UP
	UP	PIPE ELBOW UP
	DN/DROP	PIPE ELBOW DOWN OR DROP
	CONT	CONTINUATION
		FLOW IN DIRECTION OF ARROW
	UN	UNION
	PG	PRESSURE GAUGE WITH PETCOCK
FS	FS	FLOW SWITCH
PS	PS	PRESSURE SWITCH
	CV	CHECK VALVE
	GV	GATE VALVE
TS	TS	GATE VALVE WITH TAMPER SWITCH
	PRV	PRESSURE REDUCING/REGULATING VALVE
TS	OS&Y W/TS	OS & Y GATE VALVE WITH TAMPER SWITCH
TS	BV W/TS	BALL VALVE WITH TAMPER SWITCH
	VIV	VALVE IN VERTICAL
TS	VIV W/TS	VALVE IN VERTICAL WITH TAMPER SWITCH
	WACV	ALARM CHECK VALVE (WET SYSTEM)
	DACV	ALARM CHECK VALVE (DRY SYSTEM)
P	PIV W/TS	POST INDICATOR VALVE W/TAMPER SWITCH
	DCVA	HORIZONTAL DOUBLE CHECK VALVE ASSEMBLY
	WTS	WATER TIGHT SLEEVE
	DV	DRAIN VALVE WITH HOSE END
	FDV	FIRE DEPARTMENT VALVE
	SCF	SIAMESE CONNECTION (FLUSH)
	SCE	SIAMESE CONNECTION (EXPOSED)
	SZC	STORZ CONNECTION
		UPRIGHT WET SPRINKLER
		PENDENT WET SPRINKLER
		CONCEALED WET SPRINKLER
		SIDEWALL WET SPRINKLER
D	DRY	UPRIGHT DRY SPRINKLER
D	DRY	PENDENT DRY SPRINKLER
D	DRY	CONCEALED DRY SPRINKLER
D	DRY	SIDEWALL DRY SPRINKLER
#		NODE NUMBER
#		SPRINKLER NUMBER
NAS	NAS	NO AUTOMATIC SPRINKLERS
- / FP-1		DIAGRAM NO. & DWG. NO. REFERENCE
DC	DC	DRESSER COUPLING
	EB	ELECTRIC BELL

FIRE PROTECTION LEGEND

ABBREVIATION	DESCRIPTION
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
LFPC	LIMIT OF FIRE PROTECTION CONTRACT
NFPC	NOT IN FIRE PROTECTION CONTRACT
GC	GENERAL CONTRACTOR
FPC	FIRE PROTECTION CONTRACTOR
PC	PLUMBING CONTRACTOR
EC	ELECTRICAL CONTRACTOR
HVAC	HVAC CONTRACTOR
FI	FURNISH & INSTALL
CFOI	CONTRACTOR FURNISHED / OWNER INSTALLED
OFCI	OWNER FURNISHED / CONTRACTOR INSTALLED
FFE	FINISHED FLOOR ELEVATION
WSE	WATER SERVICE ENTRANCE

NOTE- NOT ALL SYMBOLS APPEAR ON DRAWINGS

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ORIGINAL DRAWING SIZE IS 22 x 34

FIRE PROTECTION LEGEND AND GENERAL NOTES

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

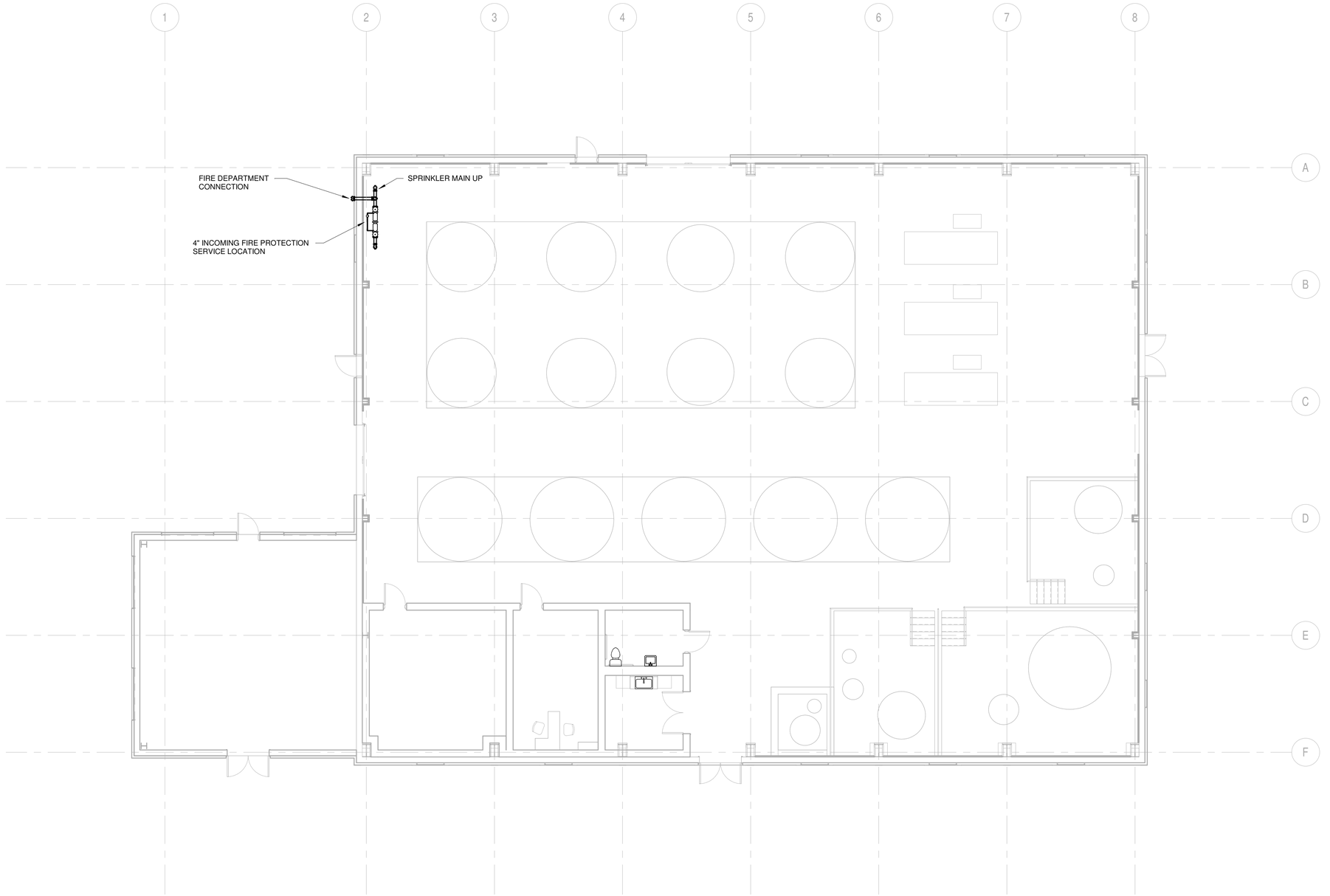
PROJECT NO.	20233667.002A
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CHECKED BY	RHB
APPROVED BY	MC

FP001

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1 LOWER LEVEL PLAN
1/8" = 1'-0"

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FIRE PROTECTION LOWER LEVEL PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 ESTD MAY 3, 1939

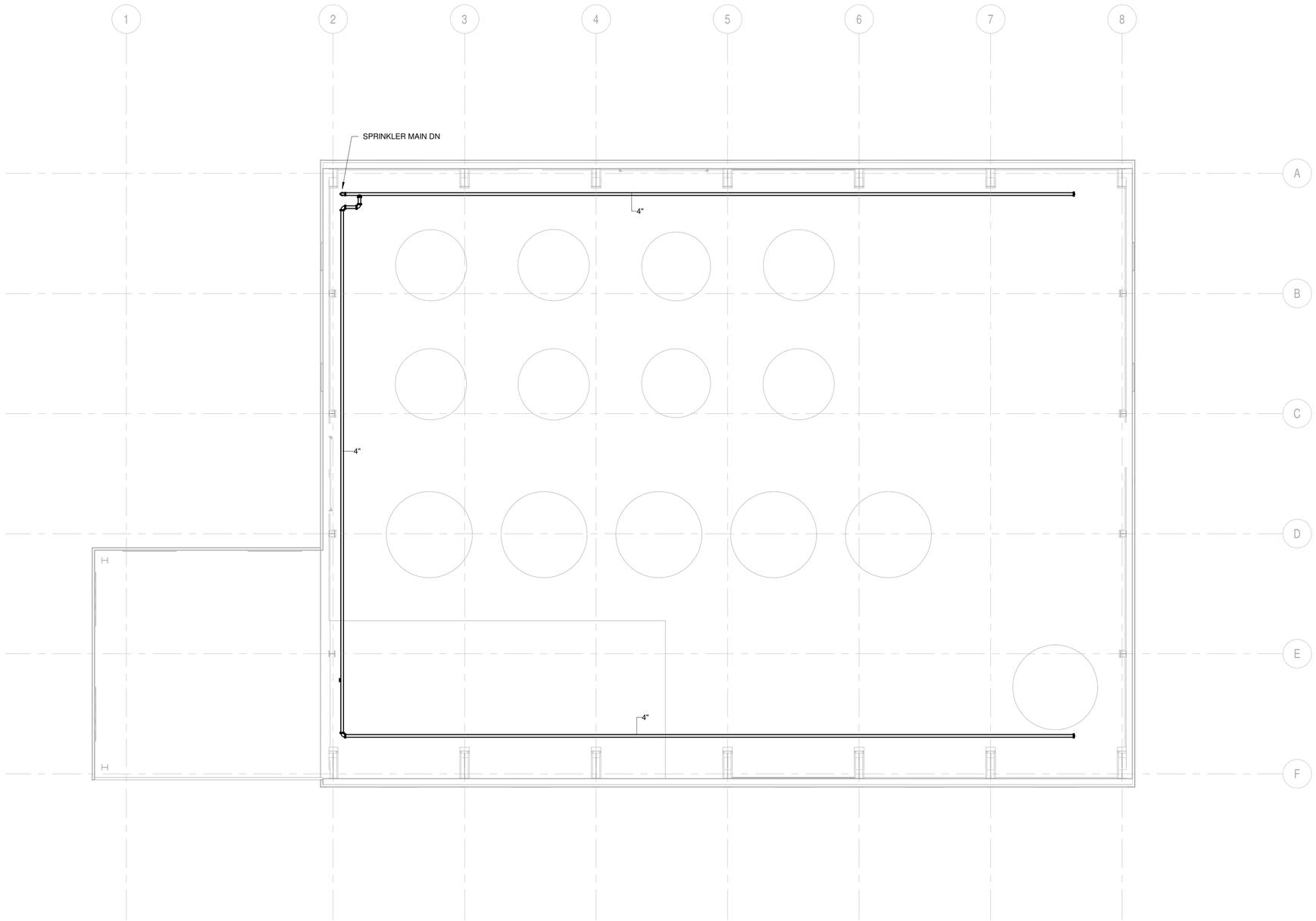
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BARNSTABLE DPW - WATER DIVISION
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1 UPPER LEVEL PLAN
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FIRE PROTECTION UPPER LEVEL PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

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PIPING LEGEND

CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
CWS	CONDENSER WATER SUPPLY
CWR	CONDENSER WATER RETURN
HWS	HOT WATER SUPPLY (HEATING)
HWR	HOT WATER RETURN (HEATING)
RL	REFRIGERANT - LIQUID
RS	REFRIGERANT - SUCTION
RD	REFRIGERANT - COMPRESSOR DISCHARGE
RV	REFRIGERANT - VENT
S-15	STEAM - PSIG
C-15	CONDENSATE RETURN - PSIG
PC-25	PUMPED CONDENSATE - PSIG
ATMOS V	ATMOSPHERIC VENT
SRV	SAFETY RELIEF VENT
DEE	DIESEL ENGINE EXHAUST
FOS	FUEL OIL SUPPLY
FOR	FUEL OIL RETURN
CF	CHEMICAL FEED
GWS	GLYCOL/WATER SOLUTION SUPPLY
GWR	GLYCOL/WATER SOLUTION RETURN
GCC	GRAVITY CONDENSATE FROM COOLING COILS
PCC	PUMPED CONDENSATE FROM COOLING COILS
AS	ATOMIZING STEAM
BO	BLOWOFF
CBD	CONTINUOUS BLOWDOWN

EQUIPMENT TAG SYMBOLS & ABBREVIATIONS

EQUIPMENT NOT REQUIRING ELECTRIC SERVICE — TAG NO — SEE SCHEDULE FOR PERFORMANCE REQUIREMENTS — TAG NO — EQUIPMENT REQUIRING ELECTRIC SERVICE

FTR-1 / MBH / LENGTH — FINNED TUBE RADIATION

ACCU	AIR COOLED CONDENSING UNIT
AHU	AIR HANDLING UNIT
AF	AIR FILTER
AS	AIR SEPARATOR
B	BOILER
CC	COOLING COIL
CH	CHILLER
CT	COOLING TOWER
CUH	CABINET UNIT HEATER
C	CONVECTOR
EF	EXHAUST FAN
ERV	EXHAUST ROOF VENT
ET	EXPANSION TANK
EUH	ELECTRIC UNIT HEATER
FCU	FAN COIL UNIT
FMS	FLOW MEASURING STATION
FTR	FIN-TUBE RADIATION
HC	HEATING COIL
HP	HEAT PUMP
HRU	HEAT RECOVERY UNIT
HV	HEATING AND VENTILATING UNIT
IRV	INTAKE ROOF VENT
MAU	MAKEUP AIR UNIT
P	PUMP
PTAC	PACKAGED TERMINAL AIR CONDITIONER
REF	RETURN/EXHAUST FAN
RF	RETURN FAN
RTU	ROOFTOP UNIT
SA	SOUND ATTENUATOR
SF	SUPPLY FAN
TU	TERMINAL UNIT
UH	UNIT HEATER
UV	UNIT VENTILATOR
VAV	VARIABLE AIR VOLUME UNIT

INSTRUMENTATION

DUCTWORK LEGEND/SYMBOLS

DOUBLE LINE	DESCRIPTION
	SUPPLY AIR FLOW
	OUTSIDE AIR FLOW
	RETURN/EXHAUST AIR FLOW
	SUPPLY/OUTSIDE AIR FLOW
	RETURN AIR FLOW
	EXHAUST AIR FLOW
	RECTANGULAR SUPPLY DUCT ELBOW (UP & DN)
	RECTANGULAR RETURN DUCT ELBOW (UP & DN)
	RECTANGULAR EXHAUST DUCT ELBOW (UP & DN)
	ROUND SUPPLY DUCT ELBOW (UP & DN)
	ROUND RETURN DUCT ELBOW (UP & DN)
	ROUND EXHAUST DUCT ELBOW (UP & DN)
	FLAT OVAL SUPPLY DUCT ELBOW (UP & DN)
	FLAT OVAL RETURN DUCT ELBOW (UP & DN)
	FLAT OVAL EXHAUST DUCT ELBOW (UP & DN)
12X10	DENOTES RECTANGULAR DUCT SIZE IN INCHES (DIMENSIONS INSIDE CLEAR)
10Ø	DENOTES ROUND DUCT SIZE IN INCHES (DIMENSIONS INSIDE CLEAR)
12X10	DENOTES FLAT OVAL DUCT SIZE IN INCHES (DIMENSIONS INSIDE CLEAR)
12X10 AL	ACOUSTICAL DUCT LINING - 1" UNLESS OTHERWISE NOTED. DUCT SIZE IS INSIDE CLEAR. TYP. ROUND & FLAT OVAL
	SUPPLY AIR TERMINALS CEILING OR DUCT MOUNTED (SQUARE, RECTANGULAR, CIRCULAR & SIDEWALL W/ AIR VOLUME EXTRACTOR) CFM, SIZE & TYPE AS NOTED.
	RETURN AIR TERMINAL CFM, SIZE & TYPE AS NOTED
	EXHAUST AIR TERMINAL CFM, SIZE & TYPE AS NOTED
	SUPPLY GRILLE W/ INSIDE COLLAR
UP	DUCT RISING IN DIRECTION OF ARROW
	TRANSITION DUCT CONCENTRIC & ECCENTRIC
	FLEXIBLE CONNECTION

DUCTWORK LEGEND/SYMBOLS

DOUBLE LINE	DESCRIPTION
FS	COMBINATION FIRE/SMOKE DAMPER W / ACCESS DOOR
	MANUAL VOLUME DAMPER
	MOTOR OPERATED DAMPER
SD	DUCT MOUNTED SMOKE DETECTOR
	SQUARE VANED ELBOW
	RADIUS TYPE ELBOW WITH OR WITHOUT VANES
	DUCT SPLIT WITH VANED ELBOW
	STRAIGHT TEE
	CONICAL TEE
	45° TEE
	DOOR UNDERCUT - SQUARE FEET SIZE AS PER PLANS
	DOOR LOUVER - SQUARE FEET SIZE AS PER PLANS
	HORIZONTAL AIR DELIVERY UNIT HEATER
	VERTICAL AIR DELIVERY UNIT HEATER
T	THERMOSTAT
H	HUMISTAT
	RISER UP
	RISER DOWN
	ELBOW - 90°
	ELBOW - 45°
	LATERAL CONNECTION
	TEE CONNECTION
	CROSS CONNECTION
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	DIRECTION OF FLOW
1 / A2222 SIM	SECTION OR DETAIL IDENTIFICATION

NOTE- NOT ALL SYMBOLS APPEAR ON DRAWINGS

ABBREVIATIONS

ACD	AUTOMATIC CONTROL DAMPER
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AHAP	AS HIGH AS POSSIBLE
AP	ACCESS PANEL
ARCH	ARCHITECT
ATC	AUTOMATIC TEMPERATURE CONTROL
BDD	BACKDRAFT DAMPER
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
BOD	BOTTOM OF DUCT
CAP	CAPACITY
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CO	CLEANOUT
CONT	CONTROLLER
CP	CUT AND CAP
DIA	DIAMETER
DB	DRY BULB TEMPERATURE
DC	DUST COLLECTOR
DDC	DIRECT DIGITAL CONTROL
DN	DOWN
DWG	DRAWING
DX	DIRECT EXPANSION COOLING
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EBB	ELECTRIC BASEBOARD RADIATION
ECH	ELECTRIC CABINET HEATER
ECON	AIR-SIDE ECONOMIZER
EF	EXHAUST FAN
EFF	EFFICIENCY
EG	ETHYLENE GLYCOL
ELV	ELEVATION
ER	EXHAUST REGISTER
ESP	EXTERNAL STATIC PRESSURE
ETR	EXISTING TO REMAIN
EWT	ENTERING WATER TEMPERATURE
EXH	EXHAUST
FA	FREE AREA
FD	FIRE DAMPER
FLA	FULL LOAD AMPS
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FPI	FINS PER INCH
FPM	FEET PER MINUTE
FT	FEET
FTR	FINNED TUBE RADIATION
GAL	GALLONS
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GF	GLYCOL FEED
GPM	GALLONS PER MINUTE
HP	HORSEPOWER
HVAC	HEATING, VENTILATING AND AIR CONDITIONING
HGRH	HOT GAS REHEAT
HW	HOT WATER
HZ	HERTZ
IN	INCHES
KE	KITCHEN EXHAUST
KW	KILOWATTS
LAT	LEAVING AIR TEMPERATURE
LD	LINEAR DIFFUSER
LF	LINEAR FEET
LWT	LEAVING WATER TEMPERATURE
MBH	THOUSANDS OF BTU'S PER HOUR
MCC	MOTOR CONTROL CENTER
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAT	OUTSIDE AIR TEMPERATURE
OBD	OPPOSED BLADE DAMPER
OD	OUTSIDE DIAMETER
OED	OPEN ENDED DUCT
POS	PROVIDED UNDER OTHER SECTIONS
PSI	POUNDS PER SQUARE INCH (GAUGE)
PD	PRESSURE DROP
PRV	PRESSURE REDUCING VALVE
R	RETURN
RA	RETURN AIR
RF	RETURN/EXHAUST FAN
RG	RETURN GRILLE
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
RR	RETURN REGISTER
S	SUPPLY
SA	SUPPLY AIR
SAT	SUPPLY AIR TEMPERATURE
SF	SQUARE FEET, SUPPLY FAN
SP	STATIC PRESSURE
SR	SUPPLY REGISTER
SS	STAINLESS STEEL
STL	STEEL
TYP	TYPICAL
UC	UNDERCUT DOOR
V	VOLTS
VAV	VARIABLE AIR VOLUME
VD	VOLUME DAMPER
VFD	VARIABLE FREQUENCY DRIVE
W/	WITH
W/O	WITHOUT
WB	WET BULB TEMPERATURE
WG	WATER GAUGE
WMS	WIRE MESH SCREEN

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ORIGINAL DRAWING SIZE IS 22 x 34

HVAC LEGEND

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

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GENERAL NOTES

1. HVAC WORK IS INDICATED DIAGRAMMATICALLY. EXACT LOCATIONS OF ALL COMPONENTS ARE TO BE DETERMINED IN THE FIELD AND BY THE ACTUAL BUILDING CONDITIONS. DUCTS, PIPING OR EQUIPMENT INTERFERING WITH OTHER INSTALLATIONS SHALL BE RELOCATED AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER. EXACT LOCATIONS MUST HAVE THE APPROVAL OF THE ENGINEER.
2. ALL WORK SHALL BE COORDINATED WITH ALL OTHER TRADES BEFORE ANY INSTALLATION IS MADE.
3. ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH STATE CODES, MANUFACTURER'S APPROVED PUBLISHED LITERATURE, AND AUTHORITIES HAVING JURISDICTION.
4. INSTALLATION OF EQUIPMENT SHALL PERMIT ACCESSIBILITY FOR SERVICE AND/ REPAIR OR REPLACEMENT.
5. ALL CEILING MOUNTED EQUIPMENT SHALL BE INSTALLED IN SUCH A WAY THAT LIGHTS, PIPING, AND DUCTWORK DO NOT BLOCK ACCESS TO UNITS AND RELATED ACCESSORIES.
6. HVAC CONTRACTOR SHALL COORDINATE ALL WALL, CEILING, FLOOR, ROOF AND BEAM PENETRATIONS WITH ENGINEER AND STRUCTURAL ENGINEER.
7. ALL DUCT SIZES SHOWN ARE NET INSIDE CLEAR DIMENSIONS.
8. PROVIDE INSTRUMENT TEST HOLES WITH CAPS IN AIR DISTRIBUTION SYSTEMS AS REQUIRED TO BALANCE SYSTEM.
9. HVAC CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SHEETMETAL TRANSITIONS AT FANS, COILS, AND OTHER SIMILAR HVAC EQUIPMENT.
10. ALL MISCELLANEOUS SUPPORTS REQUIRED FOR HVAC EQUIPMENT INSTALLATION SHALL BE PROVIDED BY HVAC SUBCONTRACTOR.
11. EXACT LOCATION OF THERMOSTAT TO BE COORDINATED WITH FINAL LOCATION OF WALL MOUNTED EQUIPMENT.
12. PROVIDE FLEXIBLE DUCT CONNECTIONS ON INTAKES AND DISCHARGES OF ALL AIR HANDLING UNITS.
13. COORDINATE DUCT MOUNTED SMOKE DETECTORS WITH ELECTRICAL HVAC CONTRACTOR. FURNISH AND WIRED BY ELECTRICAL CONTRATOR, INSTALLED BY THE HVAC CONTRACTOR.
14. COORDINATE THE DIMENSIONS AND EXACT LOCATION OF THE SUSPENDED STRUCTURAL FRAME WITH THE SUPPORT REQUIREMENTS AND SERVICE ACCESS FOR DH-1.
15. REFER TO ARCHITECTURAL SECTION AND ELEVATIONS FOR LOCATION OF EXTERIOR PENETRATIONS.

SEQUENCE OF OPERATION

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HVAC GENERAL NOTES

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE, MASS. 1639 INCORPORATED MAY 4, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

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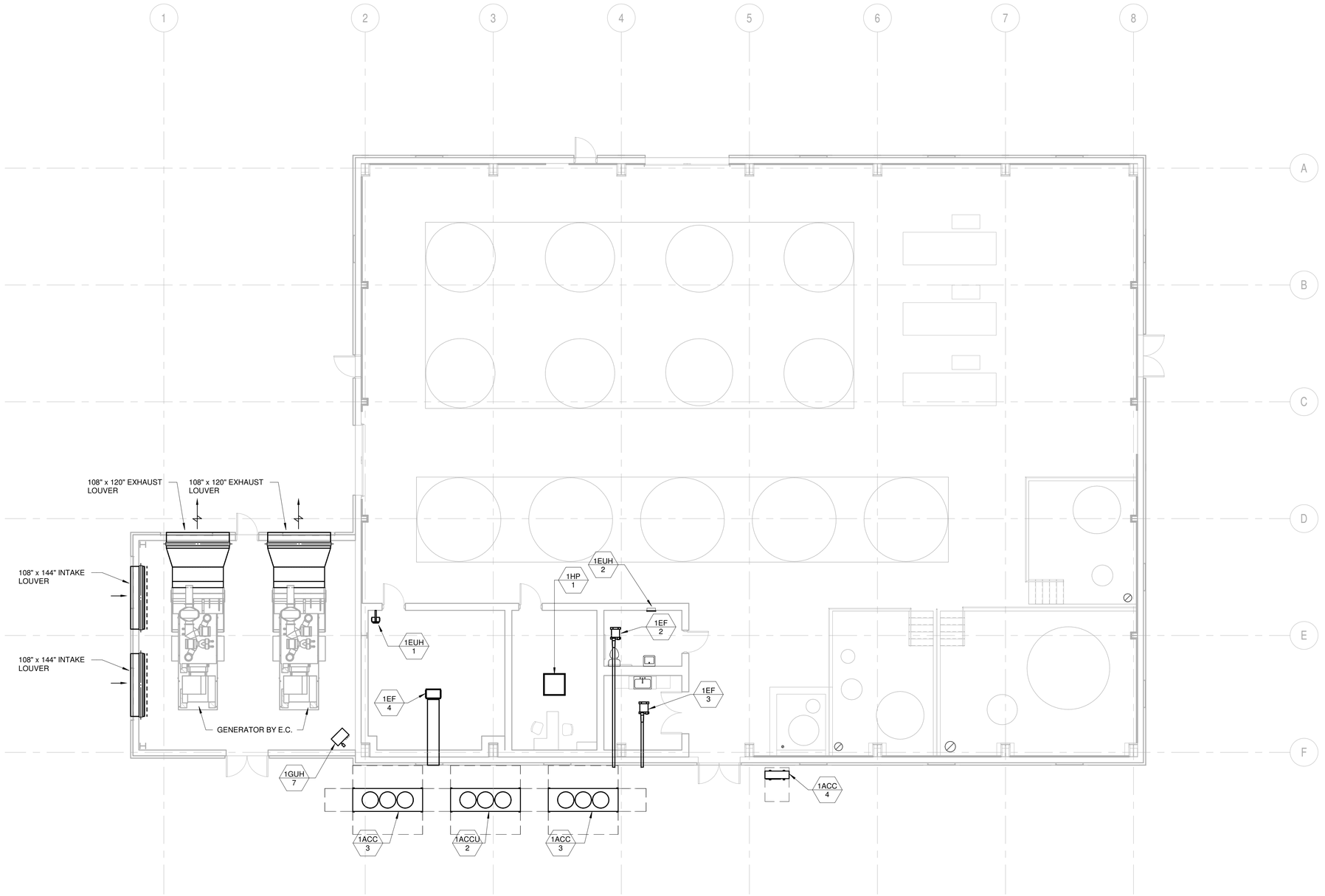
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1 1-HVAC-FINISH FLOOR WTP
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SAR ENGINEERING, INC.
Mechanical/Electrical Engineers
150 Grossman Drive, Suite 309
Braintree, Massachusetts 02184
617 221-9220
web: www.sar.com

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

ORIGINAL DRAWING SIZE IS 22 x 34

HVAC WTP LOWER LEVEL PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED MAY 4, 1685

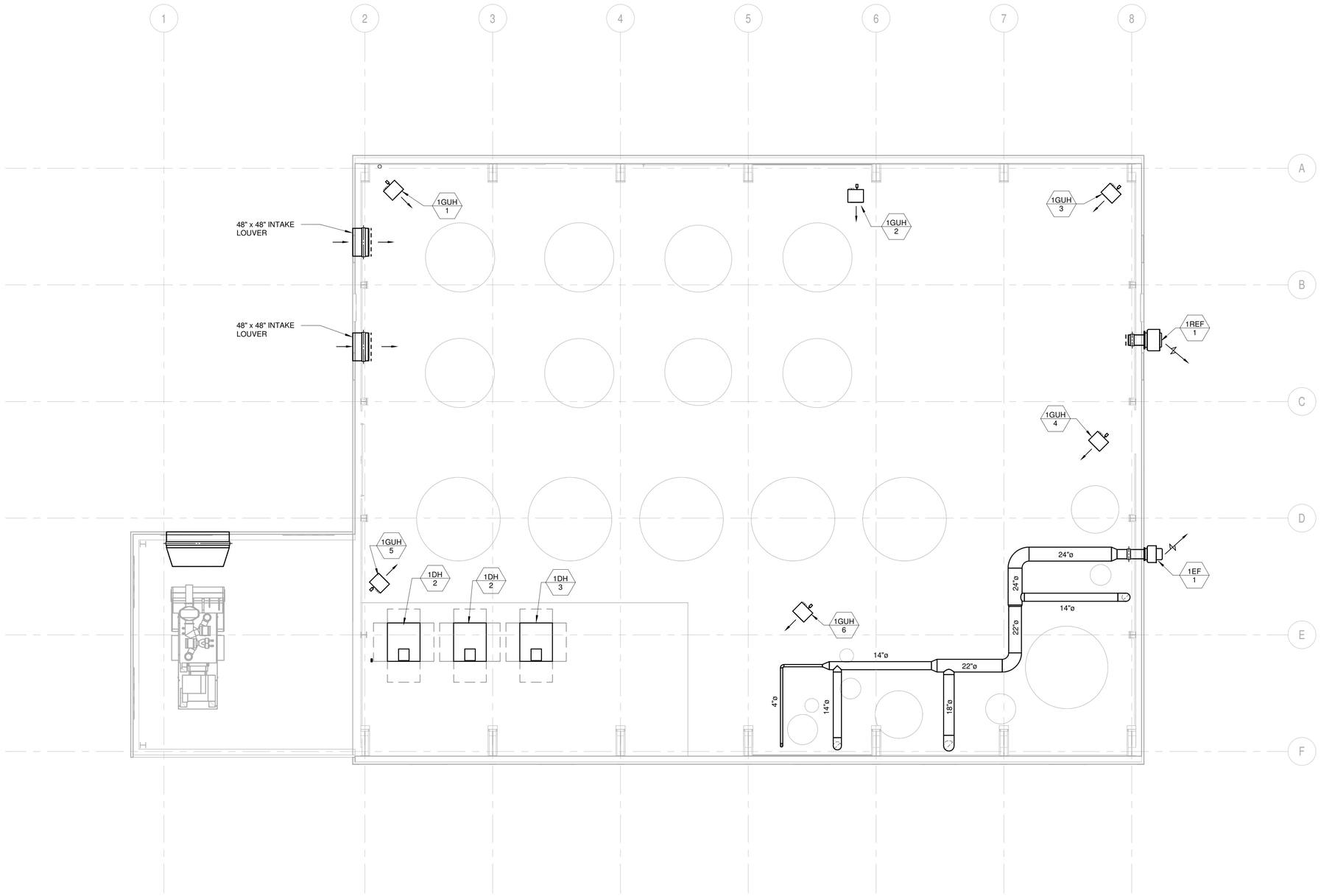
HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	20233667.002A
ISSUE DATE	05/31/2024
CURRENT REVISION	
DESIGNED BY	RLB
DRAWN BY	RLB
CHECKED BY	RHB
APPROVED BY	MC

H101

SHEET 53 of 60



1 2-HVAC-CLERESTORY (WTP)
1/8" = 1'-0"

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HVAC WTP UPPER LEVEL PLAN

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WATER TREATMENT FACILITY
DESIGN

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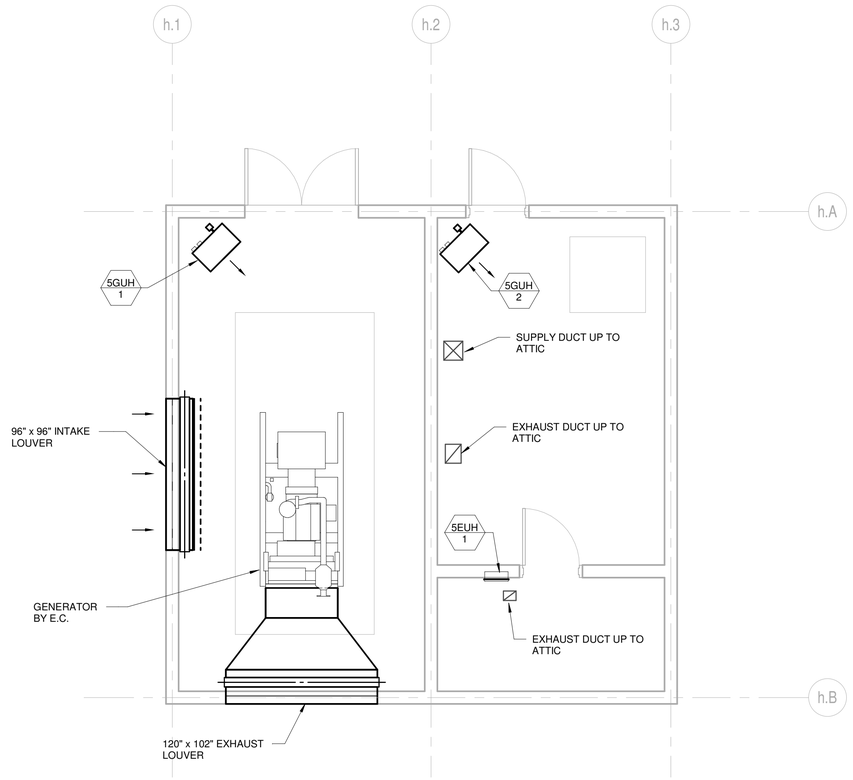
HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

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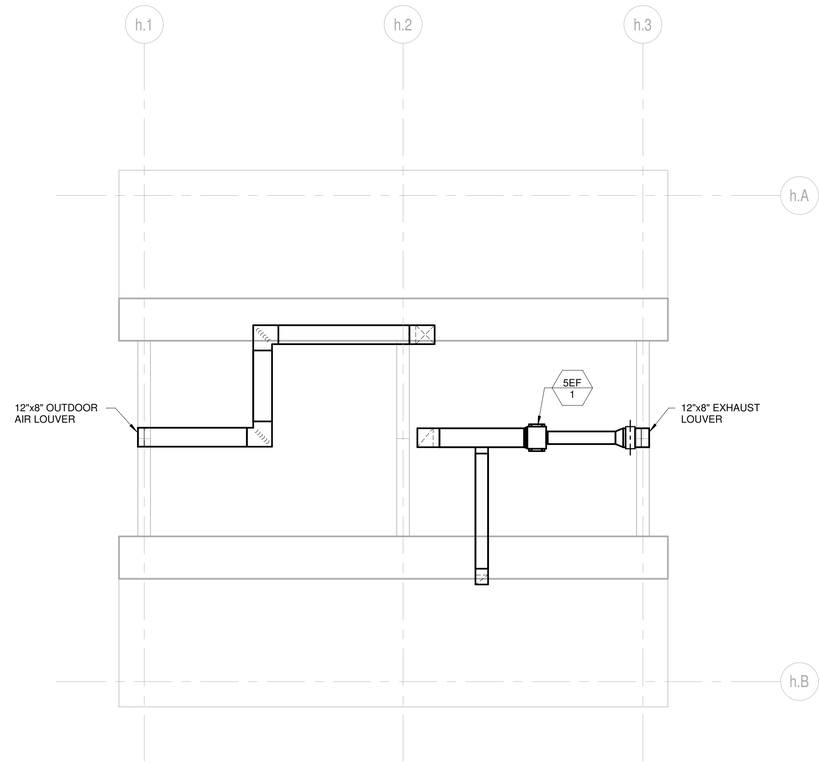
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CHECKED BY	RHB
APPROVED BY	MC

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SHEET 54 of 60



1 FLOOR PLAN
1/4" = 1'-0"



2 ATTIC PLAN
1/4" = 1'-0"

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ORIGINAL DRAWING SIZE IS 22 x 34

HVAC HYANNISPORT PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED MAY 4, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

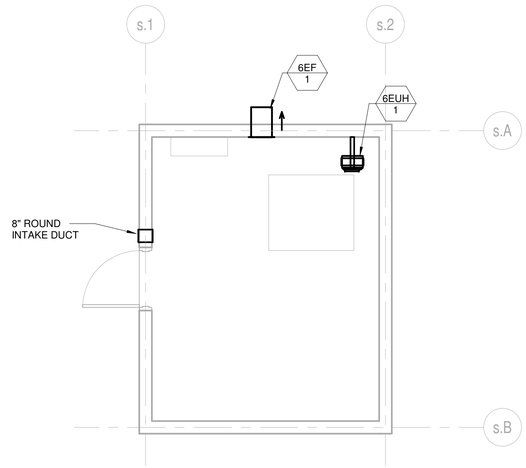
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SHEET 55 of 60

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1 PS FINISH FLOOR-SIMMONS
1/4" = 1'-0"

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HVAC SIMMONS PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	20233667.002A
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SHEET 56 of 60

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PLUMBING NOTES

1. THE WORK COVERED CONSISTS OF FURNISHING ALL LABOR AND MATERIALS NECESSARY TO INSTALL, COMPLETE AND READY FOR CONTINUOUS OPERATION, THE PLUMBING SYSTEMS, APPARATUS AND EQUIPMENT FOR THIS PROJECT.
2. ALL EQUIPMENT AND MATERIALS FURNISHED UNDER THE PLUMBING SUB-CONTRACT, LABOR AND TESTING PERFORMED HEREIN SHALL BE IN COMPLETE ACCORDANCE WITH THE STATE BUILDING CODE, LOCAL FUEL GAS AND PLUMBING CODES, ALL LOCAL CODES AND REGULATIONS, NATIONAL FIRE PROTECTION ASSOCIATION, INSURANCE REGULATIONS AND REQUIREMENTS GOVERNING SUCH WORK.
3. ANY AND ALL PERMITS REQUIRED FOR INSTALLATION OF ANY MATERIAL SHALL BE OBTAINED AS PART OF THE WORK OF THE SPECIFICATION INCLUDING ALL FEES OR EXPENSES INCURRED.
4. ALL PRODUCTS USED AS PART OF THE POTABLE WATER SYSTEM WHERE THE INTENDED PURPOSE IS TO DELIVER OR CONVEY POTABLE WATER FOR HUMAN CONSUMPTION SHALL BE LEAD FREE AND CONFORM TO THE LATEST "LEAD FREE" LAW.
5. WHERE WATER PIPING IS SHOWN DROPPING INTO PLUMBING CHASES WITH SIZES NOTED, THAT SIZE SHALL BE CARRIED FULL LENGTH THROUGH THE CHASE. REFER TO PLUMBING FIXTURE SCHEDULE ON THIS DRAWING FOR INDIVIDUAL FIXTURE CONNECTION SIZES.
6. REFER TO ARCHITECTURAL PLANS FOR EXACT LOCATION AND HEIGHT OF ALL PLUMBING FIXTURES.
7. MISCELLANEOUS DISCREPANCIES OR OMISSIONS WHICH MIGHT APPEAR ON THE PLANS OR SPECIFICATIONS WILL NOT RELIEVE THE PLUMBING SUB-CONTRACTOR OF CODE COMPLIANCE.
8. INTERIOR PLUMBING AND HVAC EQUIPMENT REQUIRING A GAS CONNECTION SHALL BE PROVIDED WITH AN EMERGENCY GAS RELIEF VENTS AT EACH GAS TRAIN IN ACCORDANCE WITH THE MASSACHUSETTS FUEL GAS CODE AND AS INDICATED WITH THE FOLLOWING CHART:

CFH	AMOUNT OF RELIEF VENT REQUIRED	SIZE OF EACH VENT		
		0' TO 40'	0' TO 100'	0' TO 200'
UNDER 1,000	1			
1,000 TO 2,500	3	3/4"	1"	1 1/4"
2,500 TO 12,500	3	3/4"	1"	1 1/4"
OVER 12,500	4	3/4"	1"	1 1/4"
		3/4"	1"	1 1/4"

PLUMBING LEGEND

SYMBOL	ABBREVIATION	DESCRIPTION
	ETR	LIGHT LINE INDICATES EXISTING PIPING TO REMAIN
	RE	REMOVE EXISTING PIPING
	CTE	CONNECT TO EXISTING
	C&C	CUT & CAP
		BELOW FLOOR PIPING (INDICATED AS DOUBLE LINEWORK)
	CW	COLD WATER
	HW	HOT WATER
	HWR	HOT WATER RECIRCULATION
	S or W	SOIL OR WASTE
	V	VENT
	RW	RAIN WATER CONDUCTOR
OFD	OFD	STORM WATER OVER FLOW DRAINAGE
G	G	NATURAL GAS
	HTI / TMC	HEAT TRACE AND INSULATE
	CONT	CONTINUATION
	UP	PIPE RISE OR UP
	DN	PIPE DROP OR DOWN
	TEE	PIPE TEE
	SOV	SHUT-OFF VALVE
		GAS COCK
	PRV	PRESSURE REDUCING VALVE
	VIV	VALVE IN VERTICAL
	CV	CHECK VALVE
	BVA	BALANCING VALVE ASSEMBLY
	W & T	WASTE & TRAP
	CO	CLEANOUT PLUG
	FCO	FLUSH FLOOR CLEANOUT
	GCO	GRADE CLEANOUT
	DCO	DANDY CLEANOUT
		CAPPED PIPE
		ARROW INDICATES DIRECTION OF FLOW
.01		ARROW INDICATES DIRECTION OF SLOPE
		UNION
	WTS	WATERTIGHT SLEEVE
TP	TP	TRAP PRIMER
	HB	HOSE BIBB
	WH	WALL HYDRANT

PLUMBING LEGEND

SYMBOL	ABBREVIATION	DESCRIPTION
1 / P-1		DIAGRAM NO. & DWG. NO. REFERENCE
	FD "A"	FLOOR DRAIN & TYPE
	RD "A"	ROOF DRAIN & TYPE
	DCVA	HORIZONTAL DOUBLE CHECK VALVE ASSEMBLY
WM	WM	WATER METER
GM	GM	GAS METER
	T	THERMOMETER
	PG	PRESSURE GAUGE WITH PETCOCK
	T&P	TEMPERATURE AND PRESSURE RELIEF VALVE
	SA	SHOCK ABSORBER
		VACUUM RELIEF VALVE
	WH-1	WATER HEATER & NUMBER
	SS	SOIL STACK
	VS	VENT STACK
	VTR	VENT THRU ROOF
	INV	INVERT
	TYP	TYPICAL
	NTS	NOT TO SCALE
	AFF	ABOVE FINISHED FLOOR
	LPC	LIMIT OF PLUMBING CONTRACT
	GC	GENERAL CONTRACTOR
	FPC	FIRE PROTECTION CONTRACTOR
	PC	PLUMBING CONTRACTOR
	EC	ELECTRICAL CONTRACTOR
	HVAC	HVAC CONTRACTOR
	WC	WATER CLOSET
	UR	URINAL
	LAV	LAVATORY
	MR	MOP RECEPTOR
	SHR	SHOWER
	DF	DRINKING FOUNTAIN
	SK	SINK
	F & I	FURNISH & INSTALL
	S=.01	SLOPE = 1/8" PER FOOT
	S=.02	SLOPE = 1/4" PER FOOT
	NO	NORMALLY OPEN
	NC	NORMALLY CLOSED
	F.F.E.	FINISHED FLOOR ELEVATION

NOTE- NOT ALL SYMBOLS APPEAR ON DRAWINGS

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PLUMBING LEGEND AND GENERAL NOTES

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE, MASS. 1639 INCORPORATED MAY 4, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

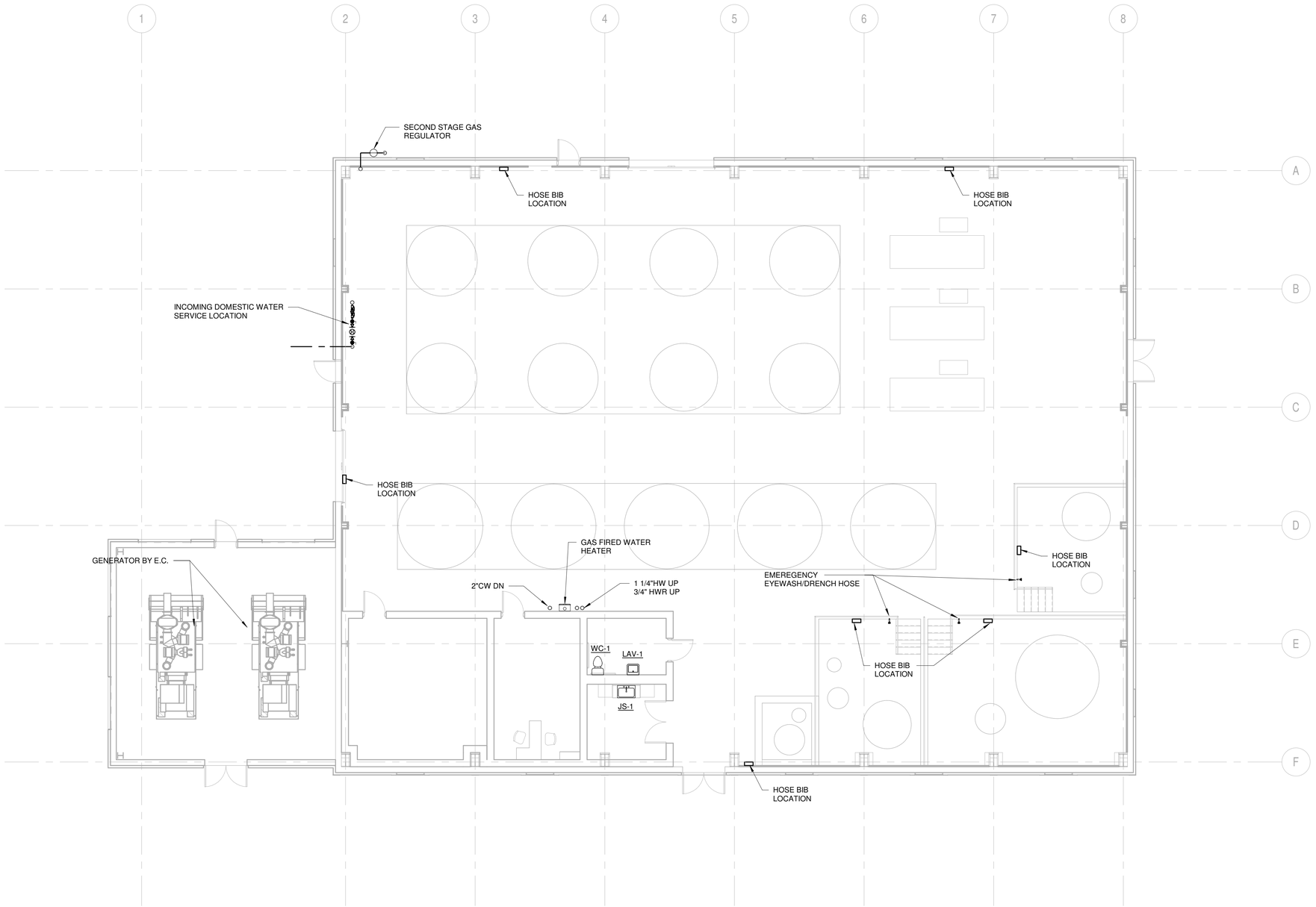
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APPROVED BY	MC

P001

SHEET 57 of 60

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1 LOWER LEVEL PLAN
1/8" = 1'-0"

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PLUMBING LOWER LEVEL PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

SEAL OF THE TOWN OF BARNSTABLE, MASS. 1639 INCORPORATED MAY 4, 1685

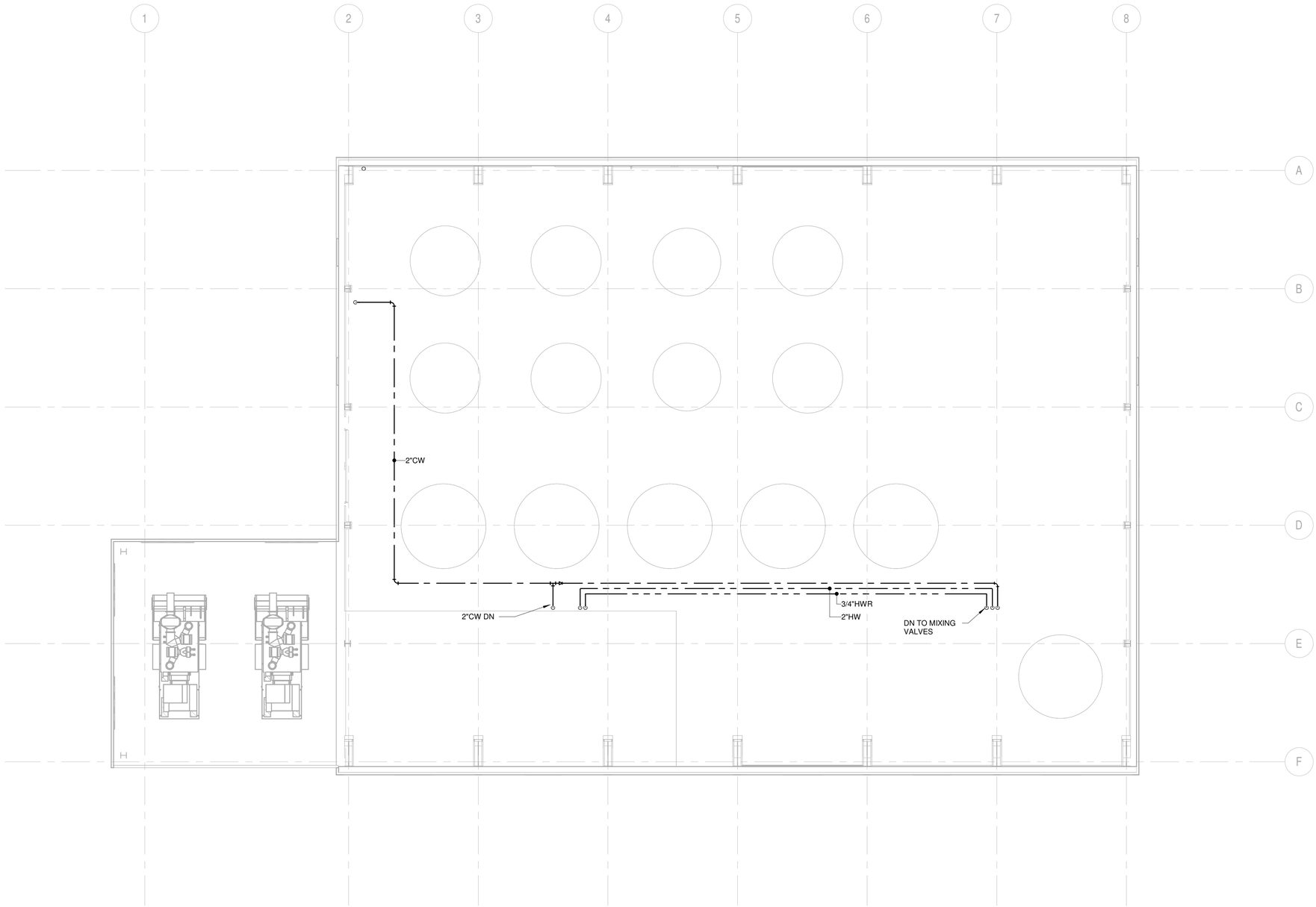
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P101

SHEET 58 of 60



1 2-PLUMB-CLERESTORY (WTP)
1/8" = 1'-0"

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STRAIGHTWAY
WATER TREATMENT FACILITY
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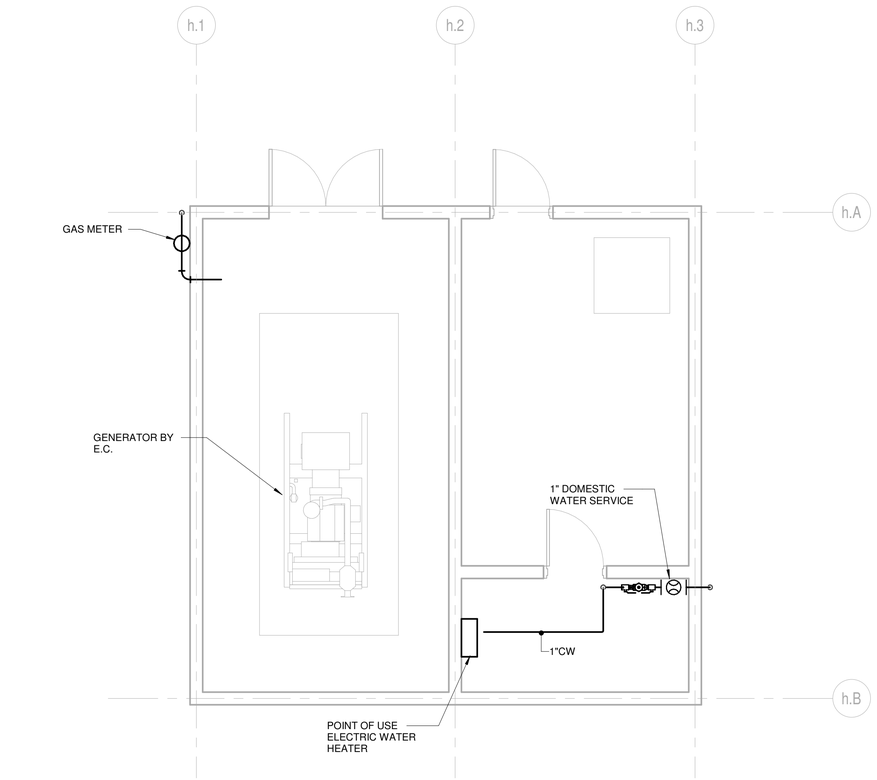
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APPROVED BY	MC

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SHEET 59 of 60



1 FLOOR PLAN
1/4" = 1'-0"

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PLUMBING HYANNISPORT PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

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APPROVED BY	MC

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SHEET 60 of 60

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KEY PLAN
SCALE: 1" = 150'

EXISTING LEGEND

- MINOR CONTOUR
- MAJOR CONTOUR
- SPOT ELEVATION
- 100-YR FLOOD ZONE
- RECORD WATER LINE
- ABANDONED/REMOVED WATER LINE
- HYDRANT
- WATER GATE
- WATER WELL
- STANDPIPE
- ELECTRIC LINE
- OVERHEAD WIRES
- UTILITY POLE
- GUY WIRE
- TRANSFORMER
- ELECTRIC MANHOLE
- RECORD GAS LINES
- GAS METER
- WETLAND LIMIT
- WETLAND FLAG
- WETLAND EDGE
- 100' WETLAND BUFFER
- 50' WETLAND BUFFER
- SOIL PROBE
- CHAINLINK FENCE
- TREELINE
- DRAIN LINE
- DRAIN MANHOLE
- SEWER LINE
- SEWER MANHOLE
- CHAIN LINK FENCE
- CONCRETE PAD
- DUCTILE IRON
- EDGE OF PAVEMENT
- EDGE OF PAVEMENT LINE
- EDGE OF WATER

PROPOSED LEGEND

- PROPOSED CONTOUR
- RAW WATER LINE
- WATER LINE
- PROPOSED WATER GATE
- CHAIN LINK FENCE
- PROPOSED TREELINE
- DRAIN LINE
- SEWER LINE
- ELECTRIC LINE
- GAS LINE
- VEHICULAR ACCESS GATE
- DRAIN MANHOLE
- CATCH BASIN
- CONCRETE
- RIPRAP
- EXTENT OF ASPHALT/STRUCTURE REMOVAL
- EXTENT OF PAVED ACCESS DRIVE
- EXTENT OF ASPHALT/STRUCTURE REMOVAL
- PROPOSED BUILDING
- AREA OF STORMWATER FEATURE
- EXTENT OF STORMWATER FEATURE
- ARBORVITAE PLANTING

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0 150 300 450

SCALE: 1" = 150' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

KEY PLAN & LEGNED

STRAIGHTWAY
WATER TREATMENT FACILITY

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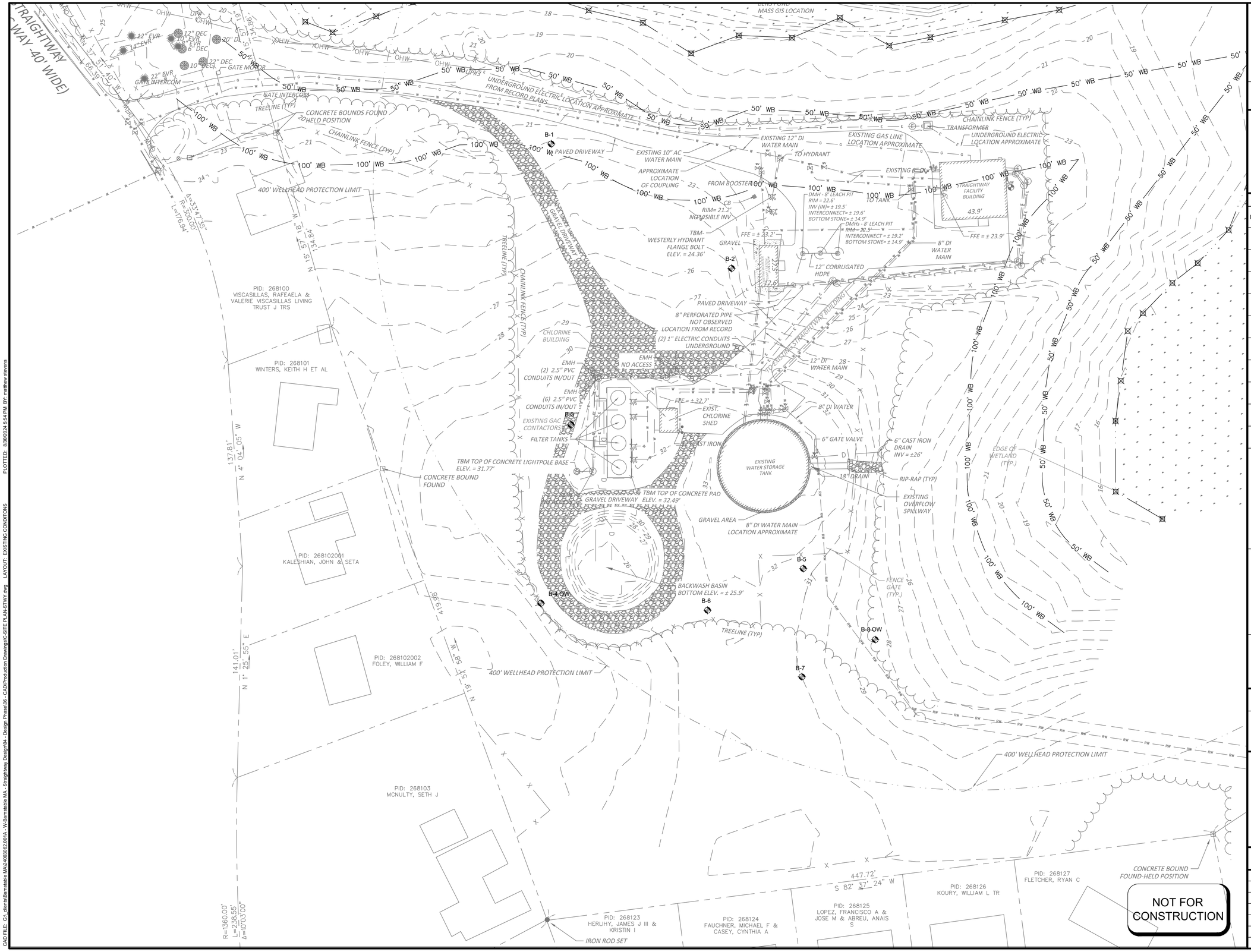
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PROJECT NO.	24003062.001A
ISSUE DATE	8/2/2024
CURRENT REVISION	-
DESIGNED BY	TB
DRAWN BY	MD/MPS
CHECKED BY	TB/GAA
APPROVED BY	GAA

C-001

SHEET 4 of 60

PLOTTED: 8/30/2024 5:53 PM BY: matthew.stevens
CAD FILE: G:_clients\Barnstable MA\24003062.001A - W.Barnstable MA - Straightway Design\04 - Design Phase\06 - CAD\Production Drawings\C-KEY PLAN.dwg LAYOUT: C-001



PLOTTED: 8/30/2024 5:54 PM BY: matthew stevens

CAD FILE: G:\clients\Barnstable MA\24003062.001A - W.Barnstable MA - Straightway Design\04 - Design Phase\08 - CAD\Production Drawings\C-SITE PLAN-STWY.dwg LAYOUT: EXISTING CONDITIONS

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0 30 60 90

SCALE: 1" = 30' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

STRAIGHTWAY SITE PLAN EXISTING CONDITIONS

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS 1639 INCORPORATED A.D. 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER SUPPLY DIVISION
47 OLD YARMOUTH ROAD
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APPROVED BY	GAA

C1-111

SHEET 5 of 60

NOT FOR CONSTRUCTION

CONSTRUCTION VEHICLE EXIT

TEMPORARY SEDIMENT BASIN

EXTENT OF TREE CLEARING AND GRUBBING

LIMIT OF DISTURBANCE (TYP.)

REMOVE AND REUSE EXISTING HYDRANT. HYDRANTS NOT USED UNDER THE CONTRACT SHALL BE RETURNED TO THE OWNER (TYP.)

STRAW WATTLE (TYP.)

REMOVE EXISTING PIPING

EXIST. 10" AC WATER MAIN TO BE ABANDONED IN PLACE

CUT AND CAP EXISTING 8" PIPE

CUT AND CAP EXISTING 8" PIPE

TEMPORARY SEDIMENT BASIN

EXISTING STRAIGHWAY FACILITY AND WELL TO REMAIN

GRAVEL DRIVEWAY TO BE REMOVED

EXISTING CHLORINE SHED TO REMAIN FOR STORAGE CHEMICAL FEED EQUIPMENT AND PIPING TO BE REMOVED

EXISTING WATER STORAGE TANK TO REMAIN

TEMPORARY SEDIMENT BASIN

EXTENT OF TREE CLEARING AND GRUBBING

EDGE OF WETLAND (TYP.)

EXISTING MAIN TO BE REMOVED AND DISPOSED

TEMPORARY SEDIMENT BASIN

EXTENT OF TREE CLEARING AND GRUBBING

IRON ROD SET

CONCRETE BOUND FOUND-HELD POSITION

CONCRETE BOUND FOUND

LEGEND:

- LIMITS OF TREE CLEARING AND GRUBBING
- REMOVAL OF EXISTING GRAVEL DRIVE

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SCALE: 1" = 30' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

STRAIGHTWAY SITE PREPARATION PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

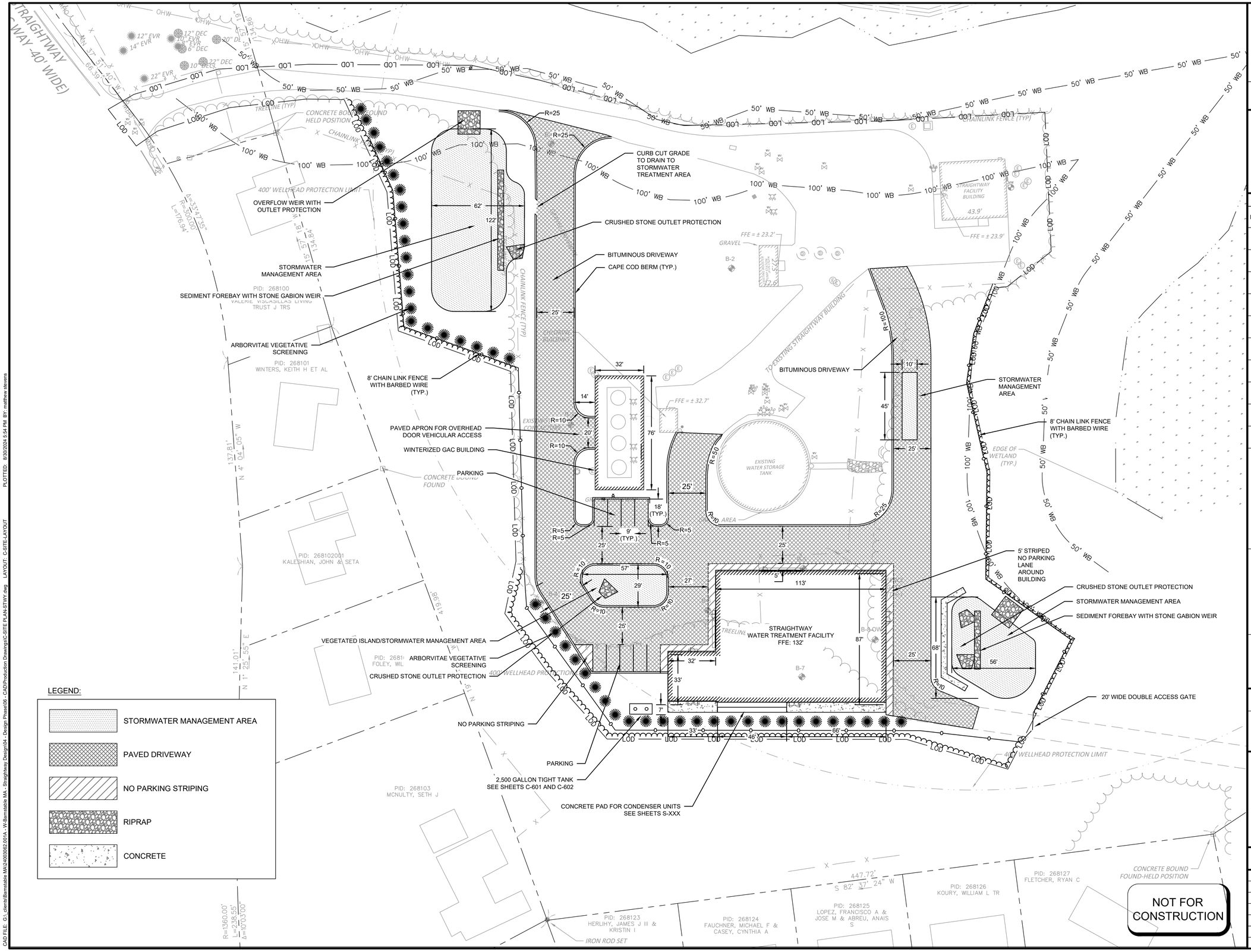
HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER SUPPLY DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

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STRAIGHTWAY SITE PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

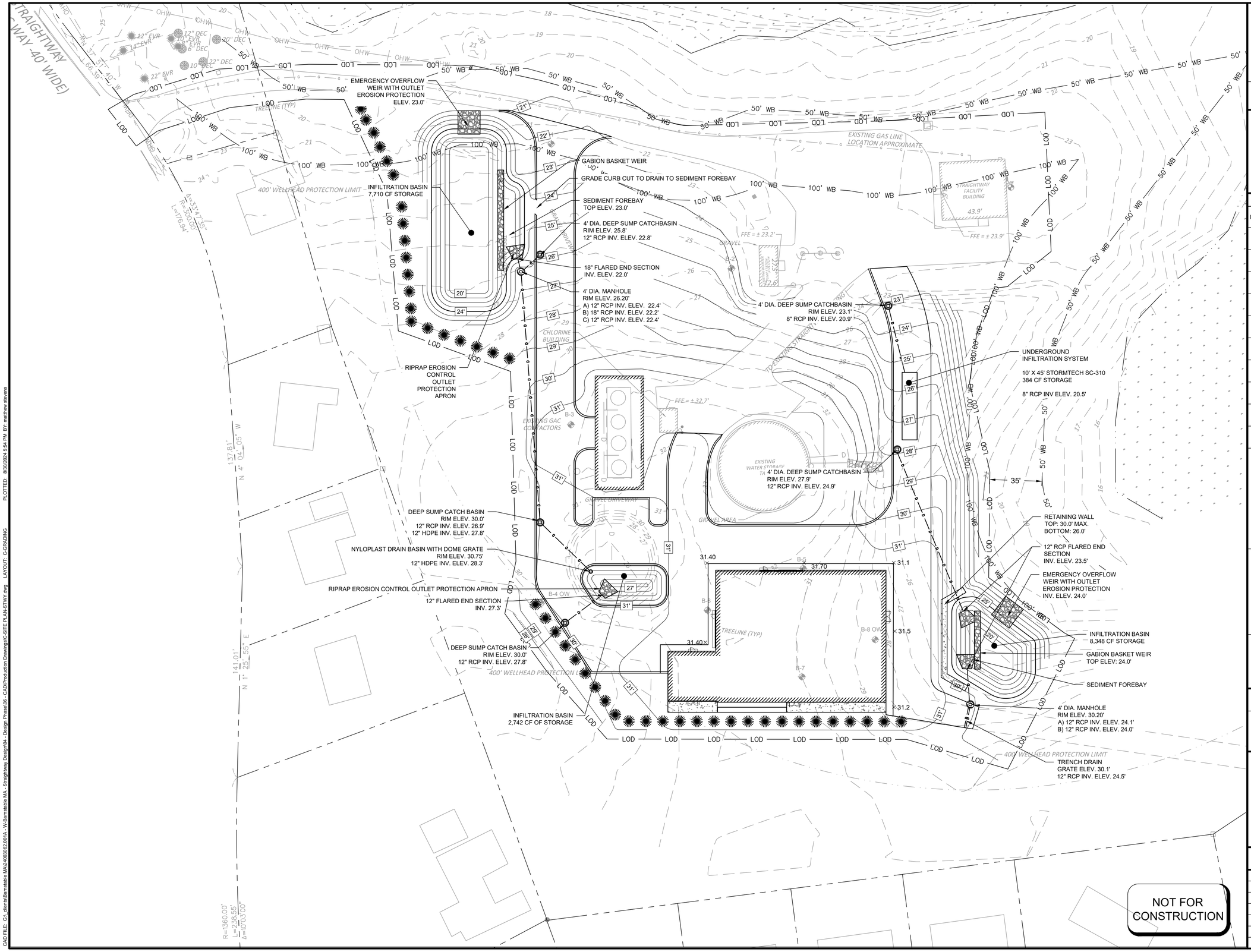
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STRAIGHTWAY GRADING PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED MAY 3, 1939

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER SUPPLY DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

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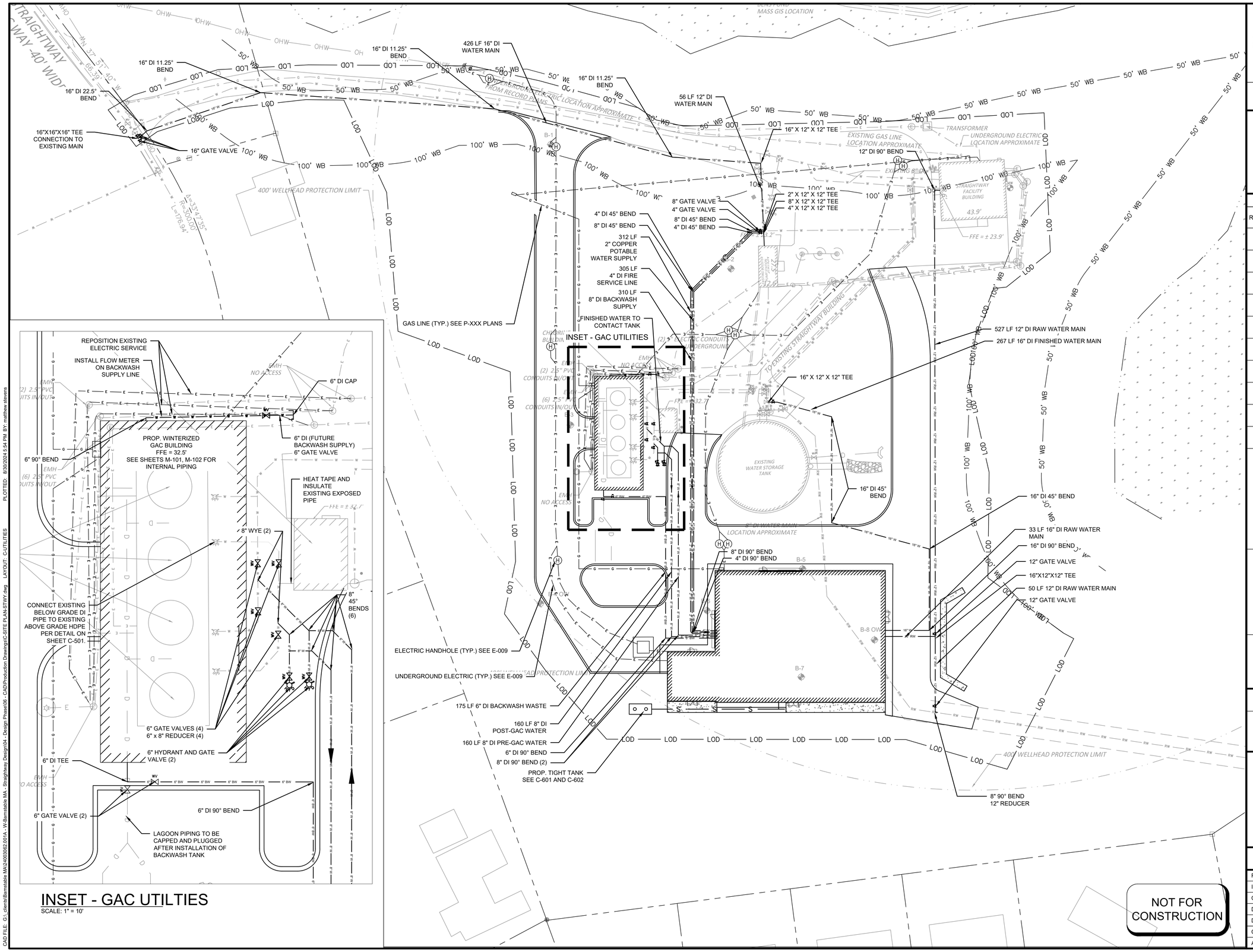
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INSET - GAC UTILTIES

SCALE: 1" = 10'

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STRAIGHTWAY UTILITIES PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER SUPPLY DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

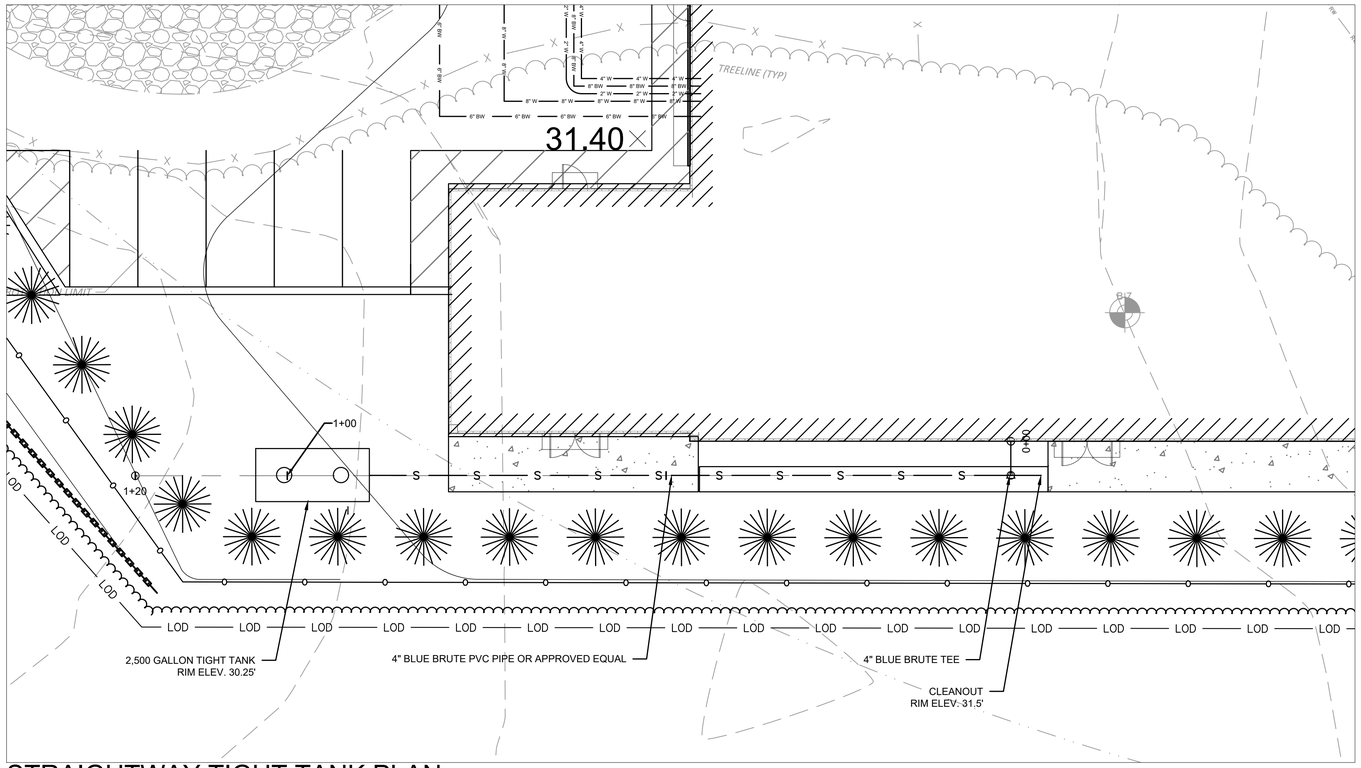
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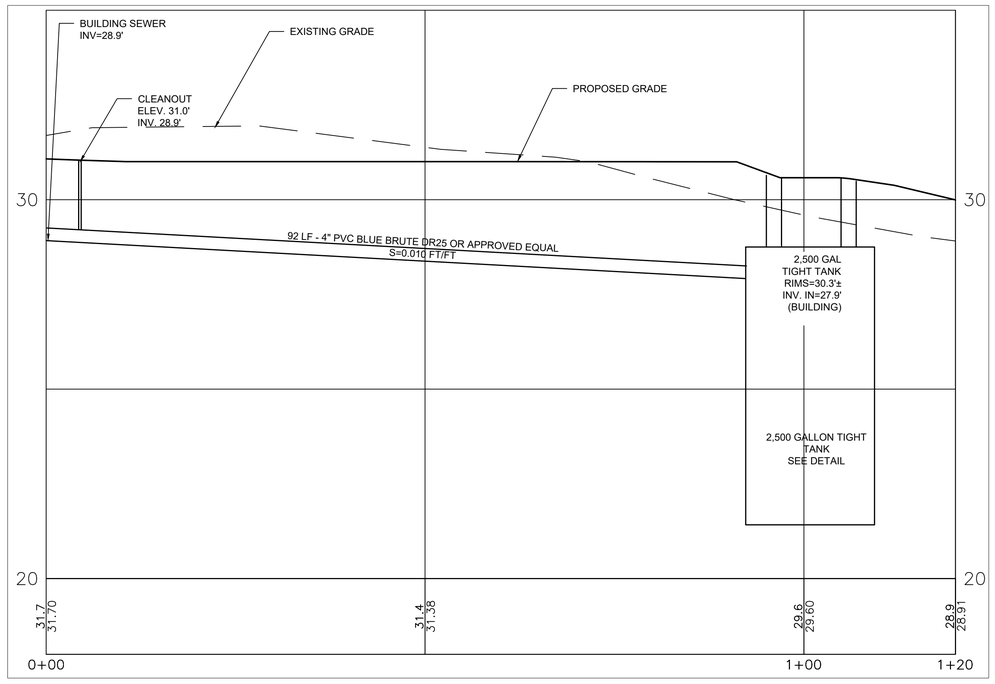
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STRAIGHTWAY TIGHT TANK PLAN

SCALE: 1" = 10'



STRAIGHTWAY TIGHT TANK PROFILE

VERTICAL SCALE: 1" = 2'
HORIZONTAL SCALE: 1" = 10'

NOTES:

1. THE PROPOSED DESIGN COMPLIES WITH TITLE 5 REQUIREMENTS AND SHALL BE INSTALLED AS SHOWN.
2. THE PROPOSED SYSTEM SHALL BE INSTALLED BY A TITLE V LICENSED SEPTIC INSTALLER LISTED ON THE TOWN OF BARNSTABLE' MOST CURRENT LIST OF LICENSED SEPTIC INSTALLERS.
3. THE BARNSTABLE ELECTRICAL INSPECTOR SHALL BE NOTIFIED AT LEAST 36 HOURS PRIOR TO INSTALLATION OF THE ALARM SYSTEM AND ASSOCIATED ELECTRICAL COMPONENTS.
4. THE BARNSTABLE STRAIGHTWAY WELL IS 403 FEET FROM THE TIGHT TANK.
5. THE TIGHT TANK IS OUTSIDE OF THE 400-FOOT RADIUS OF THE MASSDEP ZONE I PROTECTIVE AREA SURROUNDING THE WELL.
6. THERE ARE NO WETLANDS WITHIN 100 FEET OF THE TIGHT TANK.
7. THE PROPOSED TIGHT TANK WILL SERVE A PUBLIC WATER SUPPLY FACILITY WHERE IT IS NOT FEASIBLE TO CONNECT TO A PUBLIC SEWER.
8. THE PROJECT HAS NOT YET BEEN REVIEWED AND GRANTED AN ORDER OF CONDITIONS BY THE BARNSTABLE CONSERVATION COMMISSION.

THE SIZING OF THE TANK WAS DETERMINED IN ACCORDANCE WITH TITLE 5. THE ASSOCIATED CALCULATIONS ARE BELOW:

DAILY SEWAGE FLOW

USE: FACTORY, INDUSTRIAL PLANT, NO CAFETERIA

DAILY DESIGN FLOW = 15 GPD PER EMPLOYEE

DAILY FLOW (REQUIRED) 15 GPD X 2 EMPLOYEES

TOTAL DAILY FLOW WELL 3 TREATMENT FACILITY = 30 GPD

TIGHT TANK

2,500 GALLON TANK

MUST CONTAIN 500% OF SEPTIC REQUIREMENTS PER 310 CMR 15.203

48-HOUR STORAGE CAPACITY IN COMPARTMENT 30 GPD X 2 DAYS = 60 GALLONS STORAGE REQUIRED

500% OF 60 GALLONS = 300 GALLONS

2000-GALLON MINIMUM TANK SIZE PER 310 CMR 15.260

TOTAL STORAGE: 2,500 GALLONS > 2,000 GALLONS

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STRAIGHTWAY SEWER PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER SUPPLY DIVISION
47 OLD YARMOUTH ROAD
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TIGHT TANK SPECIFICATIONS

1. TIGHT TANKS SHALL BE CONSTRUCTED OF SOUND AND DURABLE WATERTIGHT MATERIALS NOT SUBJECT TO EXCESSIVE CORROSION, DECAY, OR FROST DAMAGE, OR CRACKING OR BUCKLING DUE TO SETTLEMENT OR BACKFILLING. TIGHT TANKS MAY BE CONSTRUCTED OF PRECAST REINFORCED CONCRETE (OTHER MATERIALS AS APPROVED IN WRITING BY THE DEPARTMENT, METAL TIGHT TANKS ARE PROHIBITED.)

2. TANK CONSTRUCTION MATERIALS SHALL MEET THE FOLLOWING MINIMUM SPECIFICATIONS OR AN ASTM EQUIVALENT STANDARD:
   (A) CONCRETE
   1. CONCRETE STRENGTH F'c 4,000 PSI @ 28 DAYS. DENSITY 140 PCF
   2. CEMENT, PORTLAND TYPE I OR III PER ASTM C150-96
   3. ADMIXTURES PER ASTM C233-95
   4. REINFORCING PER ASTM A615 FOR WIRE FABRIC. GRADE 40/60 R'D OR EQUIVALENT.
   5. DESIGN LOADING HS-20
   6. MINIMUM WALL THICKNESS: FOUR INCHES
   7. THE TANK SHALL BE WATERTIGHT

3. TANK, COVERS, CONNECTIONS AND PIPING SHALL BE DESIGNED AND CONSTRUCTED SO AS TO WITHSTAND AN ANTICIPATED MINIMUM HS-20 LOADING.

4. TIGHT TANK SHALL BE MANUFACTURED IN ACCORDANCE WITH A QUALITY CONTROL/QUALITY ASSURANCE PROGRAM. THE PROGRAM FOR CONCRETE TANKS SHALL BE IN CONFORMITY WITH ASTM STANDARD C 1227-96OR AN ASTM EQUIVALENT STANDARD. CONCRETE TANKS SHALL BE EMBOSSED WITH A SEAL STATING THAT THIS ASTM STANDARD HAS BEEN MET.

BUILDING SEWERS SPECIFICATIONS

1. THE BUILDING SEWER SHALL BE SUFFICIENT TO SERVE THE CONNECTED FIXTURES. IN NO CASE SHALL THE BUILDING SEWER BE LESS THAN FOUR INCHES IN DIAMETER.

2. THE BUILDING SEWER SHALL BE CONSTRUCTED OF CORROSION RESISTANT MATERIAL AND EQUIPPED WITH WATER TIGHT JOINTS; BLUE BRUTE PVC PIPE OR THE EQUIVALENT.

3. ALL PIPE JOINTS OF THE BUILDING SEWER SHALL BE MADE WATER-TIGHT AND PROTECTED AGAINST DAMAGE BY ROOTS. POURED-TYPE JOINTS SHALL BE PROPERLY WIPED ON THE INSIDE TO ELIMINATE OBSTRUCTION OF FLOW.

4. THE BUILDING SEWER SHALL BE LAID ON A COMPACTED FIRM BASE.

5. THE BUILDING SEWER SHALL BE VENTED THROUGH THE VENT STACK OR MAIN VENT OF THE BUILDING SERVED BY IT. NO TRAP SHALL BE INSTALLED IN THE BUILDING SEWER OR BUILDING DRAIN.

6. ALL BUILDING SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE STATE PLUMBING CODE, 248 CMR2.00

GENERAL CONSTRUCTION REQUIREMENTS FOR ALL SYSTEM COMPONENTS

1. TIGHT TANK:

   (A) WATERTIGHT THROUGH MANUFACTURER'S SPECIFICATION AND WARRANTY; OR

   (B) MADE WATERTIGHT BY THE MANUFACTURER, EQUIPMENT SUPPLIER OR INSTALLER USING ASPHALT OR SYNTHETIC POLYMER SEALER SPECIFIED BY THE CONCRETE OR SYNTHETIC MATERIAL MANUFACTURER.

2. TIGHT TANK SHALL BE CONSTRUCTED OR SET LEVEL AND TRUE TO GRADE ON A LEVEL STABLE BASE WHICH HAS BEEN MECHANICALLY COMPACTED. IF THE COMPONENT IS PLACED IN FILL, PROPER COMPACTION IS REQUIRED TO ENSURE STABILITY AND TO PREVENT SETTLING; NATIVE GROUND WITH A SIX INCH AGGREGATE BASE IS OTHERWISE ADEQUATE.

3. TIGHT TANK SHALL BE EQUIPPED WITH A WATERTIGHT ACCESS MANHOLE(S) WITH A MINIMUM DIAMETER OF 20 INCHES AND CONSTRUCTED OF DURABLE MATERIAL.

4. ALL SYSTEM COMPONENTS SHALL BE CONSTRUCTED OF CORROSION RESISTANT MATERIALS.

5. ALL PRESSURIZED PIPES SHALL BE DESIGNED AND INSTALLED TO MEET THE FOLLOWING REQUIREMENTS:

   (A) TO PREVENT FREEZING BY BEING INSTALLED BELOW THE FROST LINE, BY BEING ADEQUATELY INSULATED IF INSTALLED ABOVE THE FROST LINE, OR BE SELF-DRAINING;

   (B) TO SPECIFY THE APPROPRIATE CLASS OR SCHEDULE OF PIPE TO WITHSTAND MAXIMUM PRESSURE AND/OR ANTICIPATED VEHICULAR LOADS; AND

   (C) TO SPECIFY APPROPRIATE THRUST BLOCKING AT ALL ANGLES, BENDS, BRANCHES, PLUGS AND WHEREVER ELSE NECESSARY TO PREVENT DISRUPTION OF PROPER FUNCTIONING OF THE LINE.

6. THE TOP OF ALL SYSTEM COMPONENTS, INCLUDING THE TIGHT TANK SHALL BE INSTALLED NO MORE THAN 36" BELOW FINISH GRADE.

7. WHERE ANY PORTION OF ANY COMPONENT IS TO BE PLACED AT OR BELOW THE GROUND-WATER TABLE, ALL SYSTEM TANKAGE, INCLUDING THE TIGHT TANK, SHALL BE DESIGNED WITH COUNTER WEIGHTS, ANCHORS OR BALLAST AND A BUOYANCY CALCULATION FOR THE ENTIRE VOLUME OF EACH COMPONENT, WHEN EMPTY, SHALL BE PERFORMED AND SUBMITTED WITH THE SYSTEM PLANS AND SPECIFICATIONS.

8. ALL SYSTEM COMPONENTS SHALL BE MARKED WITH MAGNETIC MARKING TAPE OR A COMPARABLE MEANS IN ORDER TO LOCATE THEM ONCE BURIED.

SEPTIC SYSTEM GENERAL NOTES

1. THE SANITARY SEWAGE SYSTEM SHOWN SHALL BE INSTALLED IN ACCORDANCE WITH THE COMMONWEALTH OF MASSACHUSETTS STATE ENVIRONMENTAL CODE 310 CMR 15.00 (TITLE V) AND ANY LOCAL BOARD OF HEALTH REGULATIONS.

2. ANY MODIFICATION TO THE WORK SHALL BE APPROVED IN WRITING BY THE ENGINEER AND THE LOCAL BOARD OF HEALTH PRIOR TO PERFORMANCE.

3. THE TIGHT TANK SHALL BE H-20 DESIGN REINFORCED CONCRETE PRECAST MANUFACTURED BY OLDCASTLE PRECAST OR APPROVED EQUAL.

4. WHEREVER SEWER LINES CROSS WATER SUPPLY LINES, BOTH PIPES SHALL BE CONSTRUCTED OF CLASS 150 (MIN.) PRESSURE PIPE TO 10' ON EITHER SIDE OF CROSSING. PIPES SHALL ALSO BE PRESSURE TESTED TO ASSURE WATER TIGHTNESS.

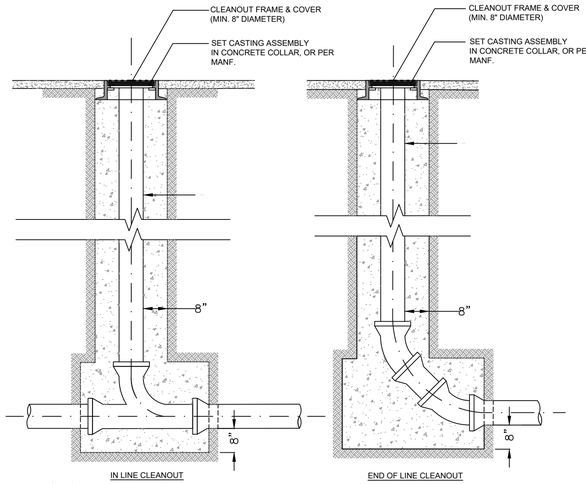
5. NOTIFY THE LOCAL BOARD OF HEALTH AGENT AND ENGINEER AT THE TIME OF EXCAVATION, PRIOR TO INSTALLATION.

6. NOTIFY LOCAL BOARD OF HEALTH AGENT AND ENGINEER WHEN SYSTEM IS COMPLETED AND READY FOR INSPECTION.

7. SHOP DRAWINGS FOR THE FOLLOWING ITEMS SHALL BE PROVIDED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO THE START OF INSTALLATION:
   - ALL UNDERGROUND STRUCTURES (TANKS, STEPS)
   - FRAMES AND COVERS
   - PIPES, FITTINGS
   - WATERPROOFING & PIPE GASKETS

STRUCTURE TESTING NOTES:

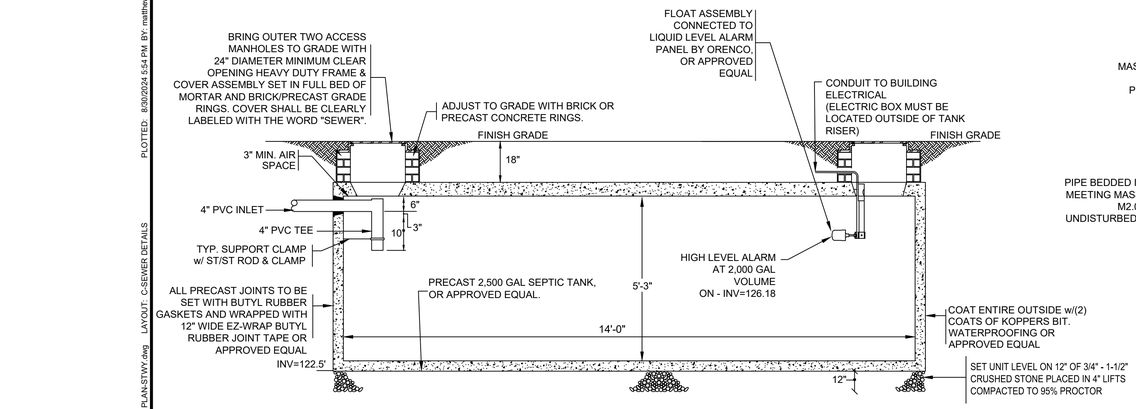
TIGHT TANK SHALL BE VACUUM TESTED FOR WATER TIGHTNESS AFTER INSTALLATION IN ACCORDANCE WITH ASTM C 1227. ALL TANKS MUST PASS TESTING PRIOR TO USE.



NOTES:
1. CLEANOUT FRAME AND COVER SHALL BE ONE OF THE FOLLOWING:
   A. PRODUCT NUMBER 00157324C01 AS MANUFACTURED BY EAST JORDAN IRON WORKS, FABRICATED FROM GRAY IRON AND CONFORMING TO ASTM A48 CLASS 35B;
   B. 8-INCH NYLOPLAST INLINE DRAIN WITH SOLID COVER (PRODUCT NUMBERS 2708AG AND 0899CGC, AS MANUFACTURED BY ADVANCED DRAINAGE SYSTEMS, INC.;
   C. OR APPROVED EQUAL.

SEWER CLEANOUT TYPICAL DETAIL

N.T.S.



THE REQUIRED BUOYANCY CALCULATIONS IN ACCORDANCE WITH TITLE 5 ARE BELOW:

ASSUMPTIONS/INITIAL INFORMATION:

GROUNDWATER AT ELEVATION 118 PER SHGWT
EARTH COVER DEPTH = 18 INCHES

WEIGHT OF EARTH = 110 PCF

WEIGHT OF WATER = 62.4 PCF

OUTER TANK DIMENSIONS (L X W X H) = (15' X 7' X 6.25')

INNER TANK DIMENSIONS (L X W X H) = (14' X 6' X 5.25')

WEIGHT OF TANK (2,500-GALLON TANK EMPTY PER MANUFACTURER) = 31,800 LBS

BUOYANCY CALCULATION

USING OUTER TANK DIMENSIONS

WEIGHT OF EARTH ON TANK = (L X W X EARTH COVER) * (WEIGHT OF EARTH)
= (15' X 7' X 1.5') * (110 PCF)
= 17,280 LBS

WEIGHT OF TANK + WEIGHT OF EARTH ON TANK = 49,080 LBS.

HYDROSTATIC PRESSURE = (L X W X SHGW HEIGHT) * (WEIGHT OF WATER)
= (15' X 7' X 0') * (62.4 PCF)
= 0 LBS

HYDROSTATIC PRESSURE =0 LBS < 66,450 LBS
<= WEIGHT OF TANK + WEIGHT OF EARTH (OK)

THE ALARM HEIGHT WAS SET AT THE VOLUME AT WHICH THE TANK WILL CONTAIN 2,000 GALLONS OF WASTEWATER AS CALCULATED BELOW:

ALARM HEIGHT

USING INNER TANK DIMENSIONS

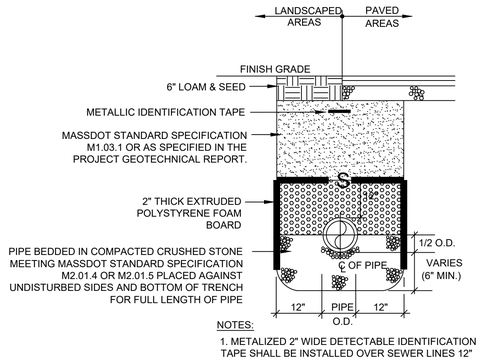
VOLUME BELOW ALARM = 2,000 GALLONS OR 267.361 CF = (L X W X ALARM HEIGHT)

ALARM HEIGHT = 267.361 CF/(L X W)
= 267.361 CF/(14' X 6')

ALARM HEIGHT = 3.18 FEET

TIGHT TANK TYPICAL DETAIL

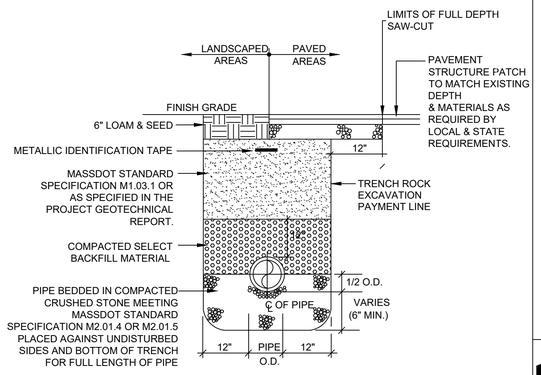
N.T.S.



NOTES:
1. METALIZED 2" WIDE DETECTABLE IDENTIFICATION TAPE SHALL BE INSTALLED OVER SEWER LINES 12" BELOW FINISH GRADE.
2. SEWER SHALL BE INSULATED IN ALL LOCATIONS WHERE FINAL COVER IS 36" OR LESS.

SEWER INSULATION DETAIL

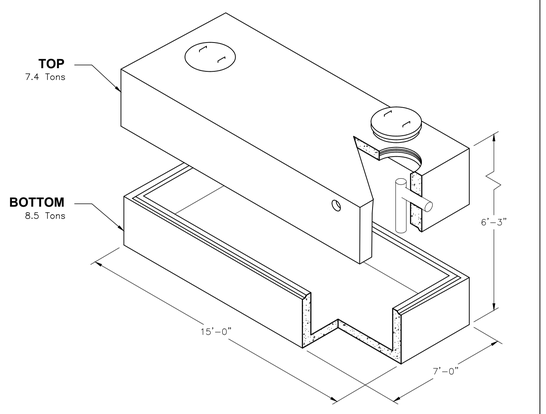
N.T.S.



NOTES:
1. METALIZED 2" WIDE DETECTABLE IDENTIFICATION TAPE SHALL BE INSTALLED OVER SEWER LINES 12" BELOW FINISH GRADE.

PVC SEWER PIPE TRENCH SECTION

N.T.S.



Oldcastle Precast®

CST-2500-2	6'-0" x 14'-0" x 5'-3" I.D. Septic Tank 2,500 Gallon Capacity
FILE NAME: 324ESCCST2500_ISO.DWG	
ISSUE DATE: January, 2008	
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STRAIGHTWAY SEWER DETAILS

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED MAY 4, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER SUPPLY DIVISION
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CAD FILE: G:_clients\Barnstable MA\24003062.001A - W-Barnstable MA - Straightway Design\04 - Design Phase\06 - CAD\Production Drawings\C-SITE PLAN-SP-HP.dwg LAYOUT: EXISTING CONDITIONS PLOTTED: 8/30/2024 5:55 PM BY: matthew stevens

400' WELLHEAD PROTECTION LIMIT

400' WELLHEAD PROTECTION LIMIT

200' RFA

100' WB

50' WB

100' RFA

200' RFA

FEMA FLOOD ZONE X BOUNDARY

TBM - SOUTH-EASTERLY HYDRANT FLANGE BOLT ELEV. = 13.61'

TBM - SOUTH-EASTERLY HYDRANT FLANGE BOLT ELEV. = 17.77'

8" DI WATER MAIN LOCATION APPROXIMATE FROM RECORD PLANS

TREELINE (TYP.)

BITUMINOUS PAVEMENT

FFE = ± 9.7'

20.0'

UNDERGROUND ELECTRIC LINE LOCATION APPROXIMATE

EXISTING 10" AC WATER MAIN

EXISTING 10" DI WATER MAIN

EXISTING 10" AC WATER MAIN

EXTERNAL GENERATOR

GRAVEL PARKING AREA

UNDERGROUND ELECTRIC LINE

PLANTER AREA W/STONE WALL PERIMETER

1" WATER SAMPLE PIPE

BENCHMARK ELEVATION = 14.7 (NAVD88) ESTABLISHED BY LUCAS ENVIRONMENTAL 11/29/2021

FFE = 14.7'

UP#34-3A

39.3'

7.0'

CB INV = ± 8.0'

CB INV = ± 6.8'

8" CI

SMITHS

(PUBLIC)

FLOW

CONCRETE HEADWALL

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SCALE: 1" = 30' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

HYANNISPORT - SIMMONS POND EXISTING CONDITIONS

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER SUPPLY DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

60% DESIGN PROGRESS PRINT

PROJECT NO.	24003062.001A
ISSUE DATE	8/2/2024
CURRENT REVISION	-
DESIGNED BY	TB
DRAWN BY	MD/MPS
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APPROVED BY	GAA

C2-111

SHEET 12 of 60

PLOTTED: 8/30/2024 5:55 PM BY: matthew stevens
CAD FILE: G:_clients\Barnstable MA\24000062.001A - W-Barnstable MA - Straightway Design\04 - Design Phase\06 - CAD\Production Drawings\C-SITE PLAN-SP-HP.dwg LAYOUT: C-SITE PREPARATION

400' WELLHEAD PROTECTION LIMIT

400' WELLHEAD PROTECTION LIMIT

TREE CLEARING AND GRUBBING AREA

EXISTING HYDRANT TO REMAIN (TYP.)

EXISTING GRAVEL PARKING AREA TO BE REMOVED

REMOVE AND DISPOSE SECTION OF EXISTING FENCE

EXIST. HYANNIS POND PUMP STATION TO BE DEMOLISHED AND HYANNISPORT WELL TO BE DECOMMISSIONED AND ABANDONED

EXIST. SIMMONS POND PUMP STATION TO BE DEMOLISHED AND SIMMONS POND WELL TO BE DECOMMISSIONED AND ABANDONED

REMOVE AND DISPOSE EXISTING PAVEMENT

ABANDON EXISTING AC WATER MAIN IN PLACE.

CUT AND CAP

TBM - SOUTH-EASTERLY HYDRANT FLANGE BOLT ELEV. = 13.61

TBM - SOUTH-EASTERLY HYDRANT FLANGE BOLT ELEV. = 17.2

FEMA FLOOD ZONE X BOUNDARY

BITUMINOUS PAVEMENT

EXTERNAL GENERATOR

UNDERGROUND ELECTRIC LINE

1" WATER SAMPLE PIPE

SMITH STREET (PUBLIC)

FLOW

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HYANNISPORT - SIMMONS POND SITE PREPARATION PLAN

STRAIGHTWAY WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 SERVICE & MAY A. 1939

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER SUPPLY DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

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SHEET 13 of 60

18' DOUBLE ACCESS GATE
SIMMONS POND PUMP STATION BUILDING
8' CHAIN LINK FENCE WITH BARBED WIRE (TYP.)
400' WELLHEAD PROTECTION LIMIT
BITUMINOUS ACCESS DRIVE AND TURNAROUND
BITUMINOUS PARKING SPACE
HYANNISPORT PUMP STATION BUILDING
2,500 GALLON TIGHT TANK
8' CHAIN LINK FENCE WITH BARBED WIRE (TYP.)
TBM SOUTH-EASTERLY HYDRANT FLANGE BOLT ELEV. = 17.77
FEMA FLOOD ZONE X BOUNDARY
BITUMINOUS PAVEMENT
UNDERGROUND ELECTRIC LINE LOCATION APPROXIMATE
MILL AND OVERLAY EXISTING DRIVEWAY
SMITH
(PUB
FLOW
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CAD FILE: G:_clients\Barnstable MA\24003062.001A - W-Barnstable MA - Straightway Design\04 - Design Phase\08 - CAD\Production Drawings\C-SITE PLAN-SP-HP.dwg LAYOUT: C-SITE HP-SP
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HYANNISPORT - SIMMONS POND SITE PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER SUPPLY DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

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SHEET 14 of 60

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400' WELLHEAD PROTECTION LIMIT

400' WELLHEAD PROTECTION LIMIT

200' RFA

100' RFA

100' WB

50' WB

LOD

BITUMINOUS PAVEMENT

FEMA FLOOD ZONE X BOUNDARY

19.00'

18.00'

17.00'

16.00'

15.00'

14.00'

13.00'

12.00'

11.00'

10.00'

20.00'

CONCRETE HEADWALL

FLOW

SMITH CT (PUBLIC)

INV = ± 8.0'

INV = ± 6.8'

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HYANNISPORT - SIMMONS POND GRADING PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED MAY 4, 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER SUPPLY DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

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400' WELLHEAD PROTECTION LIMIT

400' WELLHEAD PROTECTION LIMIT

(2) 8" SOLID SLEEVE
8"X6" DI WYE
HYDRANT
8" 45° BEND
6" GATE VALVE
8"X8"X6" TEE
LOD
BITUMINOUS PAVEMENT
16.6'
20.0'
UNDERGROUND ELECTRIC LINE LOCATION APPROXIMATE
FEMA FLOOD ZONE X
800 YEAR
EXISTING 10" AC WATER MAIN
8" DI WATER MAIN LOCATION APPROXIMATE FROM RECORD PLANS
TBM - SOUTH-EASTERLY HYDRANT FLANGE BOLT ELEV. = 13.61'
100' WB
50' WB
200' RFA
100' RFA

6" GATE VALVE
HYDRANT
TBM - SOUTH-EASTERLY HYDRANT FLANGE BOLT ELEV. = 17.87'
8" GATE VALVE
8"x8"x6" TEE
8" 45° BEND (2)
EXTERNAL GENERATOR
EXISTING 10" WATER MAIN
EXISTING 10" AC WATER MAIN
UNDERGROUND ELECTRIC LINE
1" WATER SAMPLE PIPE
UPH34-3A
INV = ±8.0'
INV = ±6.8'
8" CI
CONCRETE HEADWALL
FLOW
SMITH ST (PUBLIC)

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HYANNISPORT - SIMMONS POND UTILITIES PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

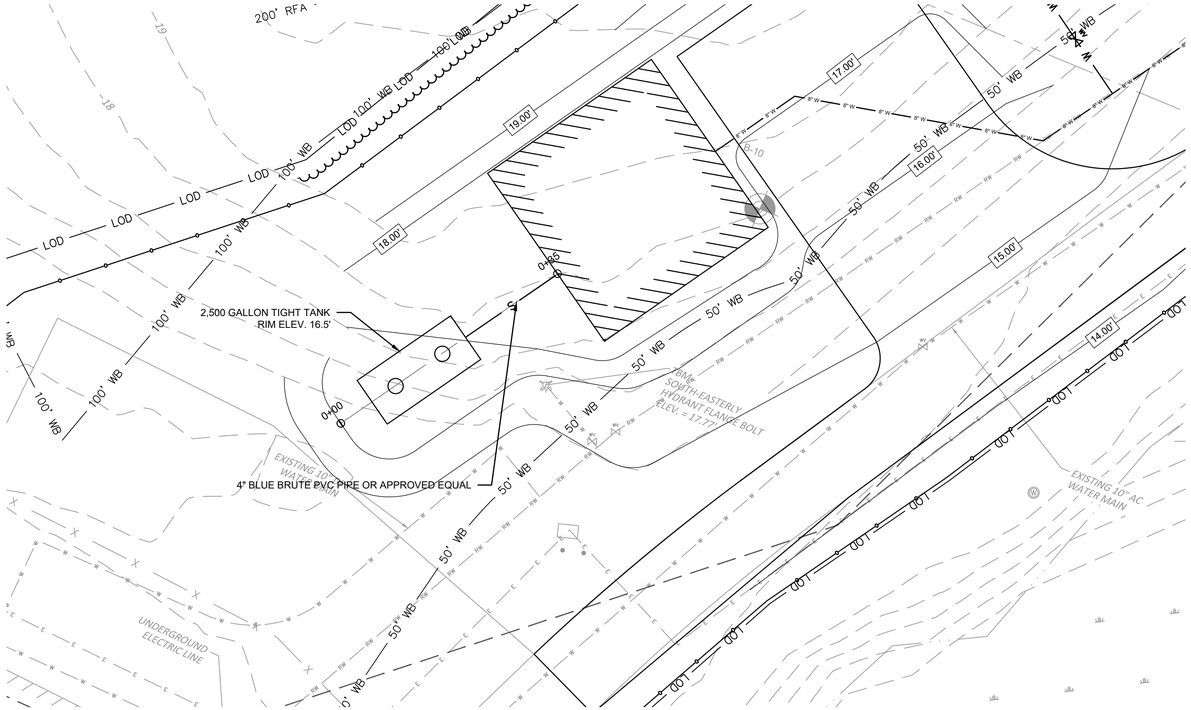
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BARNSTABLE DPW - WATER SUPPLY DIVISION
47 OLD YARMOUTH ROAD
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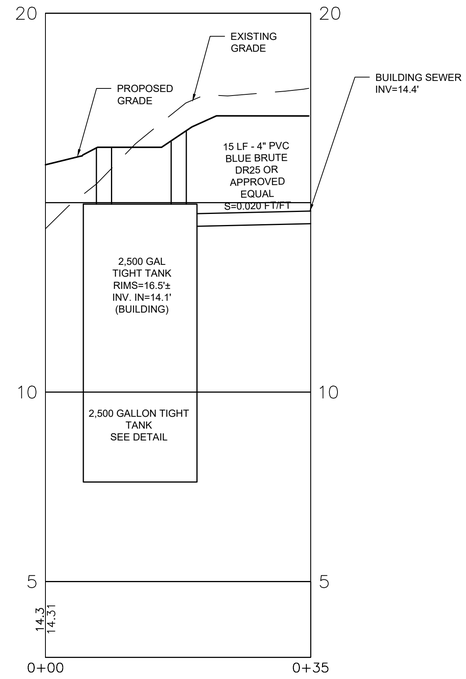
C2-115

SHEET 16 of 60



SIMMONS POND/HYANNISPORT WELLS TIGHT TANK PLAN

SCALE: 1" = 10'



SIMMONS POND/HYANNISPORT TIGHT TANK PROFILE

VERTICAL SCALE: 1" = 2'
HORIZONTAL SCALE: 1" = 10'

NOTES:

1. THE PROPOSED DESIGN COMPLIES WITH TITLE 5 REQUIREMENTS AND SHALL BE INSTALLED AS SHOWN.
2. THE PROPOSED SYSTEM SHALL BE INSTALLED BY A TITLE V LICENSED SEPTIC INSTALLER LISTED ON THE TOWN OF BARNSTABLE'S MOST CURRENT LIST OF LICENSED SEPTIC INSTALLERS.
3. THE BARNSTABLE ELECTRICAL INSPECTOR SHALL BE NOTIFIED AT LEAST 36 HOURS PRIOR TO INSTALLATION OF THE ALARM SYSTEM AND ASSOCIATED ELECTRICAL COMPONENTS.
4. THE SIMMONS POND WELL IS 450 FEET FROM THE TIGHT TANK.
5. THE HYANNISPORT WELL IS 30 FEET FROM THE TIGHT TANK.
6. THE TIGHT TANK IS WITHIN THE 400-FOOT RADIUS OF THE MASSDEP ZONE I PROTECTIVE AREA SURROUNDING THE WELL.
7. THERE ARE WITHIN 75 FEET OF THE TIGHT TANK.
8. THE PROPOSED TIGHT TANK WILL SERVE A PUBLIC WATER SUPPLY FACILITY WHERE IT IS NOT FEASIBLE TO CONNECT TO A PUBLIC SEWER.
9. THE PROJECT HAS NOT YET BEEN REVIEWED AND GRANTED AN ORDER OF CONDITIONS BY THE BARNSTABLE CONSERVATION COMMISSION.

THE SIZING OF THE TANK WAS DETERMINED IN ACCORDANCE WITH TITLE 5. THE ASSOCIATED CALCULATIONS ARE BELOW.

DAILY SEWAGE FLOW

USE: FACTORY, INDUSTRIAL PLANT, NO CAFETERIA

DAILY DESIGN FLOW = 15 GPD PER EMPLOYEE

DAILY FLOW (REQUIRED): 15 GPD X 2 EMPLOYEES

TOTAL DAILY FLOW WELL TREATMENT FACILITY = 30 GPD

TIGHT TANK

2,500 GALLON TANK

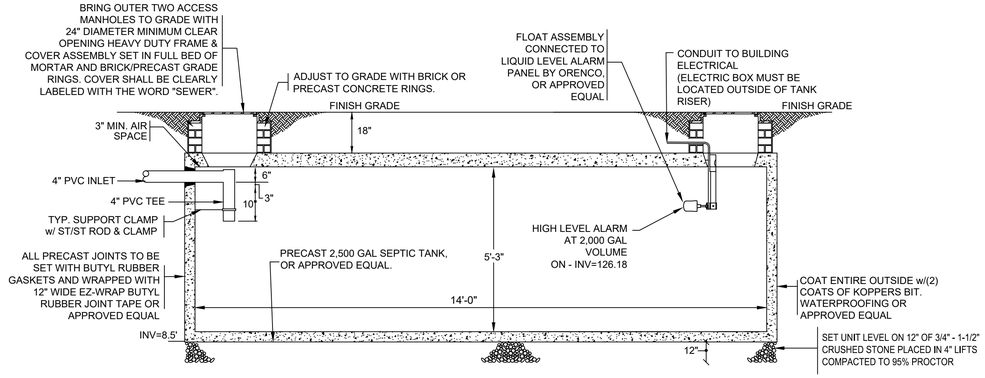
MUST CONTAIN 500% OF SEPTIC REQUIREMENTS PER 310 CMR 15.203

48-HOUR STORAGE CAPACITY IN COMPARTMENT 30 GPD X 2 DAYS = 60 GALLONS STORAGE REQUIRED

500% OF 60 GALLONS = 300 GALLONS

2000-GALLON MINIMUM TANK SIZE PER 310 CMR 15.260

TOTAL STORAGE: 2,500 GALLONS > 2,000 GALLONS



TIGHT TANK TYPICAL DETAIL

THE REQUIRED BUOYANCY CALCULATIONS IN ACCORDANCE WITH TITLE 5 ARE BELOW:

ASSUMPTIONS/INITIAL INFORMATION:

GROUNDWATER AT ELEVATION 110 PER SHGWT
EARTH COVER DEPTH = 18 INCHES

WEIGHT OF EARTH = 110 PCF

WEIGHT OF WATER = 62.4 PCF

OUTER TANK DIMENSIONS (L X W X H) = (15' X 7' X 6.25')

INNER TANK DIMENSIONS (L X W X H) = (14' X 6' X 5.25')

WEIGHT OF TANK (2,500-GALLON TANK EMPTY PER MANUFACTURER) = 31,800 LBS

BUOYANCY CALCULATION

USING OUTER TANK DIMENSIONS

WEIGHT OF EARTH ON TANK = (L X W X EARTH COVER) * (WEIGHT OF EARTH)
= (15' X 7' X 1.5') * (110 PCF)
= 17,280 LBS

WEIGHT OF TANK + WEIGHT OF EARTH ON TANK = 49,080 LBS.

HYDROSTATIC PRESSURE = (L X W X SHGW HEIGHT) * (WEIGHT OF WATER)
= (15' X 7' X 1.5') * (62.4 PCF)
= 9,828 LBS

HYDROSTATIC PRESSURE =9,828 LBS < 66,450 LBS
<= WEIGHT OF TANK + WEIGHT OF EARTH (OK)

THE ALARM HEIGHT WAS SET AT THE VOLUME AT WHICH THE TANK WILL CONTAIN 2,000 GALLONS OF WASTEWATER AS CALCULATED BELOW:

ALARM HEIGHT

USING INNER TANK DIMENSIONS

VOLUME BELOW ALARM = 2,000 GALLONS OR 267.361 CF = (L X W X ALARM HEIGHT)

ALARM HEIGHT = 267.361 CF/(L X W)
= 267.361 CF/(14' X 6')

ALARM HEIGHT = 3.18 FEET

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HYANNISPORT - SIMMONS POND SEWER PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER SUPPLY DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

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APPENDIX C

PUMP TEST PROPOSAL AND APPROVAL

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

July 16, 2024

Hans Keijser
Hyannis Water System
47 Old Yarmouth Road
Hyannis, MA 02601

RE: BARNSTABLE—Public Water Supply
Hyannis Water System
PWS ID #4020004
Replacement Well Pumping Test Proposal-
Well 03G (Hyannisport Well) and
Well 06G (Simmons Pond Well)

Dear Mr. Keijser:

Attached please find the Massachusetts Department of Environmental Protection's (the "Department") review of the pumping test proposal for the installation and testing of proposed replacement sources at the Hyannis Water System's Hyannisport Well (03G) and Simmons Pond Well (Well 06G), located off of Smith Street in Barnstable, MA.

The signature on this cover letter indicates formal issuance of the attached document. If you have any questions concerning this document, please contact Michelle Regon at (857) 207-0796 or via email at michelle.regon@mass.gov.

Sincerely,

Jim McLaughlin, Chief
Drinking Water Program
Bureau of Water Resources

JM/MR
Y:\DWP Archive\SERO\Barnstable-4020004-System Modifications-2024-07-16
ec:
Hans Keijser, Town of Hyannis- hans.keijser@town.barntable.ma.us
McKenna Roberts, Kleinfelder- MRoberts@kleinfelder.com
Tyler Bernier, Kleinfelder-TBernier@kleinfelder.com
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Town of Barnstable-BOH: health@town.barnstable.ma.us

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Town of Barnstable
Hyannis Water System
PWS ID #4020004
Replacement Well Pumping Test Proposal-
Well 03G (Hyannisport Well) and Well 06G (Simmons Pond Well)

The Massachusetts Department of Environmental Protection (the "Department") received a replacement well pumping test proposal application on May 8, 2024, for the installation and testing of the proposed replacement sources for Wells 4020004-03G (Hyannisport Well) and Well 4020004-06G (Simmons Pond Well) located off of Smith Street in Barnstable, Massachusetts. The pumping test proposal and supporting materials were prepared and submitted on behalf of the Hyannis Water System ("the PWS") by its consultant Kleinfelder, over the signature of Ms. Kirsten Ryan, Registered Professional Geologist. The proposed replacement sources will be located approximately 125 feet southwest of the existing Well 03G and 150 feet northeast of existing Well 06G. The proposed replacement sources will be tested at a withdrawal rate of 500 Gallons Per Minutes (GPM) for the replacement for Well 03G and 700GPM at the replacement of Well 06G. It is proposed that the wells would achieve 0.72 Millon Gallons per Day (MGD) and 1.01MGD respectively, for production rates, which matches the approved pumping rates of the existing wells.

BACKGROUND

The PWS requires replacement sources to add to the capacity, redundancy, and flexibility of the distribution system. The existing Hyannisport Well (03G) and the Simmons Pond Well (06G) have declined in capacity over 20% since their activation in 1975, despite frequent rehabilitation attempts. The existing well's close proximity to wetlands will contribute to continued well screen fouling. The PWS seeks to construct proposed replacement production wells and will test for capacity and water quality. The replacement well regulations state that a well must be within 50 feet of the existing well but can be up to 250 FT from the original well depending on other circumstances, such as relocating away from a wetland. A land use survey was included in this pumping test proposal.

REPLACEMENT SOURCES- TEST WELL DESIGN, CONSTRUCTION, DEVELOPMENT

HYANNISPORT WELL REPLACEMENT: TEST WELL HP-02B

A 2.5-inch diameter PVC exploratory test well (HP-02B) was installed at the site near the Hyannisport Well, developed, and tested for preliminary water quality and quantity measurements. The exploratory test well boring encountered the bottom of the saturated thickness at 84 FT below land surface ("BLS"). The exploratory test well was constructed with 5 feet of wire wound stainless steel screen across an interval of 65-70 FT BLS and the observation well 2 feet from the HP-02B was constructed with 5 feet of screen across 65-70 FT BLS (HP-02B-OW). During development of HP-02B, exploratory test well, a drawdown of 3.63 feet at 72 GPM was observed in HP-02B-OW observation well, corresponding to a specific capacity of 20GPM/FT. A natural gravel was utilized during construction of the exploratory test well, in the annular filter pack.

SIMMONS POND WELL REPLACEMENT: TEST WELL SP-03A

A 2.5-inch diameter PVC exploratory test well (SP-03A) was installed at the site near to the Simmons Pond Well, developed, and tested for preliminary water quality and quantity measurements. The exploratory test well boring encountered the bottom of the saturated thickness at 80 FT BLS. The exploratory test well was constructed with 5 feet of wire wound stainless steel screen across an interval of 70-75 FT BLS and the observation well 2 feet from the SP-03A was constructed with 5 feet of screen across 70-75 FT BLS (SP-03A-OW). During development of SP-03A, exploratory test well, a drawdown of 2.31 feet at 52 GPM was observed in SP-03A-OW observation well,

corresponding to a specific capacity of 23GPM/FT. A natural gravel was utilized during construction of the exploratory test well, in the annular filter pack.

The proposed final replacement production wells will be constructed as 12-inch diameter cased well bores within 5 feet of their respective test well. Each well will be constructed with a gravel filter pack in the annulus and a screened interval of about 5 feet with an anticipated depth of 70-80 feet BLS. The stainless-steel wire wrapped screen size will be determined during drilling the proposed replacement production wells.

Well Construction Comparison

WELL NAME	WELL DIAMETER (IN)	WELL DEPTH (FT)	SCREEN INTERVAL (DEPTH)
Existing Well 03G	24	75	UNK
HP-02B	2.25	84	65-70
HP-02B-OW	2.25	70	65-70
Existing Well 06G	18	75	UNK
SP-03A	2.25	80	70-75
SP-03A-OW	2.25	75	70-75

ZONE I

HYANNISPORT WELL REPLACEMENT: TEST WELL HP-02B

The existing Well 03G and the proposed replacement source (HP-02B) are both not compliant with current Zone I requirements. The PWS does not own nor control the entirety of the ZONE I's. 55% of the 400ft radius zone of protection for the existing well is currently conforming. For the proposed replacement source (HP-02B) the percentage of conformance of the Zone I is 70%. The Department's Guidelines require replacement well Zone I's to be more conforming than the existing well's Zone I. The non-compliant section of the Zone I is across the bottom 1/3 of the protective radius. There are 10 private properties, 2 roadways and a section of a golf course. All the area inside of the Zone I, apart from the private property, is forested and not developed. The proposed replacement Zone I is further northeast of the existing well, which decreases the number and amount of private property, and also excludes the golf course from the proposed protective radius. The PWS is pursuing a conservation easement agreement on the private landowner's property deed. There is no identified contamination in the proposed Zone I. An updated conservation easement will be required to be recorded on all private property owner's deeds for this well specifically, even if there is already an easement recorded for Well 03G.

SIMMONS POND WELL REPLACEMENT: TEST WELL SP-03A

The proposed new source well (SP-03A) site is compliant with current Zone I requirements. The PWS owns and controls the land in the 400 ft radius protection zone. The PWS is following an Aquifer Protection Zoning by-law that meets the requirements of 310 CMR 22.21 and was drafted following the MassDEP Model Aquifer Protection By-law. There are no contamination or land use concerns in the Zone I.

ZONE II

The proposed replacement sources are located 125 and 150 feet respectively from the existing wells, constructed into the same hydrostratographic unit and will operate at the approved capacity of existing wells. The existing Zone II boundary will remain unchanged once the proposed replacement wells are brought online. All existing wellhead protections in place for existing 03G and 06G will apply to the proposed replacement sources.

PROPOSED PUMPING TEST

Two separate 48-Hour pumping tests will be conducted at anticipated withdrawal rates of 500 Gallons Per Minute (GPM) for the replacement for Well 03G and 701GPM at the replacement of Well 06G. It is proposed that the wells would achieve 0.72 Millon Gallons per Day (MGD) and 1.01MGD respectively, for production rates, which is the approved pumping rate of the existing wells they are replacing.

A submersible pump will be utilized for the pumping test. Based on the Pumping Test Proposal, the location for the discharged water is dependent on the Barnstable Conservation Commission. The plan is to have the discharge directed about 200 feet to southwest down gradient of the proposed replacement sources; if that's not allowable then the discharge will be 400 feet to the east and flow to land surface. Flow measurements for each of the pumping tests will be made using a totalizing flowmeter. During the pumping tests, water levels will be recorded in the pumping well, in the existing Well 03G and Well 06G, and in the observation wells (HP-02B-OW, SP-03A-OW respectively). Since the proposal is not requesting to increase the approved pumping rate of either replacement wells from that of the original wells, there is no requirement to monitor the surrounding wetlands or surface water bodies as the amount of stress on the aquifer from the proposed replacement well source will be the same as the existing Well 03G and Well 06G production stress.

WATER QUALITY SAMPLING

During the proposed replacement sources pumping tests, temperature, pH, and specific conductance will be measured in the field one hour after startup of the test, at the midpoint, and just prior to shutdown of the test. Water quality testing parameters for this 48-Hour test can be found in Appendix A of the Department's *Guidelines and Policies for Public Water Systems*. Water quality samples for laboratory analysis will be collected for secondary contaminants one hour after startup of the test, at the midpoint, and just prior to shutdown of the test. Samples for volatile organic compounds (EPA Method 524.2) and Per- and Polyfluoroalkyl Substances (PFAS) will also be collected at the end of the test. Samples will be submitted to a Department certified laboratory under a chain of custody for analysis.

Preliminary water quality testing showed a high concentration of manganese, a low pH and high PFAS concentrations, the remainder of the constituents tested were under the respective maximum contaminant level (MCL) or secondary maximum contaminant level (SMCL).

Raw water from the existing Simmons Pond Well (06G) and Hyannisport Well (03G) is disinfected (in pre) and then transmitted approximately 2,300 feet north to the Straightway Treatment Plant where it goes through four (non-winterized) GAC contactor vessels for PFAS removal, receives disinfection (in post) and then blends in Straightway baffled tank to receive the contact time required for 4-log disinfection. The replacement wells will receive the same treatment as the existing wells.

Preliminary Water Quality Results Gathered During Exploration

Well Name	**Manganese (mg/L)**	**Mn SMCL**	**pH**	**pH MCL**	**PFAS6 (ng/L)**	**PFAS6 MCL**
HP-02B	0.109	0.05	5.39	6.5-8.5	70.7	20
SP-03A	ND	0.05	5.77	6.5-8.5	94.5	20

PER- and POLYFLUOROALKYL SUBSTANCES

On October 2, 2020, the Department published final regulations establishing a drinking water standard, or a Maximum Contaminant Level (MCL), for the sum of six per- and polyfluoroalkyl substances (PFAS). The MCL

is 20 parts per trillion (ppt) for what the regulations call PFAS6, or the sum of six PFAS compounds: perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorohexane sulfonic acid (PFHxS), perfluorononanoic acid (PFNA), perfluoroheptanoic acid (PFHpA), and perfluorodecanoic acid (PFDA). PFAS Drinking Water Regulations require all public water supplies to collect baseline PFAS samples and take other actions if results exceed the MCL. For information and technical support documents see: https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas#health-advisories-and-downloadable-fact-sheets-.

On April 10, 2024, the United States Environmental Protection Agency (EPA) issued National Primary Drinking Water Regulations (NPDWR) for Per- and Polyfluoroalkyl Substances (PFAS) establishing Maximum Contaminant Levels (MCLs) for six PFAS. The EPA regulations limit PFAS levels in Community (COM) and Non-Transient Non-Community (NTNC) public drinking water sources at levels lower than, and compounds different from, the Department's current requirements. States are required to establish regulations that are no less stringent than the federal standards within 2 years, with the possibility of an extension of up to 2 years. The current Massachusetts regulations, described above, will be revised to reflect the federal standards. In addition, the federal MCLs cover two additional PFAS (PFBS and GenX) that are not included in the current Massachusetts PFAS6 MCL and will need to be added to the Department's regulations. The Department's process to update its standards will include opportunities to review proposed amendments, provide written comment, and participate in public hearings.

Treatment will be required for pH adjustment, PFAS6, (and likely iron and manganese in the near future) prior to the wells being activated.

GWUDI

SP-03A is the proposed replacement well that is the closest to a surface water feature, 186 feet from Simmons Pond. The well is to be constructed with a sanitary seal. The proposed location, greater than 150 feet from surface water, and construction meet the exemption criteria for Groundwater Under Direct Influence of Surface Water (GWUDI). The proposed replacement sources will not be subject to Microparticulate Analysis testing (MPA) or the Surface Water Treatment Rule (SWTR).

CONCLUSION

Following the completion of the pumping tests, a source final report, shall be submitted to the Department. The report shall include a qualitative and quantitative evaluation of the data gathered during the pumping tests, and a surveyed site plan showing the locations and elevations of the proposed replacement sources with a clear depiction of the Zone 1 for each well. Specifications for construction of the finished wells may be submitted electronically. The Department is currently utilizing the ePlace portal to facilitate online submission of well permitting documents. Please contact Department staff prior to submitting the pumping test report for instructions on how to submit the materials should you need assistance. Please note, a proposed replacement sources will require an amendment to the existing Water Management Act (WMA) permit.

Either following or simultaneously with the source final report, the PWS will need to submit an application and additional information for permit category BRP WS 20 – Approval to Construct a Source 70 Gallons per Minute or Greater. The application package shall include: a surveyed site plan showing the locations and elevations of the wells and the extent of the Zone I for each well; profile of each well; design plans and specifications for construction of the finished wells, any associated pumping station upgrades, and conveyance to a water treatment plant.

The proposed replacement sources may not be used for public water supply until the Department has granted its written final approval to do so. The Department will issue a public water supply source identification number upon final approval.

Please be reminded that you are responsible to comply with all other Federal, State, or local laws, regulations and/or ordinances applicable to this project.

May 8, 2024

Jim McLaughlin, P.E.
Drinking Water Program Chief
MassDEP-SERO
20 Riverside Drive
Lakeville, MA 02347

SUBJECT: Replacement Well Proposal, Simmons Pond and Hyannisport Wells
Hyannis Water System, Town of Barnstable
PWSID: 4020004-06G and 4020004-03G, respectively
Kleinfelder Project No: 24003062.001A

Dear Mr. McLaughlin,

On behalf of the Town of Barnstable's Hyannis Water System (HWS), Kleinfelder is submitting the following plan to replace the existing Simmons Pond Well (PWS ID #4020004-06G) and Hyannisport Well (PWS ID #4020004-03G) for your review and approval.

The existing wells are both located off Smith Street in Barnstable, Massachusetts (Figure 1). HWS is proposing to replace both gravel-packed wells to restore lost capacity seen in recent years due to the incrustation of the well screens as well as the plugging of the aquifer in close proximity to the screen. Furthermore, the wells will be relocated outside of the 500-yr flood plain to reduce the risk of flooding. This letter has been prepared in accordance with the MassDEP Guidelines for Replacement Well Proposals to define the project scope for replacing the Simmons Pond and Hyannisport Wells.

Existing Conditions and Proposed Improvements

As seen in Figure 1, both wells are located in a wooded area west of Simmons Pond and within the 500-year floodplain, putting them at risk of flooding as a result of rainfall and impacts of climate-related sea level rise. Furthermore, the current location of the Simmons Pond Well is directly on the edge of bordering vegetated wetlands.

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The Hyannisport Well is a 75-foot-deep gravel packed well located within the Hyannisport Water Treatment Facility. The well was originally installed in 1975 as a 24-inch diameter well and was relined as a 9-inch diameter well in 2013. The well has an approved maximum daily withdrawal of 0.72 MGD. However, in recent years the well has required frequent redevelopment which has failed to restore the well to its full permitted capacity. The well has been redeveloped at least five times since 2010. The most recent redevelopment in December 2022 used muriatic acid, Pantonite, and mechanical pumping and surging. Following the latest redevelopment, capacity was only restored to approximately 0.58 MGD.

The Simmons Pond Well is located approximately 650 feet north of the Hyannisport Water Treatment Facility. It is an 18-inch diameter, 75-foot-deep gravel packed well originally installed in 1975. The well has an approved maximum daily withdrawal of 1.01 MGD. However, HWS has been unable to restore the well to its full permitted capacity through cleaning and redevelopment. The most recent redevelopment in 2019 used muriatic acid, Pantonite, and mechanical pumping and surging. Following redevelopment in 2019 the well capacity was only restored to approximately 0.72 MGD. Appendix A contains documentation of the existing wells' infrastructure and maintenance histories.

Raw water from the Simmons Pond and Hyannisport Wells is treated with C5, C9, and sodium hydroxide and then transmitted approximately 2,300 feet north to the Straightway site where it goes through four (non-winterized) GAC contactor vessels, receives disinfection through sodium hypochlorite, and blends in the Straightway baffled tank to receive the contact time (CT) required for 4-log disinfection. Piloting raw water quality results from both wells are shown below in Table 1.

Table 1: Hyannisport and Simmons Pond Well Raw Water Quality (from Piloting)

Contaminant	Unit	Level of Concern	Hyannisport	Simmons Pond
PFAS-6	ng/L	20 [1]	**45**	**79 - 80**
PFOA	*ng/L*	*4* [2]	***69***	***13***
PFOS	*ng/L*	*4* [2]	***16***	***34***
Hazard Index	---	*1* [2,3]	***2.4***	***3.2***
1,4-dioxane	ug/L	0.3 [4]	<0.30	0.15 - **0.40**
Iron	mg/L	0.3 [5]	<0.30	<0.30
Manganese	mg/L	0.05 [5]	**0.126**	**0.129 - 0.148**

1 – MassDEP PFAS-6 MCL for combination of: PFOA, PFOS, PFHxS, PFNA, PFHpA, AND PFDA
2 – EPA PFAS Primary Drinking Water Standard
3 – EPA PFAS Hazards Index (HI) is a calculated mixture of PFNA, PFHxS, PFBA, and GenX.
4- ORSG = MA Office of Research & Standards Guideline
5- SMCL = Secondary Maximum Contaminant Level

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HWS is currently designing a new Water Treatment Facility (WTF) at the Straightway site which will include corrosion control, pH adjustment, greensand filtration for iron and manganese removal, UV-AOP for 1,4-dioxane treatment, and GAC for PFAS treatment. The replacement wells will be constructed under the same contract as the new water treatment facility. Raw water for the replacement wells, along with the existing Straightway Wells 1 and 2 will all be treated centrally at the new Straightway WTF.

Hydrogeology

The U.S. Geologic Survey surficial geologic map of the Hyannis Quadrangle identifies the area as Barnstable outwash-plain deposits. Barnstable outwash-plain deposits are gravelly sand with some small pebbles and boulders up to 1 foot in diameter. Outwash plain deposits were spread across Cape Cod by the glacial meltwater streams as ice receded from the region.

Exploratory Drilling

Kleinfelder contracted with Maher Services, Inc. to perform exploratory drilling. On January 31, 2024, Maher Services mobilized a Geoprobe direct push rig (Model 7822DT) to the Hyannisport Well and Simmons Pond Well. Maher used the Geoprobe direct push rig to advance each boring with a 3.0-inch inside diameter casing and collect continuous soil samples from 2.25-inch diameter core sleeves in 5-foot coring runs. In general, the borings showed that the site stratigraphy consists of silty sand to a depth of approximately 35 feet below grade (B.G.), followed by a layer of dense grey clay occurring between 35 and 50 feet B.G., which overlies tan fine to coarse sand. The static water level was observed to be approximately 10-13 feet B.G. at the time of drilling.

Six (6) borings were completed, and a total of three (3) test wells and two (2) observation wells were constructed. Figure 2 provides a Site Plan identifying the boring and well locations. HP-01 was drilled to a depth of 60 feet B.G., but with poor soil sample recovery. Therefore, HP-01 was redrilled but hit refusal in dense gray clay 47 feet B.G., and the location was abandoned without test well construction. HP-02A hit refusal in dense gray clay at approximately 40 feet B.G., so the test boring was abandoned and relocated approximately 20 feet southwest to a new location, HP-02B. HP-02B was successfully drilled to a depth of 84 feet B.G., and SP-01 was advanced to a depth of 80 feet B.G. SP-02 hit refusal in cobbles 47 feet B.G. and was abandoned, and SP-03A was successfully drilled to a depth of 80 feet B.G.

Based on the favorable soil samples recovered, test wells were constructed at locations HP-02B, SP-01, and SP-03A using 5-foot stainless steel well screens and 2-inch PVC riser pipe. Wells were developed until they were sufficiently free of sand and color. The best ratings during well development were observed in HP-02B and SP-03A, therefore 2-foot offset observation wells were installed at each location for data collection during pump

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testing. Each well was completed with a locking protective casing. A summary of well construction details is provided in Table 2. Boring and well construction logs are included in Appendix B.

Table 2: Test and Observation Well Construction Details

Well ID	Borehole Depth (ft)	Well Diameter (in)	Screen Depth (ft B.G.)	Screen Slot Size (in)	Depth to Water (ft)	Stick Up (ft)	Water Level Below Ground Surface (ft) (Date)
HP-02B	84	2	65-70	40 SS	12.5	2.0	10.5 (2/5/24)
HP-02B-OW	70	2	65-70	50 SS	12.5	2	10.5 (2/5/24)
SP-01	80	2	70-75	50 SS	15.35	2.0	13.35 (2/8/24)
SP-03A	80	2	70-75	40 SS	12.2	2.0	10.2 (2/7/24)
SP-03A-OW	75	2	70-75	40 SS	12.2	2	10.2 (2/7/24)

SS= Stainless steel

Short Term Pumping Tests

Short-term pumping tests were performed on test wells HP-02B and SP-03A to obtain an estimate of potential well yield and preliminary water quality. The existing wells were not operated during the short-term pumping tests and have been offline since Fall 2023. Water was pumped from the test wells using a 2-inch centrifugal pump. Pumped water was piped through a temporary 4-inch diameter hose to a low area distant from the well, so that discharged water did not to interfere with observations of test well water levels. The rate of flow was estimated by measuring the time elapsed to fill a 55-gallon drum.

Drawdown was recorded in a 2-foot offset observation well located adjacent to each test well. The short-term pumping test data is included in Appendix B with results summarized in Table 3. The specific capacities observed during these limited duration tests indicate both well locations are viable for replacement well development of similar yield to the existing wells. As an additional benefit, both locations are several feet higher in elevation, above the 500-yr floodplain, which provides added protection against future flooding, storm surge, and rising sea levels due to climate change.

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Table 3: Short Term Pumping Test Results

Test Well ID	Date	Flow Rate (gpm)	Pumping Duration (min)	Observation Well ID	Observation Well Drawdown (ft)	Specific Capacity (gpm/ft)	Recovery (min)
HP-02B	02/14/2024	72	120	HP-02B-OW	3.63	20	93% in 15 min
SP-03A	02/14/2024	52	120	SP-03A-OW	2.31	23	89% in 15 min

Water Quality

Water samples were collected from each of the test wells at the end of the 2-hour pumping test for laboratory analytical testing. Water quality samples were collected from a sampling port located on the discharge line and analyzed by Nashoba Analytical located in Ayer, Massachusetts. Both wells were tested for routine secondary contaminants, metals, and volatile organic compounds (VOCs), as well as PFAS by Method 537.1. Water quality results are summarized in Table 4 with the laboratory reports included in Appendix C. Water quality met all Massachusetts secondary maximum contaminant levels (SMCLs) except for pH and manganese. Test results indicated that the raw water quality of the test wells was comparable to the raw water quality of the existing Simmons Pond and Hyannisport wells. As expected, the test well raw water sample results exceeded the Massachusetts MCL for PFAS6.

The HP-02B results indicated the following:

- pH was reported as 5.39 s.u., below the Massachusetts Secondary Maximum Contaminant Level (SMCL) range of 6.5 to 8.5 standard units.
- Manganese was reported at 0.109 mg/L which is above the SMCL of 0.05 mg/L.
- Nitrite was not detected.
- Nitrate was detected at levels comparable to existing well samples.
- No VOCs were detected.
- The PFAS6 concentration was 70.7 ng/L, exceeding the Massachusetts MCL of 20 ng/L

The SP-03A results indicated the following:

- pH was reported as 5.77 s.u., below the SMCL range of 6.5 to 8.5 standard units.
- Nitrite was not detected.
- Nitrate was detected at levels comparable to existing well samples.
- No VOCs were detected.
- The PFAS6 concentration was 94.5 ng/L, exceeding the Massachusetts MCL of 20 ng/L but comparable to levels in the existing Simmons Pond Well.

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Table 4: Analytical Results from Test Well Water Quality Sampling

Parameter	Units	Reporting Limit	Mass. MCL or SMCL	Existing Hyannisport Well	HP-02B	Existing Simmons Pond Well	SP-03A
Sample Date	---	---	---	6/15/21	2/14/24	4/29/21	2/14/24
pH	Std. Unit	NA	6.5-8.5[2]	**6.1**	**5.39**	6.7	**5.77**
Turbidity	NTU	0.20	1	< 1.0	ND	< 0.4	ND
Color	A.P.C.U.	5.0	15[2]	< 5.0	ND	< 2.5	ND
Odor	TON	1	3[2]	---	ND	---	ND
Alkalinity, as $CaCO_3$	mg/L	2.00	NE	6	4.2	38	8.3
Hardness, Total	mg/L	0.660	NE	36	29	70	51
Total Dissolved Solids	mg/L	10	500[2]	230	220	230	76
Chloride	mg/L	0.50	250[2]	98	98.8	81	113
Sulfate	mg/L	1.00	250[2]	15	15.0	20	17.6
Nitrite-Nitrogen	mg/L	0.050	1	---	ND	---	ND
Nitrate-Nitrogen	mg/L	0.10	10	3.8[4]	5.64	4.3	6.86
Aluminum	mg/L	0.100	0.05-0.2[2]	---	0.026	---	0.017
Calcium	mg/L	0.100	NE	8.8	8.4	19	14
Copper	mg/L	0.010	1.0[2]	---	ND	---	ND
Iron	mg/L	0.050	0.3[2]	< 0.050	0.040	0.044	0.027
Magnesium	mg/L	0.100	NE	3.3	1.9	5.3	4.0
Manganese	mg/L	0.010	0.05[2]	**0.120**	**0.109**	**0.15**	ND
Potassium	mg/L	2.50	NE	---	3.1	---	3.7
Silver	mg/L	0.007	0.10[2]	---	ND	---	ND
Zinc	mg/L	0.050	5[2]	< 0.010	ND	0.0068	ND
PFAS6	ng/L	NA	20	**45.4**	**70.7**	**79.4**	**94.5**
VOCs	µg/L	0.50	Various	---	ND	---	ND

Abbreviations: (Bolded values indicate an exceedance)
[1] Mass. Max. Contaminant Level NT = Not Tested ug/L = microgram per liter
[2] Mass. Secondary Max. Contaminant Level ND = Not Detected mg/L = milligram per liter
[3] Mass. Drinking Water Guideline NE = Not Established --- = No data available
[4] Sample from 07/10/2013
NTU = Nephelometric Turbidity Units
TON = Threshold Odor Number

Well Replacement Proposal

To recover lost yield and increase the time between well cleaning, redevelopment, and maintenance, HWS proposes replacing both the existing Simmons Pond and Hyannisport wells with new gravel-packed wells. The Town is not seeking to increase withdrawal volume from the source beyond the DEP authorized volume, and will continue to manage the sources in conformance with its Water Management Act Permit.

Two 18-inch diameter gravel packed replacement wells will be constructed at the locations of the test wells (HP-02B and SP-03A). SP-03A is located approximately 140 feet southwest of the existing Simmons Pond Well, and HP-02B is approximately 120 feet northeast of the existing Hyannisport Well. The proposed replacement wells

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will be located in the same hydrogeologic formation and will not alter existing groundwater hydraulics or Zone II boundaries.

According to MassDEP's PWS Guidelines, replacement wells must be located within 50 feet of the existing well, or up to 250 feet from the original well as long as that greater distance improves the Zone I area. The replacement well locations for Simmons Pond and Hyannisport wells are greater than 50 feet to improve the Zone I locations and move the pump stations out of the 500-year flood plain, as shown in Figure 1. This reduces the risk of flooding, thus improving water quality. Moving the wells farther from the wetlands has the additional benefit of protecting wetland habitat. Finally, installing replacement wells at higher locations protects the wells from anticipated sea level rise associated with climate change. Both the existing and proposed Zone I areas for the Simmons Pond Well are located entirely on Town owned property. The proposed Zone I for the Hyannisport Well encompasses more Town owned land than the existing Zone I area. No negative impacts are expected from the shift in Zone I areas since no new sources of incompatible land use or contamination are encompassed within the Zone I areas.

Land Use

Also included for review by MassDEP is a Land Use Plan (Figure 3) showing land uses within a ½ mile radius of the proposed well and a portion of the associated Zone II. The map is constructed with GIS data from the MassMapper database. Immediately surrounding the proposed wells are forests, ponds, and wetlands with medium and low-density residential housing. A small amount of commercial and industrial land is located the edge of the ½ mile radius for both the Simmons Pond Well and the Hyannisport Well. No sources of contaminations such as underground storage tanks or Tier Classified Sites exist within the ½ mile radius of either well. It is important to note that the proximity of existing wells to these land uses has not posed a significant or detectable threat, or deterioration to the existing wells water quality. It is therefore expected that the proposed wells, due to their proximity to the existing wells and minor shift in the Zone I, are not expected to cause significant changes to the local hydrogeological conditions.

Proposed Well Design

The proposed wells will be designed in accordance with the MassDEP Guidelines and Policies for replacement wells. The wells will be constructed in a similar manner to the existing, as depicted in Appendix A. Well screens will be constructed of stainless-steel wire wound screen, with sizing to be determined based on sieve analysis of samples obtained during production well drilling. Wells will be completed with vertical turbine pumps housed within small modular pump station buildings. Appendix D provides typical examples of vertical turbine pumps, which will be fully specified by the engineer during the next phase of the project. There is currently some pre-treatment done at the existing wellheads, whereas all treatment for new wells would be completed at the new

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WTF in accordance with the MassDEP-approved Pilot Report: iron and manganese removal by greensand, PFAS removal by GAC, 1,4-dioxane destruction by UV-AOP, disinfection, and pH adjustment.

Proposed Pumping Test

Upon completion of the test wells being re-drilled and installed as production wells, the proposed pumping test will be performed, and at a minimum will consist of the following:

- Following installation, each well will undergo a step test to determine final proposed pumping test rate.
- Ideally, the existing wells will be shut down at least 12 hours prior to the pumping test, during the pumping tests, and until the completion of water level recovery monitoring. We anticipate a total offline period of 70 to 80 hours. This work will be scheduled for a low-demand period, if possible.
- Water level transducers will be installed in nearby observations wells to measure and record water levels prior to, during, and after the pumping test at intervals in accordance with the MassDEP guidelines for pumping test performance.
- The replacement wells will be pumped to waste for 48 hours at the design flow rate to simulate normal pumping conditions. Water pumped during each test will be discharged through a sedimentation filter bag to remove fines. Erosion and sedimentation controls will be established prior to discharging to the wooded area located approximately 200-feet southeast (downgradient) of the proposed wells. (Refer to Figure 2). Coordination with the Conservation Commission will be conducted well in advance to agree on best practices for pumping discharge.
- Water quality samples will be collected immediately prior to the end of the pumping test. Each well will be sampled for the same parameters mentioned in Table 4 including all analytes required by MassDEP Guidelines and Policies for Public Water Systems.

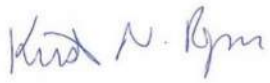
Upon evaluation of the pumping test results, additional consultation with MassDEP will take place as needed to refine the proposed relocation of the existing wells and operation scheme for the replacement wells. After activation of the proposed replacement wells, the existing wells will be decommissioned in accordance with the MassDEP Guidelines.

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If after your review of this proposed well replacement project you should have any questions, please do not hesitate to contact me at 617-498-4778 or kryan@kleinfelder.com.

Sincerely,

KLEINFELDER



Kirsten Ryan, PG (NH)
Prinicpal Hydrogeologist
Senior Project Manager

cc: Hans Keisjer, Barnstable Water Supply Division
Griffin Beaudoin, PE; Matthew Wrobel, PE; Michael Tieu, PE - Town of Barnstable DPW
Michelle Regon, PG - MassDEP
Tyler Bernier; Mark Thompson, PE - Kleinfelder
File

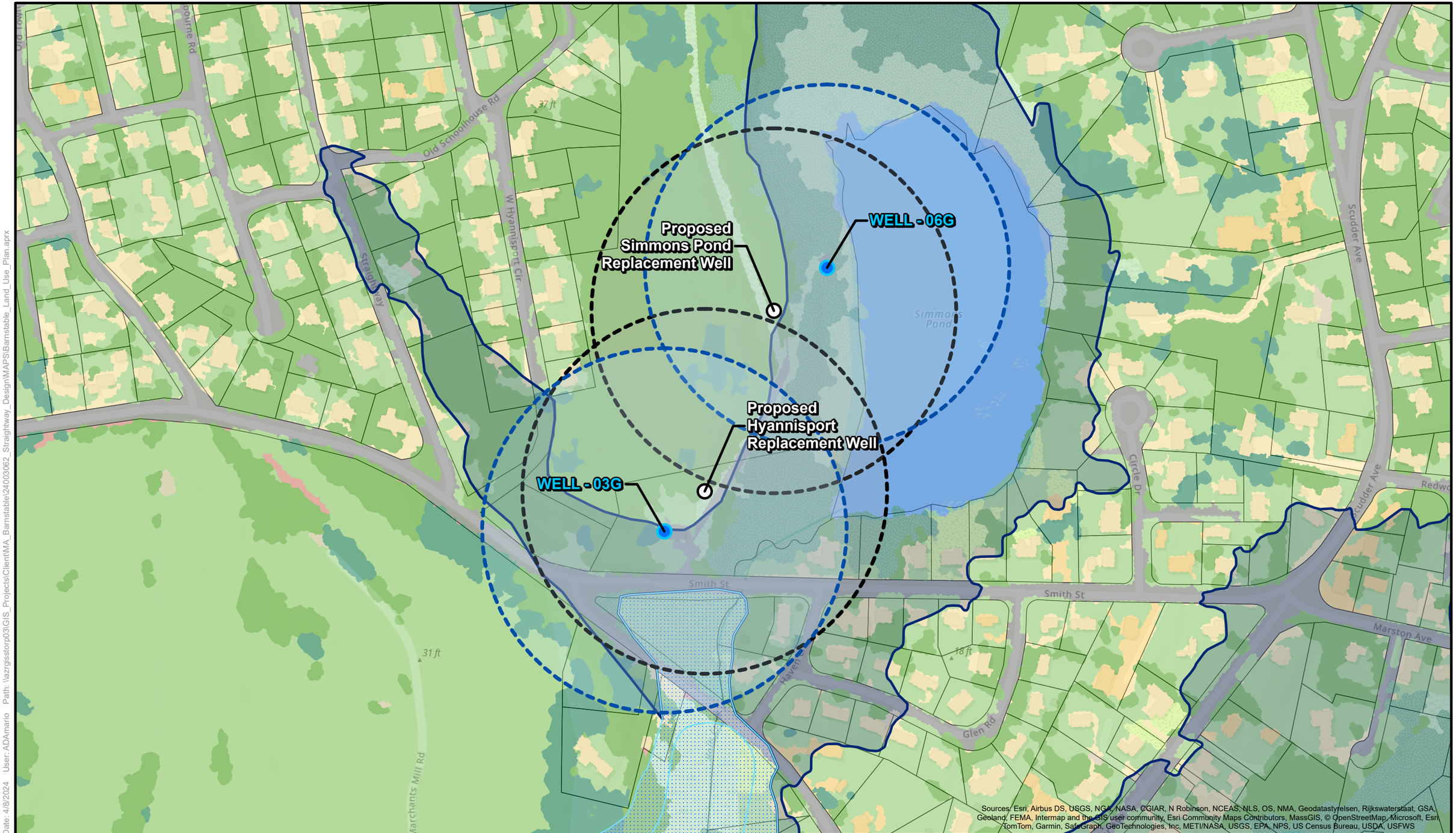
ATTACHMENTS:

Figure 1 – Existing and Proposed Zone I
Figure 2 – Site Plan
Figure 3 – Land Use within ½-mile
Attachment A – Existing Infrastructure and Maintenance Records
Attachment B – Boring logs
Attachment C – Water Quality Sampling Results
Attachment D – Specification Example for Vertical Turbine Pumps

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FIGURE 1

EXISTING AND PROPOSED ZONE I



Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Esri Community Maps Contributors, MassGIS, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS

Date: 4/8/2024 User: ADAmario Path: \\azrgistorp03\GIS_Projects\Client\MA_Barnstable\24003062_Straightway_Design\MAPS\Barnstable_Land_Use_Plan.aprx

LEGEND

- Proposed Well Location
- Well Location
- Existing Well Zone 1 (400ft)
- Proposed Well Zone 1 (400ft)
- Parcel Boundary
- 0.2% Annual Chance Flood Hazard
- 1% Annual Chance Flood Hazard

Landuse/Land Cover

- Residential - Single Family
- Residential - Multi-Family
- Commercial
- Other Impervious
- Right-of-way
- Developed Open Space
- Deciduous Forest
- Evergreen Forest
- Grassland
- Scrub/Shrub
- Bare Land
- Forested Wetland
- Non-forested Wetland
- Water
- Aquatic Bed

N

0 50 100 200

Feet

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PROJECT NO.	24003062
CREATED:	4/8/2024
CREATED BY:	ADAmario
CHECKED BY:	MRoberts
FILE NAME:	Barnstable_Land_Use_Plan.aprx

Existing and Proposed Zone I

Straightway WTF Design
Hyannis Water System
Barnstable, MA

FIGURE

1

FIGURE 2

SITE PLAN

LEGEND

- 100' WETLAND BUFFER
- 50' WETLAND BUFFER
- WETLAND BOUNDARY
- EXISTING ZONE I
- PROPOSED ZONE I
- TEMPORARY DISCHARGE PIPING
- EROSION AND SEDIMENTATION CONTROLS FOR PUMPING TESTS
- XX-## TEST WELL AND OBSERVATION WELL LOCATION
- XX-## BORING LOCATION - REFUSAL



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FIG. 2

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REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

0 150 300

SCALE: 1" = 150' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 11 x 17

HYANNISPORT & SIMMONS POND REPLACEMENT WELL PROPOSAL

HYANNIS WATER SYSTEM
BARNSTABLE DPW – WATER DIVISION

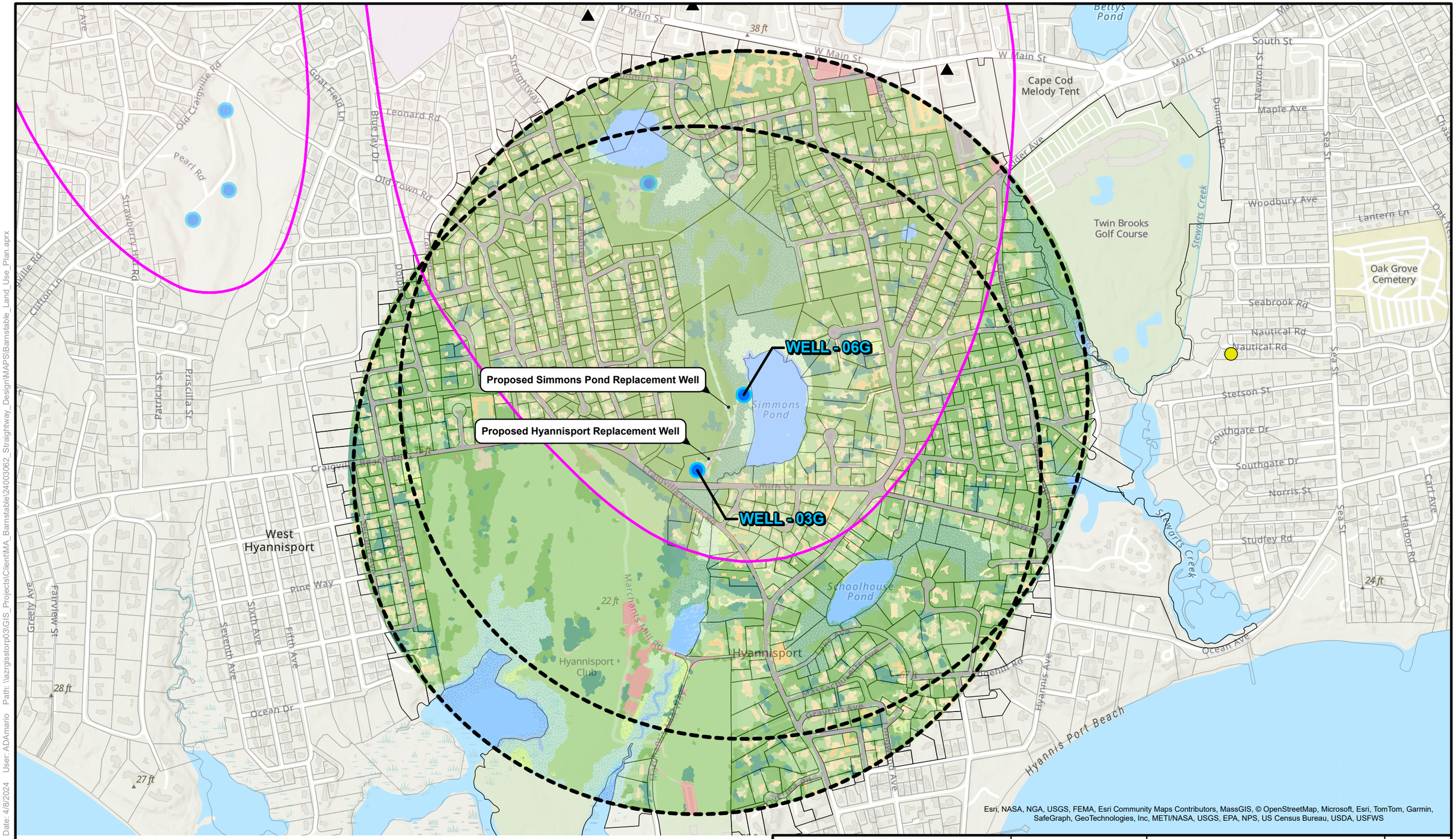
PROJECT NO.	24003062
ISSUE DATE	04/08/2024
CURRENT REVISION	4
DESIGNED BY	KR
DRAWN BY	MR
CHECKED BY	TB
APPROVED BY	KR

SHEET 1 of 1

FILENAME=G:_clients\Barnstable MA\24003062.001A - W-Barnstable MA - Straightway Design\04 - Design Phase\05 - Well Replacement\DWGs\Well_Memo_Fig_2.dwg PLOT DATE=5/7/2024 1:03:14 PM USER=MCKENNA ROBERTS

FIGURE 3

LAND USE WITHIN ½-MILE OF THE WELLFIELD



Date: 4/8/2024 User: ADAmario Path: \\azrgisstorp03\GIS_Projects\Client\MA_Barnstable\24003062_Straightway_Design\MAPS\Barnstable_Land_Use_Plan.aprx

LEGEND

- Well Location
- Underground Storage Tank
- Tier Classified Chapter 21E Site
- Zone II Wellhead Protection Area
- Landfills (Not within extent)
- Dumping Grounds (Not within extent)
- Well Location 1/2 Mile Buffer
- Parcel Boundary

Landuse/Land Cover

- Residential - Single Family
- Residential - Multi-Family
- Commercial
- Industrial
- Other Impervious
- Right-of-way
- Developed Open Space
- Deciduous Forest
- Evergreen Forest
- Grassland
- Scrub/Shrub
- Bare Land
- Forested Wetland
- Non-forested Wetland
- Saltwater Wetland
- Water
- Unconsolidated Shore
- Aquatic Bed

0 300 600 1,200

Feet

N

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PROJECT NO.	24003062
CREATED:	4/8/2024
CREATED BY:	ADAmario
CHECKED BY:	MRoberts
FILE NAME:	Barnstable_Land_Use_Plan.aprx

Land Use within 1/2 Mile of Proposed Replacement Wells

Straightway WTF Design
Hyannis Water System
Barnstable, MA

FIGURE

3

ATTACHMENT A

EXISTING INFRASTRUCTURE AND MAINTENANCE RECORDS

MAHER services ™

71 Concord Street
North Reading, MA 01864
Tel: 978-664-WELL (9355) Fax: 978-664-9356
www.maherserv.com

12/09/2022

Kevin Sampson
Veolia Barnstable Hyannis Water Systems
400 Beaver Dam Rd
Plymouth, MA 02360
kevin.sampson@veolia.com
Phone - (508) 775-0063

Dear Kevin,

RE: Hyannisport Redevelopment
Hyannis, MA

Hyannis Port
Well Diameter – 9”
Well Depth – 76.2’
Pump – Goulds 7CHC, 2 Stage, S/N 618440, (500 GPM @ 150’ TDH)
Motor – Franklin 30 HP, 460 V, 3 phase submersible, S/N 20C19-02-00068A
Pump Intake – 46’
Still well Depth – 43’

The Goulds 7 CHC 2 stage pump (500 GPM @ 150’ TDH) and equipment were steam cleaned, disassembled and inspected. The pump was slightly plugged but appeared to be in good condition and was reused. The Franklin 30 HP was in good condition and was reused.

The specific capacity before redevelopment was 19.3 GPM/ft @ 295 GPM as rated with our pump. After redevelopment the specific capacity is 21.8 GPM/ft @ 400 GPM as rated with your pump. The well was redeveloped with muriatic acid, Pantonite, chlorine and mechanical pumping and surging.

The video inspection shows that the screen is clean and appears to be in good condition.

Historical Specific Capacity

Nov	2022	21.86	GPM/ft	@ 400 GPM – after redevelopment
Nov	2022	19.3	GPM/ft	@ 295 GPM - before redevelopment
Sept	2022	20.27	GPM/ft	@ 300 GPM – flow test
Aug	2021	23.44	GPM/ft	@ 300 GPM – flow test
Dec	2020	19.54	GPM/ft	@ 426 GPM – after redevelopment
Dec	2020	19.2	GPM/ft	@ 285 GPM – before redevelopment
Jan	2018	20.21	GPM/ft	@ 470 GPM – after redevelopment
Jan	2018	18.81	GPM/ft	@ 271 GPM – before redevelopment
Sept	2017	22.7	GPM/ft	@ 300 GPM
Sept	2016	20.9	GPM/ft	@ 300 GPM
Feb	2016	19.8	GPM/ft	@ 495 GPM – After Redevelopment

Oct	2015	21.7	GPM/ft	@ 300 GPM
Nov	2014	20	GPM/ft	@ 450 GPM
Nov	2013	20.3	GPM/ft	@ 422 GPM
June	2013	19.5	GPM/ft	@ 498 GPM – After Reline
Dec	2012	No Test, pump was removed for relining		
Nov.	2011	23.68	GPM/ft	@ 546 GPM
Dec	2010	22.5	GPM/ft	@ 575 GPM – after redevelopment and installation of packer
Oct.	2010	15.7	GPM/ft	@ 514 GPM
Oct.	2009	18.4	GPM/ft	@ 514 GPM
Mar.	2006	19.9	GPM/ft	@ 517 GPM
Mar.	2003	19	GPM/ft	@ 508 GPM
Jan.	2001	17.5	GPM/ft	@ 508 GPM
Dec.	1999	17.6	" "	@ 508 GPM
Feb.	1998	17.9	" "	@ 520 GPM
Dec.	1991	17.9	" "	@ 514 GPM
	1989	17+	" "	
	1982	17+	" "	
	1979	19	" "	
	1978	23	" "	
	1977	22.8	" "	
	1976	22.6	" "	
	1975	22.9	" "	
Originally		18	" "	Based on Sustained Pumping

If you need further information please contact us.

Sincerely,
MAHER SERVICES, INC.

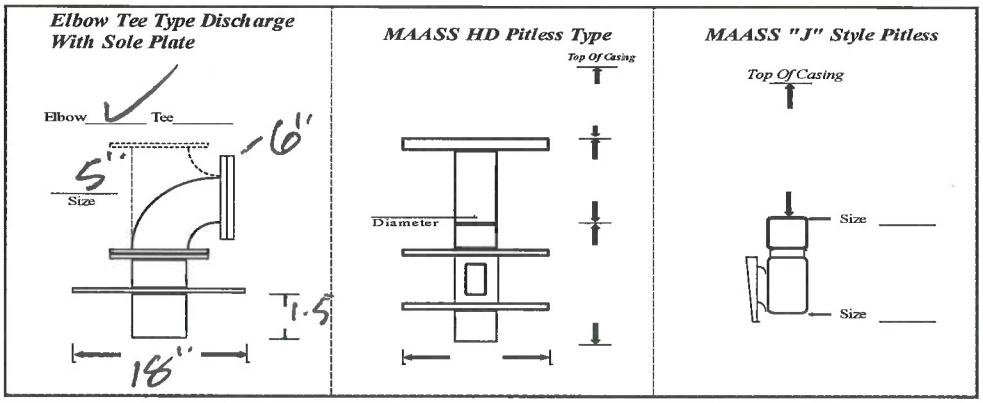
Andrew Ciccariello
aciccariello@maherserv.com

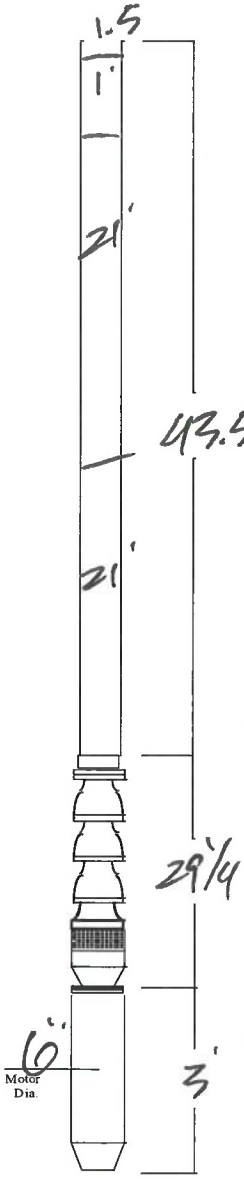
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Maher Services, Inc.
71 Concord Street
North Reading, MA 01864
Tel: 978-664-9355
Fax: 978-664-9356

Submersible Pump Installation/ Removal Report

Job Name: HYANNIS WATER Job Number: 46018 Date: 11-30-22
Well Name: HYANNIS PORT Crew: D. MEARS / Z. MAHER
Well Dia.: 8" Well Depth: 76.2 Screen: 6" Telescope SWL: 10-8
From Where: Sodeplate 25 From Where: HEAD





EQUIPMENT AND DESCRIPTION

Discharge Head: New ☐ Existing ☒
Elbow / Tee: 5" ELBOW 6" DISCHARGE
Pitless: O-Ring: New ☐ Existing ☐
Sanitary Seal:
In Shop: On Site:

Column: New ☐ Existing ☒
2-5"x21'
1-5"x1' (NEW)
In Shop: On Site:

Check Valve: New ☐ Existing ☐
N/A Holding? (Y/N):
In Shop: On Site:

Pump: New ☐ Existing ☒
Make: GOULDS Model: 7CHC Stages: 2
Diameter: 7" S/N: ME 6184 40
In Shop: On Site:

Motor: New ☐ Existing ☒
Make: FRANKLIN HP: 30 Volts: 460 Amps: 39.5
RPM: 3450 Hz: 60 PH: 3 S/N: 20C1902 000 68A
How did the motor Meg?: GOOD
Cable (Size/ Length): #6 New ☐ Existing ☒
Shroud: N/A New ☐ Existing ☐
Transducer Set At: 44.3 New ☐ Existing ☒
Comments:

Maher Services, Inc.
71 Concord Street
North Reading, MA 01864
Ph 978-664-9355
Fax 978-664-9356

Well Pump Performance Test

Pump Installation and Performance Test Data

Owner: **Hyannis Water**

Well No.: Hyannisport Location: 132 Smith St.

Job No.: 4618 Lon: 41.639134 Lat: -70.308338

Maher Representative: Z.Maher / B. Mearls

Pump / Motor Information

Pump Mfg. and Model / Nameplate Data:	Goulds 7 CHC, 2 Stage (4.69)
Pump Serial Number:	ME618440
Motor Mfg. and Model / Nameplate Data:	Franklin 460V, 39.5A
Motor HP:	30 HP
Motor Serial Number:	13C19-20-06206A
Other - Specify: Check Valve	

2022 Performance Test - After

Date: 11/30/221		Shut off	Point 1	Full Flow
GPM	Mag Meter	**0**	**200**	**400**
	Station Meter	**0**	**195**	**389**
Pressure on pump side(psi)		90	89	68
Water level		10.80	19.60	29.10
Draw Down			8.80	18.30
Height of Guage from WL measure		1.0	feet	
Total Dynamic Head		**220**	**226**	**187**
Amperage	Leg 1 red	23 / 462	25 / 462	33 / 460
	Leg 2 yellow	22 / 464	24 / 463	32 / 462
	Leg 3 black	23 / 464	25 / 463	33 / 462
	Specific Capacity:	21.86	GPM/ft @	400 GPM

2022 Performance Test - PM

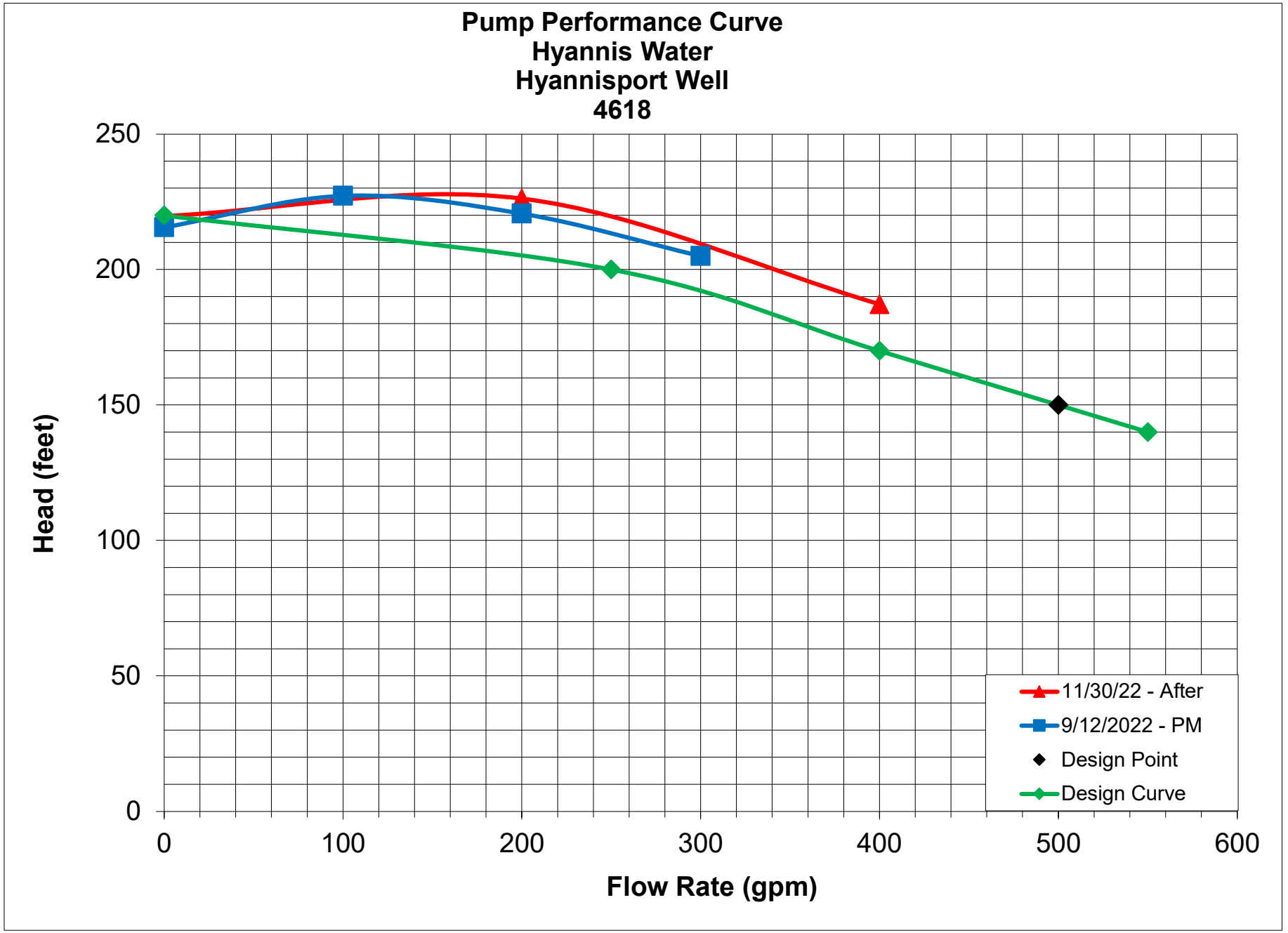
Date: 9/12/2022		Shut off	Point 1	Point 2	Full Flow
GPM	Mag Meter	**0**	**100**	**200**	**300**
	Station Meter	**0**	**103**	**205**	**303**
Pressure on pump side(psi)		87	90	85	76
Water level		13.60	18.30	23.30	28.40
Draw Down			4.70	9.70	14.80
Height of Guage from WL measure		1.0	feet		
Total Dynamic Head		**216**	**227**	**221**	**205**
Amperage	Leg 1 red	23 / 463	25 / 463	28 / 464	31 / 463
	Leg 2 yellow	22 / 464	24 / 465	26 / 464	29 / 465
	Leg 3 black	23 / 463	25 / 463	28 / 464	31 / 463
	Specific Capacity:	20.27	GPM/ft @	300	GPM

2021 Performance Test

Date: 8/12/2021		Shut off	Point 1	Point 2	Full Flow
GPM	Mag Meter	**0**	**100**	**200**	**300**
	Station Meter	**0**	**109**	**206**	**300**
Pressure on pump side(psi)		90	95	85	80
Water level		15.10	18.60	23.00	27.90
Draw Down			3.50	7.90	12.80
Height of Guage from WL measure		1.0	feet		
Total Dynamic Head		**224**	**239**	**220**	**214**
Amperage	Leg 1 red	24 / 490	26 / 488	28 / 488	32 / 488
	Leg 2 yellow	25 / 488	26 / 486	27 / 486	32 / 486
	Leg 3 black	23 / 488	25 / 488	27 / 488	31 / 488
	Specific Capacity:	23.44	GPM/ft @	300	GPM

Manufacturer Data

Design Point			Pump Design Data Points		
500	Pumping Rate (gpm)	0	250	400	550
150	Predicted head (feet)	220	200	170	140


Pump Performance Curve
Hyannis Water
Hyannisport Well
4618
Head (feet)
250
200
150
100
50
0
0
100
200
300
400
500
600
Flow Rate (gpm)
11/30/22 - After
9/12/2022 - PM
Design Point
Design Curve

MAHER services ™

71 Concord Street
North Reading, MA 01864
Tel: 978-664-WELL (9355) Fax: 978-664-9356
www.maherserv.com

2/19/2019

Mike Leahy
SUEZ C/O Barnstable Hyannis Water Systems
PO Box 229
Harrington Park, NJ 07640
Fax: (201) 784-7083
michael.leahy@suez-na.com
Phone - (508) 775-0063
Fax - (508) 790-1313

RE: Simmons Pond
Hyannis, MA

Dear Mike,

Simmons Pond
Well – 18" x 72' w/ 15' Telescope screen
Pump – Goulds 11 CLC 5 stage 1800 RPM, 600 GPM @ 265' TDH – New 11/2016
Motor – U.S. 50 HP, 460 V, RUSI Premium efficient – Installed New 2/2019
Pump Intake – 56.5'

The specific capacity before redevelopment was 13.3 GPM/ft @ 388 GPM. After redevelopment the specific capacity is 16.5 GPM/ft @ 500 GPM as rated with your new pump. The well was redeveloped with chemicals, Pantonite and mechanical pumping and surging.

The video inspection before redevelopment showed that the screen was encrusted with iron. The post redevelopment inspection shows that a majority of the encrusted iron has been removed and the screen appears to be in good condition.

The Goulds 11 CLC 5 stage 1800 RPM Vertical Turbine pump and equipment were slightly plugged with iron but found to be in good condition. The equipment was reassembled and reinstalled.

A new US 50 HP premium efficient motor was installed.

Historical Specific Capacity

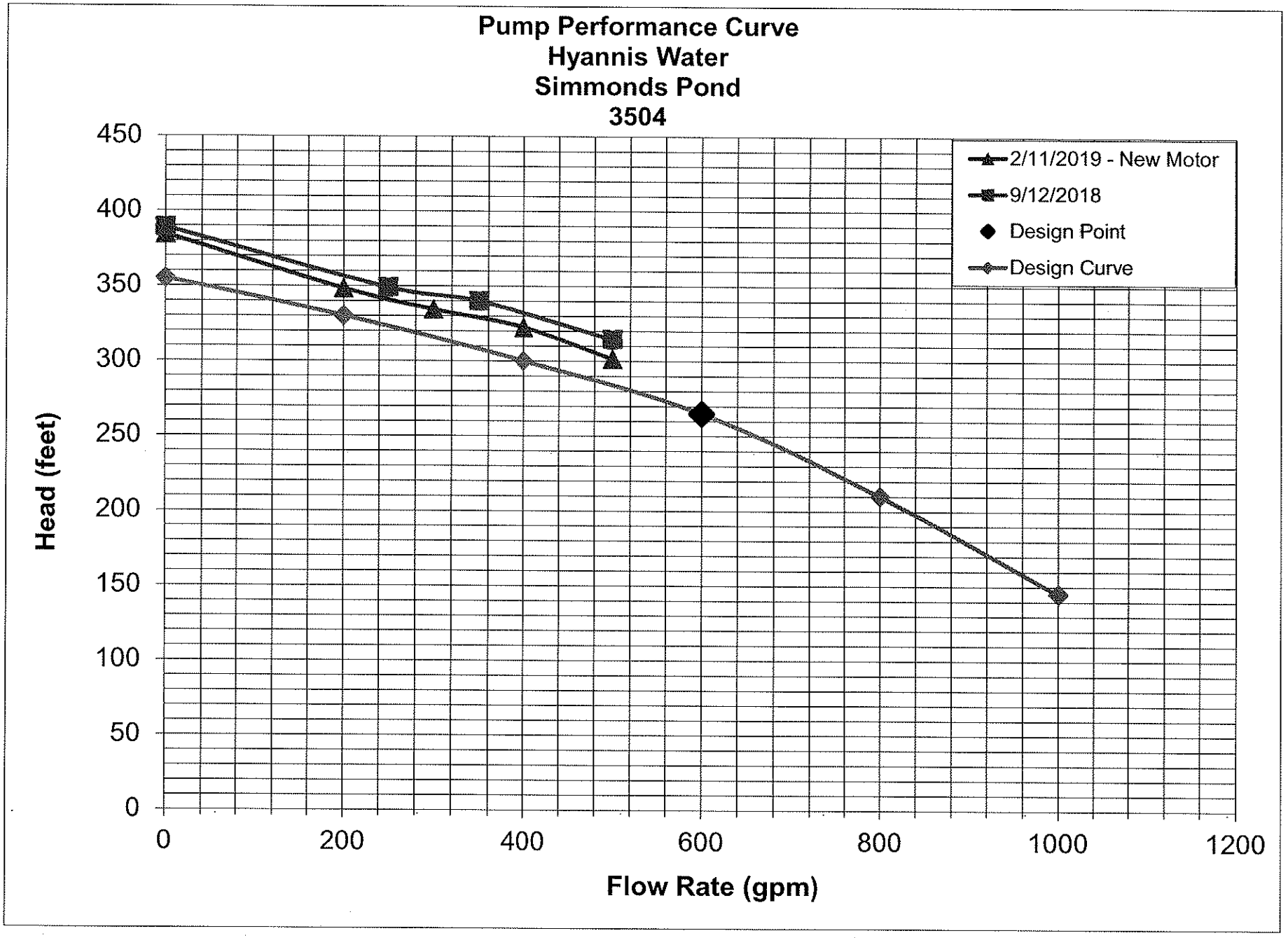
Jan	2019	16.5	GPM/ft	@ 500 GPM – After chemical redevelopment
Jan	2019	13.3	GPM/ft	@ 388 GPM – before redevelopment
Sept	2018	14.7	GPM/ft	@ 500 GPM
Sept	2017	17.9	GPM/ft	@ 350 GPM
Nov	2016	16.8	GPM/ft	@ 500 GPM – After chemical redevelopment
Oct	2016	10.1	GPM/ft	@ 465 GPM – before redevelopment
Sept	2016	13.2	GPM/ft	@ 500 GPM
Oct	2015	15.6	GPM/ft	@ 500 GPM
Nov	2014	14	GPM/ft	@ 502 GPM
Nov	2013	16.85	GPM/ft	@ 499 GPM
Dec	2012	17.58	GPM/ft	@ 452 GPM
Nov	2011	21.26	GPM/ft	@ 354 GPM
Oct.	2010	21.2	GPM/ft	@ 498 GPM
Oct.	2009	19	GPM/ft	@ 514 GPM
Jan	2009	19.8	GPM/ft	@ 603 GPM – After chemical redevelopment
Jan	2009	14.47	GPM/ft	@ 372 GPM – before redevelopment
Mar	2006	23.3	GPM/ft	@ 442 GPM
Nov	2003	22.1	GPM/ft	@ 603 GPM – after redevelopment
Mar	2003	16	GPM/ft	@ 442 GPM
Dec	1999	13	GPM/ft	@ 415 GPM
Feb	1998	17.6	GPM/ft	@ 508 GPM
Dec	1991	13.8	GPM/ft	@ 538 GPM
	1989	17	GPM/ft	@ 578 GPM
	1984	19+	GPM/ft	@ 603 GPM
	1979	20	GPM/ft	
	1978	21	GPM/ft	
	1976	21.35	GPM/ft	
	1975	21	GPM/ft	
Originally		21.1	GPM/ft	Based on Sustained Pumping of 800 GPM

If you need further information please contact us.

Sincerely,
MAHER SERVICES, INC.

Peter Maher
pmaher@maherserv.com

Maher Services, Inc.
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Pump Performance Curve
Hyannis Water
Simmonds Pond
3504
Head (feet)
450
400
350
300
250
200
150
100
50
0
0
200
400
600
800
1000
1200
Flow Rate (gpm)
2/11/2019 - New Motor
9/12/2018
Design Point
Design Curve

Maher Services, Inc.
71 Concord Street
North Reading, MA 01864
Ph 978-664-9355
Fax 978-664-9356

Well Pump Performance Test

Pump Installation and Performance Test Data

Owner: **Hyannis Water**

Well No.: Simmons Pond

Job No.: 3504

Maher Representative: Tim Coyle

Pump / Motor Information

Pump Mfg. and Model / Nameplate Data:	Goulds 11 CLC, 5 Stage (7.6")
Pump Serial Number:	CO 4349595
Motor Mfg. / HP / Nameplate Data:	US 50 HP, Frame 326 TP, Type RUSI
Volts / Amps	460 / 57
Motor Serial Number:	Z 11 7705501-0007 M 0003 1/19
Other - Specify: Check Valve	

2017 Performance Test

Date: 9/13/2017		Shut off	Point 1	Full Flow
GPM		**0**	**250**	**350**
Pressure on pump side(psi)		168	142	135
Water level		4.00	17.20	23.20
Draw Down			13.20	19.20
Height of Guage from WL measure		2.0	feet	
Total Dynamic Head		**394**	**347**	**337**
Amperage	Leg 1 red	37 / 474	40 / 472	43 / 474
	Leg 2 yellow	38 / 473	39 / 471	44 / 472
	Leg 3 black	37 / 471	40 / 470	46 / 473
	Specific Capacity:	18.23	GPM/ft @	350 GPM

2018 Performance Test

Date: 9/12/2018		Shut off	Point 1	Point 2	Full Flow
GPM	Mag Meter	**0**	**250**	**350**	**500**
	Station Meter	**0**	**265**	**366**	**509**
Pressure on pump side(psi)		165	141	134	118
Water level		5.70	21.25	28.30	39.75
Draw Down			15.55	22.60	34.05
Height of Guage from WL measure		2.0	feet		
Total Dynamic Head		**389**	**349**	**340**	**314**
Amperage	Leg 1 red	39 / 460	43 / 460	48 / 460	56 / 459
	Leg 2 yellow	40 / 460	45 / 460	50 / 458	57 / 458
	Leg 3 black	41 / 460	44 / 459	49 / 458	56 / 457
	Specific Capacity:	14.68	GPM/ft @	500	GPM

2019 Performance Test - New Motor

Date: 2/11/2019		Shut off	Point 1	Point 2	Point 3	Full Flow
GPM	Mag Meter	**0**	**200**	**300**	**400**	**500**
	Station Meter	**0**	**192**	**301**	**405**	**509**
Pressure on pump side(psi)		164	144	135	127	115
Water level		3.40	13.70	20.40	27.00	33.70
Draw Down			10.30	17.00	23.60	30.30
Height of Guage from WL measure		2.0	feet			
Total Dynamic Head		**384**	**348**	**334**	**322**	**301**
Amperage	Leg 1 red	40 / 480	42 / 480	45 / 480	50 / 480	55 / 480
	Leg 2 yellow	40 / 480	42 / 480	46 / 480	51 / 480	55 / 480
	Leg 3 black	41 / 480	42 / 480	45 / 480	49 / 480	55 / 480
	Specific Capacity:	16.5	GPM/ft @	500	GPM	

Manufacturer Data

Design Point			Pump Design Data Points			
600	Pumping Rate (gpm)	0	200	400	600	800
265	Predicted head (feet)	355	330	300	265	210

ATTACHMENT B

EXPLORATORY BORING LOGS AND SIEVE ANALYSIS

MAHER services

71 Concord Street
North Reading, MA 01864

Tel:(978) 664-9355
Fax: (978) 664-9356
www.maherserv.com

Well # HP-01 **Job #:** 4890
Project Hyannis Systems Barnstable - Simmons Road

Location Barnstable MA
LAT: ____ . ____ " **LON:** ____ . ____ "
Driller: Anderson C & Jason M
Installation Dates 02/01/24 - 02/02/24
Static Water Level NA ft.
Drilling Method DP

Depth From	Depth To	Soil Classification	Loss of Wash Water
0	2	Brown Peat	
2	10	fine silty Sand	
10	33	fine-Med Sand with silt (Tan)	
33	35	Dense fine silty Sand (Brown)	
35	44.5	Gray Clay	
44.5	60	Med-fine Sand trace of silt	(Tan)



Well Details		2' OBS.
Diameter	/	
Total Depth	/	
Comp. Depth	/	
Casing Left	/	
Casing Mat.	/	
Screen		
Diameter	/	
Length	/	
Material	/	
Slot Size	/	
Development\Pumping		
Method	/	
Hours	/	
GPM	/	
VAC	/	
Spec. Cap.	/	

Quantities of Materials			
Sand			Bags
Chips			Bags
Cement			Bags
Volclay			Bags
Lck Plug			each
Pro. Cvr.			each
Gate Box			each
Sakrete			bags
Drums			each

Remarks:

02/01/24 • Drillad to 35 broke inner rod, pullad out, went back to 35 with point, sampled to 60', broke inner rod, pullad out, Drilled back down to 55ft – 02/02/24 Drilled down to 60, casing came apart, pullad out, Point to 40, sampled to 45, hit refusal pullad out

• Used 25 sleeves total due to help runs and re-drilling

MAHER services

71 Concord Street
North Reading, MA 01864

Tel:(978) 664-9355
Fax: (978) 664-9356
www.maherserv.com

Well # HP-02B **Job #:** 4890
Project Hyannis Systems Barnstable-Simmons Pond

Location Barnstable MA
LAT: ___.___" **LON:** ___.___"
Driller: Anderson C & Jason M
Installation Dates 02/05/24
Static Water Level ___ ft. TOC=12.35
Drilling Method DP

Depth From	Depth To	Soil Classification	Loss of Wash Water
0	2	Brown Peat	
2	10	fine silty Sand	
10	33	fine-med sand with silt (tan)	
33	34.5	Dense fine silty sand (Brown)	
34.5	44	Gray Clay	
44	46	Brown/orange silty Sand	
46	70	Med-fine Sand +traces of silt	(tan)
70	80	fine-Med sand with silt (tan)	
80	84	Dense fine sand with silt	



Remarks:

Used 19 sleeves total due to help runs through the clay. Lots of heave
Used 11 sleeves on OBS

Well Details		2' OBS.
Diameter	2"	2"
Total Depth	84'	70'
Comp. Depth	70'	70'
Casing Left	67'	67
Casing Mat.	PVC	PVC
Screen		
Diameter	2"	2"
Length	5'	5'
Material	SS	SS
Slot Size	40	50
Development\Pumping		
Method	Diaphragm	Diaphragm
Hours	.75	.5
GPM	67	73
VAC	24"	24
Spec. Cap.		

Quantities of Materials			
Sand			Bags
Chips			Bags
Cement			Bags
Volclay			Bags
Lck Plug	1	1	each
Pro. Cvr.	1	1	each
Gate Box			each
Sakrete			bags
Drums			each

Maher Services, Inc.
71 Concord Street, North Reading, MA 01864
Tel: 978-664-9355 Fax 978-664-9356

RECORD OF PUMP TEST

Job: Hyannis Systems Barnstable Simmons Pond Job #: 4890 Date: 02/14/24

Well No.: HP-02 B Contact: Kleinfelder

Location: Barnstable MA How Q Measured:

Recovery

Date	Time (HHMM)	Elapsed Time	Pumping Rate	Well HP-OW	Well	Well	Well	Well HP-OV	Well	Well	Well	Well	Remarks
Static	0800	0		12.35									
		1		15.31				1 12.93					
		2		15.40				2 12.87					
		3		15.47				3 12.82					
		4		15.49				4 12.78					
		5		15.54				5 12.76					
		6		15.54				6 12.73					
		7		15.57				7 12.71					
		8		15.59				8 12.69					
		9		15.61				9 12.68					
		10	72	15.61				10 12.66					VAC: 24"
		15		15.70				15 12.60					
		20		15.75									
		25		15.77									
		30		15.80									
		40		15.83									
		50		15.88									
		60	72	15.90									
		70		15.91									
		80		15.93									
		90		15.95									
		100		15.96									
		110		15.96									
		120	72	15.98									VAC 24"
													SC = 72/3.63 = 19.83

MAHER services

71 Concord Street
North Reading, MA 01864

Tel:(978) 664-9355
Fax: (978) 664-9356
www.maherserv.com

Well # SP-02 **Job #:** 4890

Project Hyannis Systems Barnstable Simmons-pond

Location Barnstable MA

LAT: ____.____" **LON:** ____.____"

Driller: Anderson C & Jason M

Installation Dates 02/07/24

Static Water Level NA ft.

Drilling Method DP

Depth From	Depth To	Soil Classification	Loss of Wash Water
0	2	Brown Peat	
2	38.5	fine-med Sand with silt	(tan)
38.5	41	fine silty sand (& Brown) Dense!	
41	47	Gray Clay	



Remarks:

Hit refusal @ 47ft
Used 11 sleeves due to heavy runs
Cleared next site for 1 hour!

Well Details		2' OBS.
Diameter	/	
Total Depth	~~47~~	
Comp. Depth	/	
Casing Left	/	
Casing Mat.	/	
Screen		
Diameter	/	
Length	/	
Material	/	
Slot Size	/	
Development\Pumping		
Method	/	
Hours	/	
GPM	/	
VAC	/	
Spec. Cap.	/	

Quantities of Materials			
Sand			Bags
Chips			Bags
Cement			Bags
Volclay			Bags
Lck Plug			each
Pro. Cvr.			each
Gate Box			each
Sakrete			bags
Drums			each

MAHER services

71 Concord Street
North Reading, MA 01864

Tel:(978) 664-9355
Fax: (978) 664-9356
www.maherserv.com

Well # SP-03 **Job #:** 4890

Project Hyannis Water Systems Barnstable - Simmons Pond

Location Barnstable MA

LAT: 41 .6405" **LON:** -70.3675"

Driller: Anderson Cashin & Jason M

Installation Dates 02/06/24 - 02/07/24

Static Water Level 12.2 ft. TOC

Drilling Method DP

Depth From	Depth To	Soil Classification	Loss of Wash Water
0	2	Brown Peat	
2	11	L Brown silty fine sand	
11	34	fine-Med sand with silt (trace)	
34	37.5	Fine Dense Brown/gray silty clay	
37.5	44	Gray Clay	
44	46	Brown/orange Dense silty sand	
46	75	Med-fine sand with traces of silt	(trace)
75	80	fine sand with silt traces of med sand	



Well Details		2' OBS.
Diameter	2"	2"
Total Depth	80'	75'
Comp. Depth	75'	75'
Casing Left	72'	72'
Casing Mat.	PVC	PVC
Screen		
Diameter	2"	2"
Length	5'	5'
Material	SS	SS
Slot Size	40	40
Development\Pumping		
Method	Diaphragm	Diaphragm
Hours	2	.5
GPM	53	53
VAC	24	24
Spec. Cap.		

Quantities of Materials			
Sand			Bags
Chips			Bags
Cement			Bags
Volclay			Bags
Lck Plug	1	1	each
Pro. Cvr.	1	1	each
Gate Box			each
Sakrete			bags
Drums			each

Remarks:

- Used 19 sleeves total due to help runs through clay
- Lots of heave
- Spent 1.5 hours cleaning sites (SP-03, SP-02)
- Used 11 sleeves on OW in order to get through Dense material

Maher Services, Inc.
71 Concord Street, North Reading, MA 01864
Tel: 978-664-9355 Fax 978-664-9356

RECORD OF PUMP TEST

Job: Hyannis Systems Barnstable Simmons Pond
Job #: 4890
Date: 02/14/24
Well No.: SP-03A
Contact: Klemfelder
Location: Barnstable MA
How Q Measured:

Date	Time (HHMM)	Elapsed Time	Pumping Rate	Well SP-OW	Well	Well	Well	Well	Well (Recovery) SP-OW	Well	Well	Well	Well	Remarks
Static	1045	0		12.17										
		1		14.06				1	12.52					
		2		14.12				2	12.47					
		3		14.16				3	12.43					
		4		14.20				4	12.42					
		5		14.23				5	12.39					
		6		14.25				6	12.37					
		7		14.27				7	12.35					
		8		14.28				8	12.34					
		9		14.29				9	12.32					
		10	52 GPM	14.29				10	12.31					Vac: 22
		15		14.33				15	12.26					
		20		14.36										
		25		14.39										
		30		14.39										
		40		14.40										
		50		14.43										
		60	52 GPM	14.44										
		70		14.45										
		80		14.45										
		90		14.45										
		100		14.45										
		110		14.47										
		120		14.48										

MAHER services

71 Concord Street
North Reading, MA 01864

Tel:(978) 664-9355
Fax: (978) 664-9356
www.maherserv.com

Well # HP-02 A **Job #:** 4890

Project Hyannis Systems Barnstable - Simmons Road

Location Barnstable MA

LAT: ____.____" **LON:** ____.____"

Driller: Anderson C & Jason M

Installation Dates 01/31/24

Static Water Level N/A ft.

Drilling Method DP

Depth From	Depth To	Soil Classification	Loss of Wash Water
0	2	Brown Peat	
2	34	fine-Med sand traces of silt	(Tan)
34	38	Dense silty Clay	
38	43	Gray Clay	



Well Details		2' OBS.
Diameter	/	
Total Depth	/	
Comp. Depth	/	
Casing Left	/	
Casing Mat.	/	
Screen		
Diameter	/	
Length	/	
Material	/	
Slot Size	/	
Development\Pumping		
Method	/	
Hours	/	
GPM	/	
VAC	/	
Spec. Cap.	/	

Quantities of Materials			
Sand			Bags
Chips			Bags
Cement			Bags
Volclay			Bags
Lck Plug			each
Pro. Cvr.			each
Gate Box			each
Sakrete			bags
Drums			each

Remarks:

- Refusal @ 43ft
- Spun Used 9 sleeves
- Spent 1.75 hours clearing sites (HP-02A, HP-01)

MAHER services

71 Concord Street
North Reading, MA 01864

Tel:(978) 664-9355
Fax: (978) 664-9356
www.maherserv.com

Well # SP-01 **Job #:** 4890

Project Hyannis Systems Barnstable Simmons Pa

Location Barnstable MA

LAT: ____ " **LON:** ____ "

Driller: Anderson C & Jason M

Installation Dates 02/08/24

Static Water Level 15.35 ft.

Drilling Method DP

Depth From	Depth To	Soil Classification	Loss of Wash Water
0	2	Brown Peat	
2	36.5	fine-med sand with silt (tan)	
36.5	40	fine silty sand (L Brown) Dense!	
40	46	Gray Clay	
46	47.5	Silty Sand (Brown/orange) Dense!	
47.5	75	Med-fine sand traces of silt	(tan)
75	80	fine-med sand with silt (tan)	



Remarks:

Used 19 sleeves due to half runs

Well Details		2' OBS.
Diameter	2"	
Total Depth	80'	
Comp. Depth	75'	
Casing Left	72'	
Casing Mat.	PVC	
Screen		
Diameter	2"	
Length	5'	
Material	SS	
Slot Size	50	
Development\Pumping		
Method	Diaphragm	
Hours	1	
GPM	50	
VAC	23	
Spec. Cap.		

Quantities of Materials			
Sand			Bags
Chips			Bags
Cement			Bags
Volclay			Bags
Lck Plug	1		each
Pro. Cvr.	1		each
Gate Box			each
Sakrete			bags
Drums			each

ATTACHMENT C

WATER QUALITY SAMPLING RESULTS

NASHOBA ANALYTICAL
A DIVISION OF GRANITE STATE ANALYTICAL SERVICES, LLC
31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4428 | website: www.nashobaanalytical.com

Laboratory Report

Maher Services
71 Concord Street
North Reading, MA 01854

Date Printed:	**02/23/2024**
Work Order #:	**2402-02460**
Client Job #:	**17045**
Date Received:	**02/14/2024**
Sample collected in:	**Massachusetts**

Attached please find results for the analysis of the samples received on the date referenced above.

Unless otherwise noted in the attached report, the analyses performed met the requirements of the analyzing laboratory's Quality Assurance Plan, Standard Operating Procedures and State Accreditation. This certificate shall not be reproduced, except in full, without the written approval of the analyzing laboratory. The results presented in this report relate to the samples listed on the following pages in the condition in which they were received. Accreditation for each analyte is identified by the * symbol following the analyte name. Location of our analyzing laboratory is identified by the code in the Analyst Column.

A & L Laboratory:
Identified by ME in Analyst Column
155 Center Street, Auburn, Maine 04210
www.allaboratory.com

Granite State Analytical Services LLC:
Identified by NH in Analyst Column
22 Manchester Road, Derry, NH 03038
www.granitestateanalytical.com

Nashoba Analytical:
Identified by MA in the Analyst Column
31A Willow Road, Ayer, MA 01432
www.nashobaanalytical.com

ANALYSIS RELATED NOTES:

- RL: "Reporting limit" means the lowest level of an analyte that can be accurately recovered from the matrix of interest.
- DF: "Dilution factor" means the ratio of the volume of the sample to the volume of the final (dilute) solution.
- MDL: "Minimum Detection Limit" means the minimum result which can be reliably discriminated from a blank with a predetermined confidence level.
- A & L Laboratory / Granite State Analytical Services LLC / Nashoba Analytical. accreditation lists can be found on our websites listed above.
- Subcontracted samples will be identified by the Accreditation number of the subcontract laboratory in the analyst field for each analyte and the appropriate laboratory will be listed here.This report contains data that were produced by a subcontracted laboratory accredited for the fields of testing performed, if available. Accreditation for each analyte is identified by the * symbol following the analyte name.
  Alpha Analytical-Mansfield, 320 Forbes Boulevard, Mansfield, MA 02048 Accreditation # M-MA030
  R.I. Analytical, Inc., 41 Illinois Ave, Warwick, RI 02888 Accreditation # M-RI015
- Data Qualifiers (DQ) Flags provide additional information in regards to the receipt, analysis or quality control of a sample. These are indicated under the DQ Flags Column on your report and listed here if necessary: Data Qualifier (DQ) Flags: H = Hold time non-compliant., J = Estimated concentration.

SAMPLE STATE SPECIFIC NOTES:

Additional Narrative or Comments: Data qualifiers present in subcontract report.

We appreciate the opportunity to provide you with laboratory services. If you have any questions regarding the enclosed report, please contact the laboratory and we will be happy to assist you.

Erin Shaw
Erin Shaw
Laboratory Director

NASHOBA ANALYTICAL
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31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4428 | website: www.nashobaanalytical.com

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854
SAMPLE ID #: 2402-02460-001
SAMPLED BY: Andersen Cash
SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW-HP-02B

Legend
Passes ✓
Fails EPA Primary ⊗
Fails EPA Secondary ▽
Fails State Guideline ✕
Attention ⚠

DATE AND TIME COLLECTED: 02/14/2024 10:00AM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-Mass Secondary-NO2-NO3
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #: 17045

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
Turbidity*	<0.5	NTU			0.5	No Limit	EPA 180.1	AH-MA	02/14/2024 04:14PM
Aluminum*	0.026	mg/L	✓		0.01	0.2 mg/L	EPA 200.7	AH-MA	02/19/2024 03:50PM
Calcium*	8.4	mg/L			1	No Limit	EPA 200.7	AH-MA	02/19/2024 03:50PM
Copper*	<0.010	mg/L	✓		0.010	1.3 mg/L	EPA 200.7	AH-MA	02/19/2024 03:50PM
Iron*	0.040	mg/L	✓		0.010	0.3 mg/L	EPA 200.7	AH-MA	02/19/2024 03:50PM
Magnesium	1.9	mg/L			1.0	No Limit	EPA 200.7	AH-MA	02/19/2024 03:50PM
Manganese*	0.109	mg/L	▽		0.010	0.05 mg/L	EPA 200.7	AH-MA	02/19/2024 03:50PM
Potassium	3.1	mg/L			1.0	No Limit	EPA 200.7	AH-MA	02/19/2024 03:50PM
Silver*	<0.01	mg/L	✓		0.01	0.1 mg/L	EPA 200.7	AH-MA	02/19/2024 03:50PM
Zinc*	<0.010	mg/L	✓		0.010	5 mg/L	EPA 200.7	AH-MA	02/19/2024 03:50PM
Chloride*	98.8	mg/L	✓		2	250 mg/L	EPA 300.0	KW-MA	02/15/2024 01:17PM
Nitrate as N*	5.64	mg/L	✓		0.05	10 mg/L	EPA 300.0	KW-MA	02/15/2024 01:17PM
Nitrite as N*	<0.05	mg/L	✓		0.05	1 mg/L	EPA 300.0	KW-MA	02/15/2024 01:17PM
Sulfate*	15.0	mg/L	✓		2	250 mg/L	EPA 300.0	KW-MA	02/15/2024 01:17PM
Color, Apparent	0	CU	✓		0	15	SM 2120B	AH-MA	02/14/2024 04:12PM
Odor	0	TON	✓	H	0	3 T.O.N.	SM 2150B	KW-MA	02/14/2024 04:10PM
Total Alkalinity*	4.2	mg CaCO3/L			1	No Limit	SM 2320B	AH-MA	02/14/2024 04:30PM
Hardness (calc.)	29	mg CaCO3/L			1	No Limit	SM 2340 B	AH-MA	02/19/2024 03:50PM
Total Dissolved Solids*	220	mg/L	✓		10	500 mg/L	SM 2540C	M-RI015	02/20/2024 07:10PM
pH at 25°C*	5.39	SU	▽	H	N/A	6.5 - 8.5 SU	SM 4500-H-B	AH-MA	02/14/2024 04:17PM

Erin Shaw
Erin Shaw
Laboratory Director

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Phone: 978-391-4428 | website: www.nashobaanalytical.com

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854

SAMPLE ID #: 2402-02460-002
SAMPLED BY: Andersen Cash
SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW-HP-02B

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▽
Fails State Guideline	✕
Attention	⚠

DATE AND TIME COLLECTED: 02/14/2024 10:00AM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-VOC524.2-MA
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #:

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
1,1,1,2-Tetrachloroethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,1,1-Trichloroethane*	<0.5	ug/L	✓		0.5	200 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,1,2,2-Tetrachloroethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,1,2-Trichloroethane*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,1-Dichloroethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,1-Dichloroethylene*	<0.5	ug/L	✓		0.5	7 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,1-Dichloropropylene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,2,3-Trichlorobenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,2,3-Trichloropropane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,2,4-Trichlorobenzene*	<0.5	ug/L	✓		0.5	70 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,2,4-Trimethylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,2-Dibromo-3-chloropropane	<0.5	ug/L			0.5	0.2 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,2-Dibromoethane	<0.5	ug/L			0.5	0.05 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,2-Dichlorobenzene*	<0.5	ug/L	✓		0.5	600 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,2-Dichloroethane*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,2-Dichloropropane*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,3,5-Trimethylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,3-Dichlorobenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,3-Dichloropropane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,4-Dichlorobenzene*	<0.5	ug/L	✓		0.5	5.0 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
2,2-Dichloropropane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
2-Butanone (MEK)	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
2-Chlorotoluene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
2-Hexanone	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM

Erin Shaw
Erin Shaw
Laboratory Director

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31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4428 | website: www.nashobaanalytical.com

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854

SAMPLE ID #: 2402-02460-002
SAMPLED BY: Andersen Cash

SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW-HP-02B

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▽
Fails State Guideline	✕
Attention	⚠

DATE AND TIME COLLECTED: 02/14/2024 10:00AM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-VOC524.2-MA
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #:

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
4-Chlorotoluene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
4-Isopropyltoluene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
4-Methyl-2-pentanone (MIBK)	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Acetone	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Benzene*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
Bromobenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Bromochloromethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Bromodichloromethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Bromoform*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Bromomethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Carbon disulfide	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Carbon tetrachloride*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
Chlorobenzene*	<0.5	ug/L	✓		0.5	100 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
Chloroethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Chloroform*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Chloromethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
cis-1,2-Dichloroethylene*	<0.5	ug/L	✓		0.5	70 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
cis-1,3-Dichloropropylene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Dibromochloromethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Dibromomethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Dichlorodifluoromethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Diethyl ether	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Diisopropyl ether (DIPE)	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Ethyl tert-butyl ether (ETBE)	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM

Erin Shaw
Erin Shaw
Laboratory Director

NASHOBA ANALYTICAL
A DIVISION OF GRANITE STATE ANALYTICAL SERVICES, LLC
31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4428 | website: www.nashobaanalytical.com

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854

SAMPLE ID #: 2402-02460-002
SAMPLED BY: Andersen Cash

SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW-HP-02B

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▼
Fails State Guideline	✕
Attention	⚠

DATE AND TIME COLLECTED: 02/14/2024 10:00AM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-VOC524.2-MA
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #:

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
Ethylbenzene*	<0.5	ug/L	✓		0.5	700 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
Hexachlorobutadiene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Isopropylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
m&p-Xylenes	<1	ug/L			1	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Methyl tert-butyl ether (MtBE)*	<0.5	ug/L	✓		0.5	70 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
Methylene chloride*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
Naphthalene*	<0.5	ug/L	✓		0.5	100 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
n-Butylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Nitrobenzene	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
n-Propylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
o-Xylene	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
sec-Butylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Styrene*	<0.5	ug/L	✓		0.5	100 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
tert-Amyl methyl ether (TAME)	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
tert-Butyl alcohol (TBA)	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
tert-Butylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Tetrachloroethylene*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
Tetrahydrofuran (THF)	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Toluene*	<0.5	ug/L	✓		0.5	1000 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
Total THMs*	<0.5	ug/L	✓		0.5	80 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
Total Xylenes*	<0.5	ug/L	✓		0.5	10000 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
trans-1,2-Dichloroethylene*	<0.5	ug/L	✓		0.5	100 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
trans-1,3-Dichloropropylene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Trichloroethylene*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM

Erin Shaw
Erin Shaw
Laboratory Director

NASHOBA ANALYTICAL
A DIVISION OF GRANITE STATE ANALYTICAL SERVICES, LLC
31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4428 | website: www.nashobaanalytical.com

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854
SAMPLE ID #: 2402-02460-002
SAMPLED BY: Andersen Cash
SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW-HP-02B

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▼
Fails State Guideline	✕
Attention	⚠

DATE AND TIME COLLECTED: 02/14/2024 10:00AM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-VOC524.2-MA
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #:

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
Trichlorofluoromethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 08:33PM
Vinyl chloride*	<0.5	ug/L	✓		0.5	2 ug/L	EPA 524.2	KV-NH	02/16/2024 08:33PM
1,2-Dichlorobenzene-d4	93	%	✓		0.5	70-130%	EPA 524.2 - SS	KV-NH	02/16/2024 08:33PM
4-Bromofluorobenzene	88	%	✓		0.5	70-130%	EPA 524.2 - SS	KV-NH	02/16/2024 08:33PM

Erin Shaw
Erin Shaw
Laboratory Director

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CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854

SAMPLE ID #: 2402-02460-003
SAMPLED BY: Andersen Cash
SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW-HP-02B

DATE AND TIME COLLECTED: 02/14/2024 10:00AM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-PFC-18-alpha-MA
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #:

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▽
Fails State Guideline	✕
Attention	⚠

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic Acid*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 10:52AM
4,8-dioxa-3H-perfluorononanoic acid*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 10:52AM
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 10:52AM
Date Extracted	-					No Limit	EPA 537.1	MA00030	02/21/2024 01:40AM
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 10:52AM
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 10:52AM
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 10:52AM
Perfluorobutanesulfonic Acid (PFBS)*	4.71	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 10:52AM
Perfluorodecanoic Acid (PFDA)*	<2.00	ng/L			Sub Report		EPA 537.1	MA00030	02/21/2024 10:52AM
Perfluorododecanoic Acid (PFDoA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 10:52AM
Perfluoroheptanoic Acid (PFHpA)*	3.38	ng/L			Sub Report		EPA 537.1	MA00030	02/21/2024 10:52AM
Perfluorohexanesulfonic Acid (PFHxS)*	34.1	ng/L			Sub Report		EPA 537.1	MA00030	02/21/2024 10:52AM
Perfluorohexanoic Acid (PFHxA)*	7.53	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 10:52AM

Erin Shaw
Erin Shaw
Laboratory Director

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Phone: 978-391-4428 | website: www.nashobaanalytical.com

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854

SAMPLE ID #: 2402-02460-003
SAMPLED BY: Andersen Cash
SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW-HP-02B

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▽
Fails State Guideline	✕
Attention	⚠

DATE AND TIME COLLECTED: 02/14/2024 10:00AM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-PFC-18-alpha-MA
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #:

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
Perfluorononanoic Acid (PFNA)*	1.58	ng/L		J	Sub Report		EPA 537.1	MA00030	02/21/2024 10:52AM
Perfluorooctanesulfonic Acid (PFOS)*	22.4	ng/L			Sub Report		EPA 537.1	MA00030	02/21/2024 10:52AM
Perfluorooctanoic Acid (PFOA)*	10.8	ng/L			Sub Report		EPA 537.1	MA00030	02/21/2024 10:52AM
Perfluorotetradecanoic Acid (PFTA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 10:52AM
Perfluorotridecanoic Acid (PFTrDA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 10:52AM
Perfluoroundecanoic Acid (PFUnA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 10:52AM
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid	82	%	✓			70-130%	EPA 537.1 - SS	MA00030	02/21/2024 10:52AM
Perfluoro-n-[1,2-13C2]decanoic Acid	123	%	✓			70-130%	EPA 537.1 - SS	MA00030	02/21/2024 10:52AM
Perfluoro-n-[1,2-13C2]hexanoic Acid	107	%	✓			70-130%	EPA 537.1 - SS	MA00030	02/21/2024 10:52AM
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic Acid	105	%	✓			70-130%	EPA 537.1 - SS	MA00030	02/21/2024 10:52AM
Total 6 (PFOS PFOA PFNA PFHxS PFHpA PFDA)	70.7	ng/L	✕		Sub Report	20 ng/L Proposed	N/A calculation	MA00030	02/21/2024 10:52AM

Erin Shaw
Erin Shaw
Laboratory Director

2402-2460

NASHOBA ANALYTICAL
A DIVISION OF GRANITE STATE ANALYTICAL SERVICES, LLC
31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4428 | website: www.nashobaanalytical.com

Chain of Custody for Commercial Clients:

Your company name: MAHER SERVICES, INC. P.O. 17045

SAMPLE INFORMATION - please print clearly

Project or Customer Name:	HYANNIS WATER
Street Address:	SMITH
Town and State:	BARNSTABLE
Date Sampled:	2/14
Time Sampled:	10 AM (HP-02B), 12:50 (SP03A)
Sample Taken At: (i.e Kitchen Sink, Well Head...)	TW-HP-02B, TW SP03A
Sampled by (Name):	ANDERSEN CASH

Test(s) to be Performed: 2 sets SEC. CONT +NO_2, NO_3, VOC-002, PFAS-003 (001)

(if not sure ask an analyst)

Email Results:

Lab Use Only:	
Receipt Temperature:	15.4° Ice: Y or N
Date 2/14/24	Time 1547
Received at Lab by:	SC

ANALYTICAL REPORT

Lab Number:	L2408305
Client:	Nashoba Analytical, LLC 31A Willow Rd Ayer, MA 01432
ATTN:	Maria Braun
Phone:	(978) 391-4428
Project Name:	Not Specified
Project Number:	2402-02460
Report Date:	02/22/24

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0825), DoD (L2474), FL (E87814), IL (200081), IN (C-MA-04), KY (KY98046), LA (85084), ME (MA00030), MD (350), MI (99110) , NJ (MA015), NY (11627), NC (685), OH (CL106), OR (MA-0262), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #525-23-107-88708), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: Not Specified
Project Number: 2402-02460

Lab Number: L2408305
Report Date: 02/22/24

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2408305-01	2402-02460-003	DW	2402-02460	02/14/24 10:00	02/15/24
L2408305-02	FIELD BLANK	DW	2402-02460	02/14/24 10:00	02/15/24

Project Name:	Not Specified	**Lab Number:**	L2408305
Project Number:	2402-02460	**Report Date:**	02/22/24

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name: Not Specified
Project Number: 2402-02460
Lab Number: L2408305
Report Date: 02/22/24

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Perfluorinated Alkyl Acids by EPA 537.1

L2408305-01 and WG1887443-4: The sample was received with insufficient preservation. During sample preparation, Trizma was added to meet the acceptable pH range for the method.

L2408305-01: The sample has a detection that exceeds the Maximum Contaminant Level (MCL).

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Darian Dailey

Title: Technical Director/Representative Date: 02/22/24

ORGANICS

SEMIVOLATILES

Project Name: Not Specified
Project Number: 2402-02460
Lab Number: L2408305
Report Date: 02/22/24

SAMPLE RESULTS

Lab ID: L2408305-01
Client ID: 2402-02460-003
Sample Location: 2402-02460

Date Collected: 02/14/24 10:00
Date Received: 02/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Dw
Analytical Method: 133,537.1
Analytical Date: 02/21/24 10:52
Analyst: CAP

Extraction Method: EPA 537.1
Extraction Date: 02/21/24 01:40

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	4.71		ng/l	2.00	0.576	1
Perfluorohexanoic Acid (PFHxA)	7.53		ng/l	2.00	0.576	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	2.00	0.576	1
Perfluoroheptanoic Acid (PFHpA)	3.38		ng/l	2.00	0.576	1
Perfluorohexanesulfonic Acid (PFHxS)	34.1		ng/l	2.00	0.576	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	2.00	0.576	1
Perfluorooctanoic Acid (PFOA)	10.8		ng/l	2.00	0.576	1
Perfluorononanoic Acid (PFNA)	1.58	J	ng/l	2.00	0.576	1
Perfluorooctanesulfonic Acid (PFOS)	22.4		ng/l	2.00	0.576	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	0.576	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	2.00	0.576	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	0.576	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	0.576	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	0.576	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	0.576	1
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	2.00	0.576	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	0.576	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	0.576	1
PFAS, Total (6)	70.7		ng/l	2.00	0.576	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	107		70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	105		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	123		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	82		70-130

Project Name: Not Specified
Project Number: 2402-02460
Lab Number: L2408305
Report Date: 02/22/24

SAMPLE RESULTS

Lab ID: L2408305-02
Client ID: FIELD BLANK
Sample Location: 2402-02460

Date Collected: 02/14/24 10:00
Date Received: 02/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Dw
Analytical Method: 133,537.1
Analytical Date: 02/21/24 11:10
Analyst: CAP

Extraction Method: EPA 537.1
Extraction Date: 02/21/24 01:40

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	0.626	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	0.626	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	2.00	0.626	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	0.626	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	0.626	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	2.00	0.626	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	0.626	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	0.626	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	0.626	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	0.626	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	2.00	0.626	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	0.626	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	0.626	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	0.626	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	0.626	1
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	2.00	0.626	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	0.626	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	0.626	1
PFAS, Total (6)	ND		ng/l	2.00	0.626	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	130		70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	124		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	128		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	97		70-130

Project Name: Not Specified
Project Number: 2402-02460
Lab Number: L2408305
Report Date: 02/22/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 133,537.1
Analytical Date: 02/21/24 10:08
Analyst: CAP

Extraction Method: EPA 537.1
Extraction Date: 02/21/24 01:40

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab for sample(s): 01-02 Batch: WG1887443-1					
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	0.668
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	0.668
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	2.00	0.668
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	0.668
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	0.668
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	2.00	0.668
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	0.668
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	0.668
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	0.668
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	0.668
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	2.00	0.668
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	0.668
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	0.668
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	0.668
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	0.668
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	2.00	0.668
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	0.668
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	0.668
PFAS, Total (6)	ND		ng/l	2.00	0.668

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	104		70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	102		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	110		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	107		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: 2402-02460

Lab Number: L2408305
Report Date: 02/22/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-02 Batch: WG1887443-2								
Perfluorobutanesulfonic Acid (PFBS)	100		-		50-150	-		30
Perfluorohexanoic Acid (PFHxA)	120		-		50-150	-		30
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	104		-		50-150	-		30
Perfluoroheptanoic Acid (PFHpA)	124		-		50-150	-		30
Perfluorohexanesulfonic Acid (PFHxS)	112		-		50-150	-		30
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	139		-		50-150	-		30
Perfluorooctanoic Acid (PFOA)	126		-		50-150	-		30
Perfluorononanoic Acid (PFNA)	134		-		50-150	-		30
Perfluorooctanesulfonic Acid (PFOS)	122		-		50-150	-		30
Perfluorodecanoic Acid (PFDA)	142		-		50-150	-		30
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	118		-		50-150	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	119		-		50-150	-		30
Perfluoroundecanoic Acid (PFUnA)	121		-		50-150	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	110		-		50-150	-		30
Perfluorododecanoic Acid (PFDoA)	125		-		50-150	-		30
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	78		-		50-150	-		30
Perfluorotridecanoic Acid (PFTrDA)	129		-		50-150	-		30
Perfluorotetradecanoic Acid (PFTA)	141		-		50-150	-		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: 2402-02460

Lab Number: L2408305
Report Date: 02/22/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-02 Batch: WG1887443-2								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	111				70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	114				70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	120				70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	112				70-130

Matrix Spike Analysis

Batch Quality Control

Project Name: Not Specified

Project Number: 2402-02460

Lab Number: L2408305

Report Date: 02/22/24

Parameter	*Native Sample*	*MS Added*	*MS Found*	*MS %Recovery*	*Qual*	*MSD Found*	*MSD %Recovery*	*Qual*	*Recovery Limits*	*RPD*	*Qual*	*RPD Limits*
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1887443-3 QC Sample: L2408302-01 Client ID: MS Sample												
Perfluorobutanesulfonic Acid (PFBS)	4.36	1.65	5.36	61		-	-		50-150	-		30
Perfluorohexanoic Acid (PFHxA)	6.22	1.86	7.53	70		-	-		50-150	-		30
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA)	ND	1.86	1.83J	98		-	-		50-150	-		30
Perfluoroheptanoic Acid (PFHpA)	2.73	1.86	4.43	91		-	-		50-150	-		30
Perfluorohexanesulfonic Acid (PFHxS)	5.36	1.7	6.75	82		-	-		50-150	-		30
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND	1.76	1.92J	109		-	-		50-150	-		30
Perfluorooctanoic Acid (PFOA)	6.02Z	1.86	6.68	**36**	Q	-	-		50-150	-		30
Perfluorononanoic Acid (PFNA)	ND	1.86	2.44	131		-	-		50-150	-		30
Perfluorooctanesulfonic Acid (PFOS)	5.23	1.73	6.16	54		-	-		50-150	-		30
Perfluorodecanoic Acid (PFDA)	ND	1.86	2.20	118		-	-		50-150	-		30
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND	1.74	1.47J	85		-	-		50-150	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	1.86	1.92J	103		-	-		50-150	-		30
Perfluoroundecanoic Acid (PFUnA)	ND	1.86	1.90J	102		-	-		50-150	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	1.86	1.42J	76		-	-		50-150	-		30
Perfluorododecanoic Acid (PFDoA)	ND	1.86	2.14	115		-	-		50-150	-		30
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND	1.75	1.41J	80		-	-		50-150	-		30
Perfluorotridecanoic Acid (PFTrDA)	ND	1.86	2.09	112		-	-		50-150	-		30
Perfluorotetradecanoic Acid (PFTA)	ND	1.86	2.23	120		-	-		50-150	-		30

Matrix Spike Analysis

Batch Quality Control

Project Name: Not Specified

Project Number: 2402-02460

Lab Number: L2408305

Report Date: 02/22/24

Parameter	*Native Sample*	*MS Added*	*MS Found*	*MS %Recovery*	*Qual*	*MSD Found*	*MSD %Recovery*	*Qual*	*Recovery Limits*	*RPD*	*Qual*	*RPD Limits*
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1887443-3 QC Sample: L2408302-01 Client ID: MS Sample												

Surrogate	*MS % Recovery*	*MS Qualifier*	*MSD % Recovery*	*MSD Qualifier*	*Acceptance Criteria*
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-13C3-Propanoic Acid (M3HFPO-DA)	91				70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	91				70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	101				70-130
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	99				70-130

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: 2402-02460

Lab Number: L2408305
Report Date: 02/22/24

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1887443-4 QC Sample: L2408305-01 Client ID: 2402-02460-003						
Perfluorobutanesulfonic Acid (PFBS)	4.71	4.59	ng/l	3		30
Perfluorohexanoic Acid (PFHxA)	7.53	7.74	ng/l	3		30
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND	ND	ng/l	NC		30
Perfluoroheptanoic Acid (PFHpA)	3.38	3.40	ng/l	1		30
Perfluorohexanesulfonic Acid (PFHxS)	34.1	32.4	ng/l	5		30
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND	ND	ng/l	NC		30
Perfluorooctanoic Acid (PFOA)	10.8	10.4	ng/l	4		30
Perfluorononanoic Acid (PFNA)	1.58J	1.63J	ng/l	NC		30
Perfluorooctanesulfonic Acid (PFOS)	22.4	20.9	ng/l	7		30
Perfluorodecanoic Acid (PFDA)	ND	ND	ng/l	NC		30
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND	ND	ng/l	NC		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	ND	ng/l	NC		30
Perfluoroundecanoic Acid (PFUnA)	ND	ND	ng/l	NC		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	ND	ng/l	NC		30
Perfluorododecanoic Acid (PFDoA)	ND	ND	ng/l	NC		30
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND	ND	ng/l	NC		30
Perfluorotridecanoic Acid (PFTrDA)	ND	ND	ng/l	NC		30
Perfluorotetradecanoic Acid (PFTA)	ND	ND	ng/l	NC		30

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: 2402-02460

Lab Number: L2408305
Report Date: 02/22/24

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits

Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1887443-4 QC Sample: L2408305-01 Client ID: 2402-02460-003

Surrogate	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	107		114		70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	105		110		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	123		130		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	82		96		70-130

Project Name: Not Specified
Project Number: 2402-02460

Lab Number: L2408305
Report Date: 02/22/24

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2408305-01A	Plastic 250ml Trizma preserved	A	NA		2.5	Y	Absent		A2-MA-537.1(14)
L2408305-01B	Plastic 250ml Trizma preserved	A	NA		2.5	Y	Absent		A2-MA-537.1(14)
L2408305-02A	Plastic 250ml Trizma preserved	A	NA		2.5	Y	Absent		A2-MA-537.1(14)

*Values in parentheses indicate holding time in days

Project Name: Not Specified
Project Number: 2402-02460

Lab Number: L2408305
Report Date: 02/22/24

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA/PFTeDA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS/PFDoS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
Perfluoropropanesulfonic Acid	PFPrS	423-41-6
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA/PFOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

Project Name: Not Specified
Project Number: 2402-02460

Lab Number: L2408305
Report Date: 02/22/24

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
FLUOROTELOMER CARBOXYLIC ACIDS (FTCAs)		
3-Perfluoroheptyl Propanoic Acid	7:3FTCA	812-70-4
2H,2H,3H,3H-Perfluorooctanoic Acid	5:3FTCA	914637-49-3
3-Perfluoropropyl Propanoic Acid	3:3FTCA	356-02-5

Project Name:	Not Specified	**Lab Number:**	L2408305
Project Number:	2402-02460	**Report Date:**	02/22/24

GLOSSARY

Acronyms

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	Not Specified	**Lab Number:**	L2408305
Project Number:	2402-02460	**Report Date:**	02/22/24

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Report Format: DU Report with 'J' Qualifiers

Project Name:	Not Specified	**Lab Number:**	L2408305
Project Number:	2402-02460	**Report Date:**	02/22/24

Data Qualifiers

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Report Format: DU Report with 'J' Qualifiers

Project Name:	Not Specified	**Lab Number:**	L2408305
Project Number:	2402-02460	**Report Date:**	02/22/24

REFERENCES

133 Determination of Selected Per- and Polyfluorinated Alkyl Substances in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS). EPA Method 537.1, EPA/600/R-18/352. Version 1.0, November 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625.1: alpha-Terpineol
EPA 8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 524.2: THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables).
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

2/15/24

L2408305

NASHOBA ANALYTICAL

A DIVISION OF GRANITE STATE ANALYTICAL SERVICES, LLC

31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4428 | website: www.nashobaanalytical.com

Chain of Custody

Client/Project Name: 2402-02460

Laboratory Number:

Sampled by: Client#1397

Sample #	Date	Time	Grab[G] or Composite[C]	Location	Container (Glass) (Plastic) (Sterile) (VOC)	Preservative	Test Requirements: EPA 537.1	Test Requirements: 18 Compounds	Test Requirements								Comments
-01 1	2/14/2024	10:00	G	2402-02460-003	2 - 250mL P	10	X	X									Drinking Water
-02 2	2/14/2024	10:00	G	Field Blank	1 - 250mL P	10											Field Blank
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Preservative: 1-Hydrochloric Acid, 2- Ice, 3-Nitric Acid, 4-None, 5-Sodium Hydroxide, 6-Sulfuric Acid, 7-Thiosulfate, 8-Filter Sterilized, 9-Ammonium Chloride
10 - Trizma

Special Notes/Requirements

X	IF THIS BOX IS CHECKED, MCL EXCEEDANCES MUST BE REPORTED IMMEDIATELY. THANK YOU.
X	IF THIS BOX IS CHECKED, PLEASE RUN FIELD BLANK (S) IF DETECTS.

Relinquished by:	Date	Time	Received by:
1.	2/15/24	9:38	DAVISAAL
2. DAVISAAL	2/15/24	10:44	
3.	2/15/24		H. Ruiz 2.15 1500
4. H Ruiz 2.15 1600			AAC
5.			

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Laboratory Report

Maher Services
71 Concord Street
North Reading, MA 01854

Date Printed:	**02/23/2024**
Work Order #:	**2402-02461**
Client Job #:	**PO: 17045**
Date Received:	**02/14/2024**
Sample collected in:	**Massachusetts**

Attached please find results for the analysis of the samples received on the date referenced above.

Unless otherwise noted in the attached report, the analyses performed met the requirements of the analyzing laboratory's Quality Assurance Plan, Standard Operating Procedures and State Accreditation. This certificate shall not be reproduced, except in full, without the written approval of the analyzing laboratory. The results presented in this report relate to the samples listed on the following pages in the condition in which they were received. Accreditation for each analyte is identified by the * symbol following the analyte name. Location of our analyzing laboratory is identified by the code in the Analyst Column.

A & L Laboratory:
Identified by ME in Analyst Column
155 Center Street, Auburn, Maine 04210
www.allaboratory.com

Granite State Analytical Services LLC:
Identified by NH in Analyst Column
22 Manchester Road, Derry, NH 03038
www.granitestateanalytical.com

Nashoba Analytical:
Identified by MA in the Analyst Column
31A Willow Road, Ayer, MA 01432
www.nashobaanalytical.com

ANALYSIS RELATED NOTES:

- RL: "Reporting limit" means the lowest level of an analyte that can be accurately recovered from the matrix of interest.
- DF: "Dilution factor" means the ratio of the volume of the sample to the volume of the final (dilute) solution.
- MDL: "Minimum Detection Limit" means the minimum result which can be reliably discriminated from a blank with a predetermined confidence level.
- A & L Laboratory / Granite State Analytical Services LLC / Nashoba Analytical. accreditation lists can be found on our websites listed above.
- Subcontracted samples will be identified by the Accreditation number of the subcontract laboratory in the analyst field for each analyte and the appropriate laboratory will be listed here.This report contains data that were produced by a subcontracted laboratory accredited for the fields of testing performed, if available. Accreditation for each analyte is identified by the * symbol following the analyte name.
  Alpha Analytical-Mansfield, 320 Forbes Boulevard, Mansfield, MA 02048 Accreditation # M-MA030
  R.I. Analytical, Inc., 41 Illinois Ave, Warwick, RI 02888 Accreditation # M-RI015
- Data Qualifiers (DQ) Flags provide additional information in regards to the receipt, analysis or quality control of a sample. These are indicated under the DQ Flags Column on your report and listed here if necessary: Data Qualifier (DQ) Flags: H = Hold time non-compliant., J = Estimated concentration.

SAMPLE STATE SPECIFIC NOTES:

Additional Narrative or Comments: Data qualifiers present in subcontract report.

We appreciate the opportunity to provide you with laboratory services. If you have any questions regarding the enclosed report, please contact the laboratory and we will be happy to assist you.

Erin Shaw
Laboratory Director

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31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4428 | website: www.nashobaanalytical.com

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854
SAMPLE ID #: 2402-02461-001
SAMPLED BY: Andersen Cash
SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW - SP03A

Legend
Passes ✓
Fails EPA Primary ⊗
Fails EPA Secondary ▽
Fails State Guideline ✕
Attention ⚠

DATE AND TIME COLLECTED: 02/14/2024 12:50PM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-Mass Secondary-NO2-NO3
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #: PO: 17045

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
Turbidity*	<0.5	NTU			0.5	No Limit	EPA 180.1	AH-MA	02/14/2024 04:19PM
Aluminum*	0.017	mg/L	✓		0.01	0.2 mg/L	EPA 200.7	AH-MA	02/19/2024 03:56PM
Calcium*	14	mg/L			1	No Limit	EPA 200.7	AH-MA	02/19/2024 03:56PM
Copper*	<0.010	mg/L	✓		0.010	1.3 mg/L	EPA 200.7	AH-MA	02/19/2024 03:56PM
Iron*	0.027	mg/L	✓		0.010	0.3 mg/L	EPA 200.7	AH-MA	02/19/2024 03:56PM
Magnesium	4.0	mg/L			1.0	No Limit	EPA 200.7	AH-MA	02/19/2024 03:56PM
Manganese*	<0.010	mg/L	✓		0.010	0.05 mg/L	EPA 200.7	AH-MA	02/19/2024 03:56PM
Potassium	3.7	mg/L			1.0	No Limit	EPA 200.7	AH-MA	02/19/2024 03:56PM
Silver*	<0.01	mg/L	✓		0.01	0.1 mg/L	EPA 200.7	AH-MA	02/19/2024 03:56PM
Zinc*	<0.010	mg/L	✓		0.010	5 mg/L	EPA 200.7	AH-MA	02/19/2024 03:56PM
Chloride*	113	mg/L	✓		2	250 mg/L	EPA 300.0	KW-MA	02/15/2024 01:35PM
Nitrate as N*	6.86	mg/L	✓		0.05	10 mg/L	EPA 300.0	KW-MA	02/15/2024 01:35PM
Nitrite as N*	<0.05	mg/L	✓		0.05	1 mg/L	EPA 300.0	KW-MA	02/15/2024 01:35PM
Sulfate*	17.6	mg/L	✓		2	250 mg/L	EPA 300.0	KW-MA	02/15/2024 01:35PM
Color, Apparent	0	CU	✓		0	15	SM 2120B	AH-MA	02/14/2024 04:17PM
Odor	0	TON	✓		0	3 T.O.N.	SM 2150B	KW-MA	02/14/2024 04:10PM
Total Alkalinity*	8.3	mg CaCO3/L			1	No Limit	SM 2320B	AH-MA	02/14/2024 04:30PM
Hardness (calc.)	51	mg CaCO3/L			1	No Limit	SM 2340 B	AH-MA	02/19/2024 03:56PM
Total Dissolved Solids*	76	mg/L	✓		10	500 mg/L	SM 2540C	M-RI015	02/16/2024 01:58PM
pH at 25°C*	5.77	SU	▽	H	N/A	6.5 - 8.5 SU	SM 4500-H-B	AH-MA	02/14/2024 04:22PM

Erin Shaw
Erin Shaw
Laboratory Director

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CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854

SAMPLE ID #: 2402-02461-002
SAMPLED BY: Andersen Cash
SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW - SP03A

Legend
Passes ✓
Fails EPA Primary ⊗
Fails EPA Secondary ▽
Fails State Guideline ✕
Attention ⚠

DATE AND TIME COLLECTED: 02/14/2024 12:50PM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-VOC524.2-MA
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #:

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
1,1,1,2-Tetrachloroethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,1,1-Trichloroethane*	<0.5	ug/L	✓		0.5	200 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,1,2,2-Tetrachloroethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,1,2-Trichloroethane*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,1-Dichloroethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,1-Dichloroethylene*	<0.5	ug/L	✓		0.5	7 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,1-Dichloropropylene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,2,3-Trichlorobenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,2,3-Trichloropropane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,2,4-Trichlorobenzene*	<0.5	ug/L	✓		0.5	70 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,2,4-Trimethylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,2-Dibromo-3-chloropropane	<0.5	ug/L			0.5	0.2 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,2-Dibromoethane	<0.5	ug/L			0.5	0.05 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,2-Dichlorobenzene*	<0.5	ug/L	✓		0.5	600 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,2-Dichloroethane*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,2-Dichloropropane*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,3,5-Trimethylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,3-Dichlorobenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,3-Dichloropropane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,4-Dichlorobenzene*	<0.5	ug/L	✓		0.5	5.0 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
2,2-Dichloropropane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
2-Butanone (MEK)	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
2-Chlorotoluene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
2-Hexanone	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM

Erin Shaw
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Laboratory Director

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CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854

SAMPLE ID #: 2402-02461-002
SAMPLED BY: Andersen Cash

SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW - SP03A

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▼
Fails State Guideline	✕
Attention	⚠

DATE AND TIME COLLECTED: 02/14/2024 12:50PM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-VOC524.2-MA
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #:

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
4-Chlorotoluene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
4-Isopropyltoluene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
4-Methyl-2-pentanone (MIBK)	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Acetone	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Benzene*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
Bromobenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Bromochloromethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Bromodichloromethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Bromoform*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Bromomethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Carbon disulfide	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Carbon tetrachloride*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
Chlorobenzene*	<0.5	ug/L	✓		0.5	100 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
Chloroethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Chloroform*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Chloromethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
cis-1,2-Dichloroethylene*	<0.5	ug/L	✓		0.5	70 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
cis-1,3-Dichloropropylene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Dibromochloromethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Dibromomethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Dichlorodifluoromethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Diethyl ether	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Diisopropyl ether (DIPE)	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Ethyl tert-butyl ether (ETBE)	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM

Erin Shaw
Erin Shaw
Laboratory Director

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CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854

SAMPLE ID #: 2402-02461-002
SAMPLED BY: Andersen Cash

SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW - SP03A

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▼
Fails State Guideline	✕
Attention	⚠

DATE AND TIME COLLECTED: 02/14/2024 12:50PM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-VOC524.2-MA
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #:

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
Ethylbenzene*	<0.5	ug/L	✓		0.5	700 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
Hexachlorobutadiene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Isopropylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
m&p-Xylenes	<1	ug/L			1	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Methyl tert-butyl ether (MtBE)*	<0.5	ug/L	✓		0.5	70 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
Methylene chloride*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
Naphthalene*	<0.5	ug/L	✓		0.5	100 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
n-Butylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Nitrobenzene	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
n-Propylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
o-Xylene	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
sec-Butylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Styrene*	<0.5	ug/L	✓		0.5	100 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
tert-Amyl methyl ether (TAME)	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
tert-Butyl alcohol (TBA)	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
tert-Butylbenzene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Tetrachloroethylene*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
Tetrahydrofuran (THF)	<10	ug/L			10	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Toluene*	<0.5	ug/L	✓		0.5	1000 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
Total THMs*	<0.5	ug/L	✓		0.5	80 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
Total Xylenes*	<0.5	ug/L	✓		0.5	10000 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
trans-1,2-Dichloroethylene*	<0.5	ug/L	✓		0.5	100 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
trans-1,3-Dichloropropylene*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Trichloroethylene*	<0.5	ug/L	✓		0.5	5 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM

Erin Shaw
Erin Shaw
Laboratory Director

NASHOBA ANALYTICAL
A DIVISION OF GRANITE STATE ANALYTICAL SERVICES, LLC
31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4428 | website: www.nashobaanalytical.com

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854
SAMPLE ID #: 2402-02461-002
SAMPLED BY: Andersen Cash
SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW - SP03A

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▼
Fails State Guideline	✕
Attention	⚠

DATE AND TIME COLLECTED: 02/14/2024 12:50PM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-VOC524.2-MA
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #:

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
Trichlorofluoromethane*	<0.5	ug/L			0.5	No Limit	EPA 524.2	KV-NH	02/16/2024 09:03PM
Vinyl chloride*	<0.5	ug/L	✓		0.5	2 ug/L	EPA 524.2	KV-NH	02/16/2024 09:03PM
1,2-Dichlorobenzene-d4	89	%	✓		0.5	70-130%	EPA 524.2 - SS	KV-NH	02/16/2024 09:03PM
4-Bromofluorobenzene	89	%	✓		0.5	70-130%	EPA 524.2 - SS	KV-NH	02/16/2024 09:03PM

Erin Shaw
Erin Shaw
Laboratory Director

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31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4428 | website: www.nashobaanalytical.com

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854

SAMPLE ID #: 2402-02461-003
SAMPLED BY: Andersen Cash
SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW - SP03A

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▽
Fails State Guideline	✕
Attention	⚠

DATE AND TIME COLLECTED: 02/14/2024 12:50PM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-PFC-18-alpha-MA
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #:

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic Acid*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 11:19AM
4,8-dioxa-3H-perfluorononanoic acid*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 11:19AM
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 11:19AM
Date Extracted	-					No Limit	EPA 537.1	MA00030	02/21/2024 01:40AM
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 11:19AM
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 11:19AM
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 11:19AM
Perfluorobutanesulfonic Acid (PFBS)*	10.3	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 11:19AM
Perfluorodecanoic Acid (PFDA)*	<2.00	ng/L			Sub Report		EPA 537.1	MA00030	02/21/2024 11:19AM
Perfluorododecanoic Acid (PFDoA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 11:19AM
Perfluoroheptanoic Acid (PFHpA)*	5.40	ng/L			Sub Report		EPA 537.1	MA00030	02/21/2024 11:19AM
Perfluorohexanesulfonic Acid (PFHxS)*	37.7	ng/L			Sub Report		EPA 537.1	MA00030	02/21/2024 11:19AM
Perfluorohexanoic Acid (PFHxA)*	14.1	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 11:19AM

Erin Shaw
Erin Shaw
Laboratory Director

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31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4428 | website: www.nashobaanalytical.com

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 02/23/2024
CLIENT NAME: Maher Services
CLIENT ADDRESS: 71 Concord Street
North Reading, MA 01854

SAMPLE ID #: 2402-02461-003
SAMPLED BY: Andersen Cash
SAMPLE ADDRESS: Hyannis Water
Smith
Barnstable MA
MORE LOC INFO: TW - SP03A

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▼
Fails State Guideline	✕
Attention	⚠

DATE AND TIME COLLECTED: 02/14/2024 12:50PM
DATE AND TIME RECEIVED: 02/14/2024 03:47PM
ANALYSIS PACKAGE: M-PFC-18-alpha-MA
RECEIPT TEMPERATURE: 15.4° CELSIUS
CLIENT JOB #:

Test Description	Result	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date - Time Analyzed
Perfluorononanoic Acid (PFNA)*	1.00	ng/L		J	Sub Report		EPA 537.1	MA00030	02/21/2024 11:19AM
Perfluorooctanesulfonic Acid (PFOS)*	39.1	ng/L			Sub Report		EPA 537.1	MA00030	02/21/2024 11:19AM
Perfluorooctanoic Acid (PFOA)*	12.3	ng/L			Sub Report		EPA 537.1	MA00030	02/21/2024 11:19AM
Perfluorotetradecanoic Acid (PFTA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 11:19AM
Perfluorotridecanoic Acid (PFTrDA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 11:19AM
Perfluoroundecanoic Acid (PFUnA)*	<2.00	ng/L			Sub Report	No Limit	EPA 537.1	MA00030	02/21/2024 11:19AM
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid	104	%	✓			70-130%	EPA 537.1 - SS	MA00030	02/21/2024 11:19AM
Perfluoro-n-[1,2-13C2]decanoic Acid	122	%	✓			70-130%	EPA 537.1 - SS	MA00030	02/21/2024 11:19AM
Perfluoro-n-[1,2-13C2]hexanoic Acid	117	%	✓			70-130%	EPA 537.1 - SS	MA00030	02/21/2024 11:19AM
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic Acid	113	%	✓			70-130%	EPA 537.1 - SS	MA00030	02/21/2024 11:19AM
Total 6 (PFOS PFOA PFNA PFHxS PFHpA PFDA)	94.5	ng/L	✕		Sub Report	20 ng/L Proposed	N/A calculation	MA00030	02/21/2024 11:19AM

Erin Shaw
Erin Shaw
Laboratory Director

2402-0246

NASHOBA ANALYTICAL

A DIVISION OF GRANITE STATE ANALYTICAL SERVICES, LLC

31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4425 | website: www.nashobaanalytical.com

Chain of Custody for Commercial Clients:

Your company name: MAHER SERVICES, INC. P.O. 17045

SAMPLE INFORMATION - please print clearly

Project or Customer Name:	HYANNIS WATER
Street Address:	SMITH
Town and State:	BARNSTABLE
Date Sampled:	2/14
Time Sampled:	10 AM (HP-02B), 12:50 (SP03A)
Sample Taken At: (i.e Kitchen Sink, Well Head...)	TW-HP-02B, TW SP03A
Sampled by (Name):	ANDERSEN CASH

Test(s) to be Performed: 2 sets SEC. CONT + NO_2, NO_3, VOC

PFAS

(if not sure ask an analyst)

Email Results:

Lab Use Only:	
Receipt Temperature:	15.4° Ice: Y or N
Date 2/14/24	Time 1547
Received at Lab by:	SC

ANALYTICAL REPORT

Lab Number:	L2408306
Client:	Nashoba Analytical, LLC 31A Willow Rd Ayer, MA 01432
ATTN:	Maria Braun
Phone:	(978) 391-4428
Project Name:	Not Specified
Project Number:	2402-02461
Report Date:	02/22/24

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0825), DoD (L2474), FL (E87814), IL (200081), IN (C-MA-04), KY (KY98046), LA (85084), ME (MA00030), MD (350), MI (99110) , NJ (MA015), NY (11627), NC (685), OH (CL106), OR (MA-0262), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #525-23-107-88708), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: Not Specified
Project Number: 2402-02461

Lab Number: L2408306
Report Date: 02/22/24

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2408306-01	2402-02461-003	DW	2402-02461	02/14/24 12:50	02/15/24
L2408306-02	FIELD BLANK	DW	2402-02461	02/14/24 12:50	02/15/24

Project Name:	Not Specified	**Lab Number:**	L2408306
Project Number:	2402-02461	**Report Date:**	02/22/24

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name: Not Specified
Project Number: 2402-02461
Lab Number: L2408306
Report Date: 02/22/24

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Perfluorinated Alkyl Acids by EPA 537.1

L2408306-01: The sample was received with insufficient preservation. During sample preparation, Trizma was added to meet the acceptable pH range for the method.

L2408306-01: The sample has a detection that exceeds the Maximum Contaminant Level (MCL).

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Darian Dailey

Title: Technical Director/Representative Date: 02/22/24

ORGANICS

SEMIVOLATILES

Project Name: Not Specified
Project Number: 2402-02461
Lab Number: L2408306
Report Date: 02/22/24

SAMPLE RESULTS

Lab ID: L2408306-01
Client ID: 2402-02461-003
Sample Location: 2402-02461

Date Collected: 02/14/24 12:50
Date Received: 02/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Dw
Analytical Method: 133,537.1
Analytical Date: 02/21/24 11:19
Analyst: CAP

Extraction Method: EPA 537.1
Extraction Date: 02/21/24 01:40

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	10.3		ng/l	2.00	0.626	1
Perfluorohexanoic Acid (PFHxA)	14.1		ng/l	2.00	0.626	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	2.00	0.626	1
Perfluoroheptanoic Acid (PFHpA)	5.40		ng/l	2.00	0.626	1
Perfluorohexanesulfonic Acid (PFHxS)	37.7		ng/l	2.00	0.626	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	2.00	0.626	1
Perfluorooctanoic Acid (PFOA)	12.3		ng/l	2.00	0.626	1
Perfluorononanoic Acid (PFNA)	1.00	J	ng/l	2.00	0.626	1
Perfluorooctanesulfonic Acid (PFOS)	39.1		ng/l	2.00	0.626	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	0.626	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	2.00	0.626	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	0.626	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	0.626	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	0.626	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	0.626	1
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	2.00	0.626	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	0.626	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	0.626	1
PFAS, Total (6)	94.5		ng/l	2.00	0.626	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	117		70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	113		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	122		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	104		70-130

Project Name: Not Specified
Project Number: 2402-02461
Lab Number: L2408306
Report Date: 02/22/24

SAMPLE RESULTS

Lab ID: L2408306-02
Client ID: FIELD BLANK
Sample Location: 2402-02461

Date Collected: 02/14/24 12:50
Date Received: 02/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Dw
Analytical Method: 133,537.1
Analytical Date: 02/21/24 11:27
Analyst: CAP

Extraction Method: EPA 537.1
Extraction Date: 02/21/24 01:40

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	0.668	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	0.668	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	2.00	0.668	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	0.668	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	0.668	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	2.00	0.668	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	0.668	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	0.668	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	0.668	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	0.668	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	2.00	0.668	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	0.668	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	0.668	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	0.668	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	0.668	1
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	2.00	0.668	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	0.668	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	0.668	1
PFAS, Total (6)	ND		ng/l	2.00	0.668	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	120		70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	119		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	125		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	107		70-130

Project Name: Not Specified
Project Number: 2402-02461
Lab Number: L2408306
Report Date: 02/22/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 133,537.1
Analytical Date: 02/21/24 10:08
Analyst: CAP

Extraction Method: EPA 537.1
Extraction Date: 02/21/24 01:40

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab for sample(s): 01-02 Batch: WG1887443-1					
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	0.668
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	0.668
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	2.00	0.668
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	0.668
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	0.668
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	2.00	0.668
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	0.668
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	0.668
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	0.668
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	0.668
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	2.00	0.668
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	0.668
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	0.668
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	0.668
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	0.668
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	2.00	0.668
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	0.668
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	0.668
PFAS, Total (6)	ND		ng/l	2.00	0.668

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	104		70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	102		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	110		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	107		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: 2402-02461

Lab Number: L2408306
Report Date: 02/22/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-02 Batch: WG1887443-2								
Perfluorobutanesulfonic Acid (PFBS)	100		-		50-150	-		30
Perfluorohexanoic Acid (PFHxA)	120		-		50-150	-		30
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	104		-		50-150	-		30
Perfluoroheptanoic Acid (PFHpA)	124		-		50-150	-		30
Perfluorohexanesulfonic Acid (PFHxS)	112		-		50-150	-		30
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	139		-		50-150	-		30
Perfluorooctanoic Acid (PFOA)	126		-		50-150	-		30
Perfluorononanoic Acid (PFNA)	134		-		50-150	-		30
Perfluorooctanesulfonic Acid (PFOS)	122		-		50-150	-		30
Perfluorodecanoic Acid (PFDA)	142		-		50-150	-		30
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	118		-		50-150	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	119		-		50-150	-		30
Perfluoroundecanoic Acid (PFUnA)	121		-		50-150	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	110		-		50-150	-		30
Perfluorododecanoic Acid (PFDoA)	125		-		50-150	-		30
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	78		-		50-150	-		30
Perfluorotridecanoic Acid (PFTrDA)	129		-		50-150	-		30
Perfluorotetradecanoic Acid (PFTA)	141		-		50-150	-		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: 2402-02461

Lab Number: L2408306
Report Date: 02/22/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-02 Batch: WG1887443-2								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	111				70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	114				70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	120				70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	112				70-130

Matrix Spike Analysis

Batch Quality Control

Project Name: Not Specified
Project Number: 2402-02461

Lab Number: L2408306
Report Date: 02/22/24

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1887443-3 QC Sample: L2408302-01 Client ID: MS Sample												
Perfluorobutanesulfonic Acid (PFBS)	4.36	1.65	5.36	61		-	-		50-150	-		30
Perfluorohexanoic Acid (PFHxA)	6.22	1.86	7.53	70		-	-		50-150	-		30
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA)	ND	1.86	1.83J	98		-	-		50-150	-		30
Perfluoroheptanoic Acid (PFHpA)	2.73	1.86	4.43	91		-	-		50-150	-		30
Perfluorohexanesulfonic Acid (PFHxS)	5.36	1.7	6.75	82		-	-		50-150	-		30
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND	1.76	1.92J	109		-	-		50-150	-		30
Perfluorooctanoic Acid (PFOA)	6.02Z	1.86	6.68	**36**	Q	-	-		50-150	-		30
Perfluorononanoic Acid (PFNA)	ND	1.86	2.44	131		-	-		50-150	-		30
Perfluorooctanesulfonic Acid (PFOS)	5.23	1.73	6.16	54		-	-		50-150	-		30
Perfluorodecanoic Acid (PFDA)	ND	1.86	2.20	118		-	-		50-150	-		30
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND	1.74	1.47J	85		-	-		50-150	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	1.86	1.92J	103		-	-		50-150	-		30
Perfluoroundecanoic Acid (PFUnA)	ND	1.86	1.90J	102		-	-		50-150	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	1.86	1.42J	76		-	-		50-150	-		30
Perfluorododecanoic Acid (PFDoA)	ND	1.86	2.14	115		-	-		50-150	-		30
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND	1.75	1.41J	80		-	-		50-150	-		30
Perfluorotridecanoic Acid (PFTrDA)	ND	1.86	2.09	112		-	-		50-150	-		30
Perfluorotetradecanoic Acid (PFTA)	ND	1.86	2.23	120		-	-		50-150	-		30

Matrix Spike Analysis

Batch Quality Control

Project Name: Not Specified
Project Number: 2402-02461

Lab Number: L2408306
Report Date: 02/22/24

Parameter	*Native Sample*	*MS Added*	*MS Found*	*MS %Recovery*	*Qual*	*MSD Found*	*MSD %Recovery*	*Qual*	*Recovery Limits*	*RPD*	*Qual*	*RPD Limits*
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1887443-3 QC Sample: L2408302-01 Client ID: MS Sample												

Surrogate	*MS % Recovery*	*MS Qualifier*	*MSD % Recovery*	*MSD Qualifier*	*Acceptance Criteria*
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-13C3-Propanoic Acid (M3HFPO-DA)	91				70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	91				70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	101				70-130
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	99				70-130

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: 2402-02461

Lab Number: L2408306
Report Date: 02/22/24

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1887443-4 QC Sample: L2408305-01 Client ID: DUP Sample						
Perfluorobutanesulfonic Acid (PFBS)	4.71	4.59	ng/l	3		30
Perfluorohexanoic Acid (PFHxA)	7.53	7.74	ng/l	3		30
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA)	ND	ND	ng/l	NC		30
Perfluoroheptanoic Acid (PFHpA)	3.38	3.40	ng/l	1		30
Perfluorohexanesulfonic Acid (PFHxS)	34.1	32.4	ng/l	5		30
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND	ND	ng/l	NC		30
Perfluorooctanoic Acid (PFOA)	10.8	10.4	ng/l	4		30
Perfluorononanoic Acid (PFNA)	1.58J	1.63J	ng/l	NC		30
Perfluorooctanesulfonic Acid (PFOS)	22.4	20.9	ng/l	7		30
Perfluorodecanoic Acid (PFDA)	ND	ND	ng/l	NC		30
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND	ND	ng/l	NC		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	ND	ng/l	NC		30
Perfluoroundecanoic Acid (PFUnA)	ND	ND	ng/l	NC		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	ND	ng/l	NC		30
Perfluorododecanoic Acid (PFDoA)	ND	ND	ng/l	NC		30
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND	ND	ng/l	NC		30
Perfluorotridecanoic Acid (PFTrDA)	ND	ND	ng/l	NC		30
Perfluorotetradecanoic Acid (PFTA)	ND	ND	ng/l	NC		30

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: 2402-02461

Lab Number: L2408306
Report Date: 02/22/24

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits

Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1887443-4 QC Sample: L2408305-01 Client ID: DUP Sample

Surrogate	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	107		114		70-130
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-13C3-Propanoic Acid (M3HFPO-DA)	105		110		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	123		130		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	82		96		70-130

Project Name: Not Specified
Project Number: 2402-02461

Lab Number: L2408306
Report Date: 02/22/24

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2408306-01A	Plastic 250ml Trizma preserved	A	NA		2.5	Y	Absent		A2-MA-537.1(14)
L2408306-01B	Plastic 250ml Trizma preserved	A	NA		2.5	Y	Absent		A2-MA-537.1(14)
L2408306-02A	Plastic 250ml Trizma preserved	A	NA		2.5	Y	Absent		A2-MA-537.1(14)

*Values in parentheses indicate holding time in days

Project Name: Not Specified
Project Number: 2402-02461

Lab Number: L2408306
Report Date: 02/22/24

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA/PFTeDA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS/PFDoS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
Perfluoropropanesulfonic Acid	PFPrS	423-41-6
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA/PFOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

Project Name: Not Specified
Project Number: 2402-02461

Lab Number: L2408306
Report Date: 02/22/24

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
FLUOROTELOMER CARBOXYLIC ACIDS (FTCAs)		
3-Perfluoroheptyl Propanoic Acid	7:3FTCA	812-70-4
2H,2H,3H,3H-Perfluorooctanoic Acid	5:3FTCA	914637-49-3
3-Perfluoropropyl Propanoic Acid	3:3FTCA	356-02-5

Project Name:	Not Specified	**Lab Number:**	L2408306
Project Number:	2402-02461	**Report Date:**	02/22/24

GLOSSARY

Acronyms

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	Not Specified	**Lab Number:**	L2408306
Project Number:	2402-02461	**Report Date:**	02/22/24

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Report Format: DU Report with 'J' Qualifiers

Project Name:	Not Specified	**Lab Number:**	L2408306
Project Number:	2402-02461	**Report Date:**	02/22/24

Data Qualifiers

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Report Format: DU Report with 'J' Qualifiers

Project Name:	Not Specified	**Lab Number:**	L2408306
Project Number:	2402-02461	**Report Date:**	02/22/24

REFERENCES

133 Determination of Selected Per- and Polyfluorinated Alkyl Substances in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS). EPA Method 537.1, EPA/600/R-18/352. Version 1.0, November 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625.1: alpha-Terpineol
EPA 8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 524.2: THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables).
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

U15724

L2408306

NASHOBA ANALYTICAL

A DIVISION OF GRANITE STATE ANALYTICAL SERVICES, LLC

31A Willow Road Ayer, Massachusetts 01432
Phone: 978-391-4428 | website: www.nashobaanalytical.com

Chain of Custody

Client/Project Name: 2402-02461

Laboratory Number:

Sampled by: Client

Sample #	Date	Time	Grab[G] or Composite[C]	Location	Container (Glass) (Plastic) (Sterile) (VOC)	Preservative	Test Requirements: EPA 537.1	Test Requirements: 18 Compounds	Test Requirements								Comments
-01 1	2/14/2024	12:50	G	2402-02461-003	2 - 250mL P	10	X	X									Drinking Water
-02 2			G	Field Blank	1 - 250mL P	10											Field Blank
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Preservative: 1-Hydrochloric Acid, 2- Ice, 3-Nitric Acid, 4-None, 5-Sodium Hydroxide, 6-Sulfuric Acid, 7-Thiosulfate, 8-Filter Sterilized, 9-Ammonium Chloride
10 - Trizma

Special Notes/Requirements

X	**IF THIS BOX IS CHECKED, MCL EXCEEDANCES MUST BE REPORTED IMMEDIATELY. THANK YOU.**
X	**IF THIS BOX IS CHECKED, PLEASE RUN FIELD BLANK (S) IF DETECTS.**

Relinquished by:	Date	Time	Received by:
1.	2/15/24	9:38	DAVIS AAL
2.	2/15/24	10:40	Walstad
3.	2/15/24	1500	H Ruiz 2/15 1500
4. H Ruiz 2/15		1600	GAGC1 - AAL 2/15/24 1600
5.			

SPECIFICATION EXAMPLES FOR VERTICAL TURBINE PUMPS

GOULDS WATER TECHNOLOGY
a xylem brand

SUBMITTAL

Quote ID: 9001-231006-034:0:1 QTY: 1
VIT-DITM 12WALC, 4 Stages

PERFORMANCE ON DESIGN CURVE AT 1770 RPM

	Shut Off	Design [2]	Run Out [5]		
Flow (USGPM)	0.0	520.0	711.0	**Best Efficiency**	82.90 % at 519.0 USgpm
TDH-Bowl (ft)	377.0	281.0	195.0	**Design Flow % BEP**	100.19 %
TDH-Disch Flange (ft)	371.2	274.1	187.1	**Pump Efficiency**	81.61 %
Bowl Efficiency (%)	-	82.80	72.20	**Overall Efficiency**	77.12 %
Guaranteed Bowl Efficiency (%)	-	80.32	-	**NOL Power**	48.4 Hp at 711.0 USgpm
Power (Hp)	25.3	44.6	48.4	**Specified NPSH Ratio**	1.1
Guaranteed Power (Hp)	-	46.4	-	**Thrust Load Power Loss**	0.28637 Hp
NPSHr (ft) [1]	-	8.0	12.9	**Total Flow Derate Factor**	1.00
NPSH Margin (ft) [1]	-	57.2	52.4	**Total Head Derate Factor**	1.00
Hydraulic Thrust(lb)	2653.0	1979.0	1373.0	**Total Efficiency Derate Factor**	1.00
Thrust (lb)	3069.0	2334.4	1674.2	**Actual Submergence**	392.12 in
Pressure-Bowl (psi)	163.2	121.6	84.4	**Shaft Friction Power Loss**	0.18 Hp
Pressure-Disch Flange (psi)	160.7	118.6	81.0	**Min Flow (MCSF)**	130.0 USgpm
Min Submergence (Inch) [3]	-	19.15	21.96	**kWh per 1000 gal**	1.14416
Friction Loss (ft) [4]	-	1.18	2.16	**Impeller Running Clearance**	0.13 in
Lineshaft Elongation (Inch)	0.04719	0.03520	-		
Column Elongation (Inch)	0.00124	0.00093	-		
Lateral (Inch)	0.17594	0.16427	-		

[1] at 1st impeller eye [2] rated values [3] from pump suction inlet [4] from bowl to disch flange [5] per published data

OPERATING CONDITIONS

Specified Flow	520.00 USgpm
Specified TDH	280.00 ft
Rated Speed	1770 RPM
Atmospheric Pressure	14.70 psi
TPL	38.00 ft
Pumping Level	5.00 ft
Min. Recommended Sump Depth	38.34 ft
NPSHa at 1st Impeller	65.3 ft
NPSHa at Grade	34.0 ft
Operational Design	Constant Speed

FLUID CHARACTERISTICS

Fluid	Water
Fluid Temperature	68.0 °F
Specific Gravity	1.0000
Viscosity	1.0017 cP
Vapor Pressure	0.3393 psi
Density	62 lbs/ft³

MATERIALS & DIMENSIONS

Bowl Data

Bowl Material	Cast Iron with Glass Enamel
Impeller Material	316SS
Bowlshaft Material	416SS
Impeller Attachment	Taper Lock
Taperlock Material	Carbon Steel
Discharge Bowl Material	Cast Iron
Suction Type	Bell
Suction Material	Cast Iron
Bowl Bolting Material	Carbon Steel
Sand Collar	304SS
Pipe Plug	Iron
Suction Bearing	Bronze

Bowl Data

Discharge Bowl Bearing	Bronze
Intermediate Bowl Bearing	Bronze
Impeller Trim	8.81 in
Bowl Pressure Limit	380 psi
Model Max Sphere Size	0.66 in
Available Lateral	0.62 in
Bowl Shaft Diameter	1 11/16 in [42.9 mm]
Impeller Balance	Manufacturer's Standard
Impeller Design	Enclosed
Bowl Shaft Power Limit	374.72 Hp
Bowl Assembly Provided By	Xylem

Bowl Specials

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SUBMITTAL

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VIT-DITM 12WALC, 4 Stages

Column Data

Column Type	Threaded
Column Diameter	6 in [152 mm]
Lineshaft Diameter	1 in [25.4 mm]
Column Pipe Material	Carbon Steel
Lineshaft Material	416SS
Lineshaft Bearing Material	Rubber (Dog Bone)
Lineshaft Coupling Type	Threaded
Lineshaft Coupling Material	416SS
Column Loss	0.78 ft
Column Velocity	5.94 ft/s
Separate Bearing Retainer	304SS
Bearing Retainer Design	Separate
Maximum Bearing Spacing	10 ft [3 m] Spacing

Column Data

Max Column Section Length	120 in
Number of Bearings	3
First Lateral Critical Speed	1000 RPM
First Lateral Critical Speed Ratio	0.57
Second Lateral Critical Speed	2747 RPM
Second Lateral Critical Speed Ratio	1.55
Column Wall Thickness	0.28 in
Lubrication Method	(Open LS) Product Lube
Lineshaft Power Limit	70 Hp
Column Assembly Provided By	Xylem

Column Specials

Head Data

Head Type	DI (Ductile Iron)
Discharge Flange Rating	150 #
Disch Flange Pressure Limit	250 psi
Head Design	One Piece Head
Discharge Head Material	Ductile Iron
Headshaft Material	416SS
Headshaft Coupling Type	Threaded
Headshaft Coupling Material	416SS
Headshaft Diameter	1.00 in
Discharge Head Size	6 in [152 mm]
Discharge Head BD	12 in [305 mm]

Head Data

Sealing Method	Packing
Packing Material	Acrylic Yarn and Graphite
Stuffing Box Material	Cast Iron
Stuffing Box / Seal Hsg Bolt	316SS
Stuffing Box / Seal Hsg Brg	Bronze
Head Loss	0.40 ft
Head Bolting	Carbon Steel
Split Gland	316SS
Head Assembly Provided By	Xylem

Head Specials

Motor Data

Driver Type	Vertical Hollow Shaft Motor
Manufacturer	US
HP Rating	50 Hp
Speed [Poles]	1800 rpm [4 pole]
Voltage	230/460 V
Phase / Frequency	3 PH / 60 Hz
Enclosure	TEFC Corro-Duty
Efficiency / Config	Premium
Motor Efficiency	94.50 %
Motor Frame	326TPH
BD	12.0 in
BX / U	1.00 in
BE	1.00 in

Motor Data

Thrust Level	100% HT
Thrust Capacity	4500 lbs
Inverter Duty	Yes
Steady Bushing	No
Coupling	NRR w/o Steady Bushing
SF / Insulation**	1.15 H
Mfg Catalog Number	CHT50V2BLG-C
Motor Part Number	H050B2A1FB-CVNU-100A0B000
Motor Provided By	Xylem
Motor Mounted By	Customer

Motor Specials

Coating Data

Bowl OD	Goulds Water Technology Blue Enamel
Column OD	Goulds Water Technology Blue Enamel

Coating Data

Head OD	Goulds Water Technology Blue Enamel

Testing Data

Accessories

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GOULDS WATER TECHNOLOGY a xylem brand

SUBMITTAL

Quote ID: 9001-231006-034:0:1 QTY: 1
VIT-DITM 12WALC, 4 Stages

Engineering Services

Engineering Services Notes

Miscellaneous Specials

Assembly and Crating

Assembly	Fully Assembled
Crating	Domestic Skid

Assembly and Crating Notes

In general, pumps are crated and shipped fully assembled* via standard freight methods (LTL/LCL) if overall crated length is 20 ft or less and weight is 2500 lbs or less. Up to 45 ft and 4000 lbs can still be fully assembled but will ship via dedicated freight methods (FTL/FCL/flatbed/air/special). Otherwise, each sub-assembly (bowl, column, and head) is crated separately ("column loose"). *Motors, suction cans, mechanical seals, spare parts, and other special items are crated separately. Coordinate specific expectations with the factory at time of order.

Weight Data

Total Bowl Weight	525 lbs
Total Column Weight	816 lbs
Head Weight	230 lbs

Weight Data

Motor Weight	750 lbs
Total Weight	2321 lbs

Comments

INFO, WARNING & ERROR MESSAGES

Our offer does not include specific review and incorporation of any Statutory or Regulatory Requirements, and the offer is limited to the requirements of the design specifications. Should any Statutory or Regulatory requirements need to be reviewed and incorporated, then the Customer is responsible to identify those and provide copies for review and revision of our offer.

Our quotation is offered in accordance with our comments and exceptions identified in our proposal and governed by our standard terms and conditions of sale – Xylem Americas. Available here: https://www.xylem.com/en-us/support/xylem-americas-standard-terms-and-conditions/

For units requiring a factory performance test, all performance tests will be conducted per ANSI/HI 14.6 standards unless otherwise noted. As a standard, test results for the primary design point meeting grade 2B tolerances for pumps with a rated shaft power of 134 hp or less and grade 1B for greater than 134 hp will be considered passing. If secondary or tertiary design points are required to be tested, these will be subject to grade 3B tolerances. For testing of more than 3 points, consult the factory. Other acceptance grades are available and must be clearly noted and mutually agreed upon between the Customer and Xylem before release to manufacture.

Holding shipment for testing approval allows 2 weeks of calculated production lead time for the approval process. If shipment approval has not been obtained by 4 weeks after submission of passing test results, Xylem reserves the right to ship product on purchase orders less than or equal to $10,000 USD without explicit approval, or to impose storage fees until shipment approval is granted on purchase orders greater than $10,000 USD. For planned approval processes exceeding 2 weeks, please consider that additional lead time and coordinate expectations with the factory, including storage fees. For faster shipment, select "No" to the hold shipment for testing approval option.

For units not requiring a factory performance test, product performance can be expected to meet 3B tolerances primarily due to the variability of field conditions. Field-measured performance may vary from factory-measured performance or published data as a result of unknown or unpredictable system conditions and measurement variability. If field performance testing is required after installation, factory performance testing before shipment is strongly recommended. Field performance test results do not constitute a warranty claim unless verified by Xylem.

The information provided in this submittal is published data nominally representative of the selected pump model's performance characteristics. If factory performance testing is included, actual as-tested performance curves for each tested pump will be provided after testing is complete. Impeller trim diameter is subject to change to meet intended design conditions.

Special requests are subject to further review after receipt of customer purchase order during the factory's order entry and design engineering processes. If NSF 61 certified construction is required, an additional audit will completed. The Xylem team will communicate any discrepancies and possible changes.

Customer is responsible for verifying that the recommendations made and the materials selected are satisfactory for the Customer's intended environment and Customer's use of the selected pump. Customer is responsible for determining the suitability of Xylem recommendations for all operating conditions within Customer's and/or End User's control. Xylem disclaims all warranties, express or implied warranties, including, but not limited to, warranties of merchantability and fitness for a particular purpose, and all express warranties other than the limited express warranty set forth in the attached standard terms and conditions of sale – Xylem Americas attached hereafter.

Xylem does not guarantee any pump intake configuration. The hydraulic and structural adequacies of these structures are the sole responsibility of the Customer or his representatives.

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Further, Xylem accepts no liability arising out of unsatisfactory pump intake field operating conditions. The Customer or his representatives are referred to the Hydraulic Institute Standards for recommendations on pump intake design. To optimize the hydraulic design of a field pump intake configuration, the Customer should strongly consider performing a detailed scale model pump intake study. However, the adequacies of these recommendations are the sole responsibility of the Customer.

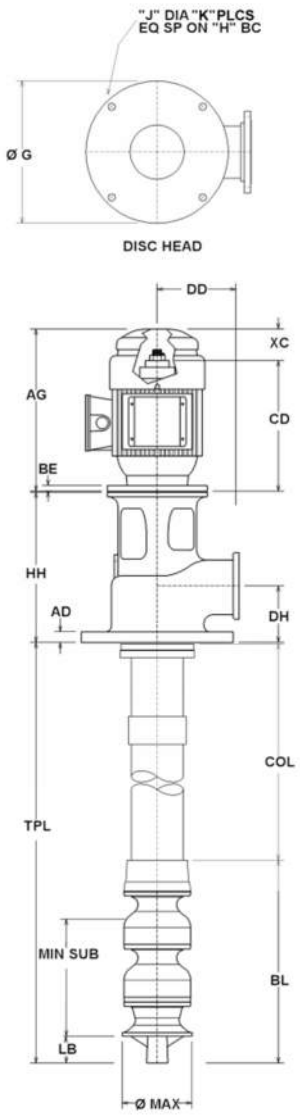
Xylem's standard enamel paint offering is a coating applied at no extra charge and is intended to provide a limited cosmetic improvement over the bare metal product. The coating will not prevent rust, corrosion, or fading. Fading, flaking, chipping, or bleeding rust can be expected within 3 months of exposure to weather or other elements. For applications where visual aesthetics or corrosion resistance is important, please consider one of our protective coating options.

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OUTLINE DRAWING

Quote ID: 9001-231006-034:0:1 QTY: 1
VIT-DITM 12WALC, 4 Stages



DIMENSIONS

Dim G [Mounting Flange Dia]:	19.00 in
J [Mounting Flange Hole Dia]	0.75 in
K [Mounting Hole Places]	4
H [Mounting Flange Bolt Circle]	17.00 in
AG [Motor Height]	35.63 in
CD [Motor Coupling Height]	28.50 in
XC [Top Hdshft to top VHS Motor]	6.88 in
BD [Motor Base Dia]	12.00 in
BE [Motor Base Thickness]	1.00 in
Discharge Head Size	6.00 in
BD Head [Discharge Head Base Dia]	12.00 in
HH [Head Height]	21.00 in
AD [Mounting Flange Thickness]	0.88 in
DD [Disch Flange Stickout]	10.00 in
DH [Disch Flange Height]	9.00 in
R [Hanger Flange OD]	7.31 in
COL [Column Length]	405.11 in
Column Diameter	6.00 in
TPL [Total Pump Length]	456.00 in
MIN SUB [Minimum Submergence]	19.15 in
LB [Length to Bottom]	3.88 in
MAX [Max Assembly OD]	11.60 in
BL [Bowl Assembly Length]	50.89 in
SU [Shaft Stickup]	8.00 in
Discharge Flange	6"-150#

PUMP DATA

Column Diameter	6 in [152 mm]
Lineshaft Diameter	1 in [25.4 mm]
Specified Flow	520.00 USgpm
Specified TDH	280.00 ft
Pumping Level	5.00 ft
Motor Manufacturer	US
Driver Type	Vertical Hollow Shaft Motor
Selected Motor Power	50.00 Hp
Motor Speed	1770 RPM
Phase / Frequency	3 PH / 60 Hz
Voltage	230/460 V

WEIGHTS

Total Bowl Weight	525 lbs
Total Column Weight	816 lbs
Head Weight	230 lbs
Motor Weight	750 lbs
Total Weight	2321 lbs

NOTES	
1	Total Pump Length ± 1.0 inch.
2	Tolerance on all dimensions is .12 or ± .12 inch per 5 ft, whichever is greater.
3	All dimensions shown are in inches unless otherwise specified.
4	Drawing not to scale.
5	½" NPT – Gauge Conn (plugged)
6	Driver may be rotated at 90º intervals about vertical centerline for details refer to driver dimension drawing.
7	Refer to product IOM for impeller setting requirements.
8	This assembly has been designed so that its natural frequency responses avoid the specific operating speeds by an adequate safety margin. The design has assumed the foundation to be rigid.

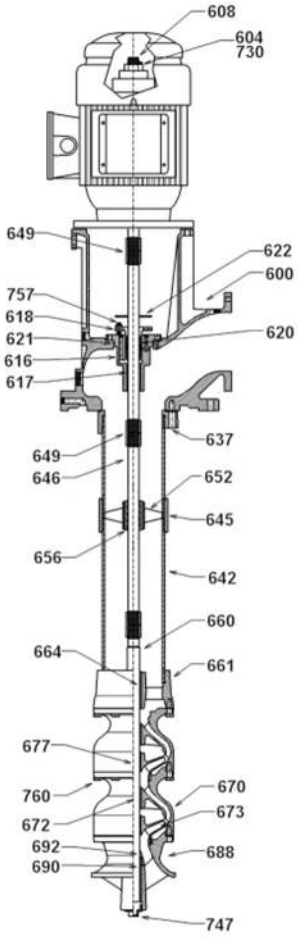
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CROSS SECTION DRAWING

Quote ID: 9001-231006-034:0:1 QTY: 1
VIT-DITM 12WALC, 4 Stages



BILL OF MATERIALS

ITEM	PART NAME	CODE	MATERIAL	ASTM#
Head Assembly				
608	Headshaft	2227	SST 416	A582 S41600
600	Head - Discharge	1018	Ductile Iron 65-45-12	A536
604	Nut - Adjusting	2242	Carbon Steel 1018	A108
616	Box - Stuffing	1003	Cast Iron CL 30	A48 CLASS 30B
617	Bearing - Seal Housing	1618	Bismuth Bronze	B584 Modified
618	Gland - Split	1203	SST 316	A744M
620	Packing	5026	Graphite Packing	ML402-99
621	O-Ring	5302	Nitrile Buna N	D4322
622	Slinger	5121	Rubber EPDM	D3568
649	Coupling - Headshaft	2265	SST 416	A582M
730	Key - Motor Gib	2242	Carbon Steel 1018	A108
757	Screw - Gland Adj	2229	SST 316	A276
760	Capscrew - Hex	2298	Steel Bolting GR 8	J429
Column Assembly				
642	Pipe - Column	6501	Black Pipe Sch 40	A53
645	Column - Coupling	6501	Black Pipe Sch 40	A53
646	Lineshaft	2227	SST 416	A582 S41600
649	Coupling - Lineshaft	2265	SST 416	A582M
652	Retainer - Bearing	1205	SST 304	A744M
656	Bearing - Lineshaft	5121	Rubber EPDM	D3568
Bowl Assembly				
660	Bowlshaft	2227	SST 416	A582 S41600
661	Bowl - Discharge	1003	Cast Iron CL 30	A48 CLASS 30B
664	Bearing - Discharge Bowl	1618	Bismuth Bronze	B584 Modified
670	Bowl - Intermediate	6911	Cast Iron CL 30 Enamel	A48
672	Bearing - Intermediate Bowl	1618	Bismuth Bronze	B584 Modified
673	Impeller	1203	SST 316	A744M
677	Taperlock - Impeller	2242	Carbon Steel 1018	A108
688	Suction	1003	Cast Iron CL 30	A48 CLASS 30B
690	Bearing - Suction	1618	Bismuth Bronze	B584 Modified
692	Sandcollar	1205	SST 304	A744M
747	Plug - Pipe	1046	Malleable Iron	A197
760	Capscrew - Hex	2298	Steel Bolting GR 8	J429

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APPENDIX D

FISH AND WILDLIFE SERVICE CONSULTATIONS

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
https://www.fws.gov/office/new-england-ecological-services

August 14, 2024

McKenna Roberts
Kleinfelder
One Beacon St., Suite 8100
Boston, MA 02108

RE: Straightway and Hyannisport PFAS Treatment Facility, Barnstable, MA (In reply refer to Project Code 2024-0078878)

Dear McKenna Roberts:

This responds to your request, dated August 13, 2024, and received in our office on the same date, for our concurrence with your determination that the Town of Barnstable's proposed installation of the Straightway and Hyannisport PFAS Treatment Facility in Barnstable, MA, funded through the U.S. Environmental Protection Agency's (EPA) Drinking Water State Revolving Fund (Project), may affect, but is not likely to adversely affect, the federally endangered northern long-eared bat (*Myotis septentrionalis*) and proposed endangered tricolored bat (*Perimyotis subflavus*). Your request and our response are made pursuant to section 7 of the Endangered Species Act of 1973, as amended (87 Stat. 884, as amended; 16 U.S.C 1531, et seq.) (ESA). We understand the Town of Barnstable is acting as a non-Federal representative of the EPA for the purpose of consultation under section 7.

Based on our knowledge, expertise, and review of the information and analysis included with your consultation request, we concur with your determination because any effects from the proposed action on the subject species would be insignificant and/or discountable.

The Town of Barnstable has made a no effect determination for the federally endangered American chaffseed (*Schwalbea americana*) and endangered sandplain gerardia (*Agalinis acuta*).

Further consultation under section 7 of the ESA is not required at this time. If any of the criteria at 50 CFR 402.16(a) are met, reinitiation of consultation is required, and the Town of Barnstable or the EPA should contact us immediately and suspend activities that may affect those species until the appropriate level of consultation is completed with our office. Thank you for your

cooperation, and please contact Eliese Dykstra of this office at 603-568-4652 or Eliese_Dykstra@fws.gov if you have questions or need further assistance.

Sincerely yours,

AUDREY MAYER

Digitally signed by AUDREY MAYER
Date: 2024.08.14 14:28:22 -04'00'

Audrey Mayer
Supervisor
New England Field Office

cc: mroberts@kleinfelder.com
kryan@kleinfelder.com
bmong@kleinfelder.com

Re: [EXTERNAL] Re: Eagles and MBTA Consultation

Ladin, Zachary S <zachary_ladin@fws.gov>
Thu 7/11/2024 9:46 AM
To:McKenna Roberts <MRoberts@kleinfelder.com>
Cc:Bethany Mong <BMong@kleinfelder.com>;Kirsten Ryan <KRyan@kleinfelder.com>

External Email

Hi there,

Thank you for your patience in our review and feedback on the Barnstable Water Treatment project. After reviewing the proposed project scope, activities, and timing, we do not see any adverse impacts to migratory birds listed under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act (BGEPA). If the project is able to adhere to the proposed time-of-year restriction for clearing trees outside of the primary breeding season of birds (April-May) and there are no active bald eagle nests within 660 feet of the project area, then we see no adverse effects at this time.

If in the event an active bald eagle nest is detected during the course of the project, please reach out to our office, and we can help recommend best practices, and suggest any permits to avoid violations under BGEPA.

Best wishes,
Zach

Zachary Ladin
Supervisory Wildlife Biologist
Migratory Bird Program
Northeast Region
US Fish & Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035
Email: zachary_ladin@fws.gov
Web: https://fws.gov/ePermits
Office Phone: (413) 253-8541
Mobile Phone: (413) 244-2307

From: Permits R5MB, FW5 <permitsr5MB@fws.gov>
Sent: Wednesday, July 3, 2024 4:11 PM
To: Ladin, Zachary S <zachary_ladin@fws.gov>; Sanchez, Arthur <arthur_sanchez@fws.gov>
Subject: Fw: [EXTERNAL] Re: Eagles and MBTA Consultation

From: McKenna Roberts <MRoberts@kleinfelder.com>
Sent: Wednesday, July 3, 2024 1:51 PM
To: Permits R5MB, FW5 <permitsr5MB@fws.gov>
Cc: Kirsten Ryan <KRyan@kleinfelder.com>; Bethany Mong <BMong@kleinfelder.com>
Subject: [EXTERNAL] Re: Eagles and MBTA Consultation

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Hello,

I wanted to reach out again to inquire if our water treatment plant construction project would be expected to affect migratory birds or bald and golden eagles. Please find more information on the projects below. If you need any additional information, please do not hesitate to reach out!

Best,

McKenna Roberts, EIT
Staff Engineer

One Beacon St.
Ste 8100
Boston, MA 02108
o| 617.497.7800
m| 989.350.5960

KLEINFELDER
Bright People. Right Solutions.

From: McKenna Roberts
Sent: Tuesday, June 4, 2024 8:51 AM
To: permitsR5MB@fws.gov <permitsR5MB@fws.gov>
Cc: Kirsten Ryan <KRyan@kleinfelder.com>; Bethany Mong <BMong@kleinfelder.com>
Subject: Eagles and MBTA Consultation

Hello,

I am working on permitting for the Barnstable PFAS Upgrades - Straightway project, a water treatment plant construction project in Barnstable, Mass. We have generated a species list and migratory birds list for our project. We were hoping that you could confirm that our project will not have an effect on migratory birds or bald and golden eagles. There are no known bald eagle nests at the project site. The project includes approximately 0.5 acres of tree clearing, which will be completed outside of the months of April - September.

I have included a full project summary below and attached our species list for the project, our site plans, and the USGS quadrangle showing our project location.

Summary:
The Town of Barnstable is currently receiving State Revolving Fund (SRF) funding via the federal Bipartisan Infrastructure Law (BIL), for the proposed installation of a new water treatment facility at its existing Straightway Water Treatment Plant on Cape Cod. The existing project site includes four production wells, two water treatment facilities, a booster water pump station, a water storage tank, and associated yard piping. The existing Straightway Water Treatment Facility receives and treats raw water from Straightway Wells No. 1 & No. 2. A seasonally-operated interim granular activated carbon (GAC) filtration system and backwash lagoon were installed at this location during spring 2020 for removing PFAS contaminants. In addition, the Plant's existing Hyannisport Water Treatment Facility receives and treats raw water from the on-site Hyannisport and Simmons Pond Wells. Finished water from both treatment facilities is pumped to a 400,000-

gallon baffled contact storage tank (the Straightway Tank), which provides 4-log disinfection credits for virus inactivation to meet the requirements of the Groundwater Rule. Water from the tank is pumped into the distribution system on Straightway by a 1,500-gpm booster pumping station. This provides a single entry point to the municipal water distribution system from the two water treatment facilities.

The proposed treatment facility will centralize all raw water treatment for these four wells into a single new building, capable of providing year-round treatment for up to 2,800 gpm of water. The proposed plant will include pH adjustment, corrosion control, greensand filtration for manganese removal, UVAOP treatment for 1-4 Dioxane, and GAC filtration for PFAS6 removal. The construction of the new building will require approximately 0.4 acres of tree removal.

The project also includes the relocation of two existing groundwater wells: the Hyannisport and Simmons Pond Wells. The new well locations will move the well at least 3 vertical feet outside of the FEMA Zone AE National Flood Hazard Layer, as well as outside of the 500-year floodplain. This will require approximately 0.1 acres of tree clearing. Existing pumping stations for the Simmons Pond and Hyannisport wells, which are located within bordering vegetated wetland, will be demolished and the areas reseeded with native plants. The attached site plans show the existing site layout and the proposed site layout.

If you have any further questions about our project, please do not hesitate to reach out!

Best,

McKenna Roberts, EIT
Staff Engineer

One Beacon St.
Ste 8100
Boston, MA 02108
o| 617.497.7800
m| 989.350.5960

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APPENDIX E

COASTAL ZONE MANAGEMENT LETTER

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
OFFICE OF COASTAL ZONE MANAGEMENT
100 Cambridge Street, Suite 900, Boston, MA 02114 ◦ (617) 626-1200

July 23, 2024

McKenna Roberts, EIT
Staff Engineer
Kleinfelder
One Beacon St.
Suite 8100
Boston, MA 02108

RE: Federal Consistency Certification: Straightway Water Treatment Facility Construction Project; Barnstable

Dear Ms. Roberts:

The Massachusetts Office of Coastal Zone Management (CZM) has completed its review of the proposed project which consists of construction at the Straightway Water Treatment Facility to winterize existing PFAS units, as well as to increase supply, pumping, and treatment capacity, to improve resiliency to sea level rise, and to improve system reliability for meeting current and future drinking water regulations.

- The project consists of improved treatment for several contaminants of concern, winterization of the existing PFAS units at 228 Straightway, and construction of a new 10,660 square feet treatment facility at 228 Straightway. These improvements will remove iron and manganese to improve the lifespan and operational efficiency of the GAC units, reduce downtime, and increase the capacity and reliability of PFAS treatment. The project will also implement a new treatment technology (UV-AOP) in the new Straightway building to remove 1,4-Dioxane. Straightway Well 2 will also be reactivated with the proposed improvements.

Although the activities associated with this project are located within the defined Massachusetts Coastal Zone, they fall below the thresholds that CZM generally uses to require review under our federal consistency provisions. Consequently, a formal decision from this office regarding consistency with our enforceable program policies is not necessary. Any federal licenses or permits for the work performed may be subject to CZM's federal consistency review. It is incumbent upon the proponent to notify CZM, submit an explanation of the nature of the work, and submit necessary data and information. CZM will use this information to determine if further federal consistency review is required.

Thank you for submitting the information to CZM. If you have any questions regarding our review process, feel free to contact me at sean.duffey@mass.gov.

Sincerely,

Sean Duffey
CZM Project Review and Dredging Coordinator

APPENDIX F

MASSACHUSETTS HISTORICAL COMMISSION DOCUMENTATION

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A
MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: **Straightway & Hyannisport Water Treatment Facility Improvements**

Location / Address: **228 Straightway / 132 Smith Street, Barnstable MA**

City / Town: **Barnstable**

Project Proponent

Name: **Town of Barnstable, Department of Public Works**

Address: **382 Falmouth Road**

City/Town/Zip/Telephone: **Hyannis, MA 02601, Town of Barnstable, Project Manager Matt Wrobel, 508-790-6400**

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	Type of License or funding (specify)
See Attachment 1.	**See Attachment 1.**

Project Description (narrative):

See Attachment 2 for narrative and photographs of existing conditions.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

Yes, this project includes demolition of the existing Hyannisport and Simmons Pond well buildings located at 132 Smith Street in order to relocate the wells at higher elevations out of the floodplain. These are both masonry buildings constructed after 1975.

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

There will be minor modifications to the existing building at 228 Straightway, in order to make the water works compatible with proposed new treatment facility construction. Modifications will include exterior and interior piping. 228 Straightway is a 1998 masonry building.

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

Yes, this project includes the new construction of a water treatment plant to provide enhanced water quality treatment and improved resiliency for the Town of Barnstable Hyannis Water System. See Attachment 3, Conceptual Design Plans.

APPENDIX A (continued)

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify. ***Yes. MACRIS was reviewed and 132 Smith St is part of an inventoried, MHC # BRN.AS Hyannis Port Area. The existing Simmons Pond and Hyannisport pump stations, which will be demolished, are within this area. However, the pump stations were constructed after 1975 and are not expected to have historical significance. (See Attachment 2).***

What is the total acreage of the project area?

* Note- calculated from 2016 Land Use. Floodplain acreage is 1% annual chance (100-yr) floodzone.

Woodland	1.4 acres	Productive Resources:	n/a
Wetland	0.11 acres	Agriculture	acres
Floodplain	0.00* acres	Forestry	acres
Open space	0.29 acres	Mining/Extraction	acres
Developed	2.10 acres	Total Project Acreage	3.90 acres

What is the acreage of the proposed new construction? 0.32 acres ***See also, Attachment 3, Conceptual Design Plans***

What is the present land use of the project area?

At present the project area is used as a drinking water treatment facility campus. The majority of the area is developed open space. The southern portion of the project site borders a wetland. Both the northern and southern portions of the project site include wooded areas. Approximately 0.5 acres of woodlands will be cleared as a result of the project.

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

See Attachment 5 for USGS Quadrangle map of project location. Limits of disturbance for the work are included in the Attachment 3, Conceptual Design Plans.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of Person submitting this form: Kirsten N. Ryan Date: ***June 6, 2024***

Name: ***Kirsten Ryan, Project Manager***

Address: ***Kleinfelder, 1 Beacon Street, Suite 8100***

City/Town/Zip: ***Boston, MA 02108***

Telephone: ***617-498-4778***

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

Attachment 1

List of Agency Licenses and Funding for the Project

Attachment 1. List of Agency Licenses and Funding for the Project

Barnstable Straightway - Hyannisport WTP Project Environmental Permitting Matrix		
Regulation or Permit	Agency	Filing or Application
State Permits		
Massachusetts Environmental Policy Act (MEPA) (301 CMR 11.00)	Executive Office of Energy and Environmental Affair's MEPA Office	Expanded Environmental Notification Form (EENF), Environmental Impact Report (EIR)
Massachusetts Wetlands Protection Act (WPA) (310 CMR 10.00)	Barnstable Conservation Commission	Notice of Intent (NOI) for issuance of Order of Conditions (OOC)
Massachusetts State Register of Historic Places Review (950 CMR 71.00)	Massachusetts Historical Commission (MHC)	Project Notification Form (PNF)
Water Supply Permits - Approval to Construct a Source >70GPM	MassDEP	BRP WS20
Approval of Treatment Facility Modification	MassDEP	BRP WS25
Federal Permits		
Endangered Species Act (ESA) Review	US Fish and Wildlife Service (USFWS)	IPaC Official Species List and programmatic key(s)
Coastal Zone Management (CZM) Act	MA CZM Office	Application for Certificate
Federal Flood Risk Management Standard (FFRMS)	EPA/MassDEP	Application for approval
US EPA NPDES Construction General Permit (CGP)	US EPA	Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWPPP)
US EPA NPDES Dewatering and Remediation General Permit (DRGP)	US EPA	NOI and SWPPP
Local Permits		
Town of Barnstable Wetlands Ordinances	Barnstable Conservation Commission	NOI local requirements (same submittal as state WPA)
Site Plan Review	Building Dept.	Submit application and drawings online
Funding		
Drinking Water State Revolving Fund 2024 IUP	MassDEP	Project Financial Assistance Applicatiom

Attachment 2

Project Narrative

Attachment 2. Project Narrative and Schedule

The proposed project to expand and improve the Straightway and Hyannisport Water Treatment Facilities is critical to public health and water system resiliency. It will receive Drinking Water State Revolving Fund (DWSRF) funding as part of the 2024 Final SRF Intended Use Plan to address per- and poly-fluoroalkyl substances (PFAS) contamination. The Town of Barnstable's Hyannis Water System (HWS) operates three water treatment campuses with a total of 12 wells and serves a year-round population of approximately 18,000 which surges to about 35,000 in the summer. All of the HWS wells have been impacted by PFAS contamination. When the EPA's Health Advisory was lowered to 70 ppt in 2016, the Town voluntarily moved quickly to implement seasonal treatment using unwinterized granular activated carbon (GAC) units at each location, at a cost of tens of millions of unanticipated capital dollars. The Straightway and Hyannisport Treatment Facilities are a critical campus, representing 30% of HWS's total potential supply. The property's four wells: Straightway 1 (STWY-1), Straightway 2 (STWY-2), Hyannisport (HP), and Simmons Pond (SP) have the potential to supply up to 4 million gallons per day (MGD) of water. However, the campus is currently only providing about 1.15 MGD. This project consists of improvements required to increase supply, pumping and treatment capacity, improve resiliency to sea level rise, and meet current and future drinking water regulations.

The Hyannisport Treatment Facility consists of the Simmons Pond and Hyannisport Pump Stations, at 132 Smith Street. Each of the pump stations treats the raw water from their respective wells for iron and manganese sequestration. Water from the Simmons Pond Well is then pumped to the Hyannisport Pump station for treatment to adjust pH and provide corrosion control. The treated water is then pumped north to the Straightway Treatment plant at 228 Straightway, where it is combined with water from Straightway Wells 1 & 2.

The Straightway Treatment Facility houses Straightway Wells 1 & 2. It also houses chemical feed systems to treat raw water for iron and manganese sequestration, pH adjustment, and corrosion control. Water exiting the Straightway Treatment Facility combines with water from the Hyannisport Treatment Facility and then flows through GAC filtration for PFAS removal and is dosed with sodium hypochlorite. It then flows into a 400,000 gallon storage tank to achieve 4-log disinfection. A booster pump station downstream of the tank pumps water from the tank into the distribution system.

Existing PFAS treatment at the Straightway site was installed quickly to meet summer demand and as such is non-optimized (without prefiltration for removal of elevated iron and manganese), and, non-winterized (the GAC units are on a slab with no shelter or climate-control and must be drained each fall). HWS requires treatment improvements to the Straightway and Hyannisport facilities to be able to: 1) reliably and continually meet existing and anticipated future water quality regulations, 2) to optimize the performance and efficiency water treatment, and 3) to allow for maximum flexibility and reliability to protect against disruption to its system at any single location. The proposed project consists of the following elements required to achieve these goals:

1. Winterize the existing GAC PFAS treatment units at 228 Straightway to keep them operational year- round for increased system resiliency. (See Photo 2) This portion of the project consists of constructing a pre-engineered metal building around the existing units. It requires no demolition.
2. At 132 Smith Street, install replacement wells and pump stations for the Hyannisport Well and the Simmons Pond Well to restore lost yield due to formation plugging and to relocate these functions at elevations above the 500-year floodplain. The Hyannisport Pump Station and Simmons Pond Pump station will be demolished after the new ones are operational. (See Photos 3 and 4.) Piping between the existing pump stations will be abandoned. New piping will be installed to connect the proposed pump stations to the existing main.
3. Construct a new Straightway Water Treatment Facility at the existing facility at 228 Straightway to provide enhanced treatment and expanded treatment capacity. The facility will consist of a single pre-engineered metal building which will house GAC filters for PFAS filtration, green sand filters for iron and manganese removal, and UVAOP equipment for 1-4 Dioxane removal.

Anticipated Project Schedule

Project Phase	Start Date	End Date
Design Contract Executed/Notice to Proceed	**January 2024**	**--**
Survey, Geotech, Conceptual Design; Preliminary Design	**January 2024**	**June 2024**
60% Design & Permitting	**June 2024**	**October 2024**
90% - 100% Design	**November 2024**	**March 2025**
Bidding; Contract Award	**April 2025**	**June 2025**
Construction	**July 2025**	**July 2027**

The existing facilities to be modified or demolished were constructed after 1975. Photographs are provided below in Attachment 2A. The property at 132 Smith Street is part of MHC inventoried area, BRN.AS. One MHC Inventoried Property, the John Hopper Smith House (BRN.549), is located about 700 feet southeast of the project site at 56 Smith Street, as shown below in Attachment 2B. The property is a single-family dwelling built in 1820. This project will not effect the 132 Smith Street property. To see the limits of disturbance for this project refer to Attachment 3, Conceptual Design Plans.

Attachment 2A: Photographs of Existing Site Facilities



Photo 1: Existing Straightway Water Treatment Facility (ca 1998) – minor piping modifications proposed.



Photo 2: 228 Straightway campus view to the southwest. Proposed facility to be constructed to the south of the Tank.

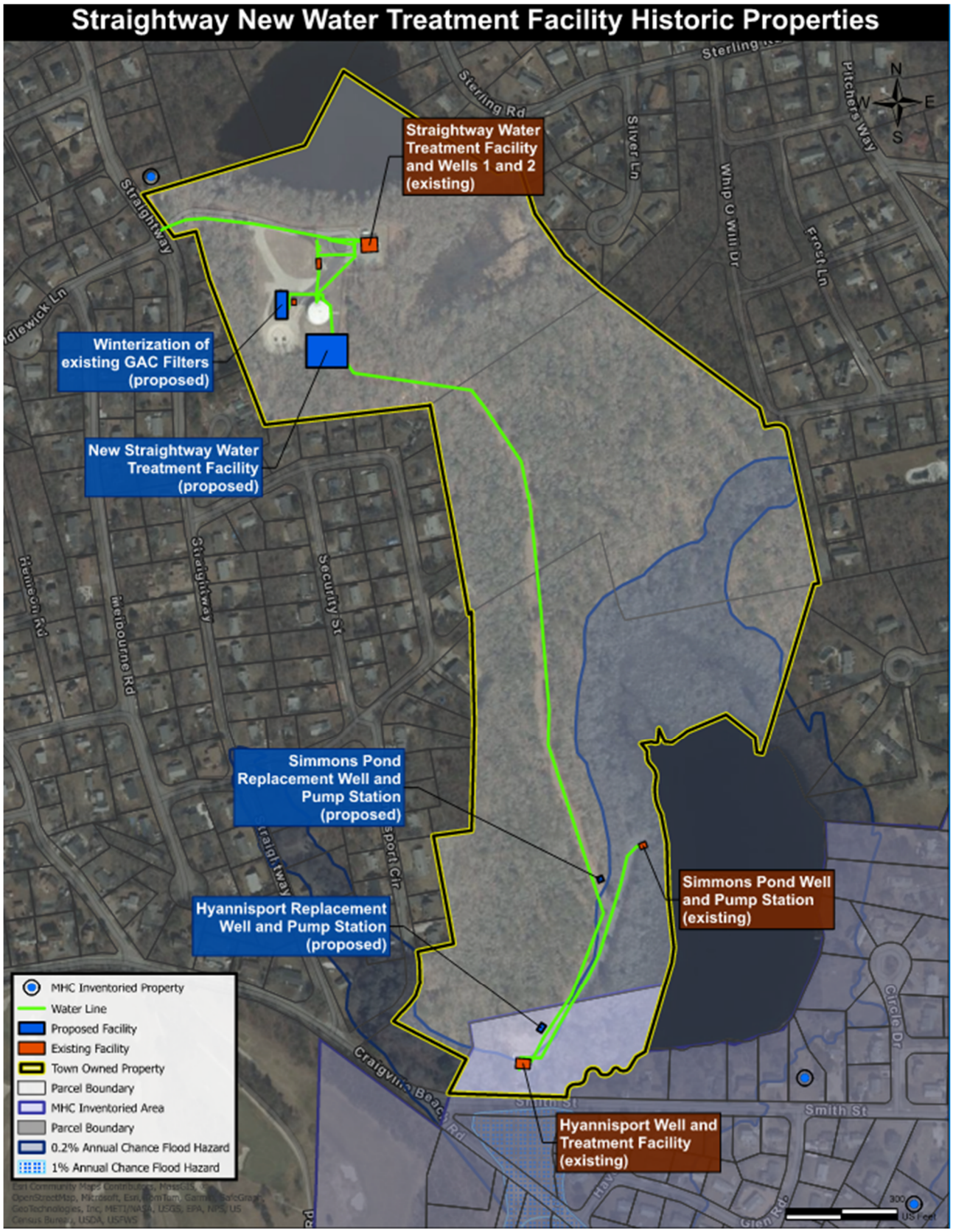


Photo 3: Existing Hyannisport Pump Station (circa 1995 construction) to be demolished after new facilities are placed online.



Photo 4: Existing Simmons Pond Pump Station (circa 1975) to be demolished after new station online.

Attachment 2B: MACRIS Massachusetts Historical Commission Inventory near Project Site



Attachment 3

Conceptual Design Plans



KEY PLAN
SCALE: 1" = 150'

EXISTING LEGEND

- MINOR CONTOUR
- MAJOR CONTOUR
- SPOT ELEVATION
- 100-YR FLOOD ZONE
- RECORD WATER LINE
- ABANDONED/REMOVED WATER LINE
- HYDRANT
- WATER GATE
- WATER WELL
- STANDPIPE
- ELECTRIC LINE
- OVERHEAD WIRES
- UTILITY POLE
- GUY WIRE
- TRANSFORMER
- ELECTRIC MANHOLE
- RECORD GAS LINES
- GAS METER
- WETLAND LIMIT
- WETLAND FLAG
- WETLAND EDGE
- 100' WETLAND BUFFER
- 50' WETLAND BUFFER
- SOIL PROBE
- CHAINLINK FENCE
- TREELINE
- DRAIN LINE
- DRAIN MANHOLE
- SEWER LINE
- SEWER MANHOLE
- CHAIN LINK FENCE
- CONCRETE PAD
- DUCTILE IRON
- EDGE OF PAVEMENT
- EDGE OF PAVEMENT LINE

PROPOSED LEGEND

- WATER LINE
- PROPOSED WATER GATE
- CHAIN LINK FENCE
- PROPOSED TREELINE
- DRAIN LINE
- SEWER LINE
- VEHICULAR ACCESS GATE
- EXTENT OF CRUSHED STONE ACCESS DRIVE
- EXTENT OF ASPHALT/STRUCTURE REMOVAL
- PROPOSED BUILDING
- EXTENT OF STORMWATER FEATURE

GENERAL NOTES:

1. WETLAND FLAGS SHOWN WERE DELINEATED BY LUCAS ENVIRONMENTAL ON NOVEMBER 29, 2023.
2. EXISTING CONDITIONS SURVEY SHOWN WAS CONDUCTED BY CHESS ENGINEERING, DATED APRIL 6,2024

NOT FOR CONSTRUCTION

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Boston, MA 02108
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####

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

0 150 300 450

SCALE: 1" = 150' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

KEY PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

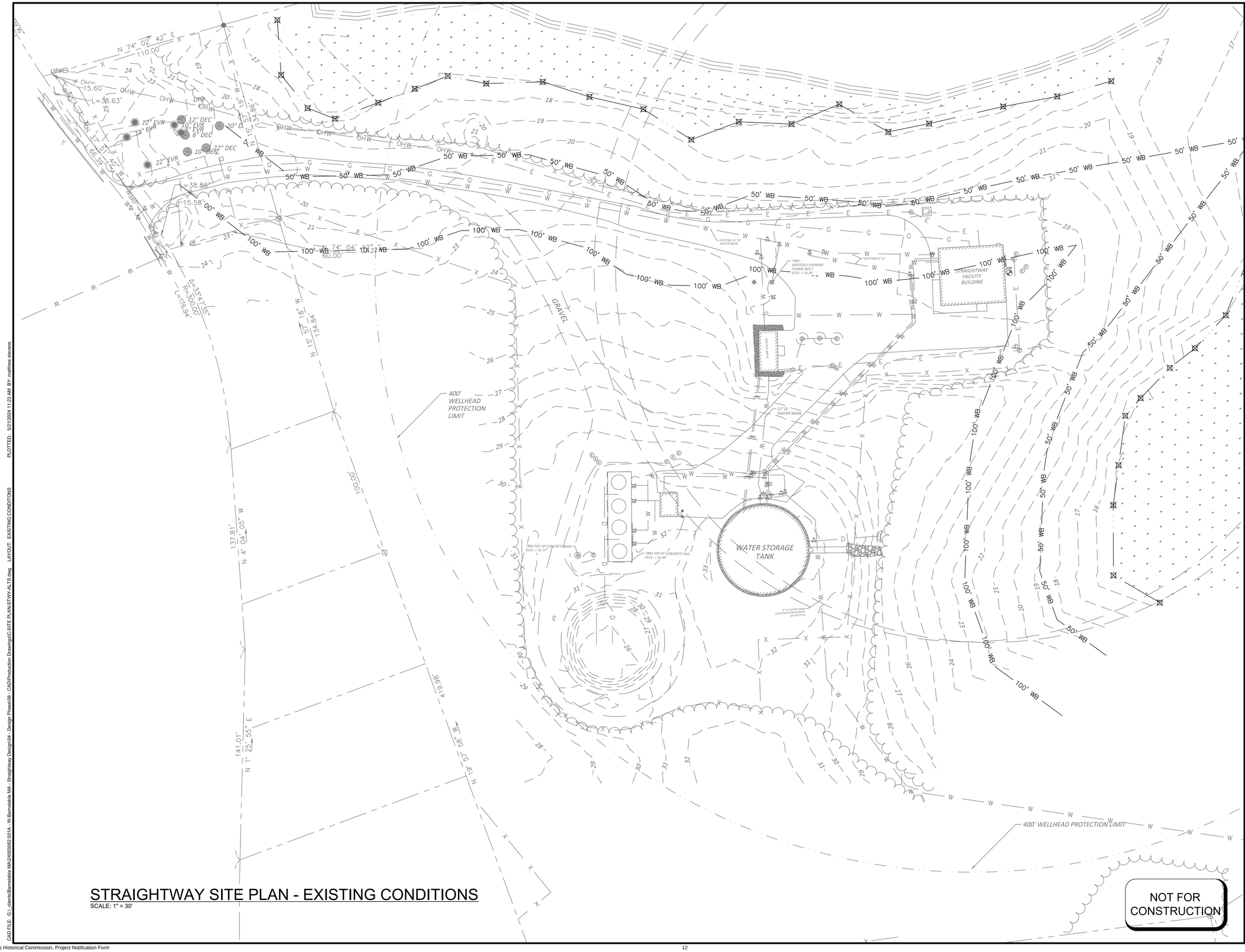
30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	05/21/2024
CURRENT REVISION	
DESIGNED BY	
DRAWN BY	MD/MPS
CHECKED BY	TB/GAA
APPROVED BY	GAA

C-001

SHEET 1 of 9

CAD FILE: G:_clients\Barnstable MA\24003062.001A - W.Barnstable MA - Straightway Design\04 - Design Phase\09 - CAD\Production Drawings\C-KEY PLAN.dwg LAYOUT: C-KEY PLAN PLOTTED: 5/21/2024 11:23 AM BY: matthew stevens



STRAIGHTWAY SITE PLAN - EXISTING CONDITIONS

SCALE: 1" = 30'

NOT FOR CONSTRUCTION

PLOTTED: 5/21/2024 11:23 AM BY: matthew stevens

CAD FILE: G:_clients\Barnstable MA\24003062.001A - W.Barnstable MA - Straightway Design\04 - Design Phase\08 - CAD\Production Drawings\C-SITE PLAN-STWY-ALTS.dwg LAYOUT: EXISTING CONDITIONS

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REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SCALE VERIFICATION

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SCALE: 1" = 30' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

STRAIGHTWAY SITE PLAN - EXISTING CONDITIONS

STRAIGHTWAY
WATER TREATMENT FACILITY

SEAL OF THE TOWN OF BARNSTABLE MASS. 1639 INCORPORATED A.D. 1685

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	05/21/2024
CURRENT REVISION	
DESIGNED BY	
DRAWN BY	MD/MPS
CHECKED BY	TB/GAA
APPROVED BY	GAA

C-002

SHEET 2 of 9

CAD FILE: G:_clients\Barnstable MA\24003062.001A - W-Barnstable MA - Straightway Design\04 - Design Phase\08 - CAD\Production Drawings\C-SITE PLAN-STWY-ALTS.dwg LAYOUT: C-SITE-ALT1 PLOTTED: 5/21/2024 11:23 AM BY: matthew stevens

STRAIGHTWAY SITE PLAN

SCALE: 1" = 30'

BENS POND

EXIST. 10" AC WATER MAIN TO BE REMOVED AND DISPOSED

CUT AND CAP EXISTING 8" PIPE

CUT AND CAP EXISTING 8" PIPE

PROP. 16" WATER MAIN

PROP. STORMWATER MANAGEMENT AREA

400' WELLHEAD PROTECTION LIMIT

POTABLE WATER SUPPLY

FIRE SERVICE LINE

BACKWASH SUPPLY

FINISHED WATER TO CONTACT TANK

COMBINED RAW WATER SUPPLY

COMBINED FINISHED WATER SUPPLY

CHEMICAL INJECTION BUILDING TO BE DEMOLISHED

PROP. WINTERIZED GAC BUILDING

PROP. PAVEMENT

WATER STORAGE TANK

250' REPLACEMENT WELL RADIUS

PROP. STORMWATER MANAGEMENT AREA

COMBINED FINISH WATER OUTFLOW

COMBINED RAW WATER FROM HYANNIS POND, SIMMONS POND, AND STRAIGHTWAY WELLS

PROP. STORMWATER MANAGEMENT AREA

ARBORVITAE VEGETATIVE SCREENING

BACKWASH WASTE

PROP. ACCESS GATE

POST-GAC WATER

PARKING

PRE-GAC WATER

PROP. TIGHT TANK

PROP. STRAIGHTWAY WATER TREATMENT FACILITY

400' WELLHEAD PROTECTION LIMIT

STRAIGHTWAY FACILITY BUILDING

GRAVEL

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Boston, MA 02108
Phone: 617-497-7800
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REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

0 30 60 90

SCALE: 1" = 30' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

STRAIGHTWAY SITE PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	05/21/2024
CURRENT REVISION	
DESIGNED BY	
DRAWN BY	MD/MPS
CHECKED BY	TB/GAA
APPROVED BY	GAA

C-003

SHEET 3 of 9

SIMMONS POND

(LOCATION MASS GIS)

400' WELLHEAD PROTECTION LIMIT

400' WELLHEAD PROTECTION LIMIT

FEMA FLOOD ZONE X BOUNDARY

FEMA FLOOD ZONE X BOUNDARY

BITUMINOUS PAVEMENT

HYANNISPORT STATION

39.3'

BITUMINOUS DRIVEWAY

EXISTING GENERATOR

FLOW

HALLS BROOK

R=180.00'
L=221.80'
Δ=70°36'05"

S 61° 54' 56" W
29.05'

L=96.56'
R=150.80'

HYANNISPORT AND SIMMONS POND EXISTING CONDITIONS

SCALE: 1" = 40'

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

0 40 80 120

SCALE: 1" = 40' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

HYANNISPORT AND SIMMONS POND SITE PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	05/21/2024
CURRENT REVISION	
DESIGNED BY	
DRAWN BY	MD/MPS
CHECKED BY	TB/GAA
APPROVED BY	GAA

C-004

SHEET 4 of 9

CAD FILE: G:_clients\Barnstable MA\24003062.001A - W.Barnstable MA - Straightway Design\04 - Design Phase\06 - CAD\Production Drawings\C-SITE PLAN-HP-SP.dwg LAYOUT: EXISTING CONDITIONS PLOTTED: 5/21/2024 11:24 AM BY: matthew stevens

SIMMONS POND

(LOCATION MASS GIS)

EXIST. SIMMONS POND PUMP STATION TO BE DEMOLISHED

PROP. ACCESS GATE

PROP. SIMMONS POND PUMP STATION BUILDING

PROP. SECURITY FENCE

PROP. ACCESS GATE

400' WELLHEAD PROTECTION LIMIT

CRUSHED STONE PARKING SPACE AND ACCESS DRIVE

SP-03A

REMOVE AND DISPOSE EXISTING PAVEMENT

FEMA FLOOD ZONE X BOUNDARY

400' WELLHEAD PROTECTION LIMIT

PAVED PARKING SPACE

PROP. HYANNISPORT PUMP STATION BUILDING

TIGHT TANK

HP-02A

PROP. SECURITY FENCE

EXIST. HYANNIS POND PUMP STATION TO BE DEMOLISHED

HALLS BROOK

FEMA FLOOD ZONE X BOUNDARY

R=180.00'
L=221.80'
Δ=70°30'05"

S 61° 54' 56" W
29.05'

L=96.56'
R=150.80'

HYANNISPORT AND SIMMONS POND SITE PLAN

SCALE: 1" = 40'

NOT FOR CONSTRUCTION

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Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

0 — 40 — 80 — 120

SCALE: 1" = 40' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

HYANNISPORT AND SIMMONS POND SITE PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

30% PRELIMINARY DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	05/21/2024
CURRENT REVISION	
DESIGNED BY	
DRAWN BY	MD/MPS
CHECKED BY	TB/GAA
APPROVED BY	GAA

C-005

SHEET 5 of 9

PLOTTED: 5/21/2024 11:24 AM BY: matthew stevens

CAD FILE: G:_clients\Barnstable MA\24003062.001A - W-Barnstable MA - Straightway Design\04 - Design Phase\08 - CAD\Production Drawings\C-SITE PLAN-HP-SP.dwg LAYOUT: C-SITE HP-SP

Attachment 4

USGS Quadrangle

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

HYANNIS QUADRANGLE
MASSACHUSETTS - BARNSTABLE COUNTY
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 19T

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, August 2018 - August 2018
Roads.....U.S. Census Bureau, 2018
Names.....GNIS, 1974 - 2023
Hydrography.....National Hydrography Dataset, 2005 - 2022
Contours.....National Elevation Dataset, 2019
Boundaries.....Multiple sources; see metadata file 2021 - 2022

Wetlands.....FWS National Wetlands Inventory 2008 - 2011

MN
GN
14°20′
255 MILS
0°52′
15 MILS

UTM GRID AND 2023 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
CG
Grid Zone Designation
19T

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard.

18

MASSACHUSETTS
QUADRANGLE LOCATION

1 2
3 4
5 6

1 Sandwich OE N
2 Dennis OE N
3 Sandwich
4 Dennis
5 Cotuit
6 Hyannis OE S

ADJOINING QUADRANGLES

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

HYANNIS, MA
2023

NSN. 7643016369553
NGA REF NO. USGSX24K74869

APPENDIX G

RMAT REPORT

Climate Resilience Design Standards Tool Project Report

Hyannisport Water Treatment Facilities
Date Created: 6/7/2024 1:40:08 PM
Created By: MSchultz
Date Report Generated: 8/2/2024 12:49:08 PM
Tool Version: Version 1.2
Project Contact Information: Meryl Schultz (meschultz@kleinfelder.com)

Project Summary

Link to Project

Estimated Capital Cost: $3000000.00
End of Useful Life Year: 2065
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	Moderate Exposure
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Not Exposed
Extreme Heat	High Exposure



Asset Preliminary Climate Risk Rating Summary

Number of Assets: 2

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
Simmons Pond Well and Pump Station	High Risk	High Risk	Low Risk	High Risk
Hyannisport Well and Pump Station	High Risk	High Risk	Low Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Simmons Pond Well and Pump Station	2070	2050		200-yr (0.5%)	
Hyannisport Well and Pump Station	2070	2050		200-yr (0.5%)	
Extreme Precipitation					
Simmons Pond Well and Pump Station	2070			50-yr (2%)	Tier 3
Hyannisport Well and Pump Station	2070			50-yr (2%)	Tier 3
Extreme Heat					
Simmons Pond Well and Pump Station	2070		90th		Tier 3
Hyannisport Well and Pump Station	2070		90th		Tier 3

Scoring Rationale - Project Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. The rationale behind the exposure rating is provided below.

Sea Level Rise/Storm Surge

This project received a "Moderate Exposure" because of the following:

- Exposed to the 1% annual coastal flood event as early as 2030
- Located within the 0.1% annual coastal flood event within the project's useful life
- Not located within the predicted mean high water shoreline by 2030

Extreme Precipitation - Urban Flooding

This project received a "High Exposure" because of the following:

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

Extreme Precipitation - Riverine Flooding

This project received a "Not Exposed" because of the following:

- No historic riverine flooding at project site
- The project is not within a mapped FEMA floodplain [outside of the Massachusetts Coast Flood Risk Model (MC-FRM)]
- Project is more than 500ft from a waterbody
- Project is not likely susceptible to riverine erosion

Extreme Heat

This project received a "High Exposure" because of the following:

- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Existing impervious area of the project site is less than 10%
- 10 to 30 day increase in days over 90 deg. F within project's useful life
- Located within 100 ft of existing water body

Scoring Rationale - Asset Preliminary Climate Risk Rating

A Preliminary Climate Risk Rating is determined for each infrastructure and building asset by considering the overall project Exposure Score and responses to Step 4 questions provided by the user in the Tool. Natural Resource assets do not receive a risk rating. The following factors are what influenced the risk ratings for each asset.

Asset - Simmons Pond Well and Pump Station
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 10,000 people would be directly affected by the loss/inoperability of the asset
- The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Inoperability may moderately impact other facilities, assets, or buildings, but is not expected to affect their ability to operate
- There are no hazardous materials in the asset

Asset - Hyannisport Well and Pump Station
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 10,000 people would be directly affected by the loss/inoperability of the asset
- The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Inoperability may moderately impact other facilities, assets, or buildings, but is not expected to affect their ability to operate
- There are no hazardous materials in the asset

Project Climate Resilience Design Standards Output

Climate Resilience Design Standards and Guidance are recommended for each asset and climate parameter. The Design Standards for each climate parameter include the following: recommended planning horizon (target and/or intermediate), recommended return period (Sea Level Rise/Storm Surge and Precipitation) or percentile (Heat), and a list of applicable design criteria that are likely to be affected by climate change. Some design criteria have numerical values associated with the recommended return period and planning horizon, while others have tiered methodologies with step-by-step instructions on how to estimate design values given the other recommended design standards.

Asset: Simmons Pond Well and Pump Station — Building/Facility

Sea Level Rise/Storm Surge — High Risk

Target Planning Horizon: 2070
Intermediate Planning Horizon: 2050
Return Period: 200-yr (0.5%)

LIMITATIONS: The recommended Climate Resilience Design Standards for the Sea Level Rise / Storm Surge Design Criteria are based on the user drawn polygon and relationships as defined in the Supporting Documents. The projected values provided through the Tool are based on the Massachusetts Coast Flood Risk Model (MC-FRM) outputs as of 9/13/2021, which included GIS-based data for three planning horizons (2030, 2050, 2070) and six return periods (0.1%, 0.2%, 0.5%, 1%, 2%, 5%). These values are projections based on assumptions as defined in the model and the LiDAR used at the time. For additional information on the MC-FRM, review the additional resources provided on the Start Here page.

The projected values, Standards, and Guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence.

Applicable Design Criteria

Projected Tidal Datums: APPLICABLE
Note: The site is exposed to Sea Level Rise/Storm Surge, but projected Tidal Datums are not available within the site. Additional site-specific analyses are recommended to identify projected Tidal Datums for the recommended planning horizon. Consult a professional coastal engineer or modeler to estimate projected Tidal Datums based on the recommended Standards and additional outputs provided through this Tool.

Projected Water Surface Elevation: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(ft - NAVD88)		
Simmons Pond Well and Pump Station	2050	0.5% (200-Year)	16.3	14.9	15.3
	2070		17.3	16.2	16.6

Projected Wave Action Water Elevation: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(ft - NAVD88)		
Simmons Pond Well and Pump Station	2050	0.5% (200-Year)	17.5	15.6	16.7
	2070		19.2	16.8	18.2

Projected Wave Heights: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(Feet)		
Simmons Pond Well and Pump Station	2050	0.5% (200-Year)	3.0	0.0	1.8
	2070		3.0	0.0	2.1

Projected Duration of Flooding: APPLICABLE
Methodology to Estimate Projected Values

Projected Design Flood Velocity: APPLICABLE
Methodology to Estimate Projected Values

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation High Risk

Target Planning Horizon: 2070
Return Period: 50-yr (2%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Simmons Pond Well and Pump Station	2070	50-Year (2%)	8.7	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Asset: Hyannisport Well and Pump Station Building/Facility

Sea Level Rise/Storm Surge — High Risk

Target Planning Horizon: 2070
Intermediate Planning Horizon: 2050
Return Period: 200-yr (0.5%)

LIMITATIONS: The recommended Climate Resilience Design Standards for the Sea Level Rise / Storm Surge Design Criteria are based on the user drawn polygon and relationships as defined in the Supporting Documents. The projected values provided through the Tool are based on the Massachusetts Coast Flood Risk Model (MC-FRM) outputs as of 9/13/2021, which included GIS-based data for three planning horizons (2030, 2050, 2070) and six return periods (0.1%, 0.2%, 0.5%, 1%, 2%, 5%). These values are projections based on assumptions as defined in the model and the LiDAR used at the time. For additional information on the MC-FRM, review the additional resources provided on the Start Here page.

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Applicable Design Criteria

Projected Tidal Datums: APPLICABLE
Note: The site is exposed to Sea Level Rise/Storm Surge, but projected Tidal Datums are not available within the site. Additional site-specific analyses are recommended to identify projected Tidal Datums for the recommended planning horizon. Consult a professional coastal engineer or modeler to estimate projected Tidal Datums based on the recommended Standards and additional outputs provided through this Tool.

Projected Water Surface Elevation: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(ft - NAVD88)		
Hyannisport Well and Pump Station	2050	0.5% (200-Year)	16.3	14.9	15.3
	2070		17.3	16.2	16.6

Projected Wave Action Water Elevation: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(ft - NAVD88)		
Hyannisport Well and Pump Station	2050	0.5% (200-Year)	17.5	15.6	16.7
	2070		19.2	16.8	18.2

Projected Wave Heights: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(Feet)		
Hyannisport Well and Pump Station	2050	0.5% (200-Year)	3.0	0.0	1.8
	2070		3.0	0.0	2.1

Projected Duration of Flooding: APPLICABLE
Methodology to Estimate Projected Values

Projected Design Flood Velocity: APPLICABLE
Methodology to Estimate Projected Values

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 50-yr (2%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic

Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Hyannisport Well and Pump Station	2070	50-Year (2%)	8.7	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Sea Level Rise/Storm Surge Project Maps

The following three maps illustrate the Projected Water Surface Elevation for the 2030, 2050, and 2070 planning horizons corresponding to the lowest return period (largest design storm) recommended across the assets identified for this project in the Tool. For projects that only have Natural Resource assets, the maps will show the Projected Water Surface Elevations corresponding to the 5% (20-year) return period. Refer to the Climate Resilience Design Standards Output - Sea Level Rise/Storm Surge Section for additional values associated with other assets. The maps include the project area as drawn by the user with a 0.1 mile minimum buffer, but do not reflect the location of specific assets on the site.

LIMITATIONS: The recommended Climate Resilience Design Standards for the Sea Level Rise / Storm Surge Design Criteria are based on the user drawn polygon and relationships as defined in the Supporting Documents. The projected values and maps provided through the Tool are based on the Massachusetts Coast Flood Risk Model (MC-FRM) outputs as of 9/13/2021, which included GIS-based data for three planning horizons (2030, 2050, 2070) and six return periods (0.1%, 0.2%, 0.5%, 1%, 2%, 5%). These values are projections based on assumptions as defined in the model and the LiDAR used at the time. For additional information on the MC-FRM, review the additional resources provided on the Start Here page.

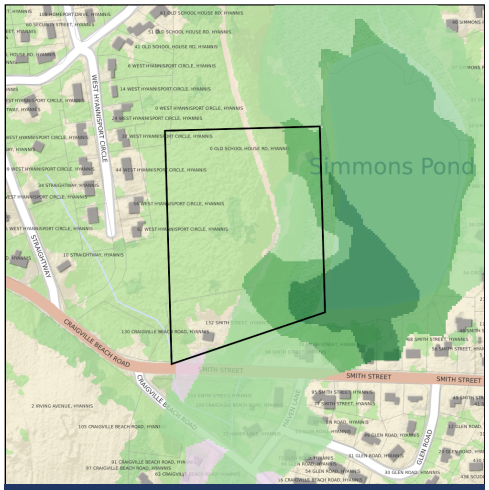
The projected values, maps, Standards, and Guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence.

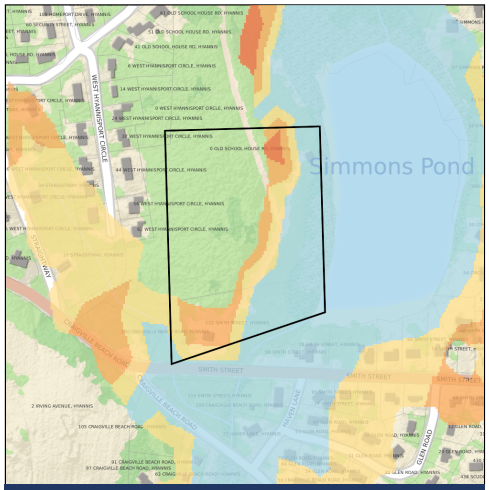
Legend

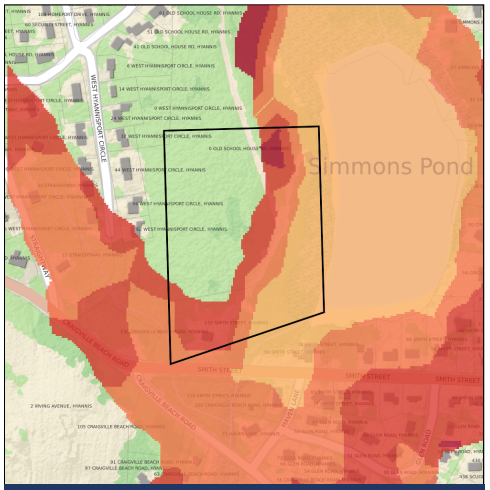
- Project Boundary

Projected Water Surface Elevation (ft-NAVD88)

- ≤ 10.0
- 10.0 - 10.3
- 10.3 - 10.8
- 10.8 - 11.3
- 11.3 - 11.8
- 11.8 - 12.3
- 12.3 - 12.8
- 12.8 - 13.3
- 13.3 - 13.8
- 13.8 - 14.3
- 14.3 - 14.8
- 14.8 - 15.3
- 15.3 - 15.8
- 15.8 - 16.3
- 16.3 - 16.8
- 16.8 - 17.3
- ≥ 17.3







Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 0.5% (200-yr)

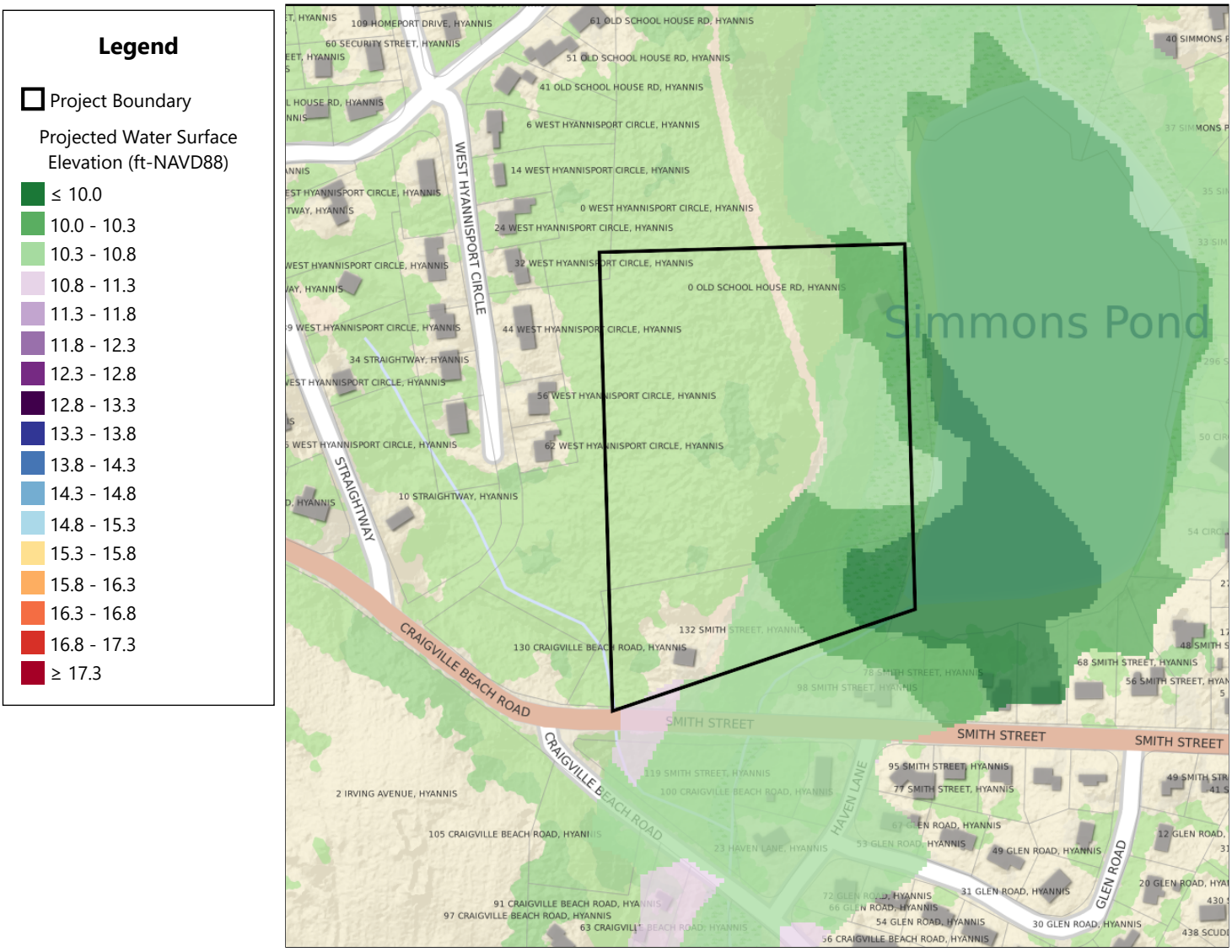
Project Name: Hyannisport Water Treatment Facilities
Location (Town): Barnstable

0.25 0.5 1.0 Miles

Created by: MSchultz
Date Created: 6/7/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average
			(ft-NAVD88)		
Simmons Pond Well and Pump Station, Hyannisport Well and Pump Station	2030	0.5% (200-yr)	10.8	10.0	10.2
	2050	0.5% (200-yr)	16.3	14.9	15.3
	2070	0.5% (200-yr)	17.3	16.2	16.6



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2030, 0.5% (200-yr)

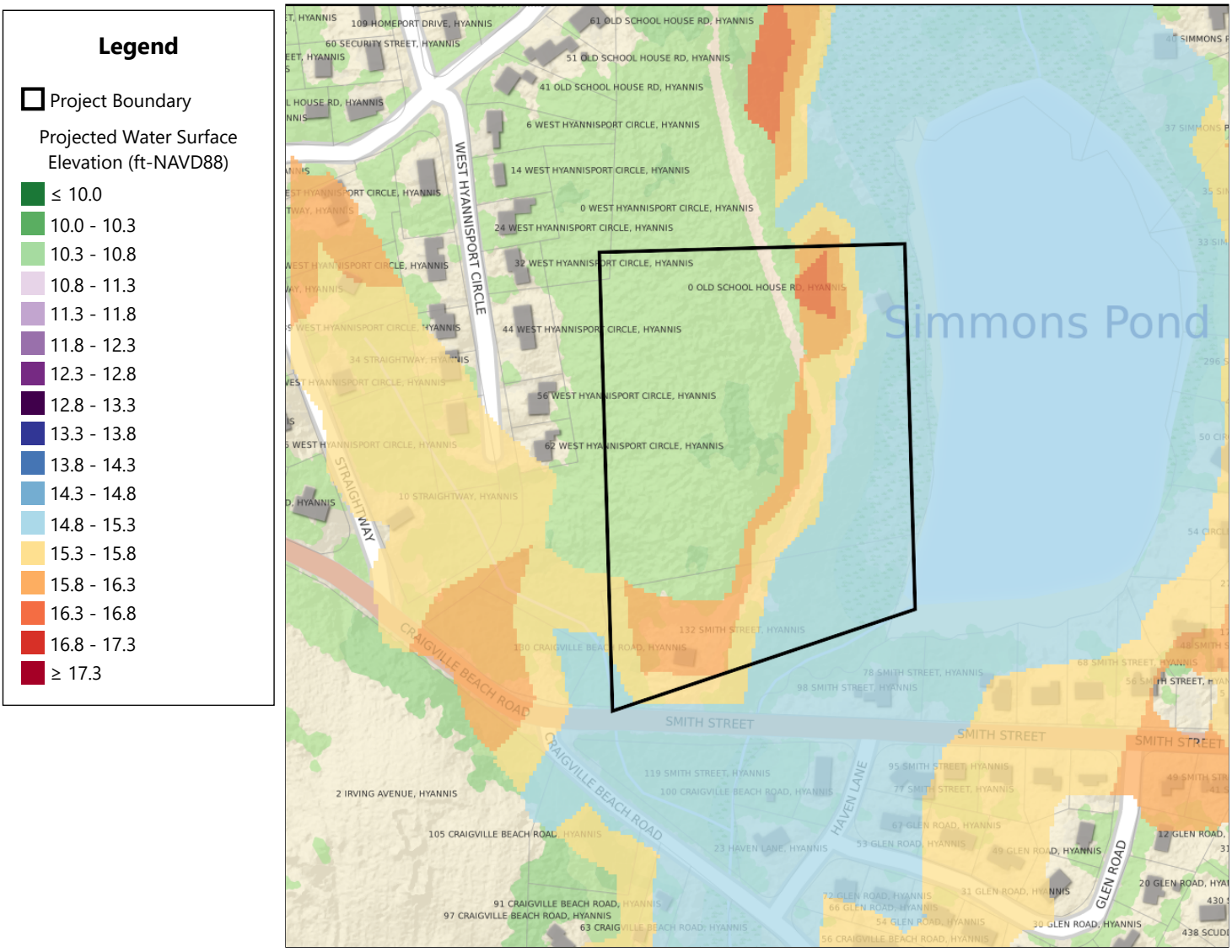
Project Name: Hyannisport Water Treatment Facilities
Location (Town): Barnstable

0.05 0.1 0.25 Miles

Created by: MSchultz
Date Created: 6/7/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
Simmons Pond Well and Pump Station, Hyannisport Well and Pump Station	2030	0.5% (200-yr)	10.8	10.0	10.2



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2050, 0.5% (200-yr)

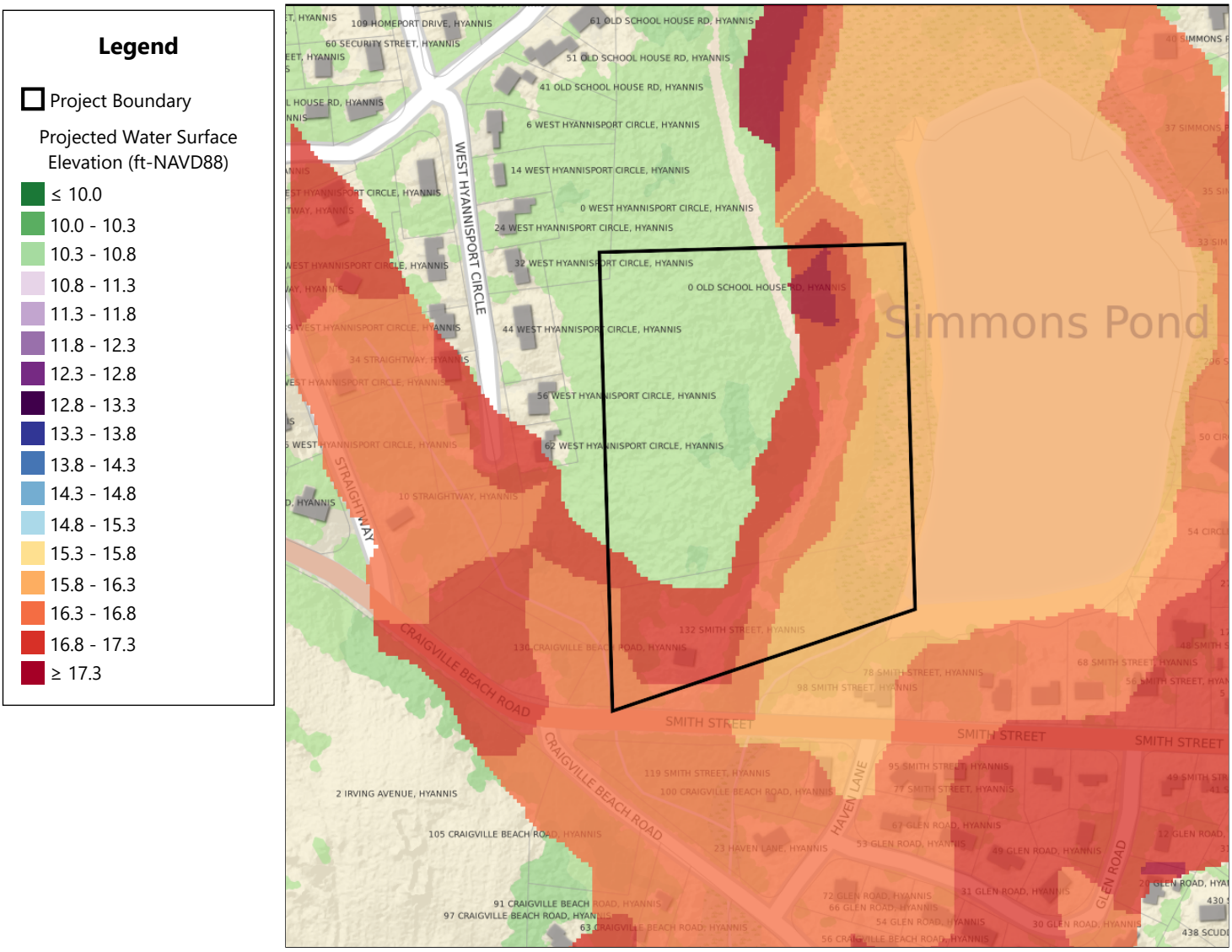
Project Name: Hyannisport Water Treatment Facilities
Location (Town): Barnstable

0.05 0.1 0.25 Miles

Created by: MSchultz
Date Created: 6/7/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
Simmons Pond Well and Pump Station, Hyannisport Well and Pump Station	2050	0.5% (200-yr)	16.3	14.9	15.3



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2070, 0.5% (200-yr)

Project Name: Hyannisport Water Treatment Facilities
Location (Town): Barnstable

0.05 0.1 0.25 Miles

Created by: MSchultz
Date Created: 6/7/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average
			(ft-NAVD88)		
Simmons Pond Well and Pump Station, Hyannisport Well and Pump Station	2070	0.5% (200-yr)	17.3	16.2	16.6

Project Inputs

Core Project Information

Name:	Hyannisport Water Treatment Facilities
Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?	2065
Location of Project:	Barnstable
Estimated Capital Cost:	$3,000,000
Who is the Submitting Entity?	Private Other Kleinfelder Meryl Schultz (meschultz@kleinfelder.com)
Is this project being submitted as part of a state grant application?	Yes
What stage are you in your project lifecycle?	Design
Is climate resiliency a core objective of this project?	Yes
Is this project being submitted as part of the state capital planning process?	No
Is this project being submitted as part of a regulatory review process or permitting?	Yes
Brief Project Description:	Improvements to the Hyannisport Water treatment facilities by Simmon's Pond to be able to: 1) reliably and continually meet existing and anticipated future water quality regulations, 2) to optimize the performance and efficiency water treatment, and 3) to allow for maximum flexibility and reliability to protect against disruption to its system at any single location. This includes relocating two pump stations to a nearby location out of the 500-year floodplain. This report is being submitted as part of a MEPA submission.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

- ✓ Project reduces storm damage
- ✓ Project protects public water supply
- ✓ Project improves water quality

Factors to Improve Output

- ✓ Incorporate nature-based solutions that may provide flood protection
- ✓ Incorporate green infrastructure to filter stormwater

Is the primary purpose of this project ecological restoration?

No

Project Benefits

Provides flood protection through nature-based solutions	Maybe
Reduces storm damage	Yes
Recharges groundwater	No
Protects public water supply	Yes
Filters stormwater using green infrastructure	Maybe
Improves water quality	Yes
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
Remediates existing sources of pollution	No
Protects fisheries, wildlife, and plant habitat	No
Protects land containing shellfish	No
Provides pollinator habitat	No
Provides recreation	No
Provides cultural resources/education	No

Project Climate Exposure

Is the primary purpose of this project ecological restoration?	No
Does the project site have a history of coastal flooding?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	Unsure
Does the project site have a history of riverine flooding?	No
Does the project result in a net increase in impervious area of the site?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Simmons Pond Well and Pump Station
Asset Type: Typically Unoccupied
Asset Sub-Type: Pump Station - Sanitary
Construction Type: New Construction
Construction Year: 2025
Useful Life: 40

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Building must be accessible/operable at all times, even during natural hazard event

Identify the geographic area directly affected by permanent loss or significant inoperability of the building/facility.
Impacts would be limited to local area and/or municipality

Identify the population directly served that would be affected by the permanent loss of use or inoperability of the building/facility.
Greater than 10,000 people

Identify if the building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

If the building/facility became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the building/facility would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

If there are hazardous materials in your building/facility, what are the extent of impacts related to spills/releases of these materials?
There are no hazardous materials in the building/facility

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Moderate – Inoperability may impact other facilities, assets, or buildings, but is not expected to affect their ability to operate

If this building/facility was damaged beyond repair, how much would it approximately cost to replace?
Less than $10 million

Is this a recreational facility which can be vacated during a natural hazard event?
No

If the building/facility became inoperable for longer than acceptable in Question 1, what are the public and/or social services impacts?
Some alternative programs and/or services are available to support the community

If the building/facility became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the building is not able to serve or operate its intended users or function)?
Loss of building may reduce the ability to maintain some government services, while a majority of services will still exist.

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to loss of confidence in government (i.e. the building is not able to serve or operate its intended users or function)?
No Impact

Asset: Hyannisport Well and Pump Station
Asset Type: Typically Unoccupied
Asset Sub-Type: Pump Station - Sanitary
Construction Type: New Construction
Construction Year: 2025
Useful Life: 40

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Building must be accessible/operable at all times, even during natural hazard event

Identify the geographic area directly affected by permanent loss or significant inoperability of the building/facility.
Impacts would be limited to local area and/or municipality

Identify the population directly served that would be affected by the permanent loss of use or inoperability of the building/facility.
Greater than 10,000 people

Identify if the building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

If the building/facility became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the building/facility would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

If there are hazardous materials in your building/facility, what are the extent of impacts related to spills/releases of these materials?
There are no hazardous materials in the building/facility

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Moderate – Inoperability may impact other facilities, assets, or buildings, but is not expected to affect their ability to operate

If this building/facility was damaged beyond repair, how much would it approximately cost to replace?
Less than $10 million

Is this a recreational facility which can be vacated during a natural hazard event?
No

If the building/facility became inoperable for longer than acceptable in Question 1, what are the public and/or social services impacts?
Some alternative programs and/or services are available to support the community
If the building/facility became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected
If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the building is not able to serve or operate its intended users or function)?
Loss of building may reduce the ability to maintain some government services, while a majority of services will still exist.
If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to loss of confidence in government (i.e. the building is not able to serve or operate its intended users or function)?
No Impact

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

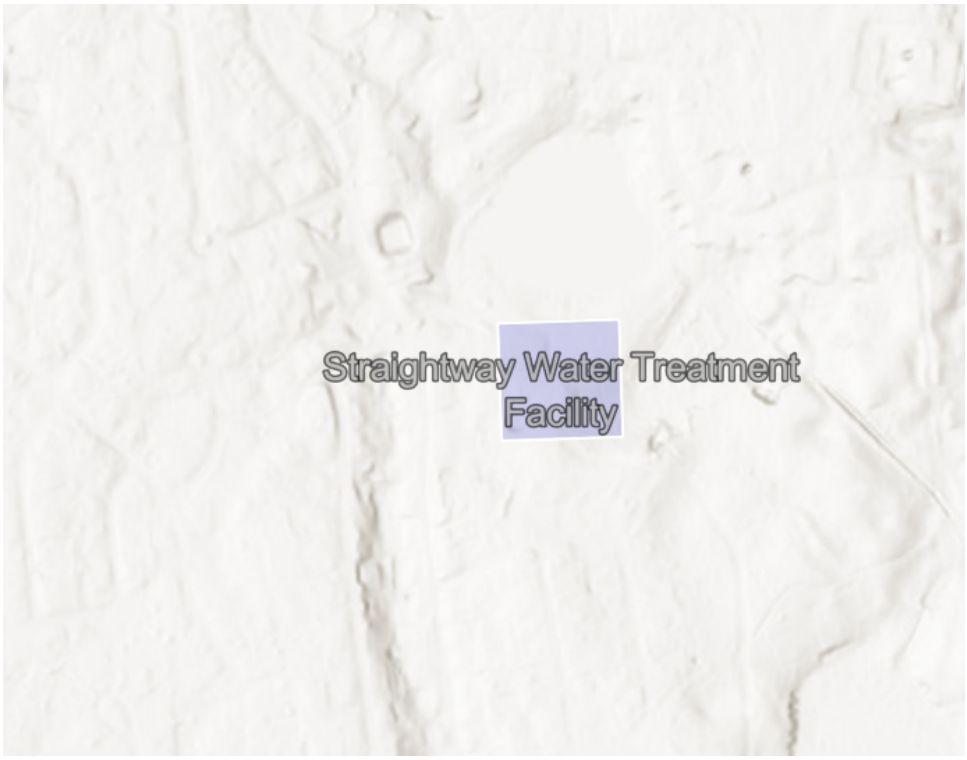
Straightway Water Treatment Facility
Date Created: 6/7/2024 1:06:38 PM
Created By: MSchultz
Date Report Generated: 8/2/2024 12:42:43 PM
Tool Version: Version 1.2
Project Contact Information: Meryl Schultz (meschultz@kleinfelder.com)

Project Summary

Link to Project

Estimated Capital Cost: $36000000.00
End of Useful Life Year: 2085
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Moderate Exposure
Extreme Heat	High Exposure



Asset Preliminary Climate Risk Rating Summary

Number of Assets: 1

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
Proposed Straightway Water Treatment Facility	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Proposed Straightway Water Treatment Facility					
Extreme Precipitation					
Proposed Straightway Water Treatment Facility	2070			100-yr (1%)	Tier 3
Extreme Heat					
Proposed Straightway Water Treatment Facility	2070		90th		Tier 3

Scoring Rationale - Project Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. The rationale behind the exposure rating is provided below.

Sea Level Rise/Storm Surge

This project received a "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

This project received a "High Exposure" because of the following:

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is between 10% and 50%

Extreme Precipitation - Riverine Flooding

This project received a "Moderate Exposure" because of the following:

- Part of the project is within 500ft of a waterbody and less than 20ft above the waterbody
- No historic riverine flooding at project site
- The project is not within a mapped FEMA floodplain [outside of the Massachusetts Coast Flood Risk Model (MC-FRM)]
- Project is not likely susceptible to riverine erosion

Extreme Heat

This project received a "High Exposure" because of the following:

- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Existing impervious area of the project site is between 10% and 50%
- 10 to 30 day increase in days over 90 deg. F within project's useful life
- Located within 100 ft of existing water body

Scoring Rationale - Asset Preliminary Climate Risk Rating

A Preliminary Climate Risk Rating is determined for each infrastructure and building asset by considering the overall project Exposure Score and responses to Step 4 questions provided by the user in the Tool. Natural Resource assets do not receive a risk rating. The following factors are what influenced the risk ratings for each asset.

Asset - Proposed Straightway Water Treatment Facility
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 10,000 people would be directly affected by the loss/inoperability of the asset
- The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Few alternative programs and/or services are available to support the community
- Cost to replace is between $30 million and $100 million
- Spills and/or releases of hazardous materials would be relatively easy to clean up

Project Climate Resilience Design Standards Output

Climate Resilience Design Standards and Guidance are recommended for each asset and climate parameter. The Design Standards for each climate parameter include the following: recommended planning horizon (target and/or intermediate), recommended return period (Sea Level Rise/Storm Surge and Precipitation) or percentile (Heat), and a list of applicable design criteria that are likely to be affected by climate change. Some design criteria have numerical values associated with the recommended return period and planning horizon, while others have tiered methodologies with step-by-step instructions on how to estimate design values given the other recommended design standards.

Asset: Proposed Straightway Water Treatment Facility — Building/Facility

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Proposed Straightway Water Treatment Facility	2070	100-Year (1%)	9.7	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Project Inputs

Core Project Information

Name:	Straightway Water Treatment Facility
Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?	2085
Location of Project:	Barnstable
Estimated Capital Cost:	$36,000,000
Who is the Submitting Entity?	Private Other Kleinfelder Meryl Schultz (meschultz@kleinfelder.com)
Is this project being submitted as part of a state grant application?	No
Which grant program?	
What stage are you in your project lifecycle?	Design
Is climate resiliency a core objective of this project?	Yes
Is this project being submitted as part of the state capital planning process?	No
Is this project being submitted as part of a regulatory review process or permitting?	Yes
Brief Project Description:	This project will improve the Straightway Water Treatment facility to be able to: 1) reliably and continually meet existing and anticipated future water quality regulations, 2) to optimize the performance and efficiency water treatment, and 3) to allow for maximum flexibility and reliability to protect against disruption to its system at any single location. This includes winterizing the facility, increasing treatment capacity, and improving the removal of PFAs to meet regulation. This report is being used for a MEPA submission.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

- ✓ Project reduces storm damage
- ✓ Project protects public water supply
- ✓ Project improves water quality

Factors to Improve Output

- ✓ Incorporate nature-based solutions that may provide flood protection

Is the primary purpose of this project ecological restoration?

No

Project Benefits

Provides flood protection through nature-based solutions	Maybe
Reduces storm damage	Yes
Recharges groundwater	No
Protects public water supply	Yes
Filters stormwater using green infrastructure	No
Improves water quality	Yes
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
Remediates existing sources of pollution	No
Protects fisheries, wildlife, and plant habitat	No
Protects land containing shellfish	No
Provides pollinator habitat	No
Provides recreation	No
Provides cultural resources/education	No

Project Climate Exposure

Is the primary purpose of this project ecological restoration?	No
Does the project site have a history of coastal flooding?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	Unsure
Does the project site have a history of riverine flooding?	No
Does the project result in a net increase in impervious area of the site?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Proposed Straightway Water Treatment Facility
Asset Type: Typically Unoccupied
Asset Sub-Type: Water treatment plant (potable water)
Construction Type: New Construction
Construction Year: 2025
Useful Life: 60

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Building must be accessible/operable at all times, even during natural hazard event

Identify the geographic area directly affected by permanent loss or significant inoperability of the building/facility.
Impacts would be limited to local area and/or municipality

Identify the population directly served that would be affected by the permanent loss of use or inoperability of the building/facility.
Greater than 10,000 people

Identify if the building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

If the building/facility became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the building/facility would not be expected to result in injuries

If there are hazardous materials in your building/facility, what are the extent of impacts related to spills/releases of these materials?
Spills and/or releases of hazardous materials would be relatively easy to clean up

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Moderate – Inoperability may impact other facilities, assets, or buildings, but is not expected to affect their ability to operate

If this building/facility was damaged beyond repair, how much would it approximately cost to replace?
Between $30 million and $100 million

Is this a recreational facility which can be vacated during a natural hazard event?
No

If the building/facility became inoperable for longer than acceptable in Question 1, what are the public and/or social services impacts?
Few alternative programs and/or services are available to support the community

If the building/facility became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the building is not able to serve or operate its intended users or function)?
Loss of building may reduce the ability to maintain some government services, while a majority of services will still exist.

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to loss of confidence in government (i.e. the building is not able to serve or operate its intended users or function)?
No Impact

Report Comments

N/A

APPENDIX H

EJ SCREENING FORM AND DISTRIBUTION LIST

Environmental Justice Screening Form

Project Name	Straightway Water Treatment Facilities Improvements
Anticipated Date of MEPA Filing	8/15/2024
Proponent Name	Town of Barnstable, Department of Public Works
Contact Information (e.g., consultant)	Kleinfelder, 1 Beacon St. Boston, MA 02108; Kate Riley, kariley@kleinfelder.com
Public website for project or other physical location where project materials can be obtained (if available)	https://townofbarnstable.us/Departments/watersupply/Straightway-Water-Treatment-Plant.asp
Municipality and Zip Code for Project (if known)	Barnstable, MA 02601
Project Type* (list all that apply)	Water Supply, Treatment / Conveyance
Is the project site within a mapped 100-year FEMA flood plain? Y/N/ unknown	No
Estimated GHG emissions of conditioned spaces (click **here** for GHG Estimation tool)	n/a improvement / expansion of a drinking water treatment facility

Project Description

1. **Provide a brief project description, including overall size of the project site and square footage of proposed buildings and structures if known.**

This project will provide a public health benefit and increase the drinking water quality, reliability, and resiliency of the Town of Barnstable's Hyannis Water System (HWS). HWS operates three drinking water treatment complexes with a total of 12 wells and serves a year-round population of approximately 18,000 people which surges to about 35,000 in the summer. Recent summer demand has hit record highs, and without the proposed improvements, all wells and treatment facilities must pump continuously in summer. All the HWS's wells are impacted by per- and poly-fluoroalkyl substances (PFAS) contamination and are treated to remove PFAS. However, some of the equipment is unwinterized and wells must be turned off during winter. Beginning in 2016, when the EPA's PFAS Health Advisory was lowered from 300 to 70 nanograms per liter (ng/L), the Town voluntarily moved quickly to implement emergency seasonal PFAS treatment by installing unwinterized granular activated carbon (GAC) filter units. The PFAS removal at the Mary Dunn and Maher water treatment facilities have been winterized and can operate year-round to meet demand. However, the Straightway and Hyannisport Treatment Facilities (the project site) need improvements to winterize existing PFAS units, as well as to increase supply, pumping, and treatment capacity, to improve resiliency to sea level rise, and to improve system reliability for meeting current and future drinking water regulations.

The Straightway and Hyannisport Treatment Facilities, located at 228 Straightway and 132 Smith Street, respectively, are a critical HWS component located on approximately 48 acres of protected water supply land. The facility consists of four wells, five pumping and/or treatment buildings (totaling

about 3,630 square feet), four unwinterized PFAS filters, and a storage tank. Combined, they have the potential to supply one-third of HWS's total supply. However, when operational, the facility is currently only providing 30% of what it is capable of producing and can only operate from March to October due to the PFAS filters lack of winterization. The specific project improvements will include the following:

- Supply – Well yields for the Hyannisport and Simmons Pond Wells are significantly reduced, and the wells need replacement due to screen and aquifer plugging with iron and manganese. This project will replace them with new, more reliable, and productive wells. The Straightway Well 2 is offline due to water quality concerns. Treatment improvements (described below) will allow the well to be reactivated, increasing available supply.
- Resiliency – The Hyannisport and Simmons Pond wells will be relocated to higher elevations above the 500-yr floodplain. Treatment operations will be relocated and centralized at the Straightway site, providing more protection from flooding. These original buildings (approximately 1,400 sqft) will be decommissioned at the end of the project and demolished to restore the floodplain. The new Straightway Treatment Facility will have fully redundant backup generators, each of which will be capable of independently powering the facility.
- Treatment – Raw water needs improved treatment for several contaminants of concern. This project will winterize the existing PFAS units, and construct a new 10,660 sqft treatment facility to provide the following improvements:
    - Raw water is elevated above the Secondary Maximum Contaminant Level (SMCL) for iron (Straightway 2) and manganese (all wells). Pre-treatment filters in the new building will remove iron and manganese to improve the lifespan and operational efficiency of the GAC units, reduce down-time, and increase capacity and reliability of PFAS treatment.
    - Raw water is elevated above the Office of Research and Standards Guideline (ORSG) for 1,4- Dioxane in Straightway 2 and Simmons Pond Wells. This project will include a new treatment technology (UV-AOP) in the new Straightway building to remove 1,4-Dioxane.
    - Raw water is above the Massachusetts PFAS drinking water limit in all four wells. Additional GAC units proposed for the new Straightway building will be able to treat the full flow of the wells.
    - Straightway Well 2 has been taken offline for high levels of PFAS6, 1,4-Dioxane, and Manganese. With the new building and improvements, Straightway Well 2 can be reactivated.
- Pumping – The existing Booster Pump Station is undersized for the future needs of the site. The pumping capacity will be doubled to treat the proposed facility capacity. In addition, the pumps for the Straightway Wells 1 and 2 will be upgraded.
- Environmental Benefits - In addition, the project will benefit the environment by relocating two existing wells further away from wetland resources and out of the floodplain which helps protect both the wells and the environment.

2. List anticipated MEPA review thresholds (301 CMR 11.03) (if known)

4) Water, subsection b), criteria 5: Expansion of an existing drinking water treatment plant by the greater of 1,000,000 or more gpd or 10% of existing capacity.

3. List all anticipated state, local and federal permits needed for the project (if known)

State:

- Massachusetts Historical Commission Approval
- Massachusetts Environmental Policy Act Approval (Environmental Notification Form; Environmental Impact Report; Environmental Justice Protocols)
- Coastal Zone Management review
- Massachusetts Department of Environmental Protection, Southeast Region Approvals (WS20,

WS25, WS29)

Local:

- Town of Barnstable
  - Conservation Commission, Order of Conditions
  - Site Plan Review
  - Stormwater Management Permit
  - Board of Health review
  - Building Permit; Fire Department review

Federal:

- US Fish & Wildlife Services review
- Federal Flood Risk Management Standard review

4. **Identify EJ populations and characteristics (Minority, Income, English Isolation) within 5 miles of project site (can attach map identifying 5-mile radius from EJ Maps Viewer in lieu of narrative)**

https://arcg.is/HinOu0 - link to map. Populations are identified as:

- Minority
- Minority and Income
- Minority and English Isolation
- Minority, Income, and English Isolation

5. Identify any municipality or census tract meeting the definition of "vulnerable health EJ criteria" in the DPH EJ Tool located in whole or in part within a 1 mile radius of the project site

Barnstable does not meet the Vulnerable Health EJ Criteria for heart attack, childhood blood lead, low birth weight, or childhood asthma.

6. **Identify potential short-term and long-term environmental and public health impacts that may affect EJ Populations and any anticipated mitigation**

The project provides a long-term public health and environmental benefits, as described in item 1. During the short term, during construction of the improved infrastructure, residents close to the project may notice some construction noise. Direct abutters close to construction areas may see land clearing activities and utility upgrade installations in the public right of way. As mitigation, the HWS will require contractors to work during normal weekday working hours, to control dust, and to limit vehicle idling. Work areas upgradient (uphill) from wetland resources will have sedimentation and erosion control installed to protect environmental resources.

7**. Identify project benefits, including "Environmental Benefits" as defined in 301 CMR 11.02, that may improve environmental conditions or public health of the EJ population**

This project will provide a public health benefit and increase the drinking water quality, reliability, and resiliency of the Town of Barnstable's Hyannis Water System (HWS).

In addition, the project will benefit the environment by relocating the existing Hyannisport and Simmons Pond wells further away from wetland resources and out of the floodplain which helps protect both the wells and the environment. The original Hyannisport and Simmons Pond well buildings and paving will be removed to allow some revegetation in the wetland buffer zone.

8. **Describe how the community can request a meeting to discuss the project, and how the community can request oral language interpretation services at the meeting. Specify how to request other accommodations, including meetings after business hours and at locations near public transportation.**

The EJ community can request a meeting to discuss the project and request oral language interpretation services at the meeting or other accomodations by contacting The Hyannis Water Systems email: hyanniswater@town.barnstable.ma.us

Matthew Wrobel at 774-487-5330 or Kelly Collopy at 774-487-5782

Formulário de triagem da Justiça Ambiental

Nome do projeto	Melhorias nas instalações de tratamento de água de Straightway
Data prevista para arquivamento da Lei de Política Ambiental de Massachusetts (MEPA)	15/8/2024
Nome do Proponente	Prefeitura de Barnstable, Departamento de Obras Públicas
Informações de contato (por exemplo, consultor)	Kleinfelder, 1 Beacon St. Boston, MA 02108; Kate Riley, kariley@kleinfelder.com
Site público do projeto ou outro local físico onde os materiais do projeto podem ser obtidos (se disponível)	https://townofbarnstable.us/Departments/watersupply/Straightway-Water-Treatment-Plant.asp
Município e CEP do projeto (se conhecido)	Barnstable, MA 02601
Tipo de projeto* (liste todos que se aplicam)	Abastecimento de água, tratamento/transporte
O local do projeto está dentro de uma planície de inundação de 100 anos mapeada pela Agência Federal de Gerenciamento de Emergências (FEMA)? S/N/desconhecido	Não
Emissões estimadas de GEE de espaços condicionados (clique **aqui** para a ferramenta de estimativa de GEE)	n/a melhoria/expansão de uma instalação de tratamento de água potável

Descrição do projeto

1. **Fornecer um resumo da descrição do projeto, incluindo o tamanho total do local do projeto e a metragem quadrada dos edifícios e estruturas propostos, se conhecida.**

Este projeto proporcionará um benefício à saúde pública e aumentará a qualidade, confiabilidade e resiliência da água potável do Sistema de Água de Hyannis (HWS) da Cidade de Barnstable. O HWS opera três complexos de tratamento de água potável com um total de 12 poços, atendendo a uma população permanente de aproximadamente 18.000 pessoas, que aumenta para cerca de 35.000 no verão. A demanda de verão recente atingiu níveis recordes e, sem as melhorias propostas, todos os poços e instalações de tratamento precisarão operar continuamente no verão. Todos os poços do HWS são impactados pela contaminação por substâncias per e polifluoroalquílicas (PFAS) e são tratados para remoção de PFAS. No entanto, parte do equipamento não está preparado para o inverno, e os poços precisam ser desligados durante o inverno. A partir de 2016, quando o Informativo de Saúde da Agência de Proteção Ambiental (EPA) sobre PFAS foi reduzido de 300 para 70 nanogramas por litro (ng/L), a prefeitura voluntariamente agiu rapidamente para implementar o tratamento sazonal emergencial de PFAS, instalando unidades de filtro de carvão ativado granular (GAC) não preparadas para o inverno. A remoção de PFAS nas instalações de tratamento de água Mary Dunn e Maher foi preparada para o inverno e pode operar o ano todo para atender à demanda. No entanto, as instalações de tratamento de Straightway e Hyannisport (o local do projeto) necessitam de melhorias para a adaptação das unidades existentes de Substâncias Per e Polifluoroalquílicas (PFAS) ao inverno,

bem como para aumentar a capacidade de fornecimento, bombeamento e tratamento, melhorar a resiliência à elevação do nível do mar e aumentar a confiabilidade do sistema para atender às regulamentações atuais e futuras de água potável.

As instalações de tratamento de Straightway e Hyannisport, localizadas em 228 Straightway e 132 Smith Street, respectivamente, são um componente crítico do HWS localizado em aproximadamente 48 acres de terra protegida para abastecimento de água. A instalação é composta por quatro poços, cinco edifícios de bombeamento e/ou tratamento (totalizando cerca de 3.630 pés quadrados), quatro filtros de PFAS não preparados para o inverno e um tanque de armazenamento. Combinadas, elas têm o potencial de fornecer um terço do suprimento total do HWS. No entanto, quando operacional, a instalação atualmente fornece apenas 30% do que é capaz de produzir e só pode operar de março a outubro devido à falta de preparação para o inverno dos filtros de PFAS. As melhorias específicas do projeto incluirão o seguinte:

- Fornecimento: as produções dos poços de Hyannisport e Simmons Pond estão significativamente reduzidas, e os poços precisam ser substituídos devido ao entupimento das telas e aquíferos com ferro e manganês. Este projeto substituirá esses poços por novos poços, mais confiáveis e produtivos. O Poço 2 de Straightway está desativado devido a problemas de qualidade da água. Melhorias no tratamento (descritas abaixo) permitirão a reativação do poço, aumentando o fornecimento disponível.
- Resiliência: os poços de Hyannisport e Simmons Pond serão realocados para elevações mais altas, acima da planície de inundação de 500 anos. As operações de tratamento serão realocadas e centralizadas no local de Straightway, proporcionando mais proteção contra inundações. Esses edifícios originais (aproximadamente 1.400 pés quadrados) serão desativados ao final do projeto e demolidos para restaurar a planície de inundação. A nova instalação de tratamento de Straightway terá geradores de reserva totalmente redundantes, cada um capaz de alimentar independente a instalação.
- Tratamento: a água não tratada precisa de tratamento aprimorado para vários contaminantes preocupantes. Este projeto irá preparar para o inverno as unidades existentes de PFAS e construirá uma nova instalação de tratamento de 10.660 pés quadrados para fornecer as seguintes melhorias:
    - A água não tratada será elevada acima do Nível Máximo de Contaminantes Secundários (SMCL) para ferro (Straightway 2) e manganês (todos os poços). Os filtros de pré-tratamento no novo edifício removerão ferro e manganês para melhorar a vida útil e a eficiência operacional das unidades de GAC, reduzir o tempo de inatividade e aumentar a capacidade e a confiabilidade do tratamento de PFAS.
    - A água não tratada está elevada acima das diretrizes do Departamento de Pesquisa e Normas (Office of Research and Standards Guideline, ORSG) para 1,4-Dioxano nos poços Straightway 2 e Simmons Pond. Este projeto incluirá uma nova tecnologia de tratamento (UV-AOP) no novo edifício de Straightway para remover o 1,4-Dioxano.
    - A água não tratada está acima do limite de PFAS para água potável de Massachusetts em todos os quatro poços. Unidades adicionais de GAC propostas para o novo edifício de Straightway serão capazes de tratar todo o fluxo dos poços.
    - O Poço 2 de Straightway foi desativado devido a altos níveis de PFAS6, 1,4-Dioxano e Manganês. Com o novo edifício e melhorias, o Poço 2 de Straightway poderá ser reativado.
- Bombeamento: a Estação de Bombeamento de Reforço existente é subdimensionada para as necessidades futuras do local. A capacidade de bombeamento será duplicada para atender à capacidade proposta da instalação. Além disso, as bombas dos poços Straightway 1 e 2 serão modernizadas.

- Benefícios Ambientais: além disso, o projeto beneficiará o meio ambiente ao realocar dois poços existentes para mais longe dos recursos de áreas úmidas e fora da planície de inundação, o que ajuda a proteger tanto os poços quanto o meio ambiente.

2. Listar os limites previstos de revisão da MEPA (301 CMR 11.03) (se conhecidos)

4) Água, subseção b), critério 5: Expansão de uma estação de tratamento de água potável existente no que for maior entre 1.000.000 galões por dia ou mais ou 10% da capacidade existente.

3. Listar todas as licenças estaduais, locais e federais necessárias para o projeto (se conhecidas)

Estadual:

- Aprovação da comissão histórica de Massachusetts
- Aprovação da lei de política ambiental de Massachusetts (Formulário de notificação ambiental; Relatório de impacto ambiental; Protocolos de justiça ambiental)
- Revisão do gerenciamento da zona costeira
- Aprovações da Região Sudeste do Departamento de Proteção Ambiental de Massachusetts (WS20, WS25, WS29)

Local:

- Prefeitura de Barnstable
  - Comissão de conservação, ordem de condições
  - Revisão do plano do local
  - Licença de gestão de águas pluviais
  - Revisão do conselho de saúde
  - Alvará de construção; revisão do Corpo de Bombeiros

Federal:

- Revisão da Agência de Pesca e Vida Selvagem (US Fish & Wildlife Services)
- Revisão da norma federal de gerenciamento de risco de inundação

4. **Identificar populações e características de justiça ambiental (minoria, renda, isolamento linguístico referente ao inglês) dentro de um raio de 5 milhas do local do projeto (pode anexar um mapa identificando o raio de 5 milhas do Visualizador de mapas de EJ em vez de uma narrativa)**

https://arcg.is/HinOu0 - link para o mapa. As populações são identificadas como:

- Minoria
- Minoria e renda
- Minoria e isolamento linguístico referente ao inglês
- Minoria, renda e isolamento linguístico referente ao inglês

5. Identificar qualquer município ou setor censitário que atenda à definição de "critérios de EJ de saúde vulnerável" no Ferramenta do Departamento de Saúde Pública (DPH) de EJ localizada no todo ou em parte dentro de um raio de 1 milha do local do projeto

Barnstable não atende aos Critérios de Justiça Ambiental de Saúde Vulnerável para ataque cardíaco, chumbo no sangue na infância, baixo peso ao nascer ou asma infantil.

6. **Identificar impactos ambientais e de saúde pública potenciais de curto e longo prazo que possam afetar populações de EJ, bem como quaisquer medidas de mitigação previstas.**

O projeto proporciona benefícios de saúde pública e ambientais a longo prazo, conforme descrito no item 1. No curto prazo, durante a construção da infraestrutura aprimorada, os moradores próximos ao projeto podem notar algum ruído de construção. Os vizinhos diretos próximos às áreas de construção podem observar atividades de desmatamento e instalações de melhorias de serviços públicos no direito de passagem público. Como medida de mitigação, o HWS exigirá que os empreiteiros trabalhem durante o horário normal de trabalho nos dias úteis, controlem

a poeira e limitem o tempo de marcha lenta dos veículos. Áreas de trabalho íngremes (em subida) dos recursos de áreas úmidas terão controle de sedimentação e erosão instalado para proteger os recursos ambientais.

7.**Identificar os benefícios do projeto, incluindo "Benefícios Ambientais", conforme definido no 301 CMR 11.02, que podem melhorar as condições ambientais ou a saúde pública da população de EJ**

Este projeto proporcionará um benefício à saúde pública e aumentará a qualidade, confiabilidade e resiliência da água potável do Sistema de Água de Hyannis (HWS) da Cidade de Barnstable.

Além disso, o projeto beneficiará o meio ambiente ao realocar os poços existentes de Hyannisport e Simmons Pond para mais longe dos recursos de áreas úmidas e fora da planície de inundação, o que ajuda a proteger tanto os poços quanto o meio ambiente. Os edifícios originais dos poços de Hyannisport e Simmons Pond e a pavimentação serão removidos para permitir a revegetação na zona de proteção das áreas úmidas.

8. **Descrever como a comunidade pode solicitar uma reunião para discutir o projeto e como a comunidade pode solicitar serviços de interpretação oral durante a reunião. Especificar como solicitar outros encaixes, incluindo reuniões após o horário comercial e em locais próximos ao transporte público.**

A comunidade de EJ pode solicitar uma reunião para discutir o projeto e solicitar serviços de interpretação oral na reunião ou outros encaixes entrando em contato através do e-mail dos Sistemas de Água de Hyannis: hyanniswater@town.barnstable.ma.us

Matthew Wrobel, pelo telefone 774-487-5330, ou Kelly Collopy, pelo telefone 774-487-5782

Formulario de Evaluación de la Justicia Ambiental

Nombre del proyecto	Mejoras de las plantas de tratamiento de aguas de Straightway
Fecha prevista de presentación de acuerdo con la Ley de Política Ambiental de Massachusetts (MEPA)	8/15/2024
Nombre del promotor	Ciudad de Barnstable, Departamento de Obras Públicas
Información de contacto (por ejemplo, consultor)	Kleinfelder, 1 Beacon St. Boston, MA 02108; Kate Riley, kariley@kleinfelder.com
Sitio web público del proyecto u otro lugar físico en el que se puedan obtener materiales para el proyecto (si está disponible)	https://townofbarnstable.us/Departments/watersupply/Straightway-Water-Treatment-Plant.asp
Municipio y código postal del proyecto (si se conocen)	Barnstable, MA 02601
Tipo de proyecto* (indique todos los que procedan)	Tratamiento/Transporte, suministro de agua
¿Se encuentra el sitio del proyecto dentro de una llanura aluvial de 100 años de la Agencia Federal para el Manejo de Emergencias (FEMA)? Sí/No/Se desconoce	No
Emisiones estimadas de gases de efecto invernadero (GHG) de los espacios acondicionados (haga clic **aquí** para ver la herramienta de cálculo de GHG)	N/C Mejora/Ampliación de una planta de tratamiento de agua potable

Descripción del proyecto

1. **Describa brevemente el proyecto, incluido el tamaño total del sitio del proyecto y la superficie en pies cuadrados de las estructuras y los edificios propuestos, si se conocen.**

Este proyecto proporcionará un beneficio para la salud pública y mejorará la resistencia, la fiabilidad y la calidad del agua potable del Sistema de Agua de Hyannis (HWS) de la ciudad de Barnstable. El HWS opera tres complejos de tratamiento de agua potable con un total de 12 pozos y abastece a una población durante todo el año de aproximadamente 18,000 personas que se eleva a cerca de 35,000 en el verano. La reciente demanda de verano ha alcanzado un récord sin precedentes y, sin las mejoras propuestas, todos los pozos y las plantas de tratamiento deben bombear continuamente en verano. Todos los pozos del HWS están contaminados por sustancias perfluoroalquiladas y polifluoroalquiladas (PFAS) y reciben tratamiento para eliminarlas. Sin embargo, algunos de los equipos no están acondicionados para el invierno y los pozos deben ponerse fuera de servicio durante esta época del año. A partir de 2016, cuando la advertencia de salud sobre PFAS de la Agencia de Protección Ambiental (EPA) se redujo de 300 a 70 nanogramos por litro (ng/L), la ciudad actuó de forma voluntaria y rápida a fin de implementar el tratamiento estacional de emergencia de PFAS mediante la instalación de unidades de filtro de carbón granular activado (GAC) no acondicionadas para el invierno. La eliminación de PFAS en las plantas de tratamiento de aguas de Mary Dunn y Maher se ha preparado para el invierno y puede funcionar todo el año a fin de satisfacer la demanda. Sin embargo, las plantas

de tratamiento de Straightway y Hyannisport (el sitio del proyecto) necesitan mejoras a fin de acondicionar para el invierno las unidades de PFAS existentes, así como aumentar la capacidad de suministro, bombeo y tratamiento, mejorar la resistencia al aumento del nivel del mar y mejorar la fiabilidad del sistema con el objetivo de cumplir con las reglamentaciones actuales y futuras sobre agua potable.

Las plantas de tratamiento de Straightway y Hyannisport, situadas en 228 Straightway y 132 Smith Street, respectivamente, son un componente crítico del HWS situado en aproximadamente 48 acres de terreno protegido para el suministro de agua. La planta está compuesta de cuatro pozos, cinco edificios de bombeo o tratamiento (con un total de unos 3,630 pies cuadrados), cuatro filtros de PFAS no acondicionados para el invierno y un depósito de almacenamiento. Cuando se combinan, tienen el potencial de suministrar un tercio del suministro total del HWS. Sin embargo, cuando se pone en marcha, la planta solo suministra actualmente el 30 % de lo que es capaz de producir y solo puede funcionar de marzo a octubre debido a que los filtros de PFAS no están acondicionados para el invierno. Las mejoras específicas del proyecto incluirán lo siguiente:

- Suministro: el rendimiento de los pozos de Hyannisport y Simmons Pond se ha reducido significativamente y es necesario sustituirlos debido a la obstrucción de los filtros y del acuífero con hierro y manganeso. Este proyecto los sustituirá por pozos nuevos, más fiables y productivos. El pozo Straightway 2 está fuera de servicio debido a problemas de calidad del agua. Las mejoras de tratamiento (descritas a continuación) permitirán reactivar el pozo, lo que aumentará el suministro disponible.
- Resistencia: los pozos de Hyannisport y Simmons Pond se trasladarán a zonas más elevadas por encima de la llanura aluvial de 500 años. Las operaciones de tratamiento se trasladarán y centralizarán en el sitio de Straightway, lo que proporcionará una mayor protección frente a las inundaciones. Los edificios originales (de unos 1,400 pies cuadrados) se clausurarán al final del proyecto y se demolerán para restaurar la llanura aluvial. La nueva planta de tratamiento de Straightway dispondrá de generadores de reserva totalmente redundantes, cada uno de los cuales podrá alimentar la planta de forma independiente.
- Tratamiento: el agua sin tratar necesita un tratamiento mejorado para varios contaminantes que generan preocupación. Gracias a este proyecto, se acondicionarán para el invierno las unidades de PFAS existentes y se construirá una nueva planta de tratamiento de 10,660 pies cuadrados a fin de proporcionar las siguientes mejoras:
    - El agua sin tratar supera el nivel de contaminante máximo secundario (SMCL) de hierro (Straightway 2) y manganeso (todos los pozos). Los filtros de pretratamiento del nuevo edificio eliminarán el hierro y el manganeso para mejorar la vida útil y la eficiencia operativa de las unidades de GAC, reducir el tiempo de inactividad y aumentar la capacidad y la fiabilidad del tratamiento de PFAS.
    - El agua sin tratar supera la Directriz de la Oficina de Investigación y Normas (ORSG) para el 1,4-dioxano en los pozos Straightway 2 y Simmons Pond. Este proyecto incluirá una nueva tecnología de tratamiento (UV-AOP) en el nuevo edificio de Straightway para eliminar el 1,4-dioxano.
    - El agua sin tratar está por encima del límite de agua potable con PFAS de Massachusetts en los cuatro pozos. Las unidades adicionales de GAC propuestas para el nuevo edificio de Straightway podrán tratar el flujo total de los pozos.
    - El pozo Straightway 2 se ha puesto fuera de servicio debido a sus altos niveles de PFAS6, 1,4-dioxano y manganeso. Gracias al nuevo edificio y a las mejoras, el pozo Straightway 2 puede reactivarse.
- Bombeo: la estación de bombeo de refuerzo existente es más pequeña de lo normal para las necesidades futuras del sitio. La capacidad de bombeo se duplicará para tratar la capacidad de la planta propuesta. Además, se modernizarán las bombas de los pozos Straightway 1 y 2.

- Beneficios ambientales: además, el proyecto beneficiará al medioambiente mediante el traslado de dos pozos existentes más lejos de los recursos de los humedales y fuera de la llanura aluvial, lo que ayuda a proteger tanto los pozos como el medioambiente.

2. Enumere los límites de revisión previstos de la MEPA (301 CMR 11.03) (si se conocen).

4) Agua, subsección b), criterios 5: Ampliación de una planta de tratamiento de agua potable existente en 1,000,000 o más de GPD o en un 10 % de la capacidad existente, lo que sea mayor.

3. Enumere todos los permisos estatales, locales y federales previstos necesarios para el proyecto (si se conocen).

Estatales:

- Aprobación de la Comisión Histórica de Massachusetts
- Aprobación de la Ley de Política Ambiental de Massachusetts (Formulario de Notificación Ambiental; Informe de Impacto Ambiental; Protocolos de Justicia Ambiental)
- Revisión de la Gestión de Zonas Costeras
- Aprobación del Departamento de Protección Ambiental de Massachusetts, Región Sudeste (WS20, WS25, WS29)

Locales:

- Ciudad de Barnstable
  - Comisión de Conservación, Orden de Condiciones
  - Revisión del plan del sitio
  - Permiso de Gestión de Aguas Pluviales
  - Revisión de la Junta de Salud
  - Revisión del Departamento de Bomberos; Permiso de Construcción

Federales:

- Revisión del Servicio de Pesca y Vida Silvestre de EE. UU.
- Revisión de los Estándares Federales para el Manejo del Riesgo de Inundación

4. **Identifique las poblaciones y características de Justicia Ambiental (EJ) (minorías, ingresos, aislamiento por el idioma inglés) en un radio de 5 millas del sitio del proyecto (puede adjuntar un mapa que identifique el radio de 5 millas del Visualizador de mapas de EJ en lugar de una descripción).**

https://arcg.is/HinOu0 - enlace al mapa. Las poblaciones se identifican de la siguiente manera:

- Minorías
- Minorías e ingresos
- Minorías y aislamiento por el idioma inglés
- Minorías, ingresos y aislamiento por el idioma inglés

5. Identifique cualquier municipio o tramo censal que cumpla con la definición de "criterios de vulnerabilidad sanitaria según la EJ" en la Herramienta de EJ del Departamento de Salud Pública (DPH) ubicada en su totalidad o en parte en un radio de 1 milla del sitio del proyecto.

Barnstable no cumple con los criterios de vulnerabilidad sanitaria según la EJ para ataques cardíacos, niveles de plomo en la sangre de los niños, bajo peso al nacer o asma infantil.

6. **Identifique los posibles impactos ambientales y de salud pública a corto y largo plazo que puedan afectar a las poblaciones de EJ y cualquier mitigación prevista.**

El proyecto proporciona beneficios para la salud pública y el medioambiente a largo plazo, como se describe en el punto 1. A corto plazo, durante la construcción de la infraestructura mejorada, es posible que los residentes cercanos al proyecto noten algo de ruido procedente de la construcción. Es posible que los dueños de propiedades colindantes cercanas a las zonas de construcción vean actividades de limpieza del terreno e instalaciones de mejora de los servicios

públicos en el derecho de paso público. Como medida de mitigación, el HWS exigirá a los contratistas que trabajen durante las horas normales de trabajo entre semana, que controlen el polvo y que limiten los vehículos detenidos con el motor encendido. Se instalarán sistemas de control de la sedimentación y la erosión en las zonas de trabajo situadas cuesta arriba de los humedales para proteger los recursos ambientales.

7**. Identifique los beneficios del proyecto, incluidos los "Beneficios ambientales" según se definen en 301 CMR 11.02, que puedan mejorar las condiciones ambientales o la salud pública de la población de EJ.**

Este proyecto proporcionará un beneficio para la salud pública y mejorará la resistencia, la fiabilidad y la calidad del agua potable del Sistema de Agua de Hyannis (HWS) de la ciudad de Barnstable.

Además, el proyecto beneficiará al medioambiente mediante el traslado de los pozos existentes de Hyannisport y Simmons Pond más lejos de los recursos de los humedales y fuera de la llanura aluvial, lo que ayuda a proteger tanto los pozos como el medioambiente. El pavimento y los edificios de los pozos originales de Hyannisport y Simmons Pond se retirarán para permitir la revegetación de la zona de amortiguación del humedal.

8. **Describa cómo la comunidad puede solicitar una reunión para debatir el proyecto, así como servicios de interpretación oral en la reunión. Especifique cómo solicitar otras adaptaciones, incluidas reuniones fuera del horario laboral y en lugares cercanos al transporte público.**

La comunidad de EJ puede solicitar una reunión para debatir el proyecto y solicitar servicios de interpretación oral en la reunión u otras adaptaciones; para ello, debe enviar un correo electrónico al Sistema de Agua de Hyannis a: hyanniswater@town.barnstable.ma.us

También puede ponerse en contacto por teléfono con Matthew Wrobel al 774-487-5330 o con Kelly Collopy al 774-487-5782.

Distribution List for Environmental Justice Screening Forms

Statewide Environmental Justice Community Based Organizations					
First Name	**Last Name**	**Title**	**Phone**	**Email**	**Affiliation**
Ben	Hellerstein	MA State Director	617-747-4368	ben@environmentmassachusetts.org	Environment Massachusetts
Cindy	Luppi	New England Director	617-338-8131 x208	cluppi@cleanwater.org	Clean Water Action
Deb	Pasternak	Director, MA Chapter	617-423-5775	deb.pasternak@sierraclub.org	Sierra Club MA
Elvis	Mendez	Organizing Director	508 904-5359	elvis@n2nma.org	Neighbor to Neighbor
Emily	Myron	Policy Manager	617-532-8311 240-372-0792	emily.myron@tnc.org	The Nature Conservancy
Heather	Clish	Director of Conservation & Recreation Policy	(617) 523-0655	hclish@outdoors.org	Appalachian Mountain Club
Heidi	Ricci	Director of Policy	781-259-2172	hricci@massaudubon.org	Mass Audubon
Julia	Blatt	Executive Director	(617) 714-4272	juliablatt@massriversalliance.org	Mass Rivers Alliance
Kelly	Boling	MA & RI State Director	(617) 367-6200	kelly.boling@tpl.org	The Trust for Public Land
Kerry	Bowie	Board President	Not Provided	kerry@msaadapartners.com	Browning the GreenSpace
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APPENDIX I

GEOTECHNICAL REPORT

PRELIMINARY GEOTECHNICAL REPORT

PROPOSED STRAIGHTWAY WATER TREATMENT FACILITY

BARNSTABLE, MASSACHUSETTS

MAY 24, 2024

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ONLY THE CLIENT OR ITS DESIGNATED REPRESENTATIVES MAY USE THIS DOCUMENT AND ONLY FOR THE SPECIFIC PROJECT FOR WHICH THIS REPORT WAS PREPARED.

A Report Prepared for:

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PRELIMINARY GEOTECHNICAL REPORT

PROPOSED STRAIGHTWAY WATER TREATMENT FACILITY
TOWN OF BARNSTABLE, MASSACHUSETTS

Kleinfelder Project Number: 24003062.001A

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1 DESCRIPTION OF PROPOSED PROJECT

1.1 GENERAL

The objective of this geotechnical report is to present the results of Kleinfelder's geotechnical subsurface exploration program and to provide preliminary geotechnical design recommendations and construction considerations for the proposed Straightway Water Treatment Facility planned in Barnstable, Massachusetts. The subsurface exploration program included soil borings and laboratory testing performed on selected soil samples obtained from the borings, per the technical proposal titled "Design Services for New Straightway Water Treatment Facility" dated September 2023.

This report was prepared in general accordance with the provision of the Massachusetts amendments to the 2015 International Building Code, 9th Edition (collectively MSBC, the Code). This report is subject to the Limitations included herein and the Limitations Section included at the end of this report.

Unless otherwise specified, in this report, latitude and longitude are referenced to the Massachusetts State Plane Coordinate System (Main Zone)/North American Datum of 1983 (NAD83) horizontal datum. Elevations (El.) provided in this report reference to North American Vertical Datum of 1988 (NAVD88) and are in feet. The approximate location of the site in relation to the surrounding area is presented as a site location map in **Figure 1**.

1.2 BACKGROUND INFORMATION

Our understanding of the proposed project is based on the following documents:

- Technical Proposal titled "Design Services for New Straightway Water Treatment Facility" drafted by Kleinfelder, Inc. dated September 2023.
- Contract titled "FY 24 Design Services for New Straightway Water Treatment Facility" executed between the Town of Barnstable and Kleinfelder, Inc. in December 2023.
- Conceptual Design Drawings titled "Straightway Treatment Facility Design," prepared by Kleinfelder, Inc. dated March 2024.

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1.3 EXISTING CONDITIONS

The project comprises of two gated sites inter-connected by a gravel access path, located in West Barnstable, Massachusetts. Both sites are owned by the Town of Barnstable. Multiple buried utilities, light poles, a paved road, and a gravel path, are present at both the sites.

The existing “Straightway Site” located near 228 Straightway, includes the current Straightway Water Treatment Facility (which houses both Straightway Wells No. 1 and No. 2), a 400,000-gallon above-grade water-storage tank (the Straightway Tank), a backwash basin, four non-winterized Granular Activated Carbon (GAC) contractor vessels, a 1,500- gpm (gallon per minute) booster pumping station, and the Straightway Facility Building. Historical aerials indicate the existing facility was constructed around 2012.

The Straightway site is surrounded by a chain link fence and is bound by Straightway (the road) to the west and by abutters, wooded areas, and wetlands to the north, south and east. Bends Pond is to the north and lower than El. 15 feet. Existing grades across the site vary between approximately El. 20 and El. 32 feet.

The existing “Hyannisport and Simmons Pond Site,” located near 132 Smith Street, is to the south of the Straightway Site. It includes the current Hyannisport Water Treatment Facility, which houses the Hyannisport well. Another existing pump station building houses the Simmons Pond Well separately.

The “Hyannisport and Simmons Pond Site” is partially surrounded by a chain link fence and is bound by the Straightway Site to the north, Smith Street to the south, Simmons Pond to the east and abutters, wooded areas, and wetlands to the west, east and north. Existing grades across the site vary between approximately El. 8 and El. 20 feet. A vegetated/wooded slope is present along the central and northern edge of the site. The tide influenced Simmons Pond is near El. 5 feet.

The existing and conceptual conditions are shown on the attached **Figure-2-1** and **Figure 2-2**.

1.4 REGIONAL GEOLOGY

The USGS surficial geologic mapping titled “Geologic map of the Hyannis quadrangle, Barnstable County, Massachusetts” (Hyannis Quadrangle), dated 1974, identifies the primary geologic unit

encompassing both the sites as “Barnstable Outwash Plain Deposits – Pleistocene (“Qbo”)” which includes mostly gravelly sand with some pebbles to small boulder deposits. The outwash sand deposits consist of angular to subrounded sand grains, with the possibility of encountering some till, clayey silt, and occasional large boulders. These sand and gravel deposits may overlie silt and clay.

The Straightway Site is also located near “Valley Floor Deposits - Holocene and Pleistocene (“Qvf”)” which includes mostly sediments comprising of mostly gravelly sand with pebble to small boulder gravel.

The wetlands surrounding the Hyannisport/Simmons Pond site is comprised of “Marsh and Swamp Deposits - Holocene and Pleistocene (“Qs”)” which includes mostly decaying marine-marsh plants mixed with varying amounts of sand, silt and clay, peat deposits overlain by beach and dune deposits.

The rock surface belonging to the Proterozoic unit - granite, gneiss, and schist undivided (“Zgg”) is buried at approximately 400 feet below the mean sea level datum.

1.5 PROPOSED CONSTRUCTION

At the time of preparation of the report, two replacement (water pumping) wells (HP-02B and SP-03A) had been installed on site by Maher Drilling Services. A new contact pipe (CT Pipe) comprising of two hundred linear feet (200 LF) of a 48-inch diameter ductile iron water main is proposed to be installed between the new Straightway Treatment Facility and the main road entrance.

The proposed development will also include the winterization of the four existing seasonal GAC contractors at the Straightway site. The proposed winterization structure comprises of combining the existing concrete slabs to create a bigger foundation and constructing a climate controlled prefabricated metal or wooden building over the existing filter units.

An infiltration lagoon system/stormwater management area is proposed near the existing backwash basin along with an alternate location behind the existing straightway storage tank.

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The new Straightway Treatment Facility Building is proposed towards the southern end of the Straightway site. A 130,000-gallon capacity, underground backwash holding tank, over the partial footprint of the new Straightway treatment building is proposed.

An extension to the existing pump station building at the Straightway site will be added. This pump station is anticipated to have a wet well approximately 15 feet deep. Two (2) new pump station buildings, housing the recently installed replacement wells - Hyannis port well and Simmons Pond well are also proposed.

Kleinfelder anticipates that most of the structures are to be supported by shallow foundation. Structural loading, structural drawings, and site grading plans were not available at the time of preparation of this report. Kleinfelder anticipates that some site regrading will be performed for the new development. However, proposed site grades are anticipated to match approximately existing grades, except in selected areas south and south-west of the Straightway site, to accommodate the infiltration lagoon system/storm water management area(s).

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2 SUBSURFACE EXPLORATIONS AND SUBSURFACE CONDITIONS

2.1 GENERAL

Two subsurface exploration programs (herein referred to as "Previous" and “Recent” subsurface explorations) including replacement well exploration(s) and, test borings/geotechnical laboratory testing were performed by Maher Services and Kleinfelder, respectively, at the project site(s). The approximate location of the explorations performed at the site are shown on the attached **Figures 2-1** and **Figure 2-2**. Select logs from the replacement well exploration program are provided in **Appendix A**. The test boring logs from the recent subsurface exploration program are provided in **Appendix B.** The results of the geotechnical laboratory tests are included on the recent test boring logs. Copies of the recent laboratory test report are included in the **Appendix C**.

2.2 PREVIOUS REPLACEMENT WELL EXPLORATIONS BY OTHERS

The replacement well exploration program at the Hyannis Port and Simmons Pond site included the drilling and installation of test wells and replacement wells, pump tests and laboratory testing on water sampled from the wells. Test wells and replacement wells were pre-drilled prior to installation by Maher Services of North Reading, Massachusetts, using a Geoprobe 7822-DT, between January 31 and February 14, 2024. The pre-drilling depths ranged between approximately 43 feet to 84 feet below ground surface (bgs).

The following generally uniform subsurface profile was observed during the pre-drilling phase: peat/topsoil (approximate depths of 0 feet to 2 feet bgs), upper silty sand (approximate depths of 2 feet to 35 feet bgs), gray clay (approximate depths of 35 feet to 45 feet bgs), lower silty sand (approximate depths of 45 feet to 84 feet bgs). Of the six (6) pre-drilled locations, two (2) were converted into replacement wells. Select logs from the replacement well exploration program are provided in **Appendix A**.

2.3 RECENT SUBSURFACE EXPLORATIONS BY KLEINFELDER

2.3.1 Test Borings

Kleinfelder conducted a recent subsurface exploration program between April 15, 2024 and April 18, 2024. The subsurface exploration program consisted of eight (8) test borings (B-1 through B-

8) in the Straightway Site, and two (2) test borings in the Hyannisport/Simmons Pond Site. The test borings were advanced by Geologic Earth Explorations of Norfolk, Massachusetts.

Prior to start of drilling, a Kleinfelder representative marked the borings in the field and contacted Digsafe to locate underground utilities. The site was partially wooded; therefore, minor removal of trees and vegetation using a chain saw was necessary prior to drilling to clear the boring locations and ensure rig access.

Soft digging techniques were used in borings (B-1, B-2, B-3, B-5 and B-8-OW), to a depth of approximately 6 feet below the ground surface (bgs), to ensure the boring locations were clear from subsurface utilities. Soft digging included a combination of vacuum excavation and hand-tool digging.

Drilling was performed using an ATV rig and drive and wash with casing drilling techniques. A 4-inch inside diameter (ID) casing was used during drilling to advance the boreholes. The bottom of the borings extended between approximately El. 15.0 and El – 22.0 (depths ranging between approximately 12 and 48 feet bgs).

Standard Penetration Test (SPT), in general accordance with ASTM D1586, was performed during drilling. Standard penetration testing entails driving an approximately 1.38-inch ID (approximately 2-inch outside diameter - OD) split spoon sampler into a soil layer using a 140-lb weight (hammer) dropping freely from a height of 30 inches and recording the number of hammer blows (blow count) for four (4) consecutive advancements of the split spoon measuring 6 inches each, for a total advancement of the split spoon of 24 inches.

For this project, a donut hammer was used during the SPTs. Split spoon samples were obtained continuously from the bottom of vacuum excavation to a depth of 10 feet bgs and at standard five-foot intervals thereafter, at borings B-1, B-2, B-3, B-5 and B-8-OW.

Split spoon samples were obtained continuously from the ground surface to a depth of 10 feet bgs and at standard five-foot intervals thereafter, at borings B-4-OW, B-6, B-7, B-9, and B-10.

Bedrock was not encountered in the borings; therefore, coring was not performed.

Two (2) groundwater monitoring wells with flush mounted road boxes, 16-feet, and 26-feet deep were installed in borings B-4-OW and B-8-OW, respectively upon drilling completion. The screen

lengths were 11 feet and 15 feet, respectively. All the other borings were backfilled with drill cuttings or sand upon drilling completion.

It should be noted, a 5-feet long section of a 4-inch diameter steel casing was lost during retrieval, at borehole B-6, within the footprint of the proposed underground backwash holding tank.

2.3.2 Drilling Oversight

A Kleinfelder engineer performed full-time drilling observations during the subsurface exploration programs. The Kleinfelder engineer prepared boring logs that included the blow counts recorded during the SPTs; a description of the soil samples recovered during the SPTs performed in general accordance with the Modified Burmister soil classification system and Unified Soil Classification System (USCS).

A Photo Ionization Detector (PID) was used for the environmental field pre-screening of soil samples, and the PID readings in parts per million (ppm) were noted on the boring logs. Additionally, soil samples for analytical laboratory tests were also collected in selected borings. Analytical test results will be submitted under a separate cover.

Soil samples collected during drilling of the test borings were stored in sealed soil jars and brought to the Kleinfelder office for review and geotechnical laboratory testing.

2.4 LABORATORY TESTING

Geotechnical laboratory testing was performed on selected soil samples from the borings to evaluate engineering soil properties.

Eighteen (18) grain size analyses (ASTM D6913) and four (4) organic content analyses (ASTM D2974) were performed on soil samples obtained from recent borings B-1 through B-10. Testing was performed by Thielsch Engineering, Inc. of Cranston, Rhode Island. Copies of the recent laboratory test report are included in the **Appendix C**.

2.5 SUBSURFACE CONDITIONS

2.5.1 Soil Stratigraphy

The generalized subsurface conditions (soil stratigraphy and groundwater) described below summarize trends observed in the borings. Actual subsurface conditions between borings could be more variable. The boundaries between soil strata presented in the boring logs are based on observations during drilling and on widely spaced borings and soil samples and should be considered approximate.

The major soil groups encountered during the field evaluation are described below in the order of their occurrence. Detailed soil descriptions are included in the boring logs in **Appendix B**.

2.5.1.1 Straightway Site

Surficial Materials: Topsoil was encountered at the ground surface in all the borings except for borings B-2 and B-3. The thickness of topsoil ranged between approximately 2 and 10 inches in the borings. At borings B-2 and B-3, the surface was overlain by an approximate 1-inch-thick gravel layer.

It should be noted that Kleinfelder utilized visual classification methods in order to field delineate the approximate topsoil thicknesses and has not performed any laboratory testing to determine the horticultural properties of the observed topsoil. Therefore, the phrase “topsoil” is not intended to indicate suitability for landscaping and/or other purposes. It should also be noted that the transition from surficial topsoil to underlying materials may be gradual, and therefore the observation and measurement of the surficial topsoil depth is subjective. Actual surficial organic soil depths should be expected to vary and generally increases with the amount of vegetation present over the site.

Existing Undocumented Fill: An undocumented fill layer was encountered underneath the surficial material in the borings except at B-7. The undocumented fill contained predominantly sand with varying amounts of silt (“and” to “trace”) and gravel (“and” to “trace”), along with frequent cobbles and root fragments. The thickness of the undocumented fill layer ranged between approximately 5.9 to 11.8 feet in the borings. N-values in the undocumented fill layer ranged between 4 and 66 blows per foot (bpf), indicating very loose to very dense material.

Subsoil: Subsoil was encountered underneath the topsoil in test boring B-7. The subsoil contained predominantly sand with varying amounts of silt (“some” to “trace”) and gravel (“little” to “trace”), along with cobbles and root fragments. The thickness of the subsoil layer was approximately 4.0 feet at these test locations. The SPT N-values in the subsoil layer ranged between 3 and 12 blows per foot (bpf), indicating very loose to medium dense material.

Upper Sand: A naturally deposited upper sand layer was encountered underneath the undocumented fill layer in borings B-4-OW, B-5 and B-6. The thickness of the upper sand layer ranged between approximately 4 feet and 38 feet in the borings. The SPT N-values in the upper sand layer ranged between 17 and 66 blows per foot (bpf), indicating medium dense to very dense material.

Sand and Gravel: Naturally deposited interlayered sand and gravel was encountered underneath the undocumented fill/subsoil layer in borings B-1, B-2, B-3, B-7 and B-8-OW. The thickness of the sand and gravel layer ranged between approximately 4.0 feet and 40.0 feet in the borings. The SPT N-values in the sand and gravel layer ranged between 10 and 47 blows per foot (bpf), indicating loose to dense material. A layer of sand and gravel was also encountered between the upper and lower sand layers in boring B-6.

Lower Sand: A naturally deposited lower sand layer was encountered underneath the sand and gravel layer in borings B-6 and B-7. The thickness of the lower sand layer ranged between approximately 8.5 feet and 13.5 feet in the borings. The SPT N-values in the lower sand layer ranged between 13 and 31 blows per foot (bpf), indicating medium dense material.

It should be noted that the upper sand, interlayered sand and gravel, and lower sand layers were not fully penetrated in the borings that were terminated in these layers. Therefore, the thickness of these layers may be greater than what was observed in the borings terminated in these layers.

2.5.1.2 Hyannisport and Simmons Pond Site

Surficial Materials: Topsoil was encountered at the ground surface of the test borings. The thickness of topsoil ranged between approximately 4 and 12 inches in the borings. However, the presence and/or thickness of the surficial materials may differ in unexplored areas of the project site.

Subsoil: Subsoil was encountered underneath the topsoil in the test borings. The thickness of the subsoil layer ranged between approximately 3.0 feet and 3.7 feet in the borings. The subsoil contained predominantly sand with varying amounts of silt (“some” to “trace”) and gravel (“little” to “trace”). The SPT N-values in the subsoil layer ranged between 7 and 19 blows per foot (bpf), indicating loose to medium dense material.

Upper Sand: A naturally deposited sand layer was encountered underneath the subsoil layer in the test borings. The thickness of this layer was approximately 27 feet in the borings. SPT N-values in the sand layer ranged between 12 and 35 blows per foot (bpf), indicating medium dense to dense material.

It should be noted that the upper sand layer was not fully penetrated in the borings that were terminated in this layer. Therefore, the thickness of this layer may be greater than what was observed in the borings terminated in this layer.

2.5.2 Groundwater

Groundwater was observed during drilling between approximately 6.0 and 16.0 feet bgs (between approximately El. 15.0 and El. 26.0) at the Straightway Site. Groundwater was observed during drilling between approximately 8.0 and 8.5 feet bgs (between approximately El. 9.0 and El. 9.5) at the Hyannis port and Straightway Site. A summary of groundwater measurements is presented in **Table 2**.

The groundwater measurements presented in this report only represent the conditions encountered at the location and time indicated. It should be noted that water was introduced in the borehole during drilling. Therefore, the collected groundwater measurements may not be representative of actual groundwater conditions. Furthermore, groundwater levels fluctuate due to local and regional factors including, but not limited to, site topography, tidal action, seasonal changes, well pumping, and periods of wet or dry weather, nearby construction, or other below grade activities, such as excavation, dewatering, infiltration basins, etc.

3 GEOTECHNICAL IMPLICATIONS OF SUBSURFACE CONDITIONS

The primary geotechnical issues for the design and construction of the proposed developments and related to the existing site conditions and to the subsurface conditions observed in the borings include:

- **Presence of undocumented fill:**
  Up to approximately 12 feet of undocumented fill (refer to Table 1) with low SPT N-values was encountered in the borings. The fill has variable in-situ density and may contain pockets of cobbles, organics and other deleterious materials and is considered unsuitable for support of foundation elements. As such, care must be taken at the time of construction to evaluate the bottom of each footing elevation as discussed herein. Weak or unsuitable materials identified at the time of construction should be removed and replaced with structural fill. Pre-excavation may be necessary prior to foundation construction to remove large boulders, cobbles, or conglomerates.

- **Presence of heave in sands**:
  Hydraulic heave, also referred to as hydrostatic “blowout” or “liquefaction,” was observed in the submerged sand layers within the deeper borings (B-2, B-5, B-6) immediately after encountering the groundwater table. This led to poor sample recoveries and prompted the circulation of special grade drilling mud to control the pressure imbalance and reduce blow out during drilling.

- **Presence of an unexplored clay layer at the Hyannis port /Simmons Pond Site:**
  A potential clay layer up to approximately 10 feet in thickness (refer to Appendix A and Section 2.2) was reported during the replacement well exploration program. The recent borings were not deep enough to penetrate this layer. The clay layer should be accounted for in case deep foundations are proposed.

- **Presence of groundwater**:
  Groundwater was encountered at all the boring locations and may potentially impact design and construction of the proposed structures and utilities depending on the proposed depths. To avoid dewatering during construction, we suggest design structure

bottoms and utilities at least 3 feet, preferably 5 feet, above groundwater; we understand structures below groundwater may be unavoidable due to other design requirements. The groundwater levels encountered during this study do not represent a “normal” seasonal high groundwater level.

- **Presence of existing structures to remain**:
  Several existing structures, including existing backwash basins, treatment buildings, utilities, and conduits (refer to Section 1.3) are in proximity of the proposed structures. These structures and their foundations need to be protected during excavations and constructions.

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4 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

The analyses and recommendations submitted in this report are based on data obtained from test borings performed at the site and our understanding of the proposed construction. The nature and extent of variations between strata may not become evident until construction. If significant variations from the subsurface conditions observed in the borings appear during construction, or if changes occur in the design of the proposed structures, it will be necessary to re-evaluate these recommendations.

Unsuitable soils include the undocumented fill, and any soft/loose, frozen, or organic soils present at the foundation subgrade. The foundation or structure bearing zone (zone of influence) is defined as the volume of soil underneath footings defined by a 1-horizontal to 1-vertical (1H:1V) plane extending downward and outward from two feet beyond the edge of foundations. Information on the future structure features including structure type, footprint, dimensions, depths, structural loads, and existing foundation types at the sites are unknown and were not available at the time of preparation of the report.

4.1 GENERAL

4.1.1 Design Groundwater Elevation

The FEMA Flood Insurance Rate Map places the Straightway Site within “Zone X – Area with reduced flood risk.” A 100-year flood elevation was not defined for this site. Based on groundwater readings taken during drilling and at the installed monitoring wells, we recommend using a design groundwater elevation of El. 17.0.

The FEMA Flood Insurance Rate Map places the Hyannisport and Simmons Pond Site in flood-prone areas (0.2% annual chance flood hazard). A 100-year flood elevation was not defined for this site. Based on groundwater readings taken during drilling, a design groundwater elevation of El. 9.0 may be assumed for this site.

4.1.2 Frost Protection and Waterproofing

Footings bearing on soils subject to frost heave should bear at least 48 inches below the lowest adjacent exterior grade; interior footings may bear 18 inches below exterior grade; however,

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consideration should be given to interior footings in unheated areas and interior footing depth should be increased, as necessary. A deeper embedment depth will increase the factor of safety against frost heave and allow more counterweight from backfill soil for uplift resistance. Waterproofing should be performed in accordance with Section 1805 of the Code, based on the design groundwater elevation provided herein (Section 4.1.1).

4.1.3 Sliding and Overturning

All footings and walls should be verified for sliding and overturning. For the sliding resistance analysis, a coefficient of friction equal to 0.55 should be used for concrete foundations on compacted structural fill or on ¾" crushed stone. A coefficient of friction equal to 0.40 should be used for cast-in-place concrete foundations on native upper sand/lower sand sand/ sand and gravel layers. Values for pre-cast concrete should be reduced by one-third.

For sliding and overturning resistance, backfill unit weight should be 135 pcf assuming backfill placed and compacted as described herein (Section 5.4). The minimum factors of safety for sliding and overturning under static loads should be 1.5. The minimum factors of safety for sliding and overturning under seismic loads should be reduced to 1.1.

4.1.4 Slab on Grade

Slab subgrade preparation procedures and soil gradation and compaction requirements are provided in the Construction section below. After overexcavation of the existing unsuitable soils from within the zone of influence of the building slab and replaced with structural fill or ¾" crushed stone wrapped in non-woven geotextile, the building slab may be designed as a slab-on-grade bearing on 12 inches of a Structural Fill base course.

4.1.5 Lateral Earth Pressures

Support of excavation structures and below grade walls will extend into undocumented fill/backfill and native upper sand, and sand & gravel layers. We recommend that below grade walls be preliminarily designed using the active, passive, and at-rest coefficient provided in **Table 4.1**.

TABLE 4.1 – SUMMARY OF PRELIMINARY LATERAL EARTH PRESSURE PARAMETERS

Strata	Moist Unit Weight γ_m (pcf)	Saturated Unit Weight γ_m (pcf)	Friction Angle ϕ' (deg)	Triangular Pressure Diagrams Active and Passive		Triangular Pressure Diagrams At Rest	Seismic Active EP coefficient	Seismic Passive EP coefficient
				K_a (-)	K_p (-)	K_o (-)	K_{ae} (-)	K_{pe} (-)
Undocumented Fill	115	120	30	0.33	3.00	0.50	0.36	2.84
Subsoil	110	115	28	0.36	2.77	0.53	0.38	2.61
Upper Sand	122	125	32	0.31	3.25	0.47	0.33	3.09
Sand and Gravel	125	127	30	0.33	3.00	0.50	0.36	2.84
Lower Sand	120	122	32	0.31	3.25	0.47	0.33	3.09
Backfill	135	137	34	0.28	3.54	0.44	0.31	3.36

Notes:

Active and passive coefficient evaluated using Rankine Theory

Active seismic coefficient evaluated using M-O Theory

At-rest coefficient evaluated as ko-1-sin(ϕ')

- Submerged unit weights defined by subtracting the unit weight of water (62.4 pcf) from the moist unit weights as recommended above, should be used for soils encountered below ground water table.
- Hydrostatic water pressure along the height of the wall below groundwater should be included for walls with undrained backfill. Add a triangular groundwater pressure below the groundwater table using 62.4 pcf as the water unit weight if hydrostatic conditions are encountered.
- A minimum surcharge of 250 psf should be considered at ground surface to account for construction equipment surcharge and for surcharges during the life of the structure.
- Structures restrained from lateral movement, such as buried structures, or walls close to buried utilities, should be designed using the at-rest coefficient of earth pressure.

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- Passive earth pressures ($K_p=1/K_a$) should only be used where special measures or provisions are taken to prevent disturbance or future removal of the soil on the passive side of the wall, or in areas where the wall design includes a key.
- Support of excavation should be anchored in dense to medium-dense sand and/or sand and gravel soils.

Walls should also be designed to resist an earthquake force F_w evaluated in accordance with Section 1610.2 of the Code as follows:

- $F_w= 0.100 \times (S_s) \times (F_a) \times (\gamma_t) \times (H^2)$

Where:

- S_S is the spectral response acceleration parameters at 0.2-second period (S_s=0.152)
- F_a is the site coefficient from Table 1613.3.3(1) of 2015 IBC (F_a=1.6 for Site Class D)
- γ_t is the soil total unit weight (γ_t=135 pcf for compacted structural fill, see above)
- H is the height of the wall.

The force resulting from active and passive earth pressure should be applied at a height of H/3 from the bottom of the base. The force resulting from surcharges behind the proposed wall should be applied at a height of H/2 from the bottom of the base. The force resulting from seismic shaking of the soil behind the proposed retaining wall should be applied at a height of 2/3 H from the bottom of the base.

4.1.6 Seismic Design

4.1.6.1 Spectral Response Accelerations

The MSBC 9th edition tabulated 5%-damped, short period/0.2-seconds (S_S) and 1-second (S_1) spectral response accelerations for the Town of Barnstable, MA are 0.152 and 0.055, respectively. The IBC 2015 and ASCE 7-10 mapped 5%-damped, (risk targeted) spectral response accelerations S_s and S_1 were 0.149 and 0.054, respectively. The peak ground acceleration (PGA) was evaluated based on the IBC 2015 mapped values and was 0.120.

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4.1.6.2 Seismic Site Class

As prescribed by the MSBC 9th edition and 2015 IBC, the Seismic Site Class was determined in accordance with Chapter 20 of ASCE 7. The seismic Site Class was also evaluated using the average SPT resistance method as described in Chapter 20.4 of ASCE-7 using uncorrected N-values from the borings. Based on this procedure and on data from the borings, the Site Class was evaluated to be Site Class D at both the Straightway and Hyannisport/Simmons Pond sites.

4.1.6.3 Seismic Design Parameters

The seismic design parameters assuming Site Class D, for the Straightway and Hyannisport/Simmons Pond sites are as follows:

Table 4.2: Seismic Design Parameters (Straightway and Hyannisport /Simmons Pond sites):

Design Parameter	Description	Recommended Value
Site Class		D
S_s (g)	5%-damped, short period/0.2-second spectral response accelerations (MCE_R ground motion)	0.152
S_1 (g)	5%-damped, 1.0-second spectral response accelerations (MCE_R ground motion)	0.055
F_a	Site amplification factor at 0.2-second	1.600
F_v	Site amplification factor at 1.0-second	2.400
S_{DS} (g)	5%-damped, numeric design spectral response accelerations at short period/0.2-second	0.162
S_{D1} (g)	5%-damped, numeric design spectral response accelerations at 1-second	0.088
PGA_M (g)	Site-modified peak ground acceleration value	0.120

4.1.6.4 Liquefaction

As prescribed by the Code, the soil profiles encountered in the borings were pre-screened for liquefaction susceptibility using figure 1804.6 (a through c). Figure 1804.6a was used for N-values taken in fill, upper sand, lower sand, and sand & gravel below the groundwater, using a donut hammer. The N-values from the ten (10) test borings all plotted above the assumed reference curve representative of the design groundwater depth(s) between approximately 6 feet and 16 feet bgs. Therefore, the site soils are not considered to be susceptible to earthquake-induced liquefaction.

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4.2 SHALLOW FOUNDATION RECOMMENDATIONS

4.2.1 Overexcavation and Replacement

Based on the subsurface conditions encountered in the borings performed for this study, assuming that the Finished Floor Elevation (FFE) will be within two feet of existing grade, and a recommended frost depth of four feet below exterior grades, the proposed developments may be supported on the existing naturally deposited sand and gravel, upper sand or lower sand layers, or on structural fill placed over natural soils in controlled, compacted layers, after the removal of unsuitable soils from within the foundation bearing zone. The bearing zone is defined as the volume of soil underneath footings defined by a 1-horizontal to 1-vertical (1H:1V) plane extending downward and outward from one foot beyond the edge of foundations. Unsuitable soils include existing undocumented fill, topsoil, subsoil, organics and any other soft/loose or frozen soil present at the foundation subgrade. Additional recommendations regarding the removal of unsuitable soils are provided in the Construction Consideration section of this report.

4.2.2 Bearing Capacity and Settlement

For foundation subgrades prepared as described herein (section 5.3), the preliminary recommendation is to use a maximum net allowable soil bearing pressure of 3.1 kips per square foot (ksf) for spread footings with a least lateral dimension of 3 feet and embedment depth of 4 feet. At the recommended bearing capacity, the total and differential settlement is expected not to exceed 1 inch and ½-inch, respectively.

For spread footings having a least lateral dimension smaller than 3 feet, the net allowable bearing pressure (in ksf) can be obtained by multiplying the least lateral dimension (in feet) by a factor of 1.15. A minimum foundation width of 2.0 feet (net allowable bearing capacity of 2.3 ksf) is recommended.

4.2.3 Slab on Grade and Modulus of Subgrade Reaction

The building slab(s) may be designed as a slab-on-grade, undercut to feed, to be bearing on over-excavated and replaced

- Compacted structural fill with the recommended modulus of subgrade reaction, k_1, of 150 pci, or
- Compacted ¾" crushed stone with the recommended modulus of subgrade reaction, k_1, of 200 pci.

All slab-on-grade details presented in the Code should be implemented into the structural construction drawings including vapor barriers, granular capillary barriers, etc.

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5 GEOTECHNICAL CONSTRUCTION CONSIDERATIONS

5.1 SITE PREPARATION

Remove all topsoil from within the proposed excavation area. Care should be taken to avoid mixing of these materials with other excavated soils. Stockpile, transport, and dispose all excavated material in accordance with Federal, State, and local regulations.

5.2 SITE EXCAVATIONS

5.2.1 General

Excavation should conform to OSHA health and safety standards for excavation contained in 29 CFR Part 1926, latest edition. Excavation height, depth and slope should conform to these OSHA standards and all local, State, and Federal safety regulations. As a safety measure, we recommend that vehicles and soil piles be kept a minimum lateral distance of five feet or as dictated by OSHA guidelines, whichever is greater, from the crest of excavations. On-site construction safety is solely the responsibility of the Contractor. The information provided herein is provided as a service to our Client and should not be interpreted to mean that Kleinfelder is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

5.2.2 Excavation Equipment for Soil

We anticipate excavations for this project may be accomplished by using regular earth moving equipment (Caterpillar E320 excavator or similar). Based on the data available from the borings, anticipated excavation depths and the review of the local bedrock geology, rock excavation is not anticipated for this project.

5.2.3 Excavation Slopes and Support of Excavation

It is anticipated that foundation excavations will be accomplished by a combination of sloping or benching the sides of the excavations, and engineered support of excavation systems depending on the depth of cut. The engineered support of excavation systems should be selected by the Contractor and designed by an experienced Professional Engineer registered in the State of Massachusetts retained by the Contractor. Possible engineered support of excavation systems

include cantilevered systems such as sheet piles, soldier pile and lagging support of excavation, with or without bracing. If the support of excavation will extend within the bearing zone of existing or proposed structures, the support of excavation should be cut below finished grade and abandoned in place after construction.

Trench excavations for pipelines and other utilities should be accomplished using shield systems such as trench boxes or slide rails. Shield systems are only for protection of workers during utility installation and should not be used as an engineered support of excavation for excavation extending within the zone of influence of existing or new structures to remain on site. When advancing shield systems, the maximum unsupported trench height should not be more than 2 feet or as recommended by the Engineer.

5.2.4 Excavation Dewatering

Based on the groundwater levels measured in the borings, groundwater will likely be encountered during the excavations for the pump stations and treatment facilities/backwash holding tank at the Straightway Site. The other locations may require minimal to no dewatering efforts depending on the proposed depth of excavation. Groundwater should be tested for environmental quality to determine if treatment of dewatered water is required prior to disposal.

Dewatering can be achieved by driving sheet piles to serve as the form for the below grade walls and permeation grouting the subgrade to form a “plug” thereby minimizing the risk of static liquefaction or boiling of excavations.

If construction dewatering is required, dewatering may be accomplished by means of a series of sumps and sump pumps or diversion trenches within and around excavations. Sumps should be provided with filters suitable to prevent pumping of fine-grained soil particles. Sumps should be located outside of the zone of influence of proposed footings. Installation and operation of the contractor’s dewatering system should be integrated with other earthwork operation and sequence of excavation, foundation construction, and backfilling.

The Contractor should dispose dewatering water in accordance with local, State and Federal regulations. Recommendations for disposal of dewatering water is beyond the scope of this report and should be evaluated separately. At this site, after the necessary treatment, dewatering water could either be reinfiltrated, discharged to the local sewer system, or transported and disposed off-site.

The Contractor is required to control water seepage, precipitation, infiltration, and surface water inflow into excavations to limit disturbance and maintain excavation subgrade integrity, and to allow foundation construction in-the-dry. We recommend temporary control measures be implemented to reduce the amount of surface water (from rainfall runoff) from potentially entering and ponding in the excavations. Temporary measures may include construction of drainage ditches and/or berms to divert and/or reduce the amount of surface water flowing over exposed subgrades during construction.

5.2.5 Foundation and Utility Excavations and Protection of Subgrades

Excavations should be sequenced to minimize disturbance of subgrades. The time that excavations near or below the groundwater table stay open should also be minimized to limit instability of the excavation walls. Excavation to final subgrade should be performed immediately before placing formwork. When possible, excavations of subgrades in granular, cohesionless soils should be completed manually for the last 3 to 6 inches; excavations of subgrades in cohesive soils should be performed with a smooth-edge excavator bucket.

Excavation subgrades exposure to heavy equipment traffic or weather should be minimized. Natural subgrades, especially in cohesive soils or soils with high fine content, are easily disturbed when wet and will require stabilization measures.

Based on construction and/or weather conditions, excavation subgrades should be protected by completing the excavation to final subgrade only immediately before placing formwork, or by placing a mud mat or working mat of crushed stone wrapped all-around in non-woven geotextile on the final excavation subgrade, or by using erosion control of heating blankets.

5.3 SUBGRADE PREPARATION

Areas of weak and unstable soils - as defined in this report - observed at the final excavation subgrade should be over excavated and replaced with compacted structural fill or ¾” crushed stone wrapped in non-woven geotextile. This will require deeper dewatering and excavation support, if needed. If encountered at the excavation subgrade, boulders should also be removed from within the zone of influence of the proposed building foundations, slab, or utility, and replaced with structural fill or ¾” crushed stone.

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Exposed subgrades in cohesionless soil should be proof-compacted prior to placement of footings, utilities, or structural fill with at least 4 passes of a heavy (10,000 lb.) vibratory roller or 10 passes of a smaller walk-behind vibratory plate compactor. When near the water table, proof-compaction should be performed at the discretion of Kleinfelder's geotechnical engineer and may need to be performed using static (non-vibratory) methods to limit disturbance of the subgrade. Exposed subgrades in cohesive soil should be excavated 12 inches below final subgrade using a smooth-edge bucket and backfilled with ¾" crushed stone wrapped in non-woven geotextile.

Following subgrade preparation, place, and compact the proposed backfill in accordance with the methods described herein.

5.4 BACKFILL COMPACTION AND BACKFILL GRADATION

Backfill should be placed in 12-inch maximum loose lift thickness (evaluated prior to compaction) or 6-inch lifts thickness in restricted areas such as trenches, behind walls or around footings. Backfill should be compacted to a minimum Relative Compaction (RC, defined as backfill target dry density as a percentage of backfill maximum dry density, obtained as described in ASTM D-1557) as follows:

- RC= 95 percent underneath structures, pavement (pavement base/subbase) and utilities
- RC= 92 percent in landscape areas.

Backfill moisture during compaction should not be higher than the optimum moisture content plus 2% and should not be lower than the optimum moisture content minus 2% unless otherwise approved by the geotechnical engineer.

Crushed Stone should be placed in loose lift thicknesses of maximum 12 inches and should be compacted with heavy compaction equipment to achieve an unyielding subgrade.

Structural fill should be used for replacement of unsuitable materials, as defined herein, below structures and pavement areas, as trench backfill underneath structures and for other over-excavations. Crushed stone may be used underneath structures in lieu of structural fill or around flexible pipelines. Common fill should be used in landscaping areas or as trench backfill as described herein. Common fill should not be used within the zone of influence of new or existing structures or as pavement base or subbase.

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Table 5.1 presents the gradation requirement for imported material of for on-site material to be reused.

Table 5.1 – Gradation Requirements of Imported and On-Site Material

Sieve Size	Percent Finer by Weight				
	Common Fill	Structural Fill Wall Backfill Pavement Base Pipe Base	3/4" Crushed Stone	Pavement Subbase	
6-inch	100	-	-	-	
3-inch	-	-	-	100	
2-inch	90-100	100	-	-	100
1-1/2 inch	-	-	-	70-100	70-100
1-inch	-	-	100	-	-
3/4-inch	-	-	90-100	50-85	50-85
1/2-inch	-	50-85	10-50	-	
3/8-inch	-	-	0-20	-	
No. 4	20-65	40-75	0-5	30-60	30-55
No. 10	-	-	-	-	
No. 16	-	-	-	-	
No. 50	-	8-28	-	-	8-24
No. 60	-	-	-	-	
No. 200	0-20	0-10	-	0-10	3-10

Flexible pipe excavations should be backfilled with ¾" crushed stone wrapped in non-woven geotextile to 12 inches minimum above the pipeline crown to minimize flexible pipeline deflection. Rigid pipe excavations should be backfilled with structural fill to 12 inches minimum above the pipeline crown. Trench backfills should be performed with common fill in landscape. Trenches within the zone of influence of new or existing structures should be backfilled with structural fill. Trenches underneath pavement may be backfilled with common fill from above a minimum of 12 inches above the pipeline crown up to the bottom of subbase (i.e., up to the pavement subbase subgrade).

Testing of the placed and compacted backfill should be performed to verify that the recommended relative compaction and moisture content have been achieved by the Contractor. Backfill testing should be performed by an experienced testing agency using methods and equipment as

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described in ASTM D6938 or, alternatively, ASTM D1556. Testing frequency should be 1 test per backfill lift per every 1,000 square feet of backfill placed.

5.5 REUSE OF ON-SITE SOILS

Existing site soils, excluding topsoil, may be re-used as common fill, at locations as described in section 5.4, regardless of gradation, provided the soil meets environmental requirements, it is free of organics, cobbles, debris, or other unsuitable material, and can be compacted to the required density and moisture content. On-site soils can be re-used as structural fill underneath structures or as pavement base, provided they meet the gradation requirement in **Table 5.1**.

If off-site disposal of soil is required, the disposal should be performed by the Contractor in accordance with applicable Federal, State, and local regulations. The evaluation of existing site soil for off-site disposal purpose was not included in the scope of this report.

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6 LIMITATIONS

This report was prepared for the proposed Straightway Water Treatment Facility in Barnstable, Massachusetts, in accordance with generally accepted soil engineering practices and the Limitations in this section and throughout this report. This report may be used only for the purposes stated for this specific project within a reasonable time from its issuance but in no event later than two (2) years from the date of the report. The recommendations and conclusions in this report should not be extrapolated to other locations or projects.

This report is considered preliminary based on conceptual level information provide to us at the time of report preparation. This report should be reassessed by the Kleinfelder geotechnical engineer upon receipt of more finalized structure locations, foundation elevations, and structural loads. The use of preliminary criteria presented in this report is not risk free as the criteria may change after more information is provided. These changes may result in rework for the users of this report. In no way can Kleinfelder be responsible for rework by others as result of deviations in recommendations between preliminary and final reports.

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services were provided. The data presented herein is based on a limited number of borings and laboratory tests. It is possible that field conditions could vary between or beyond the locations explored. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

Kleinfelder cannot be responsible for interpretation by others of this report, or interpretation of the subsurface conditions encountered in the field. If soil or groundwater conditions are encountered during construction that differ from those described herein, Kleinfelder must be notified immediately so that we may reevaluate the geotechnical recommendations for this project. A written approval must be obtained from Kleinfelder's engineer that such changes do not affect our recommendations. Failure to do so will invalidate Kleinfelder's recommendations.

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Figures

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VICINITY MAP

NOT TO SCALE

NOTES:
1. BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS COMPILED BY ESRI PRODUCTS.
2. COORDINATE SYSTEM: NAD 1983 2011 STATEPLANE MASSACHUSETTS MAINLAND FIPS 2001

LEGEND

⬢ SOIL BORING

N

0 500 1,000

1" = 500 SCALE IN FEET

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Bright People. Right Solutions.

PROJECT NO.	24003062.001A
DRAWN BY:	SPANDA
CHECKED BY:	KR
DATE:	05-07-2024

SITE LOCATION

W Barnstable Straightway Water Treatment Facility
228 Straightway/Hyannisport Station
Barnstable, MA

FIGURE 1

GIS FILE PATH: \\azrgisstorp03\working_clients_Automated_Exploration Plans\24003062.001A_WBarnstableStraightwayWaterTreatmentFacility_20240507_spanda\APRX\
GIS FILE NAME: gINT_20240507_1303_sp
PLOTTED: 5/7/2024 1:25 PM BY: SPANDA

LEGEND

WELL-ID — INDICATES APPROXIMATE LOCATION OF REPLACEMENT WELLS PERFORMED BETWEEN JANUARY 31, 2024 AND FEBRUARY 14, 2024 BY MAHER SERVICES OF NORTH READING, MASSACHUSETTS.

BORING-ID (DEPTH) — INDICATES APPROXIMATE LOCATION OF SOIL BORINGS PERFORMED BETWEEN APRIL 15, 2024 AND APRIL 18, 2024 BY GEOLOGIC EARTH EXPLORATIONS INC. OF NORFOLK, MASSACHUSETTS.

NOTES:

1) BORING LOCATION PLAN OBTAINED FROM A DRAFT CONCEPTUAL DESIGN DRAWING TITLED "STRAIGHTWAY SITE PLAN - ALTERNATIVE 2" PREPARED BY KLEINFELDER, DATED MARCH 06, 2024.

2) BORING LOCATIONS WERE DETERMINED BY TAPING AND LINEOF-SIGHT FROM SITE FEATURES. BORING LOCATIONS SHOULD BE CONSIDERED APPROXIMATE.

3) THE RECENT BORINGS WERE OBSERVED BY A KLEINFELDER REPRESENTATIVE ON A FULL-TIME BASIS.

4) CONTOUR LINES INDICATE GROUND SURFACE ELEVATION. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM (NAVD88). CONTOUR LINE SPACING IS 1 FOOT.

5) THE PLAN WAS REPRINTED TO FIT AN 11X17 SHEET. THE USER IS RECOMMENDED TO USE AN APPROXIMATE SCALE OF 1 INCH= 60 FEET.

EXIST. 12" WATER MAIN TO BE ABANDONED IN PLACE

200-LF OF 48" WATER MAIN FOR 4-LOG VIRUS DISINFECTION

PROP. PUMP STATION EXPANSION

PROP. 25' X 69' WINTERIZED GAC BUILDING

PROP. PAVEMENT

PROP. STORMWATER MANAGEMENT AREA

PROP. TIGHT TANK

PROP. 120' X 66' STRAIGHTWAY WATER TREATMENT FACILITY

CHEMICAL INJECTION BUILDING TO BE DEMOLISHED

RAW WATER MAIN FROM STRAIGHTWAY WELLS TO BE CONNECTED WITH HYANNISPORT AND SIMMONS POND WELLS RAW WATER MAIN

250' WELL RADIUS

PROP. STORMWATER MANAGEMENT AREA UNLESS GUTTERS CAN DIRECT WATER TO THE WEST

RAW WATER MAIN FROM HYANNISPORT AND SIMMONS POND WELLS TO BE CONNECTED WITH STRAIGHTWAY WELLS RAW WATER MAIN

PROP. 130,000 GALLON BACKWASH HOLDING TANK INSTALLED BELOW PROP. STRAIGHTWAY WTF

BACK[illegible] BASIN BOTTOM ELEV. = ± 25.9'

WETLAND FLAGS C100-120 DELINEATED BY LUCAS ENVIRONMENTAL 11/29/2023

WETLAND FLAGS C1-17 DELINEATED BY LUCAS ENVIRONMENTAL 11/8/2023

100' WETLAND BUFFER

TREELINE (TYP)

CHAINLINK FENCE (TYP)

GRAVEL

RIP-RAP (TYP)

TRANSFORMER

UNDERGROUND ELECTRIC LOCATION APPROXIMATE

EXISTING GAS LINE LOCATION APPROXIMATE

D3 - BYPASS REFILL
11C - REFILL

TO HYDRANT

FROM BOOSTER

TO TANK

DMH - 8' LEACH PIT
RIM = 22.6'
INV (IN)= ± 19.5'
INTERCONNECT= ± 19.2'
BOTTOM STONE= ± 14.9'

DMHs - 8' LEACH PIT
RIM = 22.5'
INTERCONNECT = ± 19.2'
BOTTOM STONE= ± 14.9'

STRAIGHTWAY FACILITY BUILDING

12" CORRUGATED HDPE

8" PERFORATED PIPE NOT OBSERVED LOCATION FROM RECORD
(2) 1" ELECTRIC CONDUITS UNDERGROUND

EMH
(2) 2.5" PVC CONDUITS IN/OUT

EMH
(6) 2.5" PVC CONDUITS IN/OUT

EMH
NO ACCESS

WATER STORAGE TANK

BENS POND MASS GIS LOCATION

B-1 (12')
B-2 (48')
B-3 (21')
B-4-OW (16')
B-5 (18')
B-6 (42')
B-7 (28')
B-8-OW (26')

CB. DH FLUSH (fnd)
CB. DH UP1 (fnd)
CB. SHALLOWDH (fnd)

A
A'
B
B'

STRAIGHTWAY SITE PLAN - ALTERNATIVE 2
SCALE: 1" = 30'

DRAFT

CAD FILE: G:_clients\Barnstable MA\24003062.001A - W.Barnstable MA - Straightway Design\04 - Design Phase\03 - Preliminary Design\Drawings\C-SITE PLAN.STWY-ALTS.dwg LAYOUT: C-SITE-ALT2 PLOTTED: 3/6/2024 3:14 PM BY: mckenna dunn

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REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING
0 — 1"
IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

0 30 60 90
SCALE: 1" = 30' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

STRAIGHTWAY SITE PLAN - ALTERNATIVE 2

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

CONCEPTUAL DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	03/06/2024
CURRENT REVISION	
DESIGNED BY	
DRAWN BY	MD
CHECKED BY	TB
APPROVED BY	

FIG-2-1

LEGEND

WELL-ID — INDICATES APPROXIMATE LOCATION OF REPLACEMENT WELLS PERFORMED BETWEEN JANUARY 31, 2024 AND FEBRUARY 14, 2024 BY MAHER SERVICES OF NORTH READING, MASSACHUSETTS.

BORING-ID / DEPTH — INDICATES APPROXIMATE LOCATION OF SOIL BORINGS PERFORMED BETWEEN APRIL 15, 2024 AND APRIL 18, 2024 BY GEOLOGIC EARTH EXPLORATIONS INC. OF NORFOLK, MASSACHUSETTS.

NOTES:

1) BORING LOCATION PLAN OBTAINED FROM A DRAFT CONCEPTUAL DESIGN DRAWING TITLED "HYANNISPORT AND SIMMONS POND SITE PLAN" PREPARED BY KLEINFELDER, DATED MARCH 06, 2024.

2) BORING LOCATIONS WERE DETERMINED BY TAPING AND LINEOF-SIGHT FROM SITE FEATURES. BORING LOCATIONS SHOULD BE CONSIDERED APPROXIMATE.

3) THE RECENT BORINGS WERE OBSERVED BY A KLEINFELDER REPRESENTATIVE ON A FULL-TIME BASIS.

4) CONTOUR LINES INDICATE GROUND SURFACE ELEVATION. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM (NAVD88). CONTOUR LINE SPACING IS 1 FOOT.

5) THE PLAN WAS REPRINTED TO FIT AN 11X17 SHEET. THE USER IS RECOMMENDED TO USE AN APPROXIMATE SCALE OF 1 INCH= 80 FEET.

PROP. SIMMONS POND PUMP STATION BUILDING

PROP. HYANNISPORT PUMP STATION BUILDING

SIMMONS POND

SIMMONS POND LOCATION MASS GIS

B-9 31' SP-03A

B-10 31' HP-02 B

C

C'

100' WETLAND BUFFER

GRAVEL PARKING AREA

HYANNISPORT STATION

HALLS BROOK

HYANNISPORT AND SIMMONS POND SITE PLAN

SCALE: 1" = 40'

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REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

0 40 80 120

SCALE: 1" = 40' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

HYANNISPORT AND SIMMONS POND SITE PLAN

STRAIGHTWAY
WATER TREATMENT FACILITY
DESIGN

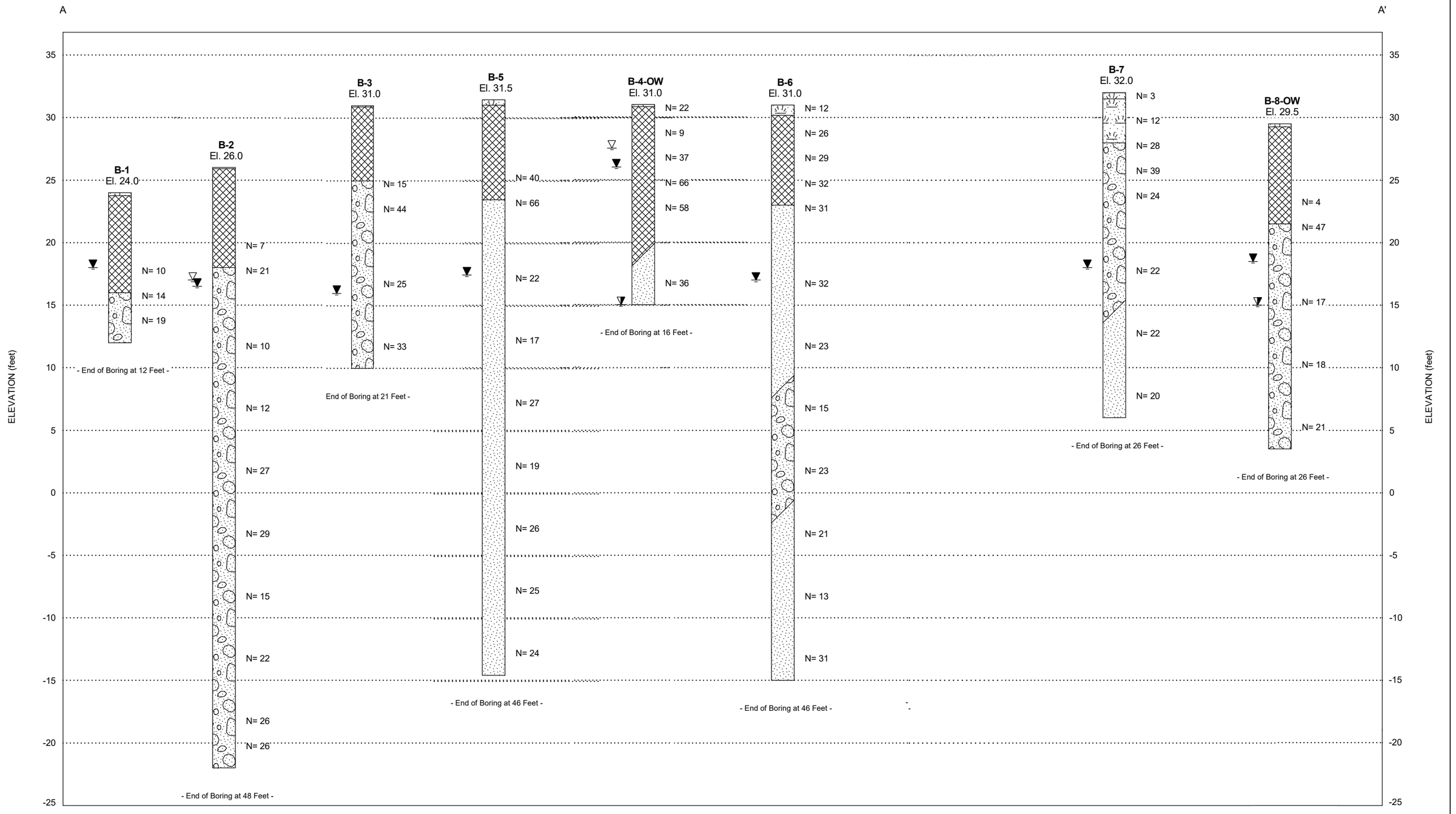
HYANNIS WATER SYSTEM
BARNSTABLE DPW - WATER DIVISION
47 OLD YARMOUTH ROAD
HYANNIS, MA 02601

CONCEPTUAL DESIGN

PROJECT NO.	24003062.001A
ISSUE DATE	03/06/2024
CURRENT REVISION	
DESIGNED BY	
DRAWN BY	MD
CHECKED BY	TB
APPROVED BY	

FIG- 2-2

CAD FILE: G:_clients\Barnstable MA\24003062.001A - W-Barnstable MA - Straighway Design\04 - Design Phase\03 - Preliminary Design\Drawings\C-SITE PLAN-HP-SP.dwg LAYOUT: C-SITE HP-SP PLOTTED: 3/6/2024 3:30 PM BY: mckenna.dunn



NOTE:
REFER TO INDIVIDUAL LOGS FOR DETAILED INFORMATION AND THE GRAPHIC LEGEND KEYS FOR GRAPHICAL SYMBOL INFORMATION.

HORIZONTAL AXIS IS NOT DRAWN TO SCALE

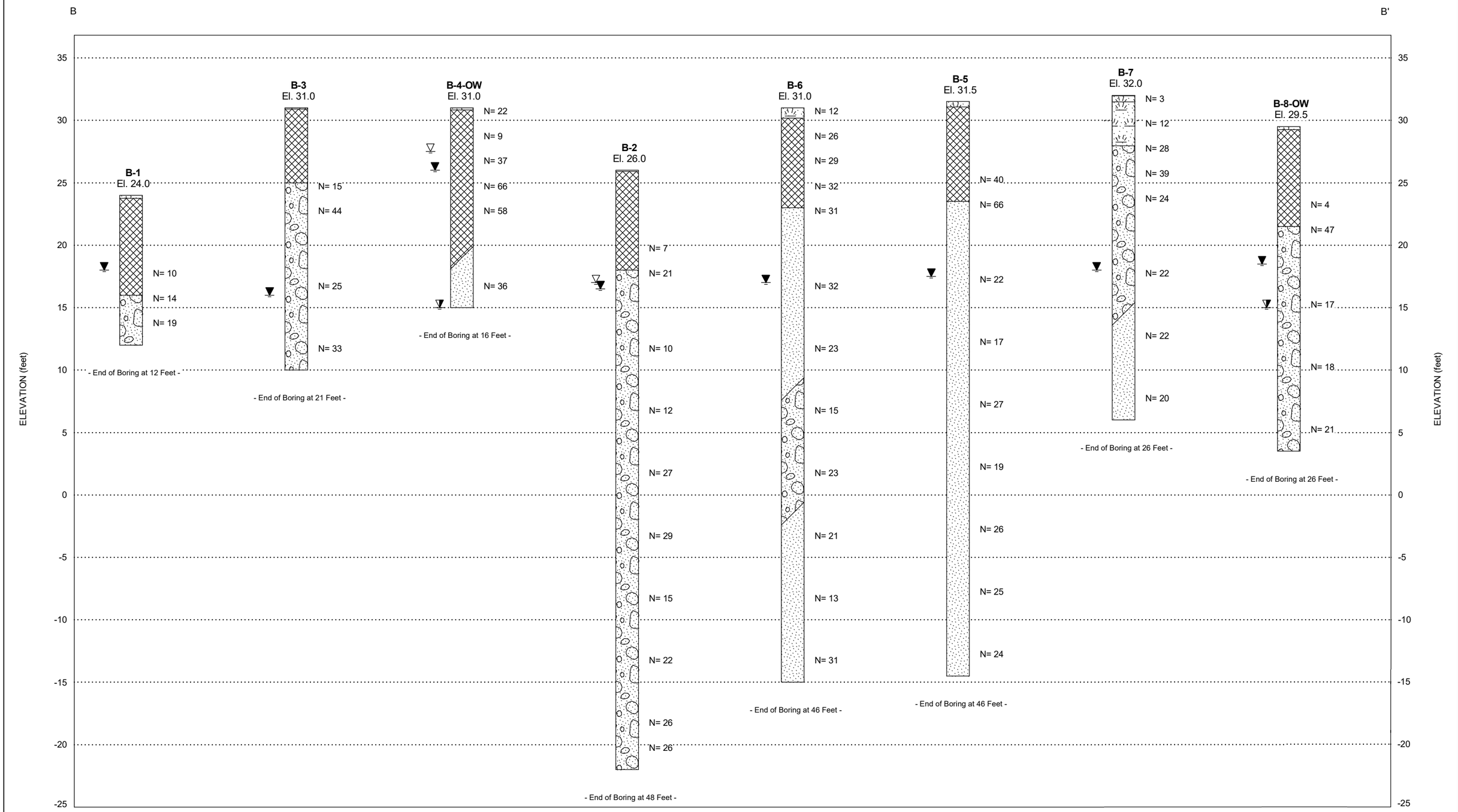
FIGURE 3-1

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SUBSURFACE CROSS-SECTION A-A'

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA



NOTE:
REFER TO INDIVIDUAL LOGS FOR DETAILED INFORMATION AND THE GRAPHIC LEGEND KEYS FOR GRAPHICAL SYMBOL INFORMATION.
HORIZONTAL AXIS IS NOT DRAWN TO SCALE

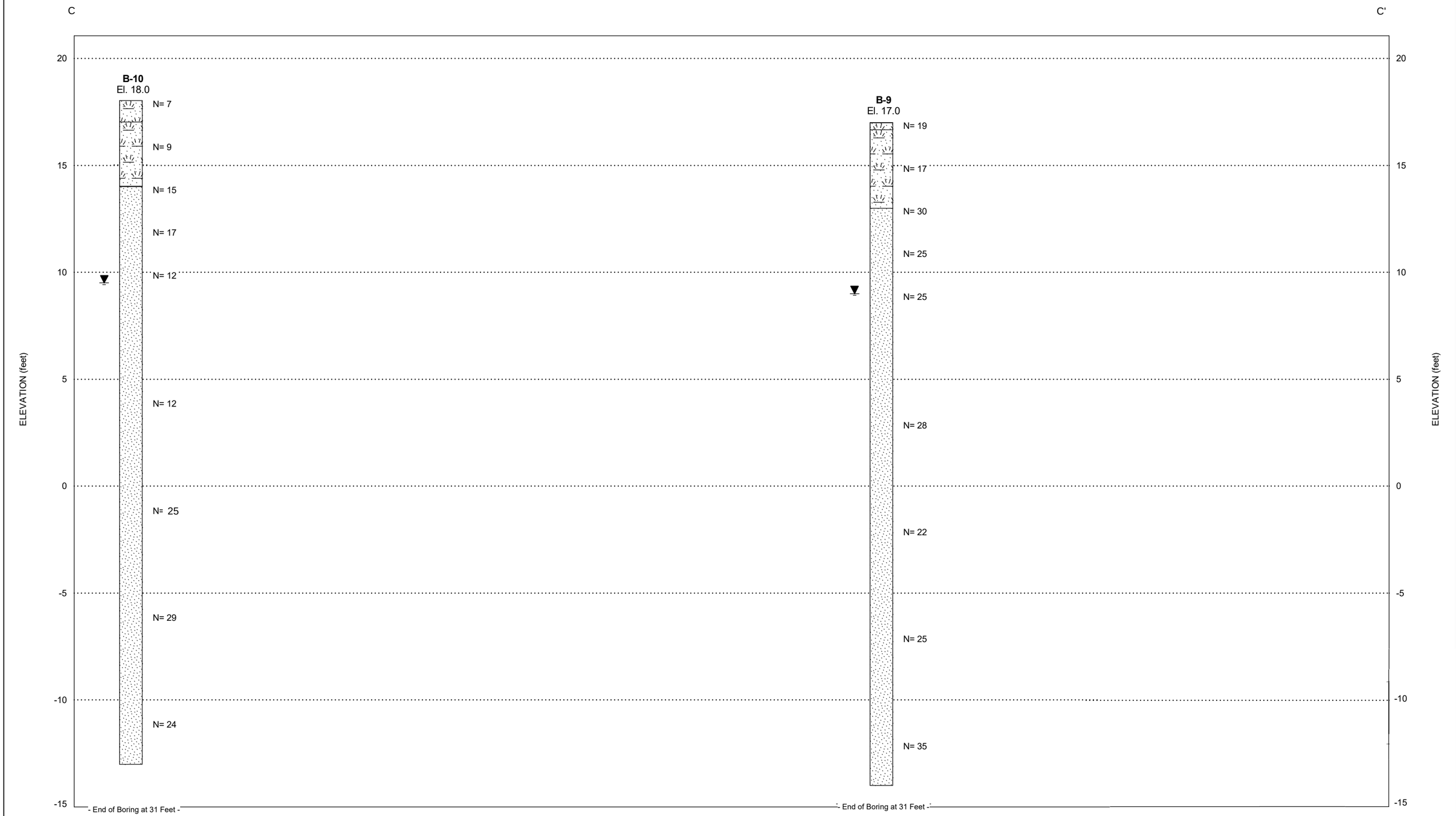
FIGURE 3-2

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SUBSURFACE CROSS-SECTION B-B'

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA



NOTE:
REFER TO INDIVIDUAL LOGS FOR DETAILED INFORMATION AND THE GRAPHIC LEGEND KEYS FOR GRAPHICAL SYMBOL INFORMATION.

HORIZONTAL AXIS IS NOT DRAWN TO SCALE

FIGURE 3-3

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CHECKED BY:	BGS
DATE:	4/19/2024

SUBSURFACE CROSS-SECTION C-C'

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

Tables

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Table 1
Town of Barnstable Department of Public Works
Straightway Water Treatment Facility , Barnstable, MA
Summary of Subsurface Conditions

Boring ID	Top of Boring El. (ft)	Bottom of Boring El. (ft)	Boring Depth (ft)	GW Depth. (ft)	GW El. (ft)	Surface Layer		Fill		Upper Sand		Sand and Gravel		Lower Sand	
						Stratum Top El. (ft)	Stratum Thickness (ft)	Stratum Top El. (ft)	Stratum Thickness (ft)	Stratum Top El. (ft)	Stratum Thickness (ft)	Stratum Top El. (ft)	Stratum Thickness (ft)	Stratum Top El. (ft)	Stratum Thickness (ft)
B-1	24.0	12.0	12.0	6.0	18.0	24.0	0.3	23.8	7.8	-	-	16.0	4.0	-	-
B-2	26.0	-22.0	48.0	9.5	16.5	26.0	0.1	25.9	7.9	-	-	18.0	40.0	-	-
B-3	31.0	10.0	21.0	15.0	16.0	31.0	0.1	30.9	5.9	-	-	25.0	15.0	-	-
B-4-OW	31.0	15.0	16.0	16.0	15.0	31.0	0.2	30.8	11.8	19.0	4.0	-	-	-	-
B-5	31.5	-14.5	46.0	14.0	17.5	31.5	0.4	31.1	7.6	23.5	38.0	-	-	-	-
B-6	31.0	-15.0	46.0	14.0	17.0	31.0	0.8	30.2	7.2	23.0	14.5	8.5	10.0	-1.5	13.5
B-7	32.0	6.0	26.0	14.0	18.0	32.0	0.5	31.5	3.5	-	-	28.0	13.5	14.5	8.5
B-8-OW	29.5	3.5	26.0	13.4	15.0	29.5	0.3	29.3	7.8	-	-	21.5	18.0	-	-
B-9	17.0	-14.0	31.0	8.0	9.0	17.0	0.3	16.7	3.7	13.0	27.0	-	-	-	-
B-10	18.0	-13.0	31.0	8.5	9.5	18.0	1.0	17.0	3.0	14.0	27.0	-	-	-	-

Notes:

"-": Indicates stratum or groundwater was not encountered

Soil strata in the general order of their occurrence in the borings are presented from left to right in this table

The groundwater levels herein only represent the conditions encountered at the location and time indicated. Water is introduced in the boreholes during drilling using drive and wash drilling techniques. Therefore, the groundwater measurements may not be representative of actual field groundwater conditions. Furthermore, groundwater levels fluctuate due to local and regional factors including seasonal changes, well pumping, and periods of wet or dry weather, nearby construction dewatering, infiltration basins, etc.

Boring ground surface elevations (El.) are based on a drawing titled Conceptual Design "Straightway Water Treatment Facility Design" prepared by Kleinfelder dated March 6, 2024

Borings drilled by Geologic Earth Explorations Inc of Norfolk, Massachusetts between April 15, 2024 and April 18, 2024 using drive and wash with casing drilling techniques

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Table 2
Straightway Water Treatment Facility Design
Summary of Groundwater Measurements

Monitoring Well/Boring ID	Ground Surface El. (ft)	Type of Measurement	Date of Measurement	Groundwater Depth (ft)	Groundwater El. (ft)
B-1	24.0	Drilling	4/15/2024	6	18.0
B-2	26.0	Drilling	4/15/2024	9.5	16.5
B-3	31.0	Drilling	4/16/2024	15	16.0
B-4-OW	31.0	Drilling	4/16/2024	5	26.0
B-4-OW	31.0	Monitoring Well	4/17/2024	16	15.0
B-4-OW	31.0	Monitoring Well	4/18/2024	16	15.0
B-4-OW	31.0	Monitoring Well	5/2/2024	NE	NE
B-4-OW	31.0	Monitoring Well	5/6/2024	NE	NE
B-5	31.5	Drilling	4/17/2024	14	17.5
B-6	31.0	Drilling	4/16/2024	14	17.0
B-7	32.0	Drilling	4/18/2024	14	18.0
B-8-OW	29.5	Drilling	4/17/2024	11	18.5
B-8-OW	29.5	Monitoring Well	4/18/2024	14.5	15.0
B-8-OW	29.5	Monitoring Well	5/2/2024	13.4	16.1
B-8-OW	29.5	Monitoring Well	5/6/2024	13.7	15.8
B-9	17.0	Drilling	4/18/2024	8	9.0
B-10	18.0	Drilling	4/18/2024	8.5	9.5

Notes:

NE: Not Encountered

Boring ground surface elevations (El.) are based on a drawing titled Conceptual Design "Straightway Water Treatment Facility Design" prepared by Kleinfelder dated March 6, 2024

The groundwater levels herein only represent the conditions encountered at the location and time indicated. Groundwater levels fluctuate due to local and regional factors including seasonal changes, well pumping, and periods of wet or dry weather, nearby construction dewatering, infiltration basins, etc.

Appendix A – Previous Replacement Well Installation Logs

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MAHER services

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Well # HP-02B **Job #:** 4890
Project Hyannis Systems Barnstable-Simmons Pond

Location Barnstable MA
LAT: ___.___" **LON:** ___.___"
Driller: Anderson C & Jason M
Installation Dates 02/05/24
Static Water Level ___ ft. TOC=12.35
Drilling Method DP

Depth From	Depth To	Soil Classification	Loss of Wash Water
0	2	Brown Peat	
2	10	fine silty Sand	
10	33	fine-med sand with silt (tan)	
33	34.5	Dense fine silty sand (Brown)	
34.5	44	Gray Clay	
44	46	Brown/orange silty Sand	
46	70	Med-fine Sand +traces of silt	(tan)
70	80	fine-Med sand with silt (tan)	
80	84	Dense fine sand with silt	



Remarks:

Used 19 sleeves total due to help runs through the clay. Lots of heave
Used 11 sleeves on OBS

Well Details		2' OBS.
Diameter	2"	2"
Total Depth	84'	70'
Comp. Depth	70'	70'
Casing Left	67'	67
Casing Mat.	PVC	PVC
Screen		
Diameter	2"	2"
Length	5'	5'
Material	SS	SS
Slot Size	40	50
Development\Pumping		
Method	Diaphragm	Diaphragm
Hours	.75	.5
GPM	67	73
VAC	24"	24
Spec. Cap.		

Quantities of Materials			
Sand			Bags
Chips			Bags
Cement			Bags
Volclay			Bags
Lck Plug	1	1	each
Pro. Cvr.	1	1	each
Gate Box			each
Sakrete			bags
Drums			each

MAHER services

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Well # SP-03 **Job #:** 4890

Project Hyannis Water Systems Barnstable - Simmons Pond

Location Barnstable MA

LAT: 41 .6405" **LON:** -70.3675"

Driller: Anderson Cashin & Jason M

Installation Dates 02/06/24 - 02/07/24

Static Water Level 12.2 ft. TOC

Drilling Method DP

Depth From	Depth To	Soil Classification	Loss of Wash Water
0	2	Brown Peat	
2	11	L Brown silty fine sand	
11	34	fine-Med sand with silt (trace)	
34	37.5	Fine Dense Brown/gray silty clay	
37.5	44	Gray Clay	
44	46	Brown/orange Dense silty sand	
46	75	Med-fine sand with traces of silt	(trace)
75	80	fine sand with silt traces of med sand	



Well Details		2' OBS.
Diameter	2"	2"
Total Depth	80'	75'
Comp. Depth	75'	75'
Casing Left	72'	72'
Casing Mat.	PVC	PVC
Screen		
Diameter	2"	2"
Length	5'	5'
Material	SS	SS
Slot Size	40	40
Development\Pumping		
Method	Diaphragm	Diaphragm
Hours	2	.5
GPM	53	53
VAC	24	24
Spec. Cap.		

Quantities of Materials			
Sand			Bags
Chips			Bags
Cement			Bags
Volclay			Bags
Lck Plug	1	1	each
Pro. Cvr.	1	1	each
Gate Box			each
Sakrete			bags
Drums			each

Remarks:

- Used 19 sleeves total due to help runs through clay
- Lots of heave
- Spent 1.5 hours cleaning sites (SP-03, SP-02)
- Used 11 sleeves on OW in order to get through Dense material

Appendix B – Graphics Key, Soil Description Key, Recent Test Boring Logs by Kleinfelder

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DRILLING METHOD/SAMPLER TYPE GRAPHICS



STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

VacTruck

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after stabilizing period)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Solid lines separating strata on the logs represent approximate boundaries only, dashed lines are inferred or extrapolated boundaries. Actual transitions may be gradual or differ from those represented.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System (ASTM D2488/D2487) designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., CL-ML, GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS

C_u - Coefficients of Uniformity
C_c - Coefficients of Curvature
WOH - Weight of Hammer
WOR - Weight of Rod

REFERENCES

1. American Society for Materials and Testing (ASTM), 2011, ASTM D2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System).

UNIFIED SOIL CLASSIFICATION SYSTEM[1]

COARSE GRAINED SOILS (More than 50% retained on No. 200 Sieve)	**GRAVELS** (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVEL WITH <5% FINES		**GW**	WELL-GRADED GRAVEL, WELL-GRADED GRAVEL WITH SAND
				**GP**	POORLY GRADED GRAVEL, POORLY GRADED GRAVEL WITH SAND
		GRAVELS WITH 5% TO 12% FINES		**GW-GM**	WELL-GRADED GRAVEL WITH SILT, WELL-GRADED GRAVEL WITH SILT AND SAND
				**GW-GC**	WELL-GRADED GRAVEL WITH CLAY (OR SILTY CLAY), WELL-GRADED GRAVEL WITH CLAY AND SAND (OR SILT CLAY AND SAND)
				**GP-GM**	POORLY GRADED GRAVEL WITH SILT, POORLY GRADED GRAVEL WITH SILT AND SAND
				**GP-GC**	POORLY GRADED GRAVEL WITH CLAY (OR SILTY CLAY), POORLY GRADED GRAVEL WITH CLAY AND (OR SILTY CLAY AND SAND)
		GRAVELS WITH > 12% FINES		**GM**	SILTY GRAVEL, SILTY GRAVEL WITH SAND
				**GC**	CLAYEY GRAVEL, CLAYEY GRAVEL WITH SAND
				**GC-GM**	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL WITH SAND
	SANDS (50% or more of coarse fraction passes the No. 4 Sieve)	CLEAN SANDS WITH <5% FINES		**SW**	WELL-GRADED SAND, WELL-GRADED SAND WITH GRAVEL
				**SP**	POORLY GRADED SAND, POORLY GRADED SAND WITH GRAVEL
		SANDS WITH 5% TO 12% FINES		**SW-SM**	WELL-GRADED SAND WITH SILT, WELL-GRADED SAND WITH SILT AND GRAVEL
				**SW-SC**	WELL-GRADED SAND WITH CLAY (OR SILTY CLAY), WELL-GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)
				**SP-SM**	POORLY GRADED SAND WITH SILT, POORLY GRADED SAND WITH SILT AND GRAVEL
				**SP-SC**	POORLY GRADED SAND WITH CLAY, POORLY GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)
		SANDS WITH > 12% FINES		**SM**	SILTY SAND, SILTY SAND WITH GRAVEL
				**SC**	CLAYEY SAND, CLAYEY SAND WITH GRAVEL
				**SC-SM**	SILTY, CLAYEY SAND, SILTY, CLAYEY SAND WITH GRAVEL
FINE GRAINED SOILS (50% or more passes the No. #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)			**ML**	SILT, SILT WITH SAND, SILT WITH GRAVEL
				CL	LEAN CLAY, LEAN CLAY WITH SAND, LEAN CLAY WITH GRAVEL
				CL-ML	SILTY CLAY, SILTY CLAY WITH SAND, SILTY CLAY WITH GRAVEL
				OL	ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL
	SILTS AND CLAYS (Liquid Limit 50 or greater)			**MH**	ELASTIC SILT. ELASTIC SILT WITH SAND, ELASTIC SILT WITH GRAVEL
				CH	FAT CLAY, FAT CLAY WITH SAND, FAT CLAY WITH GRAVEL
				OH	ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL

NOTE: USE MATERIAL DESCRIPTION ON THE LOG TO DEFINE A GRAPHIC THAT MAY NOT BE PROVIDED ON THIS LEGEND.

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Bright People. Right Solutions.

PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/19/2024

GRAPHICS KEY

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

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PROJECT NUMBER: 24003062.001A OFFICE FILTER: BOSTON
gINT FILE: Klf_gint_master_2024 gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_GEO_LEG1_GRAPHICS_KEY_W_USCS]

GRAIN SIZE[1]

DESCRIPTION		SIEVE SIZE	GRAIN SIZE
Boulders		>12 in.	>12 in. (304.8 mm.)
Cobbles		3 - 12 in.	3 - 12 in. (76.2 - 304.8 mm.)
Gravel	coarse	3/4 -3 in.	3/4 -3 in. (19 - 76.2 mm.)
	fine	#4 - 3/4 in.	0.19 - 0.75 in. (4.8 - 19 mm.)
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)
Fines		Passing #200	<0.0029 in. (<0.07 mm.)

SECONDARY CONSTITUENT[1]

Term of Use	AMOUNT	
	Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

PLASTICITY[1]

DESCRIPTION	CRITERIA
Non-Plastic	A 1/8 in. (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

MOISTURE CONTENT[1]

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CONSISTENCY - FINE-GRAINED SOIL[2, 3]

CONSISTENCY	SPT - N (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Easily penetrated several inches by fist
Soft	2 - 4	0.25 ≤ PP <0.5	500 - 1,000	Easily penetrated several inches by thumb
Medium Stiff	4 - 8	0.5 ≤ PP <1	1,000 - 2,000	Can be penetrated several inches by thumb with moderate effort
Stiff	8 - 15	1 ≤ PP <2	2,000 - 4,000	Readily indented by thumb but penetrated only with great effort
Very Stiff	15 - 30	2 ≤ PP <4	4,000 - 8,000	Readily indented by thumbnail
Hard	>30	4 ≤ PP	>8,000	Indented by thumbnail with difficulty

APPARENT DENSITY - COARSE-GRAINED SOIL[2]

APPARENT DENSITY	SPT-N (# blows / ft)
Very Loose	<4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

STRUCTURE[1]

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. (6mm) thick, note thickness.
Laminated	Alternating layers of varying material or color with the layers less than 1/4-in. (6 mm) thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and appearance throughout

ANGULARITY[1]

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

REACTION WITH HYDROCHLORIC ACID[1]

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

CEMENTATION[1]

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or little finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

REFERENCES

1. American Society for Materials and Testing (ASTM), 2017, ASTM D2488: Standard Practice for Description and Identification of Soils (Visual Manual Procedures).
2. Terzaghi, K and Peck, R., 1948, Soil Mechanics in Engineering Practice, John Wiley & Sons, New York.
3. United States Department of the Interior Bureau of Reclamation (USBR), 1998, Earth Manual, Part I.

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/19/2024

SOIL DESCRIPTION KEY
(For additional tables, see ASTM D2488)

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
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PLOTTED: 05/21/2024 03:45 PM BY: SPanda

BORING LOG B-1

Date Begin - End:	4/15/2024 - 4/15/2024	**Drilling Company:**	Geologic Earth Explorations		
Logged By:	S. Panda/T. Templeton	**Drill Crew:**	T. Gernier/M. Jimmy		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	VacTruck FX50/Acker Soil Scout	**Hammer Type - Drop:**	140 lb. Cathead - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Vacuum Excavation/Drive and Wash with Casing		
Weather:	Cloudy 50s-60s	**Exploration Diameter:**	24 in. O.D.		

Massachusetts State Plane Coordinate System
Ground Surface Elevation (ft.): 24.00
Surface Condition: Grass

Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
20	5		**G-1:** 3-in thick topsoil	G-1											PID= 1
			Dark brown, fine to medium SAND and SILT, trace gravel with root fragments [FILL]	G-2											PID= 0.5
			G-2: Light brown, fine to medium SAND and SILT, little gravel, with root fragments [FILL]	G-3											PID= 0.4
			G-3: Same as above [FILL]	G-4											PID= 0.4
			G-4: Light brown, fine to coarse SAND, little silt, trace gravel [FILL]	G-5											PID= 0.2
			G-5: Same as above	G-6											PID= 0.3
			G-6: Brown, fine to coarse SAND, little gravel, trace silt [FILL]	S-1		BC=7 5 5 7	3"								PID= 0
15	10		**S-1:** Brown, medium dense, fine to coarse SAND and GRAVEL, trace silt [FILL]	S-2		BC=10 7 7 7	11"	SP			95	2.2			PID= 0
			S-2: Brown, medium dense, fine to coarse SAND, trace gravel, trace silt	S-3		BC=12 10 9 13	24"								PID= 0
			S-3: Grey, medium dense, fine to coarse SAND and GRAVEL, trace silt with cobbles												

23.75 — 16.0 — 12.0

The boring was terminated at approximately 12 ft. below ground surface. The boring was backfilled with cuttings on April 15, 2024.

GROUNDWATER LEVEL INFORMATION:
▼ Groundwater was observed at approximately 6 ft. (Elev.= 18.00 ft.) below ground surface at the end of drilling.

GENERAL NOTES:
1. Ground surface elevation based on conceptual design drawing titled "Straightway Site Plan Alternative 2", prepared by Kleinfelder, dated March 6, 2024.
2. When strata breaks are not observed in the split spoon, strata breaks are inferred based on rig behavior (bouncing, chattering, penetration resistance, drilling water color, etc.)
3. A Photo Ionization Detector (PID in ppmv) was used for environmental field screening of soil samples.
4. Analytical samples were collected from the top 2 feet for environmental testing.
5. The top 6 feet was pre-cleared using vacuum excavation.

gINT FILE: Klf_gint_master_2024
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_BORING/TEST PIT SOIL LOG]
PROJECT NUMBER: 24003062.001A
OFFICE FILTER: BOSTON

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/24/2024

BORING LOG B-1

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

Date Begin - End: 4/15/2024 - 4/15/2024 **Drilling Company:** Geologic Earth Explorations **BORING LOG B-2**

Logged By: S. Panda/T. Templeton **Drill Crew:** T. Gernier/M. Jimmy

Hor.-Vert. Datum: NAD83 - NAVD88 **Drilling Equipment:** VacTruck FX50/Acker Soil Scout **Hammer Type - Drop:** 140 lb. Cathead - 30 in.

Plunge: -90 degrees **Drilling Method:** Vacuum Excavation/Drive and Wash with Casing

Weather: Sunny 60s-70s **Exploration Diameter:** 24 in. O.D.

Massachusetts State Plane Coordinate System
Ground Surface Elevation (ft.): 26.00
Surface Condition: Gravel

Elevation (feet) / Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
25 / 1		**G-1:** 1-inch thick gravel 25.9	G-1											PID =0.1
		Brown, fine to coarse SAND, little gravel, trace silt with root fragments [FILL]	G-2											PID = 0.2
		G-2: Tan, fine to coarse SAND, little gravel, trace silt with root fragments [FILL]	G-3					3.9						PID = 0.2; Organic content = 0.1%
		G-3: Tan, fine to coarse SAND, little gravel, trace silt with root fragments [FILL]	G-4											PID = 0.1
5		**G-4:** Tan, fine to coarse SAND, some gravel, trace silt [FILL]	G-5											PID = 0.1
20		**G-5:** Tan, fine to coarse SAND, little gravel, trace silt [FILL]	G-6											PID = 0
		G-6: Tan, coarse SAND, trace gravel, trace silt [FILL] 18.0	S-1		BC=1 2 5 8	8"	SP			87	0.9			PID = 0.1
		S-1: Tan, loose, fine to coarse SAND, little gravel, trace silt [FILL]	S-2		BC=8 12 9 12	12"								PID = 0.1
10		**S-2:** Brown, medium dense, fine to coarse SAND and GRAVEL, little silt												
15		**S-3:** Multi colored, loose, GRAVEL, trace sand	S-3		BC=8 5 5 1	1"								PID = 0
15 / 10		**S-4:** Grey, medium dense, fine to coarse SAND, trace silt	S-4		BC=4 6 6 6	9"	SP			100	1.0			PID = 0.1
20 / 5		**S-5:** Grey-brown, medium dense, fine to coarse SAND, some gravel, trace silt with cobbles	S-5		BC=8 11 16 21	17"								PID = 0
25 / 0														Rig chatter
30 / -5		**S-6:** Tan, medium dense, GRAVEL, some fine to coarse sand, trace silt	S-6		BC=11 14 15 13	3"								PID = 0; red staining
35 / -10		**S-7:** Tan, medium dense, coarse SAND, little gravel	S-7		BC=4 7 8 14	24"								PID = 0.1
			S-8			3"								PID = 0; blowount/heave in sand

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PROJECT NO.: 24003062.001A

DRAWN BY: SP

CHECKED BY: BGS

DATE: 4/24/2024

BORING LOG B-2

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

PLOTTED: 05/21/2024 03:45 PM BY: SPanda
OFFICE FILTER: BOSTON
PROJECT NUMBER: 24003062.001A
gINT FILE: Klf_gint_master_2024
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 4/15/2024 - 4/15/2024 **Drilling Company:** Geologic Earth Explorations **BORING LOG B-2**

Logged By: S. Panda/T. Templeton **Drill Crew:** T. Gernier/M. Jimmy

Hor.-Vert. Datum: NAD83 - NAVD88 **Drilling Equipment:** VacTruck FX50/Acker Soil Scout **Hammer Type - Drop:** 140 lb. Cathead - 30 in.

Plunge: -90 degrees **Drilling Method:** Vacuum Excavation/Drive and Wash with Casing

Weather: Sunny 60s-70s **Exploration Diameter:** 24 in. O.D.

FIELD EXPLORATION | LABORATORY RESULTS

Massachusetts State Plane Coordinate System
Ground Surface Elevation (ft.): 26.00
Surface Condition: Gravel

Elevation (feet) / Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
-15		**S-8:** Tan, medium dense, GRAVEL, little coarse sand, trace silt	S-8 (cont.)		BC=6 9 13 12	3" (cont.)								observed
45 -20		**S-9:** No recovery	S-9		BC=9 11 15 14	NR								PID = n/a;
		S-10: Grey-tan, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-10		BC=14 12 14 12	3"								PID = 0.1 Switched to 3-in split spoon sampler to get better sample recovery
		-22.0												
50 -25		The boring was terminated at approximately 48 ft. below ground surface. The boring was backfilled with cuttings and sand on April 15, 2024.												
55 -30														
60 -35														
65 -40														
70 -45														
75 -50														

GROUNDWATER LEVEL INFORMATION:
⧖ Groundwater was observed at approximately 9 ft. (Elev.= 17.00 ft.) below ground surface during drilling.
⧗ Groundwater was observed at approximately 9.5 ft. (Elev.= 16.50 ft.) below ground surface at the end of drilling.

GENERAL NOTES:
1. Ground surface elevation based on conceptual design drawing titled "Straightway Site Plan Alternative 2", prepared by Kleinfelder, dated March 6, 2024.
2. When strata breaks are not observed in the split spoon, strata breaks are inferred based on rig behavior (bouncing, chattering, penetration resistance, drilling water color, etc.)
3. A Photo Ionization Detector (PID in ppmv) was used for environmental field screening of soil samples.
4. Analytical samples were collected from the top 2 feet for environmental testing.
5. The top 6 feet was pre-cleared using vacuum excavation.

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/24/2024

BORING LOG B-2

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

PLOTTED: 05/21/2024 03:45 PM BY: SPanda
PROJECT NUMBER: 24003062.001A OFFICE FILTER: BOSTON
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_BORING/TEST PIT SOIL LOG]
gINT FILE: Klf_gint_master_2024

Date Begin - End: 4/15/2024 - 4/15/2024 **Drilling Company:** Geologic Earth Explorations **BORING LOG B-3**

Logged By: S. Panda/T. Templeton **Drill Crew:** T. Gernier/M. Jimmy

Hor.-Vert. Datum: NAD83 - NAVD88 **Drilling Equipment:** VacTruck FX50/Acker Soil Scout **Hammer Type - Drop:** 140 lb. Cathead - 30 in.

Plunge: -90 degrees **Drilling Method:** Vacuum Excavation/Drive and Wash with Casing

Weather: Sunny 60s-70s **Exploration Diameter:** 24 in. O.D.

Massachusetts State Plane Coordinate System
Ground Surface Elevation (ft.): 31.00
Surface Condition: Grass

Elevation (feet) / Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
30 / 0		**G-1:** 1-inch thick gravel (30.9)	G-1											PID= 0.1
		Tan, fine to coarse SAND, little gravel, trace silt with cobbles [FILL]	G-2							57	4.5			PID= 0.1
		G-2: Brown, fine to coarse SAND and GRAVEL, trace silt with cobbles [FILL]	G-3											PID= 0.1
		G-3: Brown, fine to coarse SAND and GRAVEL, trace silt [FILL]	G-4											PID= 0
5		**G-4:** Tan, coarse SAND, some gravel, trace silt with cobbles [FILL]	G-5											PID= 0
25		**G-5:** Tan, coarse SAND, little gravel, trace silt [FILL] (25.0)	S-1		BC=5 4 11 14	9"								PID= 0.1
		S-1: Tan brown, medium dense, fine to coarse SAND, little gravel, trace silt	S-2		BC=38 24 20 22	15"	SP-SM			70	5.6			PID= 0.1; metallic odor
10 / 20		**S-2:** Tan, dense, fine to coarse SAND, some gravel, little silt												Rig chatter
														Rig chatter
														Rig chatter
														Rig chatter
15 / 15		**S-3:** Multi-colored, medium dense, GRAVEL, little sand, trace silt	S-3		BC=11 13 12 11	12"								PID= 0.1, petroleum odor
20 / 10		**S-4:** Tan, dense, fine to coarse SAND and GRAVEL with cobbles (10.0)	S-4		BC=11 16 17 24	6"								PID= 0.1, red stain, petroleum odor
25 / 5														
30 / 0														
35 / -5														

The boring was terminated at approximately 21 ft. below ground surface. The boring was backfilled with cuttings on April 15, 2024.

GROUNDWATER LEVEL INFORMATION:
▼ Groundwater was observed at approximately 15 ft. (Elev.= 16.00 ft.) below ground surface at the end of drilling.

GENERAL NOTES:
1. Ground surface elevation based on conceptual design drawing titled "Straightway Site Plan Alternative 2", prepared by Kleinfelder, dated March 6, 2024.
2. When strata breaks are not observed in the split spoon, strata breaks are inferred based on rig behavior (bouncing, chattering, penetration resistance, drilling water color, etc.)
3. A Photo Ionization Detector (PID in ppmv) was used for environmental field screening of soil samples.
4. The top 6 feet was pre-cleared using vacuum excavation.

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/24/2024

BORING LOG B-3

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

PLOTTED: 05/21/2024 03:46 PM BY: SPanda
OFFICE FILTER: BOSTON
PROJECT NUMBER: 24003062.001A
gINT FILE: Klf_gint_master_2024
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End:	4/16/2024 - 4/16/2024	**Drilling Company:**	Geologic Earth Explorations	**BORING LOG B-4-OW**	
Logged By:	S. Panda	**Drill Crew:**	T. Gernier		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Acker Soil Scout	**Hammer Type - Drop:**	140 lb. Cathead - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Drive and Wash with Casing		
Weather:	Sunny 50s-60s	**Exploration Diameter:**	4 in. O.D.		

FIELD EXPLORATION

Massachusetts State Plane Coordinate System
Ground Surface Elevation (ft.): 31.00
Surface Condition: Grass

Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	MONITORING WELL CONSTRUCTION*
30			**S-1:** 2-inch thick topsoil	S-1		BC=9 9 13 16	14"								Concrete
			30.83												Soil Cuttings
			Dark brown, medium dense, fine to medium SAND, some gravel, little silt with root fragments [FILL]												PID= 0.1
			S-2: Light brown, loose, fine to coarse SAND, some silt, little gravel [FILL]	S-2		BC=10 3 6 6	14"								Bentonite Chips
			S-3: Light brown, dense, fine to coarse SAND and GRAVEL, little clayey silt [FILL]	S-3		BC=11 12 25 28	4"								2" SCH 40 Solid PVC Riser
25	5		**S-4:** Light brown, very dense, fine to coarse SAND, some gravel, trace clayey silt with stone fragments [FILL]	S-4		BC=29 29 37 34	12"	SW-SM			87	7.7			PID= 0.1
			S-5: Grey brown, very dense, fine to coarse SAND and GRAVEL, little clayey silt with stone fragments [FILL]	S-5		BC=20 29 29 21	11"								Sand
20	10														PID= 0
			19.0												Sand
			S-6: Grey tan, dense, coarse SAND, some gravel	S-6		BC=24 18 18 18	8"								PID= 0.2
15	15		15.0												2" SCH 40 Slotted 0.010 PVC Screen
															PID= 0.2
															Sand
															PID= 0

The boring was terminated at approximately 16 ft. below ground surface. The boring was backfilled with sand, bentonite seal, cuttings and cement/roadbox installed at surface on April 16, 2024.

GROUNDWATER LEVEL INFORMATION:
- Groundwater was observed at approximately 3.5 ft. (Elev.= 27.50 ft.) below ground surface during drilling.
- Groundwater was observed at approximately 5 ft. (Elev.= 26.00 ft.) below ground surface at the end of drilling.
- Groundwater was observed at approximately 16 ft. (Elev.= 15 ft.) below ground surface after drilling completion.

GENERAL NOTES:
1. Ground surface elevation based on conceptual design drawing titled "Straightway Site Plan Alternative 2", prepared by Kleinfelder, dated March 6, 2024.
2. When strata breaks are not observed in the split spoon, strata breaks are inferred based on rig behavior (bouncing, chattering, penetration resistance, drilling water color, etc.)
3. A Photo Ionization Detector (PID in ppmv) was used for environmental field screening of soil samples.

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/24/2024

BORING LOG B-4-OW

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

PLOTTED: 05/15/2024 03:53 PM BY: SPanda
OFFICE FILTER: BOSTON
PROJECT NUMBER: 24003062.001A
gINT FILE: Klf_gint_master_2024
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 4/15/2024 - 4/17/2024 **Drilling Company:** Geologic Earth Explorations **BORING LOG B-5**

Logged By: S. Panda/T. Templeton **Drill Crew:** T. Gernier/M. Jimmy

Hor.-Vert. Datum: NAD83 - NAVD88 **Drilling Equipment:** VacTruck FX50/Acker Soil Scout **Hammer Type - Drop:** 140 lb. Cathead - 30 in.

Plunge: -90 degrees **Drilling Method:** Vacuum Excavation/Drive and Wash with Casing

Weather: Sunny 50s-60s **Exploration Diameter:** 24 in. O.D.

Massachusetts State Plane Coordinate System
Ground Surface Elevation (ft.): 31.50
Surface Condition: Grass

Elevation (feet) / Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
31.50 / 0		**G-1:** 5-inch thick topsoil	G-1											PID= 0
31.00 / 0.5		Dark brown, fine to medium SAND, some silt, little gravel with root fragments [FILL]	G-2											PID= 0.1
		G-2: Same as above [FILL]	G-3											PID= 0.1
		G-3: Tan, fine to coarse SAND, trace silt, trace gravel [FILL]	G-4											PID= 0.1
		G-4: Same as above [FILL]	G-5											PID= 0
		G-5: Tan, coarse SAND, trace gravel, trace silt [FILL]												PID= 0
25 / 6.5		**S-1:** No recovery [FILL]	S-1		BC=16 15 25 12	NR								PID= N/A
23.5 / 8		**S-2:** Tan, very dense, fine to coarse SAND, trace gravel, little silt	S-2		BC=30 31 35 25	16"	SW-SM			93	6.9			PID= 0
15 / 16.5		**S-3:** Grey-tan, medium dense, fine to coarse SAND, little gravel, trace silt	S-3		BC=9 11 11 9	8"	SP			89	1.6			PID= 0
10 / 21.5		**S-4:** Grey tan, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-4		BC=11 7 10 7	7"								PID= 0
														blowout/heave in sand observed, hence drilling mud introduced
5 / 26.5		**S-5:** Tan grey, medium dense, fine to coarse SAND, trace gravel, trace silt	S-5		BC=10 11 16 12	10"	SP			95	1.9			PID= 0
0 / 31.5		**S-6:** Same as above except medium dense	S-6		BC=7 9 10 13	10"								PID= 0
-5 / 36.5		**S-7:** Tan grey, medium dense, fine to coarse SAND, some gravel, trace silt	S-7		BC=12 13 13 16	11"								PID= 0
			S-8			8"								PID= 0

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/24/2024

BORING LOG B-5

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

PLOTTED: 05/21/2024 03:46 PM BY: SPanda
OFFICE FILTER: BOSTON
PROJECT NUMBER: 24003062.001A
gINT FILE: Klf_gint_master_2024
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 4/15/2024 - 4/17/2024 **Drilling Company:** Geologic Earth Explorations **BORING LOG B-5**

Logged By: S. Panda/T. Templeton **Drill Crew:** T. Gernier/M. Jimmy

Hor.-Vert. Datum: NAD83 - NAVD88 **Drilling Equipment:** VacTruck FX50/Acker Soil Scout **Hammer Type - Drop:** 140 lb. Cathead - 30 in.

Plunge: -90 degrees **Drilling Method:** Vacuum Excavation/Drive and Wash with Casing

Weather: Sunny 50s-60s **Exploration Diameter:** 24 in. O.D.

Elevation (feet) / Depth (feet)	Graphical Log	FIELD EXPLORATION: Massachusetts State Plane Coordinate System; Ground Surface Elevation (ft.): 31.50; Surface Condition: Grass Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	LABORATORY RESULTS: USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
-10		**S-8:** Tan grey, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-8 *(cont.)*		BC=10 12 13 7	8" *(cont.)*								
45		**S-9:** Tan grey, medium dense, fine to coarse SAND, little gravel, trace silt	S-9		BC=9 10 14 14	6"								PID = 0
-15		-14.5 The boring was terminated at approximately 46 ft. below ground surface. The boring was backfilled with cuttings on April 17, 2024.												
50														
-20														
55														
-25														
60														
-30														
65														
-35														
70														
-40														
75														
-45														

GROUNDWATER LEVEL INFORMATION:
▼ Groundwater was observed at approximately 14 ft. (Elev.= 17.50 ft.) below ground surface at the end of drilling.

GENERAL NOTES:
1. Ground surface elevation based on conceptual design drawing titled "Straightway Site Plan Alternative 2", prepared by Kleinfelder, dated March 6, 2024.
2. When strata breaks are not observed in the split spoon, strata breaks are inferred based on rig behavior (bouncing, chattering, penetration resistance, drilling water color, etc.)
3. A Photo Ionization Detector (PID in ppmv) was used for environmental field screening of soil samples.
4. Analytical samples were collected from the top 2 to 10 feet for environmental testing.
5. The top 6 feet was pre-cleared using vacuum excavation.

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/24/2024

BORING LOG B-5

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

PLOTTED: 05/21/2024 03:46 PM BY: SPanda
OFFICE FILTER: BOSTON
PROJECT NUMBER: 24003062.001A
gINT FILE: Klf_gint_master_2024
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_BORING/TEST PIT SOIL LOG]

PLOTTED: 05/21/2024 03:46 PM BY: SPanda

BORING LOG B-6

Date Begin - End:	4/16/2024 - 4/17/2024	**Drilling Company:**	Geologic Earth Explorations		
Logged By:	S. Panda	**Drill Crew:**	T. Gernier		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Acker Soil Scout	**Hammer Type - Drop:**	140 lb. Cathead - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Drive and Wash with Casing		
Weather:	Sunny 60s-70s	**Exploration Diameter:**	4 in. O.D.		

Massachusetts State Plane Coordinate System
Ground Surface Elevation (ft.): 31.00
Surface Condition: Grass

Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
30	0		**S-1:** 10-inch thick topsoil	S-1		BC=3 6 6 6	12"	SP-SM			78	12			PID= 0
			Brown, medium dense, fine to coarse SAND, some gravel, little silt [FILL]												
			S-2: Yellow, medium dense, coarse SAND, some gravel, trace silt with root fragments [FILL]	S-2		BC=10 12 14 17	15"		3.3						PID= 0; Organic content = 0.5%
25	5		**S-3:** Grey, medium dense, fine to coarse SAND and GRAVEL, trace silt [FILL]	S-3		BC=10 13 16 24	7"								PID= 0
			S-4: Grey-brown, dense, fine to coarse SAND and GRAVEL, little silt with cobbles [FILL]	S-4		BC=12 16 16 18	8"								PID= 0; red staining
20	10		**S-5:** Grey, dense, fine to coarse SAND, some gravel, trace silt	S-5		BC=10 15 16 20	9"								PID= 0
15	15		**S-6:** Grey, dense, fine to coarse SAND, some gravel, trace silt	S-6		BC=13 14 18 14	10"								PID= 0
20	10		**S-7:** Grey, medium dense, fine to coarse SAND, some gravel, trace silt	S-7		BC=12 10 13 10	4"								PID= 0
25	5		**S-8:** Grey, medium dense, GRAVEL, some fine to coarse sand, little silt	S-8		BC=6 6 9 12	4"								PID= 0.2; petroleum odor
30	0		**S-9:** Grey, medium dense, GRAVEL, some fine to coarse sand, little silt	S-9		BC=8 8 15 18	4"								PID= 0.1; petroleum odor
35	-5		**S-10:** Grey, medium dense, fine to coarse SAND, trace gravel, trace silt	S-10		BC=6 7 14 10	3"								PID= 0.1; petroleum odor
			S-11: No recovery	S-11			NR								PID = N/A; blowount/heave in

0.17
23.0
8.5
-1.5

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/24/2024

BORING LOG B-6

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

gINT FILE: Klf_gint_master_2024
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_BORING/TEST PIT SOIL LOG]
PROJECT NUMBER: 24003062.001A
OFFICE FILTER: BOSTON

Date Begin - End: 4/16/2024 - 4/17/2024 **Drilling Company:** Geologic Earth Explorations **BORING LOG B-6**

Logged By: S. Panda **Drill Crew:** T. Gernier

Hor.-Vert. Datum: NAD83 - NAVD88 **Drilling Equipment:** Acker Soil Scout **Hammer Type - Drop:** 140 lb. Cathead - 30 in.

Plunge: -90 degrees **Drilling Method:** Drive and Wash with Casing

Weather: Sunny 60s-70s **Exploration Diameter:** 4 in. O.D.

Elevation (feet) / Depth (feet)	Graphical Log	Lithologic Description (Massachusetts State Plane Coordinate System; Ground Surface Elevation (ft.): 31.00; Surface Condition: Grass)	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
-10			S-11 (cont.)		BC=3 5 8 7	NR (cont.)								sand observed
45		**S-12:** Light brown, dense, fine to coarse SAND, trace silt	S-12		BC=9 10 21 20	9"	SP			100	1.9			PID = 0.1; split spoon sampler changed to 3-in sampler and left overnight to obtain a sample with recovery
-15		-15.0												

The boring was terminated at approximately 46 ft. below ground surface. The boring was backfilled with cuttings on April 17, 2024.

GROUNDWATER LEVEL INFORMATION:
▼ Groundwater was observed at approximately 14 ft. (Elev.= 17.00 ft.) below ground surface at the end of drilling.

GENERAL NOTES:
1. Ground surface elevation based on conceptual design drawing titled "Straightway Site Plan Alternative 2", prepared by Kleinfelder, dated March 6, 2024.
2. When strata breaks are not observed in the split spoon, strata breaks are inferred based on rig behavior (bouncing, chattering, penetration resistance, drilling water color, etc.)
3. A Photo Ionization Detector (PID in ppmv) was used for environmental field screening of soil samples.
4. It should be noted, a 5-feet long section of a 4-inch diameter steel casing was lost during retrieval.

-20 50
-25 55
-30 60
-35 65
-40 70
-45 75

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/24/2024

BORING LOG B-6

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

PLOTTED: 05/21/2024 03:46 PM BY: SPanda
PROJECT NUMBER: 24003062.001A OFFICE FILTER: BOSTON
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_BORING/TEST PIT SOIL LOG]
gINT FILE: Klf_gint_master_2024

Date Begin - End:	4/18/2024 - 4/18/2024	**Drilling Company:**	Geologic Earth Explorations	**BORING LOG B-7**	
Logged By:	S. Panda	**Drill Crew:**	T. Gernier		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Acker Soil Scout	**Hammer Type - Drop:**	140 lb. Cathead - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Drive and Wash with Casing		
Weather:	Cloudy 40s	**Exploration Diameter:**	4 in. O.D.		

FIELD EXPLORATION

Massachusetts State Plane Coordinate System
Ground Surface Elevation (ft.): 32.00
Surface Condition: Sparse Vegetation

Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)
30	0		**S-1:** 6-inch thick topsoil	S-1		BC=WOR 1 2 9	7"
			Brown, very loose, fine to medium SAND, some silt, little gravel with root fragments [SUBSOIL]				
			S-2: Tan, medium dense, fine to coarse SAND, trace gravel, trace silt with cobbles [SUBSOIL]	S-2		BC=4 5 7 8	9"
25	5		**S-3:** Tan, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-3		BC=7 10 18 23	12"
			S-4: Tan, dense, fine to coarse SAND and GRAVEL with cobbles	S-4		BC=12 18 21 19	14"
20	10		**S-5:** Grey tan, medium dense, fine to coarse SAND and GRAVEL, litle clayey silt	S-5		BC=12 13 11 11	9"
15	15		**S-6:** Tan, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-6		BC=13 10 12 10	9"
10	20		**S-7:** Tan, medium dense, fine to coarse SAND, trace silt	S-7		BC=9 9 13 9	7"
5	25		**S-8:** Same as above	S-8		BC=9 9 11 13	9"
0	30						
-5	35						

LABORATORY RESULTS

USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
							PID= 0
							PID= 0
SP			97	1.5			PID= 0
							PID= 0
							PID= 0
							PID= 0
							PID= 0
	11.0						PID= 0; Organic content = 0.5%
							PID = 0
SP			100	2.1			PID = 0

31.5
28.0
14.5
6.0

The boring was terminated at approximately 26 ft. below ground surface. The boring was backfilled with cuttings on April 18, 2024.

GROUNDWATER LEVEL INFORMATION:
▼ Groundwater was observed at approximately 14 ft. (Elev.= 18.00 ft.) below ground surface at the end of drilling.

GENERAL NOTES:
1. Ground surface elevation based on conceptual design drawing titled "Straightway Site Plan Alternative 2", prepared by Kleinfelder, dated March 6, 2024.
2. When strata breaks are not observed in the split spoon, strata breaks are inferred based on rig behavior (bouncing, chattering, penetration resistance, drilling water color, etc.)
3. A Photo Ionization Detector (PID in ppmv) was used for environmental field screening of soil samples.

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/24/2024

BORING LOG B-7

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

PLOTTED: 05/21/2024 03:46 PM BY: SPanda
OFFICE FILTER: BOSTON
PROJECT NUMBER: 24003062.001A
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_BORING/TEST PIT SOIL LOG]
gINT FILE: Klf_gint_master_2024

BORING LOG B-8-OW

Date Begin - End:	4/15/2024 - 4/17/2024	**Drilling Company:**	Geologic Earth Explorations		
Logged By:	S. Panda/T. Templeton	**Drill Crew:**	T. Gernier/M. Jimmy		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	VacTruck FX50/Acker Soil Scout	**Hammer Type - Drop:**	140 lb. Cathead - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Vacuum Excavation/Drive and Wash with Casing		
Weather:	Sunny 40s-50s	**Exploration Diameter:**	24 in. O.D.		

Massachusetts State Plane Coordinate System
Ground Surface Elevation (ft.): 29.50
Surface Condition: Grass

Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)
25	5	**G-1:** 3-inch thick topsoil (29.25) Brown, fine to coarse SAND, trace silt, trace gravel with root fragments [FILL] **G-2:** Same as above [FILL] **G-3:** Same as above [FILL] **G-4:** Brown, fine to coarse SAND, trace silt, trace gravel [FILL] **G-5:** Tan, fine to coarse SAND, trace silt, trace gravel with cobbles [FILL] **S-1:** Tan, very loose to loose, fine to coarse SAND, little gravel, trace silt [FILL]	G-1										
			G-2										
			G-3										
			G-4										
			G-5										
			S-1		BC=1 1 3 13	8"	SP			86	3.2		
20	10	**S-2:** Brown, dense, fine to coarse SAND, some gravel, little silt (21.5)	S-2		BC=24 25 22 22	16"							
15	15	**S-3:** Tan grey, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-3		BC=16 8 9 9	6"							
10	20	**S-4:** Tan grey, medium dense, fine to medium SAND and GRAVEL, trace silt with rock fragments	S-4		BC=8 8 10 10	7"							
5	25	**S-5:** Grey, medium dense, fine to coarse SAND and GRAVEL (3.5)	S-5		BC=8 7 14 14	4"							
0	30												
-5	35												
-10													

MONITORING WELL CONSTRUCTION*

Concrete
2" SCH 40 Solid PVC Riser
Soil Cuttings
Bentonite Chips
Sand
2" SCH 40 Slotted 0.010 PVC Screen
Sand
Sand

PID= 0 (all readings)

The boring was terminated at approximately 26 ft. below ground surface. The boring was backfilled with sand, bentonite seal, cuttings and cement/roadbox installed at surface on April 17, 2024.

GROUNDWATER LEVEL INFORMATION:
▼ Groundwater was observed at approximately 11 ft. (Elev.= 18.50 ft.) below ground surface at the end of drilling.
▼ Groundwater was observed at approximately 14.5 ft. (Elev.= 15 ft.) below ground surface after drilling completion.

GENERAL NOTES:
1. Ground surface elevation based on conceptual design drawing titled "Straightway Site Plan Alternative 2", prepared by Kleinfelder, dated March 6, 2024.
2. When strata breaks are not observed in the split spoon, strata breaks are inferred based on rig behavior (bouncing, chattering, penetration resistance, drilling water color, etc.)
3. A Photo Ionization Detector (PID in ppmv) was used for environmental field screening of soil samples.
4. The top 6 feet was pre-cleared using vacuum excavation. A PID (ppmv) was used for environmental field screening.

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/24/2024

BORING LOG B-8-OW

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

PLOTTED: 05/15/2024 03:54 PM BY: SPanda
OFFICE FILTER: BOSTON
PROJECT NUMBER: 24003062.001A
gINT FILE: Klf_gint_master_2024
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 4/18/2024 - 4/18/2024 **Drilling Company:** Geologic Earth Explorations **BORING LOG B-9**

Logged By: S. Panda **Drill Crew:** T. Gernier

Hor.-Vert. Datum: NAD83 - NAVD88 **Drilling Equipment:** Acker Soil Scout **Hammer Type - Drop:** 140 lb. Cathead - 30 in.

Plunge: -90 degrees **Drilling Method:** Drive and Wash with Casing

Weather: Cloudy/rain 40s **Exploration Diameter:** 4 in. O.D.

Massachusetts State Plane Coordinate System
Ground Surface Elevation (ft.): 17.00
Surface Condition: Sparse Vegetation

Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
17	0		**S-1:** 4-in topsoil	S-1		BC=2	8"								PID= 0.1
			16.67			6									
			Brown-yellow, medium dense, fine to medium SAND, little silt, little gravel with root fragments [SUBSOIL]			13									
15						10									
			S-2: Tan, medium dense, fine to coarse SAND, trace gravel, trace silt [SUBSOIL]	S-2		BC=10	18"								PID= 0.1
			13.0			10									
			S-3: Tan, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-3		7	7"								PID= 0.1
5						BC=9									
			S-4: Tan, medium dense, fine to coarse SAND, trace gravel, trace silt with cobbles	S-4		19	10"	SP			96	2.7			PID= 0.1
10						11									
						8									
						BC=18									
			S-5: Grey, medium dense, fine to coarse SAND, little silt, little gravel	S-5		10	7"								PID= 0.1
						15									
						12									
						BC=12									
10						11									
						14									
						13									
5															
			S-6: Grey-brown, medium dense, fine to coarse SAND, trace silt	S-6		BC=9	10"	SP			100	3.5			PID= 0.1; orange stains
15						12									
						16									
						21									
0															
			S-7: Same as above	S-7		BC=12	7"								PID= 0.1; orange stains
20						12									
						10									
						12									
-5															
			S-8: Same as above	S-8		BC=10	12"								PID= 0.1
25						13									
						12									
						24									
-10															
			S-9: Same as above except dense	S-9		BC=9	21"								PID= 0.1
30						18									
						17									
			-14.0			21									
-15			The boring was terminated at approximately 31 ft. below ground surface. The boring was backfilled with cuttings on April 18, 2024.												
35															
-20															

GROUNDWATER LEVEL INFORMATION:
▼ Groundwater was observed at approximately 8 ft. (Elev.= 9.00 ft.) below ground surface at the end of drilling.

GENERAL NOTES:
1. Ground surface elevation based on conceptual design drawing titled "Hyannisport and Simmons Pond Site Plan", prepared by Kleinfelder, March 6, 2024.
2. When strata breaks are not observed in the split spoon, strata breaks are inferred based on rig behavior (bouncing, chattering, penetration resistance, drilling water color, etc.)
3. A Photo Ionization Detector (PID in ppmv) was used for environmental field screening of soil samples.

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/24/2024

BORING LOG B-9

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

PLOTTED: 05/21/2024 03:47 PM BY: SPanda
OFFICE FILTER: BOSTON
PROJECT NUMBER: 24003062.001A
[L_KLF_BORING/TEST PIT SOIL LOG]
gINT FILE: Klf_gint_master_2024
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2024.GLB

BORING LOG B-10

Date Begin - End:	4/18/2024 - 4/18/2024	**Drilling Company:**	Geologic Earth Explorations		
Logged By:	S. Panda	**Drill Crew:**	T. Gernier		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Acker Soil Scout	**Hammer Type - Drop:**	140 lb. Cathead - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Drive and Wash with Casing		
Weather:	Cloudy/rain 40s	**Exploration Diameter:**	4 in. O.D.		

FIELD EXPLORATION | LABORATORY RESULTS

Massachusetts State Plane Coordinate System
Ground Surface Elevation (ft.): 18.00
Surface Condition: Sparse Vegetation

Elevation (feet) / Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
18 / 0		**S-1:** 12-in thick topsoil	S-1		BC=1 4 3 6	7"								PID= 0
17.0 / 1.0		Brown yellow, loose, fine to medium SAND, some silt with root fragments [SUBSOIL]												
15 / 3		**S-2:** Tan, loose, fine to coarse SAND, little silt, little gravel [SUBSOIL]	S-2		BC=4 5 4 4	15"		4.0						PID= 0; Organic content = 0.4%
14.0 / 4.0		**S-3:** Tan, medium dense, fine to coarse SAND, little silt, little gravel	S-3		BC=4 7 8 10	14"								PID= 0
12 / 6		**S-4:** Tan, medium dense, fine to coarse SAND, little silt, little gravel	S-4		BC=10 8 9 11	12"								PID= 0
10 / 8 ▼		**S-5:** Tan, medium dense, fine to coarse SAND, trace silt	S-5		BC=8 6 6 5	11"	SP			100	3.0			PID= 0
5 / 13		**S-6:** Tan, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-6		BC=3 5 7 12	10"								PID= 0.1
0 / 18		**S-7A:** Tan, fine to coarse SAND and GRAVEL, trace silt	S-7A		BC=9 9	6"								PID= 0.1
		S-7B: Yellow brown, fine to coarse SAND, little gravel, trace silt	S-7B		16 13	6"								
-5 / 23		**S-8:** Tan, medium dense, fine to coarse SAND, little gravel, trace silt	S-8		BC=11 11 18 16	11"								PID= 0.1
-10 / 28		**S-9:** Tan, medium dense, fine to coarse SAND, little gravel, trace silt	S-9		BC=9 11 13 14	16"								PID= 0.1
-13.0 / 31.0		The boring was terminated at approximately 31 ft. below ground surface. The boring was backfilled with cuttings on April 18, 2024.												

GROUNDWATER LEVEL INFORMATION:
▼ Groundwater was observed at approximately 8.5 ft. (Elev.= 9.50 ft.) below ground surface at the end of drilling.

GENERAL NOTES:
1. Ground surface elevation based on conceptual design drawing titled "Hyannisport and Simmons Pond Site Plan", prepared by Kleinfelder, March 6, 2024.
2. When strata breaks are not observed in the split spoon, strata breaks are inferred based on rig behavior (bouncing, chattering, penetration resistance, drilling water color, etc.)
3. A Photo Ionization Detector (PID in ppmv) was used for environmental field screening of soil samples.

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PROJECT NO.: 24003062.001A
DRAWN BY: SP
CHECKED BY: BGS
DATE: 4/24/2024

BORING LOG B-10

W Barnstable Straightway Water Treatment Facility
228 Straightway/132 Smith Street
Barnstable, MA

PLOTTED: 05/21/2024 03:47 PM BY: SPanda
OFFICE FILTER: BOSTON
PROJECT NUMBER: 24003062.001A
gINT FILE: Klf_gint_master_2024
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2024.GLB [_KLF_BORING/TEST PIT SOIL LOG]

Appendix C - Recent Geotechnical Laboratory Test Results

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Thielsch
DIVISION OF THE RISE GROUP

195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
cts.thielsch.com
Let's Build a Solid Foundation

Client Information:	
	Kleinfelder
	Boston, MA
Project Manager:	Shrada Panda
Assigned By:	Shrada Panda
Collected By:	S. Panda (Kleinfelder)

Project Information:	
	Barnstable Straightway
	Barnstable, MA
Project Number:	24003062.001A
Summary Page:	1 of 2
Report Date:	05.09.2024

LABORATORY TESTING DATA SHEET, Report No.: 7424-E-B002 & E-B003

Boring ID	Sample ID	Depth (ft)	Laboratory No.	Identification Tests									Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As Rcvd Moisture Content %	LL %	PL %	OD LL	Gravel %	Sand %	Fines %	Org. %	pH	g_d MAX (pcf) W_{opt} (%)	g_d MAX (pcf) W_{opt} (%) (Corr.)	Dry unit wt. (pcf)	Test Moisture Content %	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Permeability cm/sec	
				D2216	D4318			D6913			D2974	D4792	D1557								
B-1	S-2	8-10	24-S-B817					5.1	92.7	2.2											Brown poorly graded sand
B-2	S-1	6-8	24-S-B818					13.5	85.6	0.9											Brown poorly graded sand
B-2	G-3	2-3	24-S-B819	3.9							0.1										Organic Content Only
B-2	S-4	19-21	24-S-B820					0.0	99.0	1.0											Brown poorly graded sand
B-3	G-2	1-2	24-S-B821					43.2	52.3	4.5											Brown poorly graded sand with gravel
B-3	S-2	8-10	24-S-B822					29.6	64.8	5.6											Brown poorly graded sand with silt and gravel
B-4	S-4	6-8	24-S-B823					12.8	79.5	7.7											Brown well-graded sand with silt
B-5	S-2	8-10	24-S-B824					7.5	85.6	6.9											Brown poorly graded sand with silt
B-5	S-3	14-16	24-S-B825					11.1	87.3	1.6											Brown poorly graded sand
B-5	S-5	24-26	24-S-B826					4.8	93.3	1.9											Brown poorly graded sand
B-6	S-1	0-2	24-S-B827					22.5	65.7	11.8											Brown poorly graded sand with silt and gravel
B-6	S-2	2-4	24-S-B828	3.3							0.5										Organic Content Only

Organic content tested by SF & RL on 05.08.2024

Date Received: **05.02.2024**

Reviewed By: Romulo LeBlanc

Date Reviewed: **05.09.2024**

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Thielsch DIVISION OF THE RISE GROUP	195 Frances Avenue Cranston RI, 02910 Phone: (401)-467-6454 Fax: (401)-467-2398 cts.thielsch.com *Let's Build a Solid Foundation*	Client Information: Kleinfelder Boston, MA Project Manager: Shrada Panda Assigned By: Shrada Panda Collected By: S. Panda (Kleinfelder)	Project Information: **Barnstable Straightway** **Barnstable, MA** Project Number: 24003062.001A Summary Page: 2 of 2 Report Date: 05.09.2024

LABORATORY TESTING DATA SHEET, Report No.: 7424-E-B002 & E-B003

Boring ID	Sample ID	Depth (ft)	Laboratory No.	Identification Tests									Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As Rcvd Moisture Content %	LL %	PL %	OD LL	Gravel %	Sand %	Fines %	Org. %	pH	g_d MAX (pcf) W_{opt} (%)	g_d MAX (pcf) W_{opt} (%) (Corr.)	Dry unit wt. (pcf)	Test Moisture Content %	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Permeability cm/sec	
				D2216	D4318			D6913			D2974	D4792	D1557								
B-6	S-12	44-46	24-S-B829					0.0	98.1	1.9											Brown poorly graded sand
B-6	S-9	29-31	24-S-B830					7.2	91.6	1.2											Light Brown poorly graded sand
B-7	S-2	2-4	24-S-B831					3.0	95.5	1.5											Brown poorly graded sand
B-7	S-5	8-10	24-S-B832	11.0							0.5										Organic Content Only
B-7	S-7	19-21	24-S-B833					0.0	97.9	2.1											Brown poorly graded sand
B-8	S-1	6-8	24-S-B834					14.4	82.4	3.2											Brown poorly graded sand
B-9	S-4	6-8	24-S-B835					4.4	92.9	2.7											Brown poorly graded sand
B-9	S-6	14-16	24-S-B836					0.0	96.5	3.5											Brown poorly graded sand
B-10	S-2	2-4	24-S-B837	4.0							0.4										Organic Content Only
B-10	S-5	8-10	24-S-B838					0.0	97.0	3.0											Brown poorly graded sand
Organic content tested by SF & RL on 05.08.2024																					

Date Received: **05.02.2024** Reviewed By: Romelle LeBlanc Date Reviewed: **05.09.2024**

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Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.1	8.7	59.8	24.2	2.2	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	99.3		
#4	94.9		
#10	86.2		
#20	60.5		
#40	26.4		
#60	8.2		
#100	3.8		
#200	2.2		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 2.5447 D_{85}= 1.8855 D_{60}= 0.8395
D_{50}= 0.6783 D_{30}= 0.4613 D_{15}= 0.3174
D_{10}= 0.2696 C_u= 3.11 C_c= 0.94

Classification

USCS= SP AASHTO= A-1-b

Remarks

Source of Sample: B-1 Depth: 8-10'
Sample Number: S-2

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

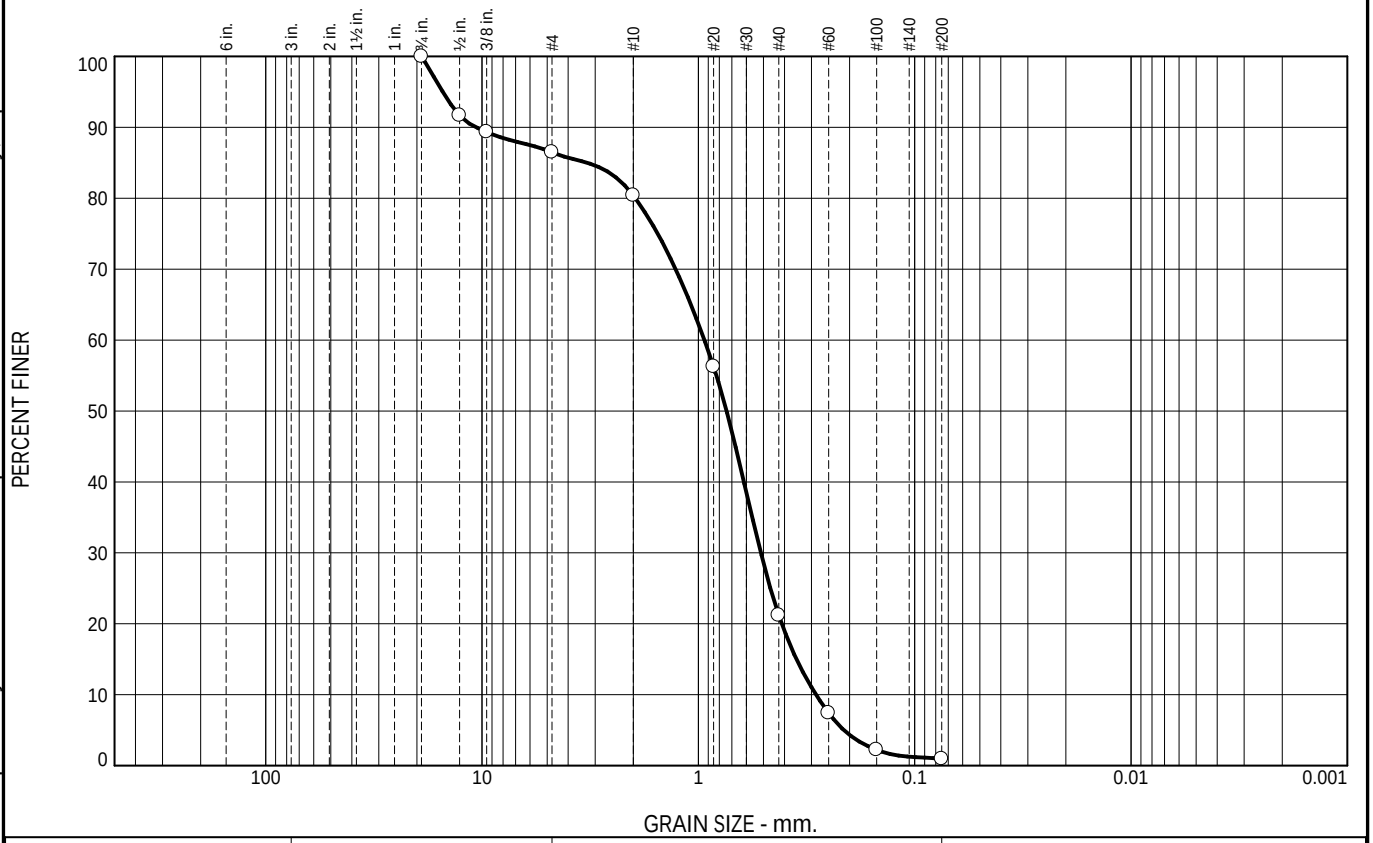
Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B817

Tested By: SF Checked By: Ronelle LeBlanc

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Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	13.5	6.1	59.2	20.3	0.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	91.7		
3/8"	89.4		
#4	86.5		
#10	80.4		
#20	56.3		
#40	21.2		
#60	7.4		
#100	2.2		
#200	0.9		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 10.6285 D_{85}= 3.2666 D_{60}= 0.9380
D_{50}= 0.7406 D_{30}= 0.5140 D_{15}= 0.3521
D_{10}= 0.2859 C_u= 3.28 C_c= 0.99

Classification

USCS= SP AASHTO= A-1-b

Remarks

Source of Sample: B-2 Depth: 6-8'
Sample Number: S-1

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

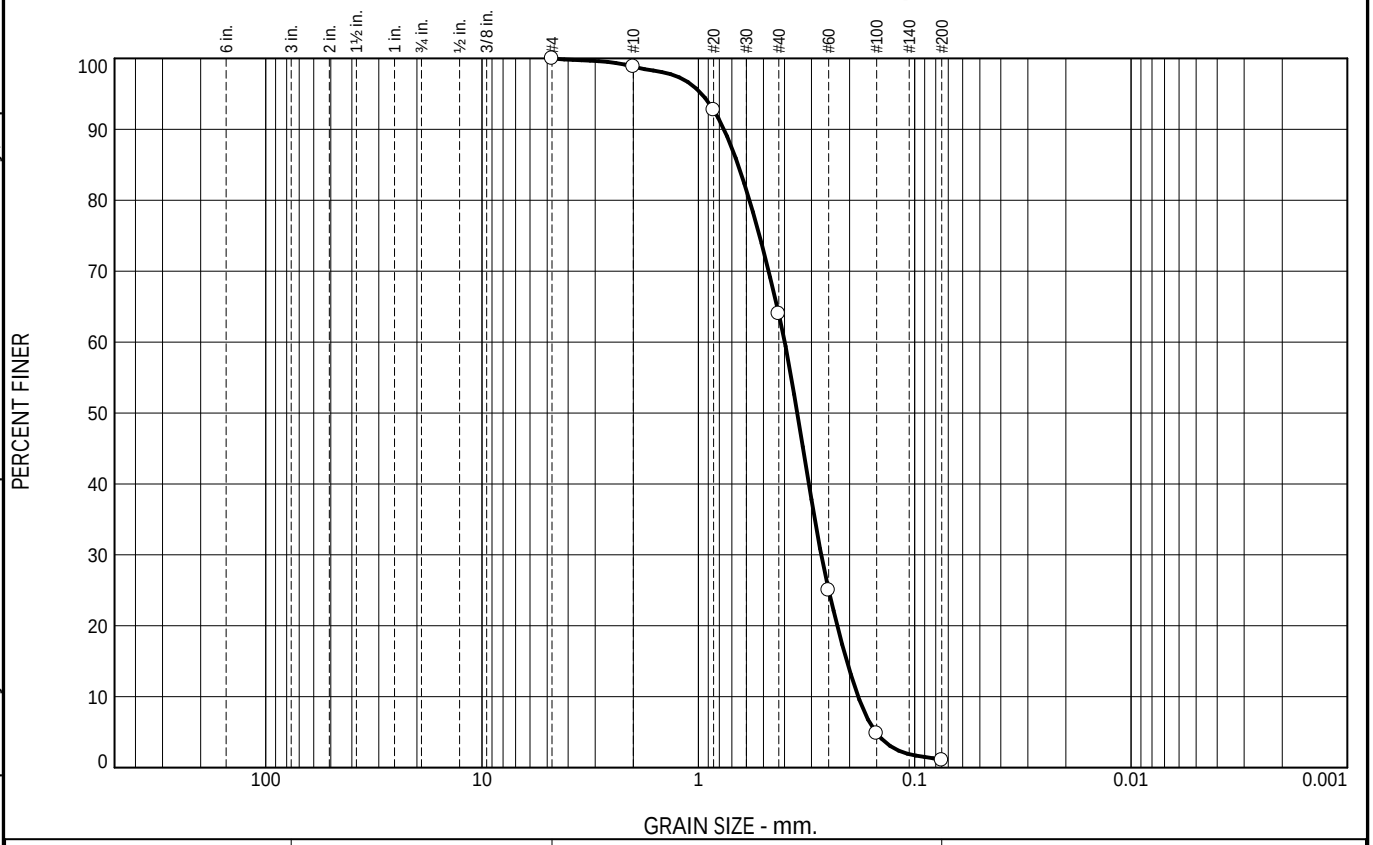
Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B818

Tested By: SF Checked By: Ronelle LeBlanc

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Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.2	34.8	63.0	1.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.8		
#20	92.7		
#40	64.0		
#60	25.0		
#100	4.8		
#200	1.0		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.7615 D_{85}= 0.6554 D_{60}= 0.3989
D_{50}= 0.3491 D_{30}= 0.2705 D_{15}= 0.2059
D_{10}= 0.1824 C_u= 2.19 C_c= 1.01

Classification

USCS= SP AASHTO= A-3

Remarks

Source of Sample: B-2 Depth: 19-21'
Sample Number: S-4

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

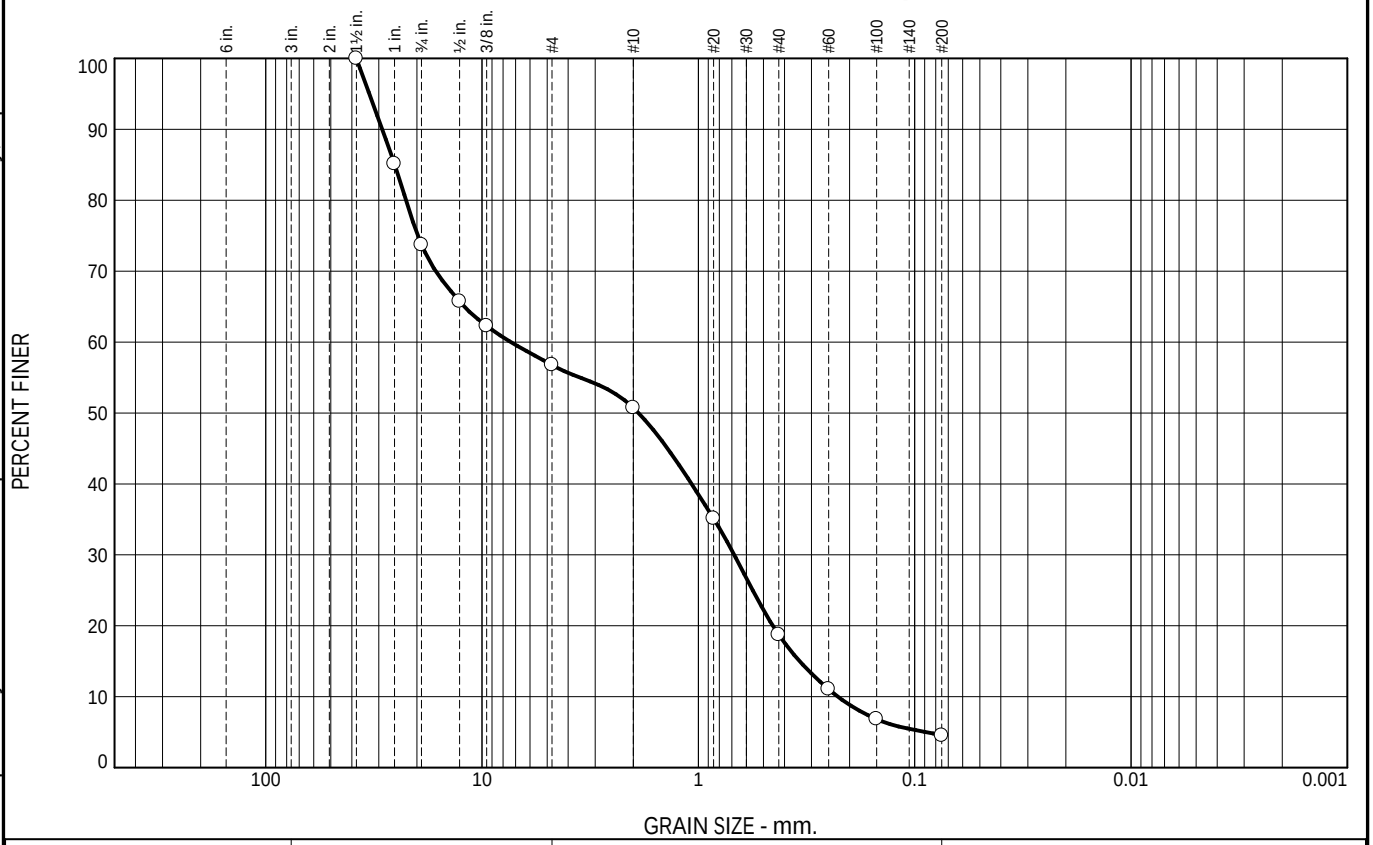
Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B820

Tested By: SF Checked By: Ronelle LeBlanc

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	26.3	16.9	6.1	32.0	14.2	4.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2"	100.0		
1"	85.1		
3/4"	73.7		
1/2"	65.7		
3/8"	62.3		
#4	56.8		
#10	50.7		
#20	35.1		
#40	18.7		
#60	11.0		
#100	6.8		
#200	4.5		

* (no specification provided)

Soil Description

Brown poorly graded sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 28.9344 D_{85}= 25.3128 D_{60}= 7.3553
D_{50}= 1.8902 D_{30}= 0.6830 D_{15}= 0.3403
D_{10}= 0.2267 C_u= 32.45 C_c= 0.28

Classification

USCS= SP AASHTO= A-1-b

Remarks

Source of Sample: B-3 Depth: 1-2'
Sample Number: G-2

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

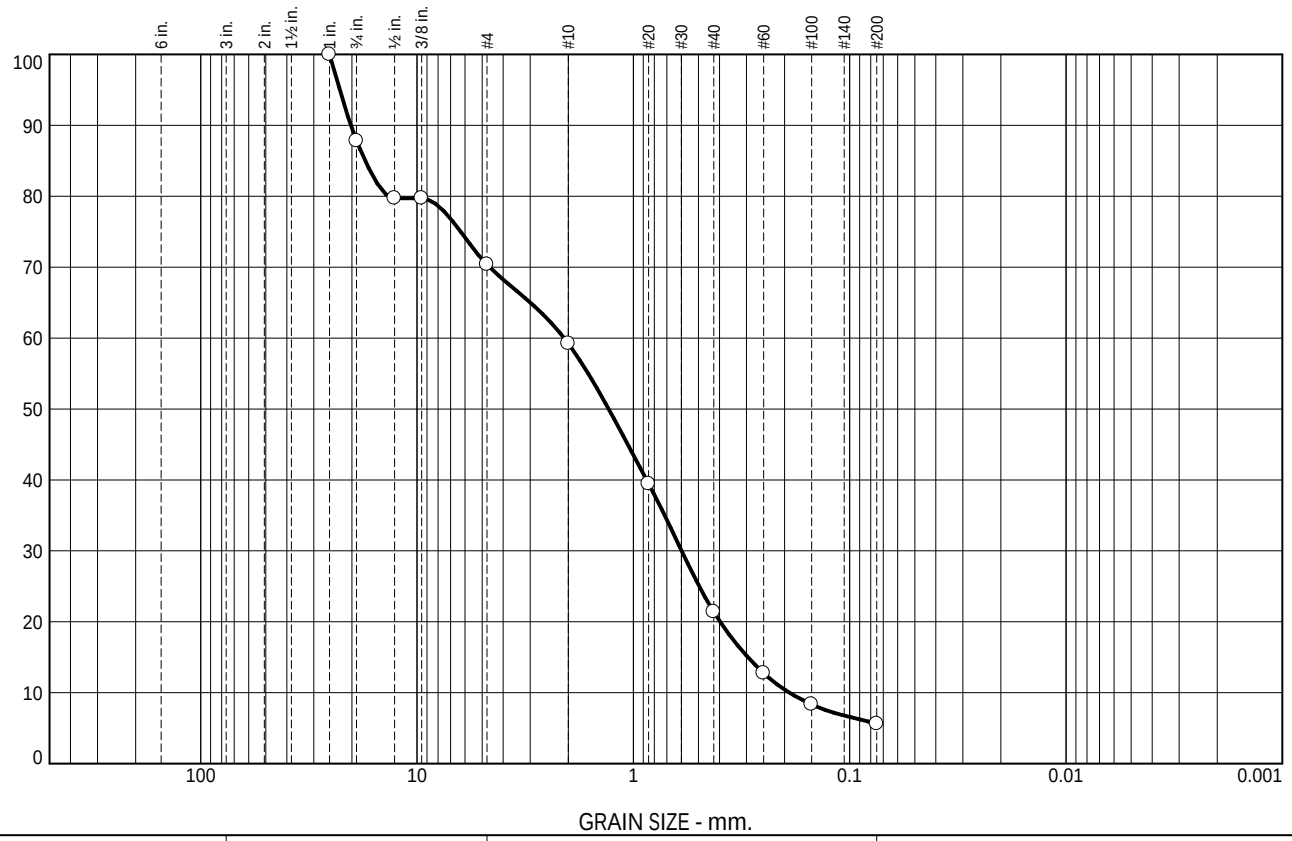
Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B821

Tested By: SF Checked By: Ronelle LeBlanc

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Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.2	17.4	11.2	37.8	15.8	5.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	87.8		
1/2"	79.7		
3/8"	79.7		
#4	70.4		
#10	59.2		
#20	39.5		
#40	21.4		
#60	12.8		
#100	8.3		
#200	5.6		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 20.2582 D_{85}= 17.3487 D_{60}= 2.0888
D_{50}= 1.3008 D_{30}= 0.5984 D_{15}= 0.2956
D_{10}= 0.1899 C_u= 11.00 C_c= 0.90

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Source of Sample: B-3 Depth: 8-10'
Sample Number: S-2

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

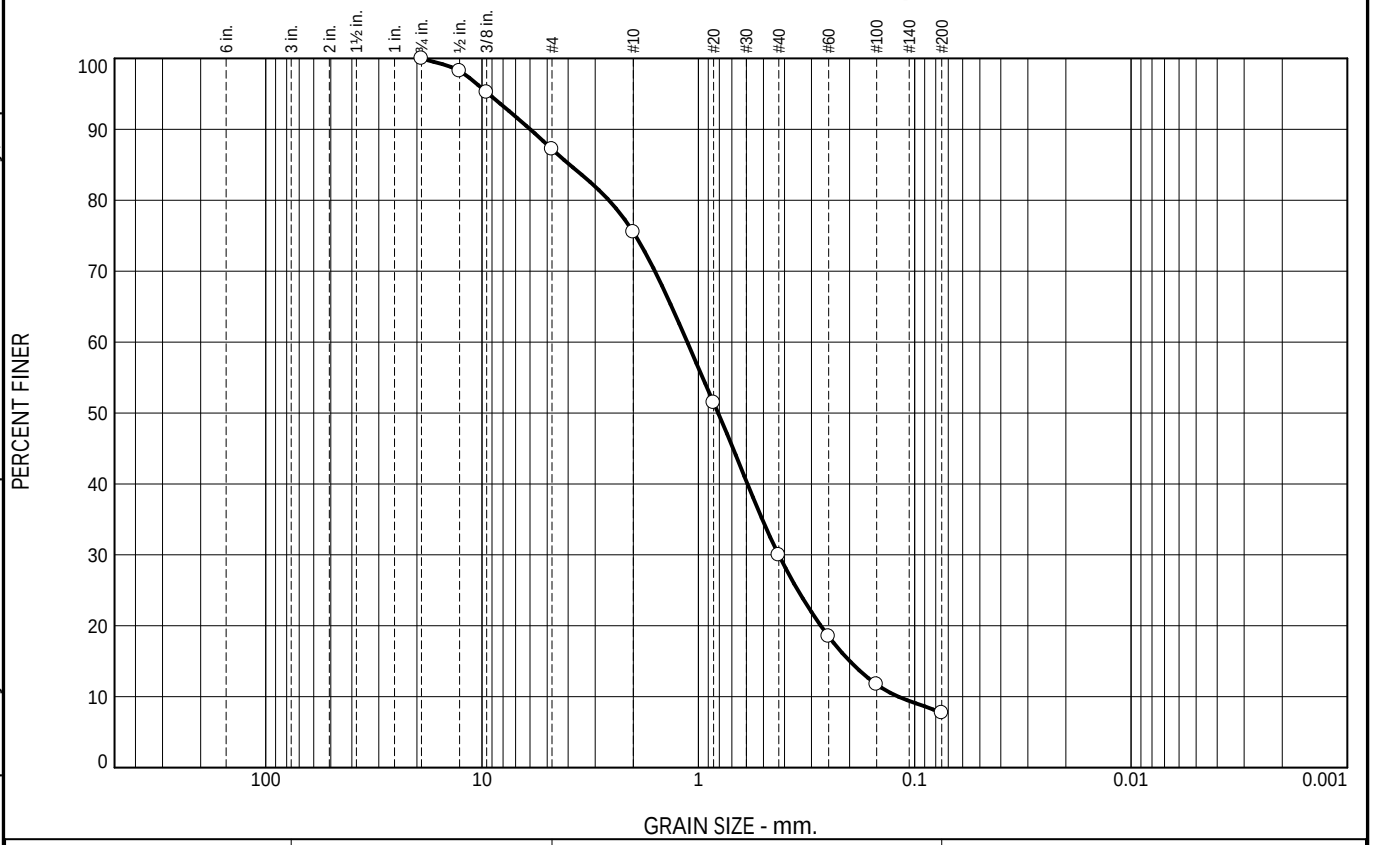
Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B822

Tested By: SF Checked By: Ronelle LeBlanc

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Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.8	11.7	45.5	22.3	7.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.2		
3/8"	95.2		
#4	87.2		
#10	75.5		
#20	51.5		
#40	30.0		
#60	18.5		
#100	11.7		
#200	7.7		

* (no specification provided)

Soil Description

Brown well-graded sand with silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 5.9849 D_{85}= 3.9290 D_{60}= 1.1259
D_{50}= 0.8097 D_{30}= 0.4255 D_{15}= 0.1995
D_{10}= 0.1189 C_u= 9.47 C_c= 1.35

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Source of Sample: B-4 Depth: 6-8'
Sample Number: S-4

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B823

Tested By: SF Checked By: Ronelle LeBlanc

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Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.5	5.2	49.6	30.8	6.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	97.2		
#4	92.5		
#10	87.3		
#20	70.5		
#40	37.7		
#60	18.9		
#100	10.8		
#200	6.9		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 2.7075 D_{85}= 1.6737 D_{60}= 0.6652
D_{50}= 0.5487 D_{30}= 0.3511 D_{15}= 0.2080
D_{10}= 0.1386 C_u= 4.80 C_c= 1.34

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Source of Sample: B-5 Depth: 8-10'
Sample Number: S-2

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

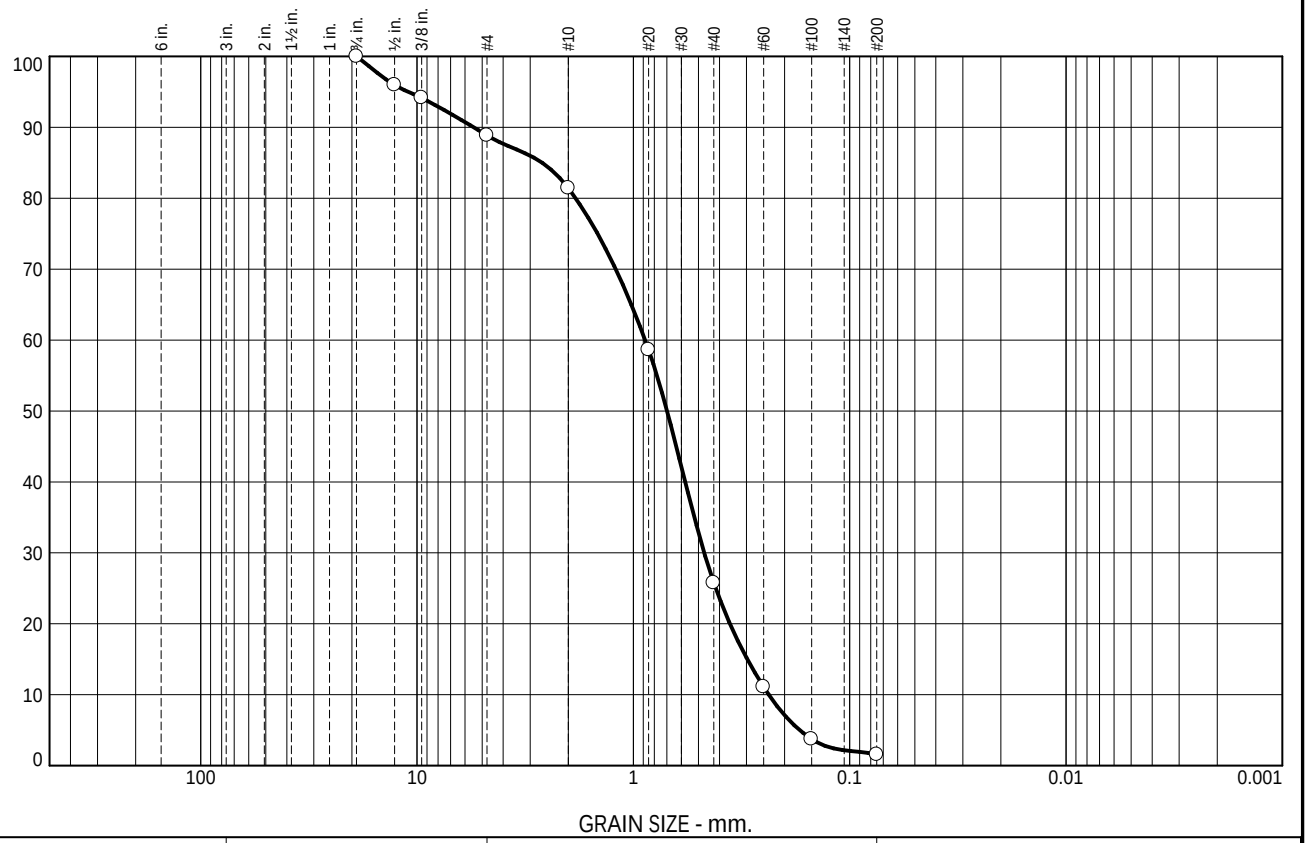
Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B824

Tested By: SF Checked By: Ronelle LeBlanc

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Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	11.1	7.5	55.6	24.2	1.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	96.0		
3/8"	94.2		
#4	88.9		
#10	81.4		
#20	58.6		
#40	25.8		
#60	11.1		
#100	3.7		
#200	1.6		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 5.4684 D_{85}= 2.6385 D_{60}= 0.8826
D_{50}= 0.6989 D_{30}= 0.4706 D_{15}= 0.2974
D_{10}= 0.2369 C_u= 3.73 C_c= 1.06

Classification

USCS= SP AASHTO= A-1-b

Remarks

Source of Sample: B-5 Depth: 14-16'
Sample Number: S-3

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

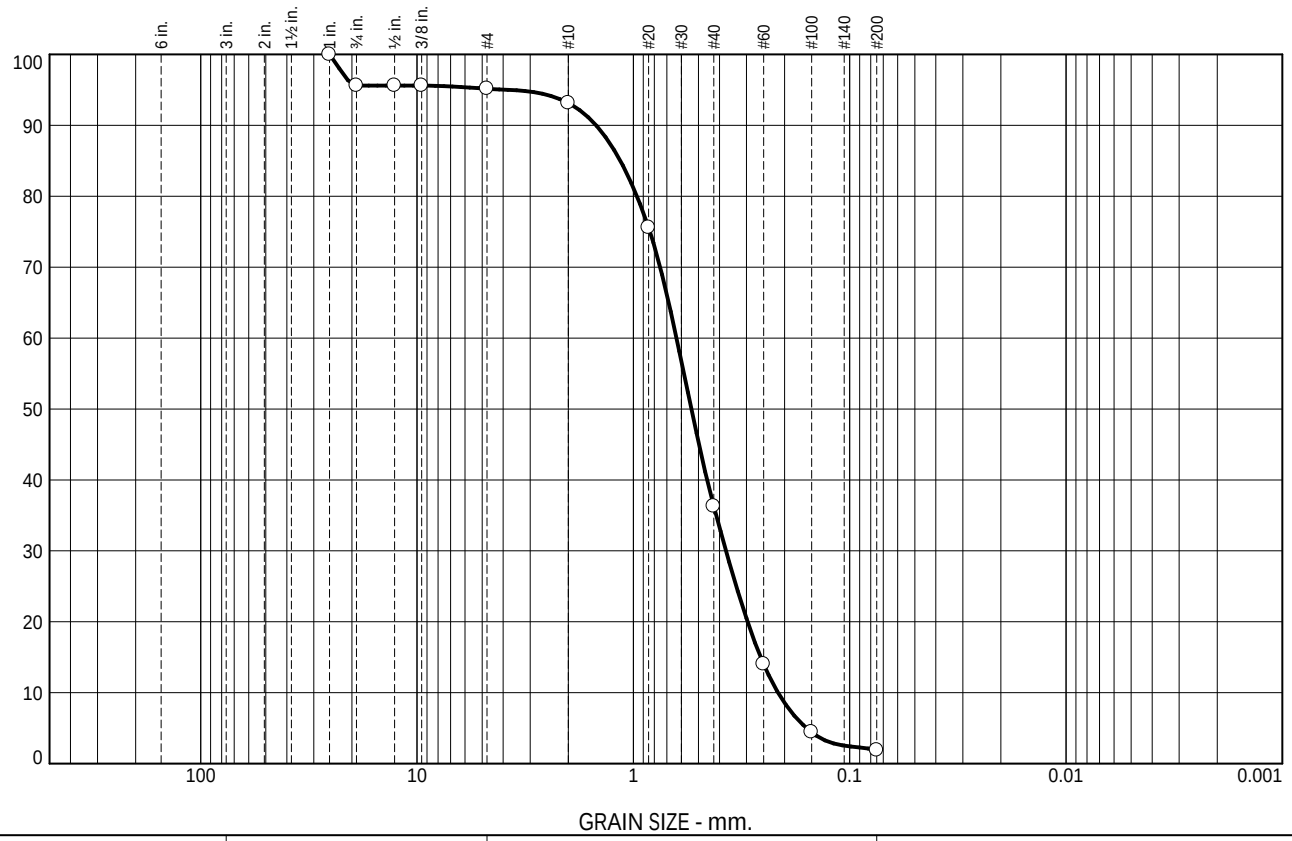
Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B825

Tested By: SF Checked By: Ronelle LeBlanc

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Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.4	0.4	2.0	56.9	34.4	1.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	95.6		
1/2"	95.6		
3/8"	95.6		
#4	95.2		
#10	93.2		
#20	75.6		
#40	36.3		
#60	14.0		
#100	4.4		
#200	1.9		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.4860 D_{85}= 1.1491 D_{60}= 0.6320
D_{50}= 0.5393 D_{30}= 0.3732 D_{15}= 0.2580
D_{10}= 0.2145 C_u= 2.95 C_c= 1.03

Classification

USCS= SP AASHTO= A-1-b

Remarks

Source of Sample: B-5 Depth: 24-26'
Sample Number: S-5

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

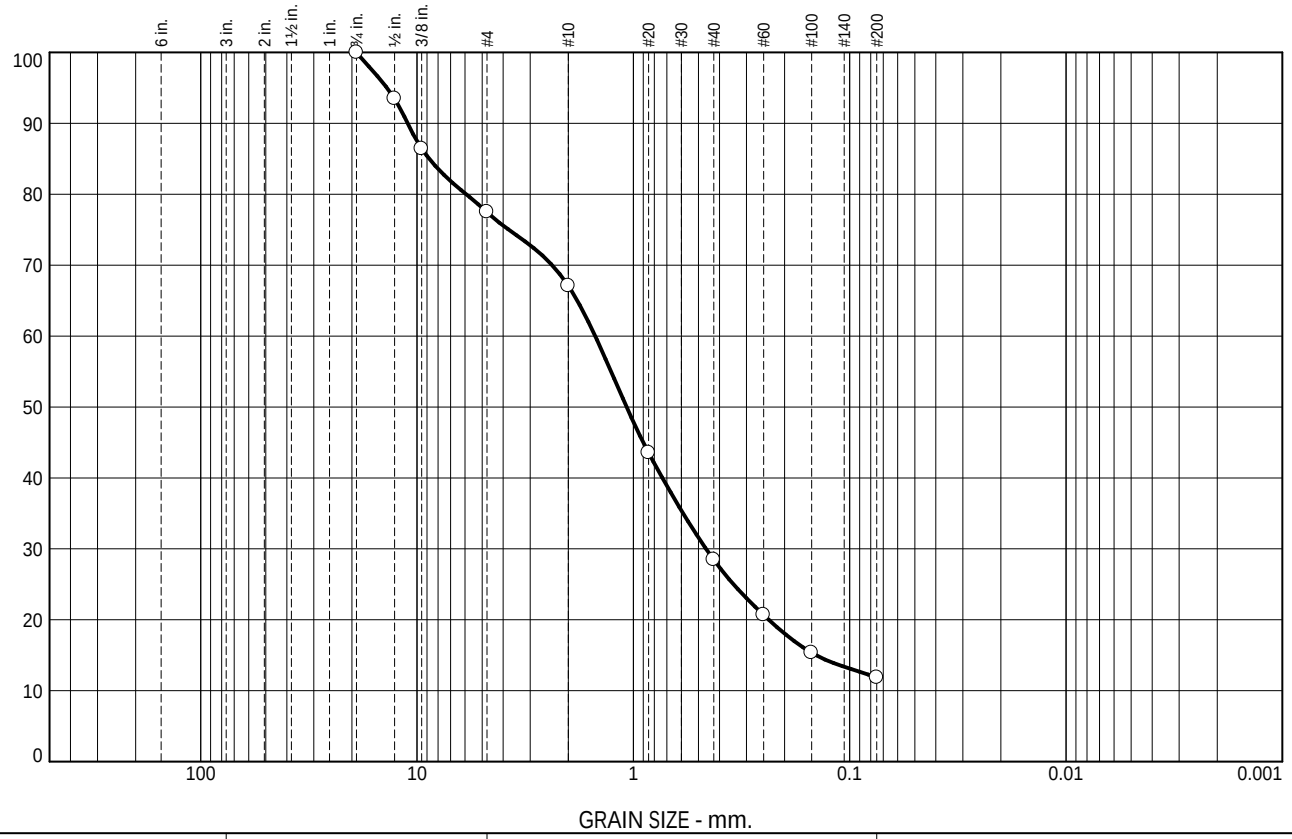
Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B826

Tested By: SF Checked By: Ronelle LeBlanc

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Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	22.5	10.4	38.6	16.7	11.8	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	93.5		
3/8"	86.4		
#4	77.5		
#10	67.1		
#20	43.5		
#40	28.5		
#60	20.7		
#100	15.4		
#200	11.8		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 11.0400 D_{85}= 8.7815 D_{60}= 1.5013
D_{50}= 1.0746 D_{30}= 0.4615 D_{15}= 0.1430
D_{10}= C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Source of Sample: B-6 Depth: 0-2'
Sample Number: S-1

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

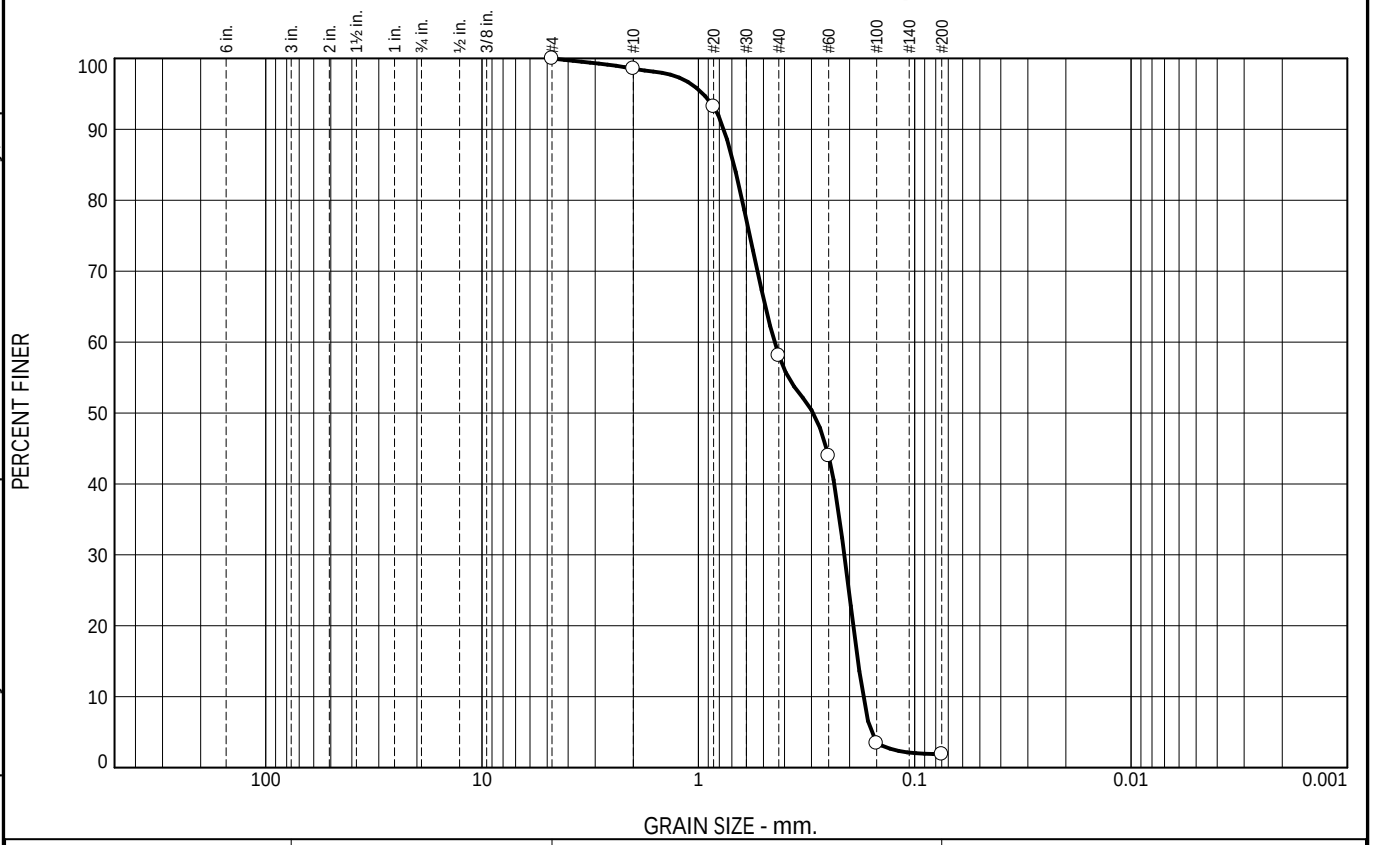
Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B827

Tested By: SF Checked By: Ronelle LeBlanc

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.4	40.5	56.2	1.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.6		
#20	93.2		
#40	58.1		
#60	44.0		
#100	3.4		
#200	1.9		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.7624 D_{85}= 0.6850 D_{60}= 0.4445
D_{50}= 0.2948 D_{30}= 0.2115 D_{15}= 0.1829
D_{10}= 0.1728 C_u= 2.57 C_c= 0.58

Classification

USCS= SP AASHTO= A-3

Remarks

Source of Sample: B-6 Depth: 44-46'
Sample Number: S-12

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

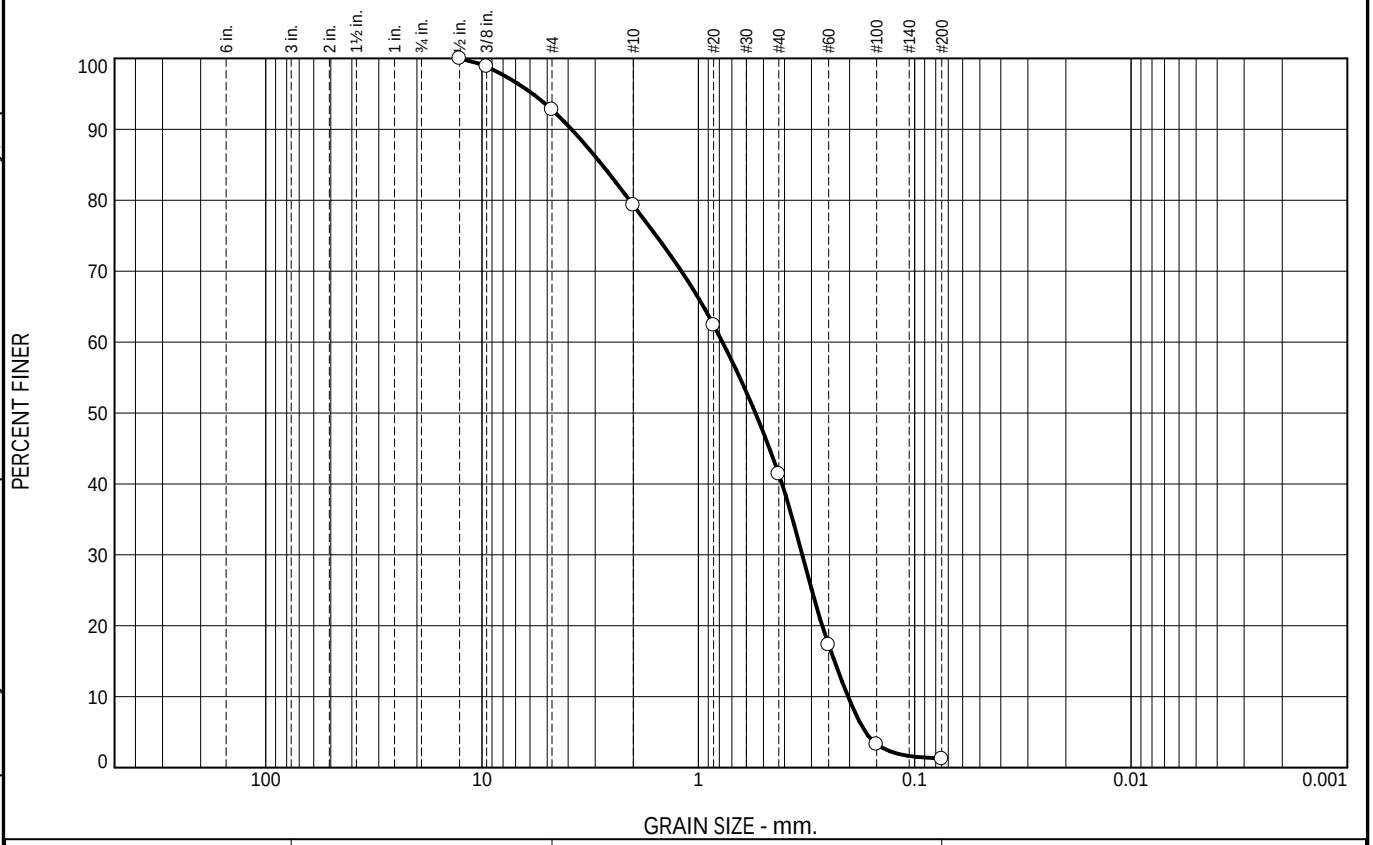
Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B829

Tested By: SF Checked By: Ronelle LeBlanc

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.2	13.5	37.9	40.2	1.2	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	98.8		
#4	92.8		
#10	79.3		
#20	62.4		
#40	41.4		
#60	17.3		
#100	3.3		
#200	1.2		

* (no specification provided)

Soil Description

Light Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 3.8537 D_{85}= 2.7873 D_{60}= 0.7736
D_{50}= 0.5449 D_{30}= 0.3310 D_{15}= 0.2348
D_{10}= 0.2032 C_u= 3.81 C_c= 0.70

Classification

USCS= SP AASHTO= A-1-b

Remarks

Source of Sample: B-6 Depth: 29-31'
Sample Number: S-9

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

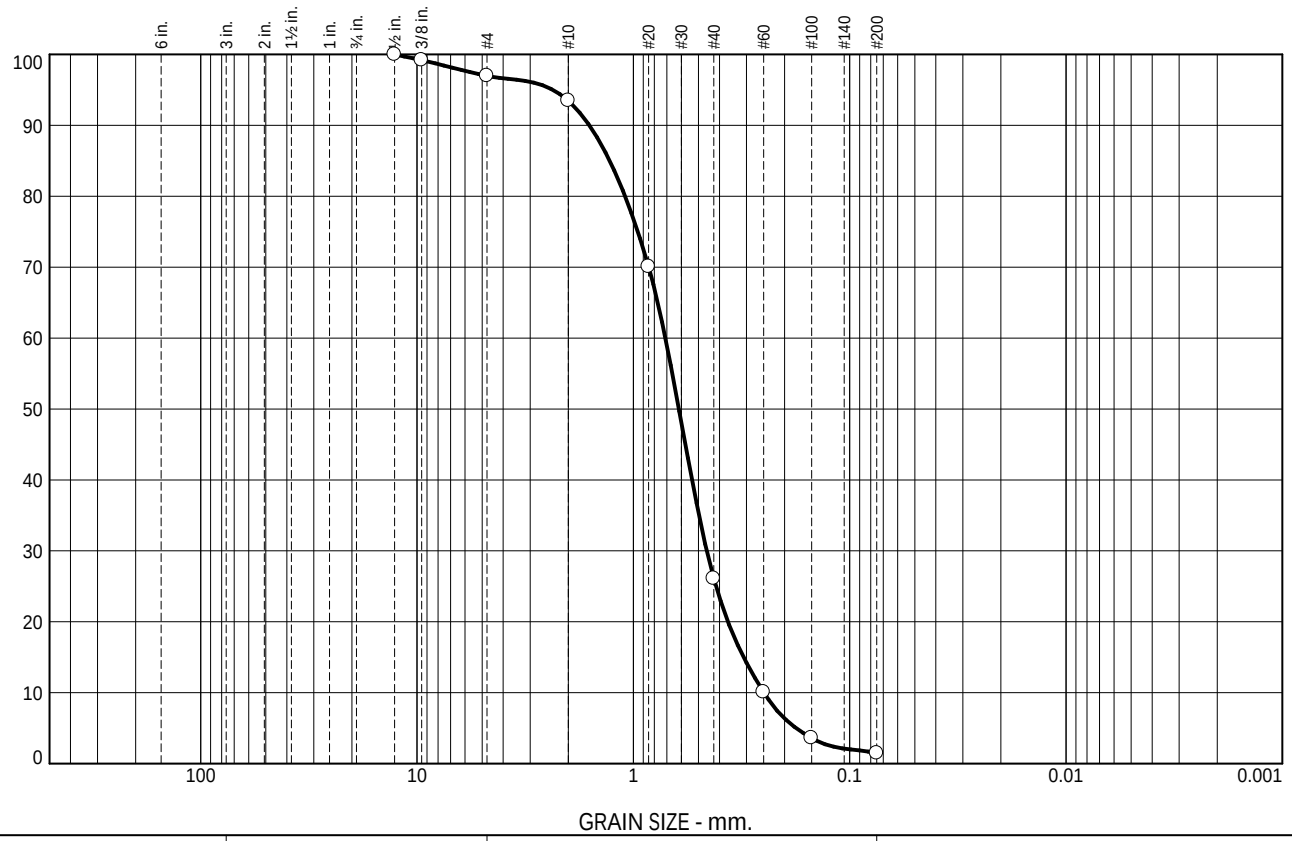
Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B830

Tested By: SF Checked By: Ronelle LeBlanc

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.0	3.5	67.4	24.6	1.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	99.2		
#4	97.0		
#10	93.5		
#20	70.1		
#40	26.1		
#60	10.1		
#100	3.6		
#200	1.5		

* (no specification provided)

Source of Sample: B-7 Depth: 2-4'
Sample Number: S-2

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.5973 D_{85}= 1.2866 D_{60}= 0.7115
D_{50}= 0.6161 D_{30}= 0.4581 D_{15}= 0.3095
D_{10}= 0.2492 C_u= 2.85 C_c= 1.18

Classification

USCS= SP AASHTO= A-1-b

Remarks

Date: 05.08.2024

Thielsch Engineering Inc.
Cranston, RI

Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A Figure 24-S-B831

Tested By: SF Checked By: Ronelle LeBlanc

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	8.4	38.0	51.5	2.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	91.6		
#20	81.6		
#40	53.6		
#60	30.9		
#100	10.9		
#200	2.1		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.6564 D_{85}= 0.9972 D_{60}= 0.4922
D_{50}= 0.3901 D_{30}= 0.2445 D_{15}= 0.1709
D_{10}= 0.1446 C_u= 3.40 C_c= 0.84

Classification

USCS= SP AASHTO= A-3

Remarks

Source of Sample: B-7 Depth: 19-21'
Sample Number: S-7

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B833

Tested By: SF Checked By: Ronelle LeBlanc

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	14.4	6.0	39.3	37.1	3.2	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	94.4		
3/8"	91.8		
#4	85.6		
#10	79.6		
#20	63.2		
#40	40.3		
#60	20.3		
#100	6.4		
#200	3.2		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 7.8429 D_{85}= 4.3622 D_{60}= 0.7579
D_{50}= 0.5580 D_{30}= 0.3250 D_{15}= 0.2126
D_{10}= 0.1792 C_u= 4.23 C_c= 0.78

Classification

USCS= SP AASHTO= A-1-b

Remarks

Source of Sample: B-8 Depth: 6-8'
Sample Number: S-1

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

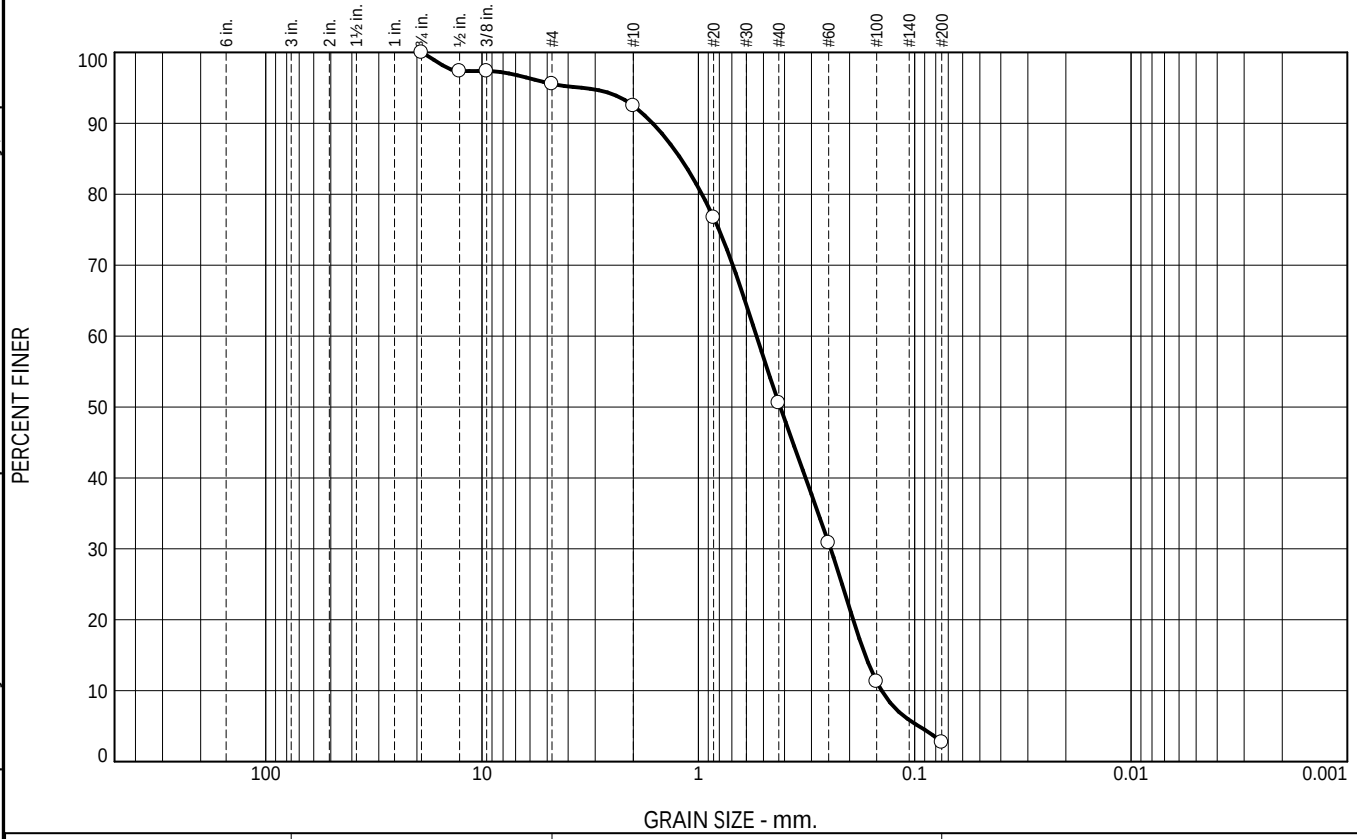
Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B834

Tested By: SF Checked By: Ronelle LeBlanc

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.4	3.1	41.9	47.9	2.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	97.4		
3/8"	97.4		
#4	95.6		
#10	92.5		
#20	76.7		
#40	50.6		
#60	30.8		
#100	11.3		
#200	2.7		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.6260 D_{85}= 1.2045 D_{60}= 0.5386
D_{50}= 0.4184 D_{30}= 0.2447 D_{15}= 0.1693
D_{10}= 0.1421 C_u= 3.79 C_c= 0.78

Classification

USCS= SP AASHTO= A-3

Remarks

Source of Sample: B-9 Depth: 6-8'
Sample Number: S-4

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B835

Tested By: SF Checked By: Ronelle LeBlanc

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	14.7	81.3	3.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#20	95.0		
#40	84.8		
#60	63.6		
#100	11.5		
#200	3.5		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.5434 D_{85}= 0.4274 D_{60}= 0.2392
D_{50}= 0.2179 D_{30}= 0.1858 D_{15}= 0.1602
D_{10}= 0.1431 C_u= 1.67 C_c= 1.01

Classification

USCS= SP AASHTO= A-3

Remarks

Source of Sample: B-9 Depth: 14-16'
Sample Number: S-6

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B836

Tested By: SF Checked By: Ronelle LeBlanc

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	21.2	75.6	3.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	97.8		
#40	78.6		
#60	40.5		
#100	11.3		
#200	3.0		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.5639 D_{85}= 0.4903 D_{60}= 0.3238
D_{50}= 0.2853 D_{30}= 0.2130 D_{15}= 0.1643
D_{10}= 0.1438 C_u= 2.25 C_c= 0.97

Classification

USCS= SP AASHTO= A-3

Remarks

Source of Sample: B-10 Depth: 8-10'
Sample Number: S-5

Date: 05.08.2024

Thielsch Engineering Inc.

Cranston, RI

Client: Kleinfelder
Project: Barnstable Straightway
Barnstable, MA
Project No: 24003062.001A

Figure 24-S-B838

Tested By: SF Checked By: Ronelle LeBlanc

APPENDIX J

WETLAND SUMMARY LETTER

LUCAS
ENVIRONMENTAL, LLC

500A Washington Street, Quincy, MA 02169

January 30, 2024

Kleinfelder
Attn: Tyler Bernier
1 Beacon Street, Suite 8100
Boston, MA 02108

Re: Wetland Summary Letter
Straightway Water Treatment Facility
Straightway & Smith Street
Barnstable, MA

Dear Mr. Bernier,

Professional Wetland Scientists from Lucas Environmental, LLC (LE) conducted a site investigation at the location of the planned New Straightway Water Treatment Facility located off Straightway and Smith Street in Barnstable, Massachusetts on November 29, 2023 to investigate the presence of wetland resources. Please note that this effort is specific to wetland resources; it does not evaluate constraints related to local planning or zoning requirements, historical or cultural significance, nor does it evaluate the potential for soil, air, or water contamination.

The wetland investigation was performed in accordance with the Massachusetts Wetlands Protection Act (M.G.L. Ch. 131, § 40) and regulations (310 CMR 10.00 *et seq*.); Section 404 of the Clean Water Act (33 U.S.C. 1344); Massachusetts Department of Environmental Protection (MassDEP) publication "Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands (2022); the U.S. Army Corp of Engineers (USACE) Wetland Delineation Manual (1987); the Northcentral and Northeast Regional Supplement (2012); and the Town of Barnstable Wetlands Protection Bylaw and Regulations (Chapter 237) (the "Bylaw") and Regulations (Part VII).

The site investigation was limited to wetland areas within 100 feet and perennial streams within 200 feet of three specific locations located off Straightway and Smith Street, as described in more detail below (i.e., Study Area). The Study Area does not include the entire parcels or off-property areas. The site was reviewed under appropriate field conditions, i.e., no snow cover or frozen ground.

The following data sources were examined prior to the site investigation:

- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM);
- United States Geological Survey Topographic Quadrangle;
- MassGIS MassDEP Wetland and Hydrography Datalayers;
- National Wetland Inventory (NWI) Maps;
- MassGIS Natural Heritage Atlas Datalayers; and
- United States Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS) Soil Survey.

1.0 EXISTING CONDITIONS

The Study Area consists of three (3) specific areas on three (3) separate parcels at and near the existing water treatment facility located off Straightway and Smith Street in Barnstable, Massachusetts (See Figure 1 – USGS Map and Figure 2 – Aerial Map). These areas total approximately 6.6-acres of land as identified in a Request for Proposal (RFP) issued by the Town of Barnstable for survey services related to a New Straightway Water Treatment Facility, and are generally described below:

- Area 1 (Portion of Map 267, Lot 99) is located at 132 Smith Street and contains a one-story building and public water supply well, and associated parking area. Halls Creek is located immediately to the east, and an unnamed perennial stream is located immediately to the west.

- Area 2 (Portion of Map 267, Parcel 190) is located north of Area 1 and contains a public water supply well and undeveloped areas. Simmons Pond is located immediately to the east.

- Area 3 (Portion of Map 268, Lot 99) is located at 228 Straightway and contains the existing water treatment plant. Area 3 is bound by Straightway to the west, residential development to the west and south, a large pond to the north, and wetland areas to the east.

A review of the current MassGIS data layer for the Massachusetts Natural Heritage Atlas (effective August 1, 2021) under the Natural Heritage & Endangered Species Program (NHESP) indicates that no portion of the Study Area is located within Estimated Habitat of Rare Wildlife or Priority Habitat of Rare Species (See Figure 3 – NHESP Map). No Certified or Potential Vernal Pools (CVP/PVP) under the jurisdiction of the Wetlands Protection Act Regulations (310 CMR 10.00 et seq.) or the Massachusetts Endangered Species Act (321 CMR 10.00 et seq.) are mapped by NHESP in the Study Area.

According to the FEMA Flood Insurance Rate Map for Barnstable County, Map Number 25001C0568J, effective July 16, 2014, most of the Study Area is located in Zone X, which is classified as an area of minimal flooding (See Figure 4 – FEMA Map). Study Areas 2 and 3 are located within an area within the 0.2% Annual Chance Flood Hazard (500-year flood). Therefore, the Study Area is not located within the 100-year floodplain and Bordering Land Subject to Flooding is not present.

The Study Area is not located within an Area of Critical Environmental Concern (ACEC), Outstanding Resource Water (ORW), or Watershed Protection Area. The Study Area is located within a MassDEP Zone I and Zone II Wellhead Protection Area.

2.0 ENVIRONMENTAL RESOURCE AREAS

Wetland resource areas observed within and near the Study Area include Inland Bank, Bordering Vegetated Wetlands (BVW), Land Under Water Bodies and Waterways (LUWW), and Riverfront Area. Under the WPA and Bylaw, the resource areas within the Study Area are defined as follows.

2.1 Inland Bank

Section 310 CMR 10.54 of the WPA defines a Bank *as the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a vegetated bordering wetland and adjacent flood plain, or, in the absence of these, it occurs between a water body and an upland. The upper boundary of a Bank is the first observable break in the slope or the mean annual flood level, whichever is lower. The lower boundary of a Bank is the mean annual low flow level*. The delineated Banks of three separate streams are described below. The Bylaw does not include any further definition of Bank.

2.2 Bordering Vegetated Wetlands

Section 310 CMR 10.55 of the WPA defines BVW *as freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The boundary of Bordering Vegetated Wetlands is the line within which 50% or more of the vegetational community consists of wetland indicator plants and saturated or inundated conditions exist. Wetland indicator plants are also those classified in the indicator categories of Facultative, Facultative+, Facultative Wetland-, Facultative Wetland, Facultative Wetland+, or Obligate Wetland in the National List of Plant Species That Occur in Wetlands: Massachusetts (Fish & Wildlife Service, U.S. Department of the Interior, 1988) or plants exhibiting physiological or morphological adaptations to life in saturated or inundated conditions.* The delineated areas of BVW are described below. The Bylaw does not include any further definition of BVW.

2.3 Land Under Water Bodies and Waterways

Section 310 CMR 10.56 of the WPA defines LUWW as *the land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock. The physical characteristics and location of Land Under Water Bodies and Waterways specified in 310 CMR 10.56(2)(a) are critical to the protection of the interests specified in 310 CMR 10.56(1). The boundary of Land Under Water Bodies and Waterways is the mean annual low water level.* This resource area is located below the edge of Bank or the Mean Annual High Water (MAHW) line of Halls Creek and two unnamed perennial streams, therefore it is not field delineated. The Bylaw does not include any further definition of LUWW.

2.4 Riverfront Area

Under Section 310 CMR 10.58 of the WPA, the Riverfront Area *is the area of land between a river's mean annual high-water line measured horizontally* outward from the river and a parallel line located 200 feet away. *The riverfront area may include or overlap other resource areas or their buffer zones.*

Furthermore, the MAHW line *is the line that is apparent from visible markings or changes in the character of soils or vegetation due to the prolonged presence of water and that distinguishes between predominantly aquatic and predominantly terrestrial land. Field indicators of bankfull conditions shall be used to determine the mean annual high-water line. Bankfull field indicators include but are not limited to: changes in slope, changes in vegetation, stain lines, top of pointbars, changes in bank materials, or bank undercuts.*

Three separate streams are depicted as perennial on the most recent USGS mapping. Therefore the 200-Foot Riverfront Area extends landward from the MAHW line of each of the streams, which in this case is coincident with the Inland Bank, described below as Streams 1, 2 and 3. The Bylaw does not include any further definition of Riverfront Area.

2.5 Vegetated Wetlands

Section 237-13 of the Town of Barnstable Wetland Regulations defines Vegetated Wetlands as the following: *Any area of at least 500 square feet where surface or ground water, or ice, at or near the surface of the ground support a plant community dominated (at least 50%) by wetland species.*

2.6 Resource Area Descriptions

Wetland A

Wetland A is a fringe BVW associated with an unnamed perennial stream (Stream 1 described below), located west of Study Area 1. The BVW boundary is delineated with pink survey tape numbered sequentially with flag series WFA-1 to WFA-9. The wetland consists of a mixed red maple/black tupelo swamp vegetated with a mix of red maple (A*cer rubrum*), black tupelo (*Nyssa sylvatica*), American elm (*Ulmus americana*), common greenbrier (*Smilax rotundifolia*), highbush blueberry (*Vaccinium corymbosum*), common winterberry (*Ilex verticillata*), cinnamon fern (*Osmundastrum cinnamomea*), and poison ivy (*Toxicodendron radicans*).

Soils generally consist of an organic rich surface horizon overlying a depleted matrix and redoximorphic features (concentrations) near the surface. The wetland boundary follows a well-defined topographic break. Indicators of wetland hydrology include shallow soil saturation and drainage patterns.

Wetland B

Wetland B is a large BVW associated with Halls Creek and Simmons Pond. The wetland boundary near Area 1 is delineated with pink survey tape numbered sequentially with flag series WFB-1 to WFB-14. The wetland boundary near Area 2 is delineated with pink survey tape numbered sequentially with flag series WFB-100 to WFB-122. Both wetland areas are similar in vegetative community, consisting of a mix of red maple, black tupelo, common greenbrier, sweet pepperbush, northern arrowwood, inkberry (*Ilex opaca*), and common winterberry. White pine (*Pinus strobus)* and pitch pine (*Pinus rigida*) were also be observed in the wetland.

Soils consist of an approximate six- to eight-inch layer of organic rich mineral overlying depleted sand with spodic development. Hydrological indicators include saturated soils, drainage patterns, and evidence of inundation.

Wetland C

Wetland C is a large BVW located north and east of Study Area 3. The wetland boundary is delineated with pink survey tape numbered sequentially with flag series WFC-1 to WFC-12, and WFC-100 to WFC-120.

The portion of the wetland delineated by flag series WFC-1 to WFC-12 appears to demarcate the edge of a former cranberry bog. This fringe wetland is vegetated with a mix of pussy willow (*Salix discolor*), buttonbush (*Cephalanthus occidentalis*), sensitive fern (*Onoclea sensibilis*), common greenbrier, oriental bittersweet (*Celastrus orbiculatus*), and poison ivy.

The portion of the wetland delineated by series WFC-100 to WFC1-120 delineates the fringe of a large pond located north of the Study Area, and is vegetated with plant species similar to the WFC-1 series. These two wetland areas are hydrologically connected by Stream 3 (described below).

Stream 1 – Unnamed Perennial Stream

The USGS map depicts an unnamed perennial stream originating approximately 600 feet northwest of Study Area 1. The stream flows south through Wetland A and drains south under Smith Street via a twelve-inch culvert. The Bank/MAHW lines were field delineated with blue survey flagging numbered sequentially from BF1-1 to BF1-9. The Banks are steep and well defined and measure approximately two to four feet wide. There was a trickle of water at the time of the site visit, and there were many upstream segments of the channel dry with no flow. Vegetation growing along the streams includes red maple, sweet pepperbush and common greenbrier. The MAHW line corresponds with a topographic break in slope. Inland Bank and the MAHW line are coincident.

As mentioned above, the stream is depicted as perennial on the USGS map, and therefore presumed to be perennial and subject to the provisions of the 200-Foot Riverfront Area per 310 CMR 10.58(2)(a)(1). However, given the small size of the streams contributing watershed, and that portions of the stream were observed dry during the site visit, it is likely the stream is not actually perennial. The presumption that the stream is perennial may be overcome, in part, through observations of no-flow once a day over any four days in a consecutive twelve-month period, in accordance with the provisions outline in 310 CMR 10.58(2(1)(d).

Stream 2 – Halls Brook

Halls Brook is located east of Study Area 1 and originates at the outlet of Simmons Pond. The western Bank/MAHW line was delineated with blue survey flagging numbered sequentially from BF2-1 to BF2-14. The stream is channelized with little sinuosity measuring approximately six to sixteen feet wide. A moderate flow of ten to twelve inches of water was observed at the time of the site visit. The Banks are well vegetated with a mix of sweet pepperbush, inkberry, speckled alder (*Alnus rugosa*), common greenbrier, black tupelo, highbush blueberry. The MAHW line corresponds with a topographic break in slope. Inland Bank and the MAHW line are coincident.

Stream 3 – Unnamed Perennial Stream

The USGS map depicts a small segment of an unnamed perennial stream between two ponded areas, approximately 200 feet east of Study Area 1. The Banks/MAHW lines were field delineated with blue survey flagging numbered sequentially from BF3-1 to BF3-5. The Banks are steep and well defined and measure approximately two to four feet wide. The channel was observed dry at the time of the site visit. Vegetation growing along the streams includes red maple, sweet pepperbush, and common greenbrier. The MAHW line corresponds with a topographic break in slope. and is coincident with Inland Bank.

Similar to Stream 1, this stream segment is depicted as perennial on the USGS map, and therefore presumed to be perennial and subject to the provisions of the 200-Foot Riverfront Area per 310 CMR 10.58(2)(a)(1). However, given the small size of the streams contributing watershed, and that the stream was observed dry during the site visit, it is likely the stream is not actually perennial. The presumption that the stream is perennial may be overcome, in part, through observations of no-flow once a day over any four days in a consecutive twelve-month period, in accordance with the provisions outlined in 310 CMR 10.58(2(1)(d).

2.7 Barnstable Wetlands Protection Bylaw

Chapter 704 Wetlands and Buffer Zone Activity establishes performance standards for work occurring within the 100-Foot Buffer Zone to wetland resource areas (Wetland Series A, B, and C). Chapter 704.3 requires a 50-foot undisturbed buffer zone remain intact from the boundary of resource areas. Work within this area cannot be approved without proving hardship or overcoming the presumption that work will not impact the interests of the WPA or Bylaw. The Bylaw and Regulations require other design aspects (i.e., mitigation, replication, waivers, etc.) that should be reviewed prior to any site development.

If you have any questions, please do not hesitate to contact me at 617.405.4053 or tel@lucasenviro.com. Thank you for your consideration in this matter.

Sincerely,

LUCAS ENVIRONMENTAL, LLC



Thomas E. Liddy, PWS/CWS, CESSWI
Environmental Consultant/Wetland Scientist

Enclosures: Figures
BVW Determination Forms



Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs; USGS Color Topographic Quadrangle

N

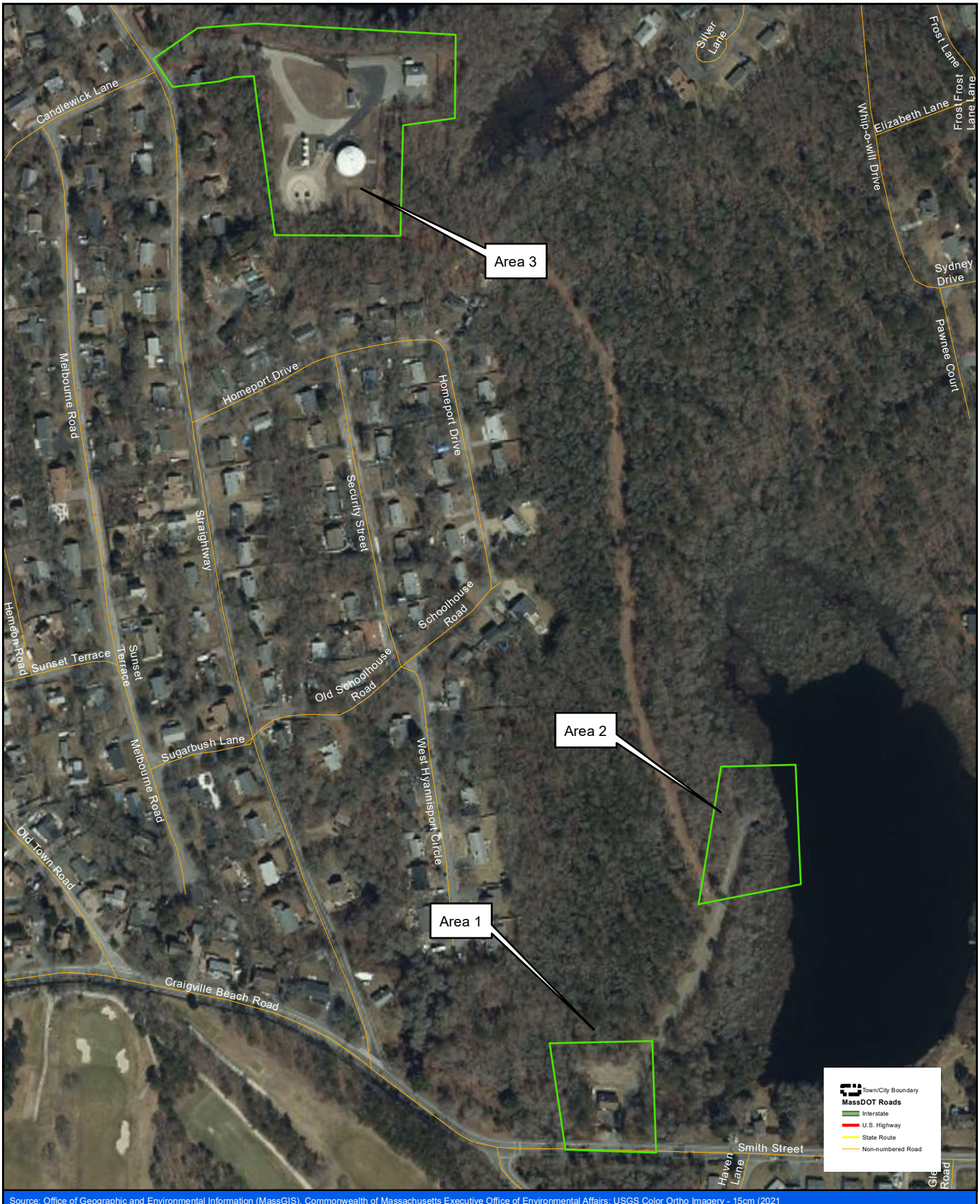
0 500 1,000 2,000 Feet

USGS Map

Wetland Summary Report
Straightway Treatment Facility
Barnstable, MA

FIGURE 1

LUCAS ENVIRONMENTAL, LLC



Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs; USGS Color Ortho Imagery - 15cm (2021

N

0 100 200 400 Feet

Aerial Map

Wetland Summary Report
Straightway Treatment Facility
Barnstable, MA

FIGURE 2

LUCAS ENVIRONMENTAL, LLC



Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs; USGS Color Ortho Imagery - 15cm (2021

N

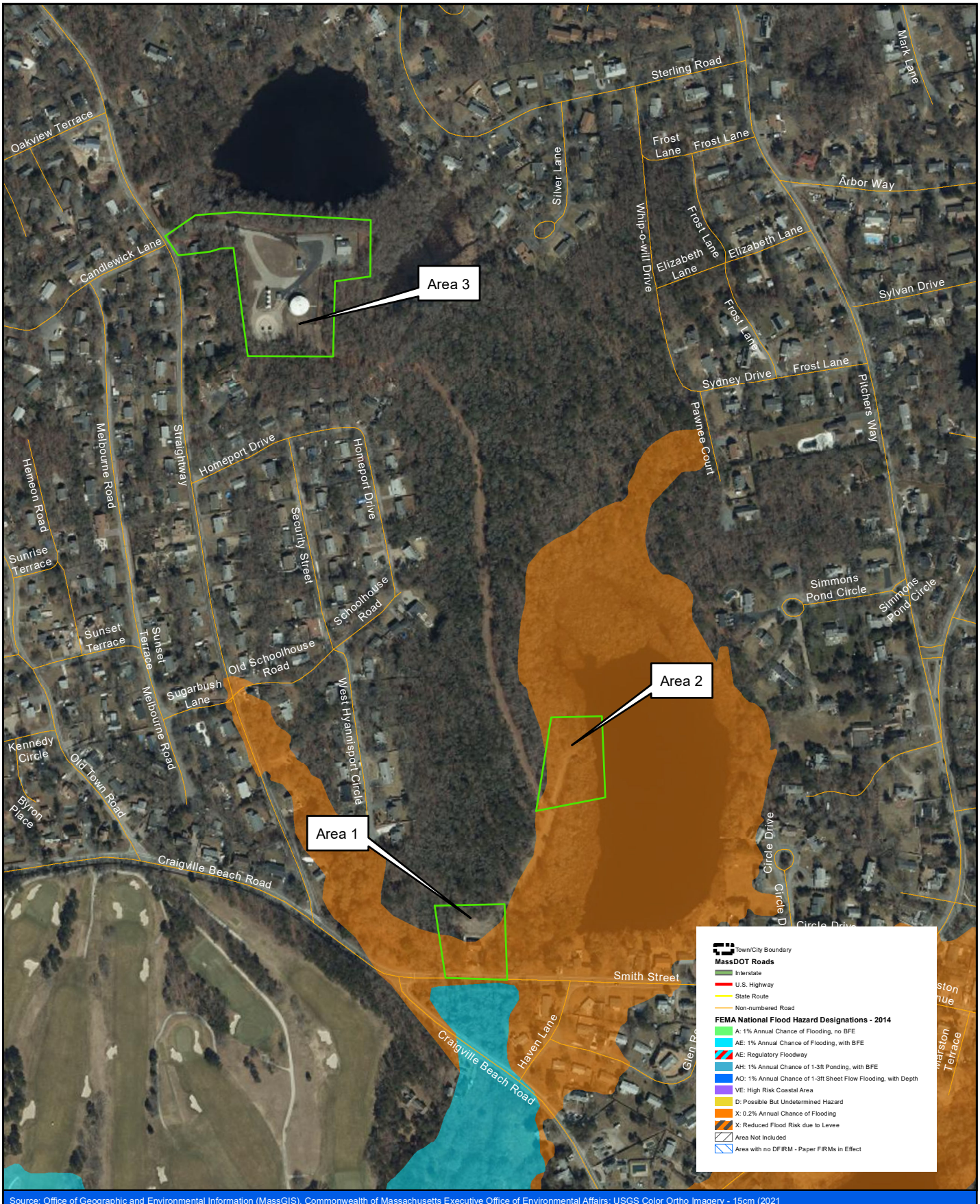
0 500 1,000 2,000 Feet

NHESP Map

Wetland Summary Report
Straightway Treatment Facility
Barnstable, MA

FIGURE 3

LUCAS ENVIRONMENTAL, LLC



Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs; USGS Color Ortho Imagery - 15cm (2021

N

0 125 250 500 Feet

FEMA Map

Wetland Summary Report
Straightway Treatment Facility
Barnstable, MA

FIGURE 4

LUCAS ENVIRONMENTAL, LLC

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Straightway Treatment Facility City/Town: Barnstable Sampling Date: 11/29/23

Applicant/Owner: Town of Barnstable Sampling Point or Zone: WFA-8 UPL

Investigator(s): Lucas Environmental, LLC Latitude / Longitude:

Soil Map Unit Name: Carver Course Sand NWI or DEP Classification: PFO

Are climatic/hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks)

Are Vegetation [ ], Soil [ ] , or Hydrology [ ] significantly disturbed? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ] , or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [ ] No [✓]	**Is the Sampled Area within a Wetland?** **Yes** [ ] **No** [✓]
Hydric Soils criterion met?	Yes [ ] No [✓]	
Wetlands hydrology present?	Yes [ ] No [✓]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)_____
Water Table Present?	Yes [ ]	No [✓]	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes [ ]	No [✓]	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[ ] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[ ] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Form Revised July 2023

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Black Oak	Querucs velutina	FACU	63.0	Yes	No
2. White Oak	Quercus alba	FAC	20.5	Yes	No
3. Pitch Pine	Pinus rigida	UPL	10.5	No	No
4.					
5.					
6.					
7.					
8.					
9.					

94.0 = Total Cover

Shrub/Sapling Stratum Plot size 15

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Nanny-berry	Viburnum lentago	FAC	38.0	Yes	Yes
2. Greenbrier	Smilax rotundifolia	FAC	20.5	Yes	Yes
3. Pitch Pine	Pinus rigida	FACU	10.5	No	No
4. High Bush Blueberry	Vaccinium corymbosum	FACW	10.5	No	Yes
5.					
6.					
7.					
8.					
9.					

79.5 = Total Cover

Herb Stratum Plot size 5

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Teaberry	Gaultheria procumbens	FACU	10.5	Yes	No
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

10.5 = Total Cover

VEGETATION – continued.

Woody Vine Stratum Plot size_____

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
			0.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW? Yes ☐ No ☑

Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants	Do wetland indicator plants make up ≥ 50% of dominant plant species?
	5	2	Yes ☐ No ☑

Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
Prevalence Index		B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐

Wetland vegetation criterion met? Yes ☐ No ☑

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-3	10YR 2/1						FSL	A
3-10	10YR 6/3						FSL	E
10-14	10YR 5/6						FSL	Bhs

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks: Very deep E horizon

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Straightway Treatment Facility City/Town: Barnstable Sampling Date: 11/29/23

Applicant/Owner: Town of Barnstable Sampling Point or Zone: WFA-8 WET

Investigator(s): Lucas Environmental, LLC Latitude / Longitude:

Soil Map Unit Name: Freetown Muck NWI or DEP Classification: PFO

Are climatic/hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks)

Are Vegetation [ ], Soil [ ] , or Hydrology [ ] significantly disturbed? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ] , or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [✓] No [ ]	**Is the Sampled Area within a Wetland?** **Yes [✓] No [ ]**
Hydric Soils criterion met?	Yes [✓] No [ ]	
Wetlands hydrology present?	Yes [✓] No [ ]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)
Water Table Present?	Yes [✓]	No [ ]	Depth (inches) 12.00
Saturation Present (including capillary fringe)?	Yes [✓]	No [ ]	Depth (inches) 4.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[ ] Water-stained leaves	[ ] Hydrological records	[✓] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[✓] Drainage patterns
[ ] Iron deposits	[✓] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[✓] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Form Revised July 2023

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red Maple	Acer rubrum	FAC	63.0	Yes	Yes
2. Tupelo	Nyssa sylvatica	FAC	38.0	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

101.0 = Total Cover

Shrub/Sapling Stratum Plot size 15

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Sweet Pepperbush	Clethra alnifolia	FAC	85.5	Yes	Yes
2. Tupelo	Nyssa sylvatica	FAC	10.5	No	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

96.0 = Total Cover

Herb Stratum Plot size 5

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Cinnamon Fern	Osmundastrum cinnamomea	FACW	85.5	Yes	Yes
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

85.5 = Total Cover

VEGETATION – continued.

Woody Vine Stratum Plot size_____

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
			0.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW? Yes ☐ No ☑

Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants	Do wetland indicator plants make up ≥ 50% of dominant plant species?
	4	4	Yes ☑ No ☐

Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
Prevalence Index		B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐

Wetland vegetation criterion met? Yes ☑ No ☐

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-4	10YR 2/1						FSL	A (mucky)
4-15	10YR 6/2						Sand	Bg

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☑ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☑ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☑ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ☑ **No** ☐

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Straightway Treatment Facility City/Town: Barnstable Sampling Date: 11/29/23

Applicant/Owner: Town of Barnstable Sampling Point or Zone: WFB-100 UPL

Investigator(s): Lucas Environmental, LLC Latitude / Longitude:

Soil Map Unit Name: Freetown Muck NWI or DEP Classification: PFO

Are climatic/hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks)

Are Vegetation [ ], Soil [ ] , or Hydrology [ ] significantly disturbed? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ] , or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [ ] No [✓]	**Is the Sampled Area within a Wetland?** **Yes** [ ] **No** [✓]
Hydric Soils criterion met?	Yes [ ] No [✓]	
Wetlands hydrology present?	Yes [ ] No [✓]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)_____
Water Table Present?	Yes [ ]	No [✓]	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes [ ]	No [✓]	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[ ] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[ ] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Form Revised July 2023

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 40'*20'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. White Oak	Querucs alba	FACU	38.0	Yes	No
2. Scarlet Oak	Quercus coccinea	FACU	20.5	Yes	No
3. Pitch Pine	Pinus rigida	UPL	20.5	Yes	No
4. Red Maple	Acer rubrum	FAC	10.5	No	Yes
5.					
6.					
7.					
8.					
9.					

89.5 = Total Cover

Shrub/Sapling Stratum Plot size 15

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Sweet Pepperbush	Clethra alnifolia	FAC	38.0	Yes	Yes
2. Quercus coccinea	Scarlet Oak	FACU	20.5	Yes	No
3. Quercus alba	White Oak	FACU	20.5	Yes	No
4. High Bush Blueberry	Vaccinium corymbosum	FACW	10.5	No	Yes
5. Red Maple	Acer rubrum	FAC	10.5	No	Yes
6. Ilex glabra	Inkberry	FACW	3.0	No	Yes
7.					
8.					
9.					

103.0 = Total Cover

Herb Stratum Plot size 5

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Teaberry	Gaultheria procumbens	FACU	10.5	Yes	No
2. Sheep Laurel	Kalmia angustifolia	FAC	10.5	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

21.0 = Total Cover

VEGETATION – continued.

Woody Vine Stratum	Plot size 40' x 20'				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Greenbrier	Smilax rotundifolia	FAC	3.0	No	Yes
2.					
3.					
4.					
			3.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species? Yes ☐ No ☑
	8	2		
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
Prevalence Index		B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐
Wetland vegetation criterion met?		**Yes** ☐ **No** ☑		

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-2	7.5YR 2.5/2						FSL	A
2-10	7.5YR 5/1						S	E
10-11	7.5YR 3/4						S	Bhs
11-16	5YR 4/6						S	Bs

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Straightway Treatment Facility City/Town: Barnstable Sampling Date: 11/29/23

Applicant/Owner: Town of Barnstable Sampling Point or Zone: WFB-100 WET

Investigator(s): Lucas Environmental, LLC Latitude / Longitude: _____

Soil Map Unit Name: Freetown Muck NWI or DEP Classification: PFO

Are climatic/hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] significantly disturbed? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [✓] No [ ]	**Is the Sampled Area within a Wetland?** **Yes [✓] No [ ]**
Hydric Soils criterion met?	Yes [✓] No [ ]	
Wetlands hydrology present?	Yes [✓] No [ ]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [✓]	No [ ]	Depth (inches)_____
Water Table Present?	Yes [ ]	No [ ]	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes [ ]	No [ ]	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[✓] Water-stained leaves	[ ] Hydrological records	[✓] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[ ] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Form Revised July 2023

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Tupelo	Nyssa sylvatica	FAC	63.0	Yes	Yes
2. Scarlet Oak	Acer rubrum	FAC	20.5	Yes	Yes
3. White Oak	Quercus alba	FACU	20.5	Yes	No
4.					
5.					
6.					
7.					
8.					
9.					

104.0 = Total Cover

Shrub/Sapling Stratum Plot size 15

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Tupelo	Nyssa sylvatica	FAC	20.5	Yes	Yes
2. Sweet Pepperbush	Clethra alnifolia	FACU	38.0	Yes	Yes
3. Swamp Azalea	Rhododendron viscosum	FACU	10.5	No	Yes
4. Red Maple	Acer rubrum	FACW	20.5	Yes	Yes
5.					
6.					
7.					
8.					
9.					

89.5 = Total Cover

Herb Stratum Plot size 5

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Sweet Pepperbush	Clethra alnifolia	FAC	10.5	Yes	Yes
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

10.5 = Total Cover

VEGETATION – continued.

Woody Vine Stratum	Plot size 30				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Greenbrier	Smilax rotundifolia	FAC	3.0	No	Yes
2.					
3.					
4.					
			3.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	7	6		Yes ☑ No ☐
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
Prevalence Index		B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐
Wetland vegetation criterion met?		**Yes** ☑	**No** ☐	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
2-0								Oe
0-10	10YR 6/1	80.00	10YR 5/2	20.00	C	M	S	E
10-14	10YR 3/1						S	Bhs
14-18	10YR 3/3						S	Bs

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☑ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ☑ **No** ☐

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Straightway Treatment Facility City/Town: Barnstable Sampling Date: 11/29/23

Applicant/Owner: Town of Barnstable Sampling Point or Zone: WFC-1 UPL

Investigator(s): Lucas Environmental, LLC Latitude / Longitude: _____

Soil Map Unit Name: Freetown Coarse Sand NWI or DEP Classification: PFO

Are climatic/hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] significantly disturbed? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [ ] No [✓]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soils criterion met?	Yes [ ] No [✓]	
Wetlands hydrology present?	Yes [ ] No [✓]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)_____
Water Table Present?	Yes [ ]	No [✓]	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes [ ]	No [✓]	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[ ] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[ ] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Form Revised July 2023

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. White Oak	Quercus alba	FACU	85.5	Yes	No
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

85.5 = Total Cover

Shrub/Sapling Stratum Plot size 15

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Glossy Buckthorn	Frangula alnus	FAC	20.5	Yes	Yes
2. Nanny-berry	Viburnum lentago	FAC	38.0	Yes	Yes
3. Ink Berry	Ilex glabra	FACW	10.5	No	Yes
4.					
5.					
6.					
7.					
8.					
9.					

69.0 = Total Cover

Herb Stratum Plot size 5

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Dewberry	Rubus flagellaris	FACU	20.5	Yes	No
2. Teaberry	Gaultheria procumbens	FACU	10.5	Yes	No
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

31.0 = Total Cover

VEGETATION – continued.

Woody Vine Stratum	Plot size 30				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Oriental bittersweet	Celastrus orbiculatus	FACU	20.5	Yes	No
2.					
3.					
4.					
			20.5 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	6	2		Yes ☐ No ☑
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
Prevalence Index		B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐
Wetland vegetation criterion met?		**Yes** ☐	**No** ☑	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-4	10YR 3/2						FS	A
4-8	10YR 4/4						FS	Bw1
8-15	10YR 5/6						FS	Bw2

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Straightway Treatment Facility City/Town: Barnstable Sampling Date: 11/29/23

Applicant/Owner: Town of Barnstable Sampling Point or Zone: WFC-1 WET

Investigator(s): Lucas Environmental, LLC Latitude / Longitude:

Soil Map Unit Name: Freetown Coarse Sand NWI or DEP Classification: PFO

Are climatic/hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] significantly disturbed? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [✓] No [ ]	**Is the Sampled Area within a Wetland?** **Yes [✓] No [ ]**
Hydric Soils criterion met?	Yes [✓] No [ ]	
Wetlands hydrology present?	Yes [✓] No [ ]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)
Water Table Present?	Yes [ ]	No [✓]	Depth (inches)
Saturation Present (including capillary fringe)?	Yes [✓]	No [ ]	Depth (inches) 6.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[ ] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[✓] Drainage patterns
[ ] Iron deposits	[ ] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[✓] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[✓] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Form Revised July 2023

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. None					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

0.0 = Total Cover

Shrub/Sapling Stratum Plot size 15

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Pussy Willow	Salix discolor	FACW	85.5	Yes	Yes
2. Buttonbush	Cephalanthus occidentalis	OBL	10.5	No	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

96.0 = Total Cover

Herb Stratum Plot size 5

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Glossy Buckthorn	Frangula alnus	FAC	10.5	Yes	Yes
2. Sensitive Fern	Onoclea sensibilis	FACW	10.5	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

21.0 = Total Cover

VEGETATION – continued.

Woody Vine Stratum	Plot size				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
			0.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species? Yes ☑ No ☐
	3	3		
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
Prevalence Index		B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐
Wetland vegetation criterion met?		**Yes** ☑	**No** ☐	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-5	10YR 2/2						FSL	A (mucky)
5-12+	10YR 6/3						Sand	Bg

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☑ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☑ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☑ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ☑ **No** ☐

APPENDIX K

GHG ANALYSIS

GREENHOUSE GAS ANALYSIS FOR THE STRAIGHTWAY WATER TREATMENT PLANT

HYANNIS, MASSACHUSETTS

August 2024

TECH environmental
FOCUSED KNOWLEDGE. REAL SOLUTIONS.

GREENHOUSE GAS ANALYSIS FOR THE STRAIGHTWAY WATER TREATMENT PLANT

HYANNIS, MASSACHUSETTS

Prepared for:

Kleinfelder
One Beacon Street, Suite 8100
Boston, MA 02108

Prepared by:

Tech Environmental, Inc.
303 Wyman Street, Suite 295
Waltham, Massachusetts 02451

August 15, 2024

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APPENDIX A - EQUEST MODEL OUTPUT

APPENDIX B - PV COST CALCULATION SPEADSHEET

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1.0 INTRODUCTION AND SUMMARY

1.1 Greenhouse Gas Analysis

A greenhouse gas (GHG) emissions analysis was performed for a proposed 4.03 million gallon per day (mgd) drinking water treatment plant (WTP) at 228 Straightway and associated improvements at 132 Smith Street in Barnstable, MA. Four new buildings will be constructed: a 10,660-sf WTP building housing most process equipment, a 2,220-sf structure to enclose the existing outdoor granulated activated carbon (GAC) filters, a 710-sf building to house the Hyannisport replacement well and pump station, and a 217-sf building to house the Simmons Pond replacement well and pump station. The HVAC design for each building is provided in Section 3.3. The plant will consume a significant amount of electricity for water processing (2,743 MWh/year with high-efficiency equipment),[1] see Section 3.1.

GHG emissions are reduced by these energy efficiency measures (EEMs):

- All-electric design for space heating, cooling, and domestic hot water heating.
- High efficiency process equipment (discussed in Section 3.1).
- High efficiency building envelope.
- Very small wall areas for building windows.
- Air source heat pumps (ASHPs) for space heating and cooling in the control room/bathroom/janitor closet space of the WTP Building, and in the two Pump Buildings. Electric coil unit heaters will provide heating (no cooling) in the process area of the WTP Building and in the GAC Filter Building.
- Interior and exterior LED lighting systems with light power density lower than Code.
- A 25-kW rooftop (or ground-based) PV system is planned.
- Forty percent of the pitched roof areas will be made solar-ready, satisfying C402.3.
- A two-port EV charging station will be installed in the WTP Building parking lot. Since there will be no more than 20 passenger vehicle spaces on the project site, these two EV charging stations satisfy the requirements of C405.13 (10% of spaces EV-ready).

The Town of Barnstable has not adopted the Stretch Code. The GHG Policy requires a project to quantify CO_2 emissions and identify measures to avoid, minimize or mitigate such emissions, quantifying the effect in terms of energy savings and emissions reduction. CO_2 emissions were quantified for: (1) the Base Case corresponding to the 10th Edition of the Massachusetts Building

[1] Kleinfelder, July 2024, provided the calculation of estimated annual process electrical use.

Code that includes the 2021 IECC Commercial Code with Massachusetts Amendments, and (2) the Proposed Design, which includes all energy saving measures, detailed in Section 3.3.

The Base Case corresponds to the 2021 IECC Commercial Code with non-stretch code Massachusetts Amendments, and Code compliance is demonstrated as follows:

- C402.1.5, see wall assembly U values in Tables 4 and 5.
- C402.3, see PV ready commitment listed above.
- C402.4, see fenestration U values in Table 4.
- C405.13, see EV charging station commitment listed above.

- C406.1, Additional efficiency credits for Other Occupancies Table C406.1.(5); a total of 15 credits is required. Interior lighting will use LED lamps. Overall light power density will be 0.4 W/sf, which is more than 10% below IECC Code of 0.82 W/sf, earning 7 credits under C406.3 for each of the four buildings. The ASHPs in the two Pump Buildings qualify as renewable space heating, earning 10 credits under C406.13. Total additional efficiency for each of the Pump Buildings is 17 credits.

  For the WTP Building and GAC Filter Building, the 25-kW PV system earns 7 credits under C406.5 for on-site renewable energy, and a fault detection and diagnostics system with sensors in the two buildings wired to the Town's SCADA earns 1 credit under C406.11. Total additional efficiency for the WTP Building and GAC Filter Building is 15 credits.

1.2 Summary of Results for the GHG Analysis

The Proponent commits to the CO_2 reduction presented below, but retains the flexibility to achieve this goal using energy efficiency measures that may be refined at the stage of detailed design for the Project. Table 3 reveals that the Proposed Design will reduce CO_2 emissions (for stationary sources) by 15.2% compared to the Base Case. As discussed in Section 2.0, Transportation Demand Management (TDM) measures for this project will reduce Project-related motor vehicle CO_2 emissions by 2%. The net reduction of the Project's total CO_2 emissions (stationary sources plus transportation) is 15.2% compared to the Base Case.

1.3 Section 61 Findings

At the completion of construction, the Proponent will provide a certification to the MEPA Office, signed by an appropriate professional. The certification will identify either of the following: 1) all of the energy efficiency mitigation measures adopted by the Project as part of the Mitigation Alternative have been implemented; or 2) an equivalent set of energy efficiency mitigation measures, which together are designed to achieve the same percentage reduction in CO_2 emissions as the Proposed Design, when compared to the Base Case, based on the same modeling assumptions in this report, have been adopted.

2.0 TRANSPORTATION GHG EMISSIONS

The only traffic to the project site, both for the Existing and Future Build conditions, will be one trip per day by water system operations staff.[2] The transportation portion of the GHG analysis therefore is limited to quantifying this very small emissions component, which does not increase for the Future Build condition.

For this analysis, the one daily trip is assumed to cover the distance from Route 28 in Barnstable to the project site and back, a total of 3 vehicle miles of travel. The EPA MOVES model calculated emission rate for a 25-mph vehicle speed in the future year 2031 is 371.6 grams/mile CO_2, which yields total transportation emissions of 1.1 kg/day, or 0.45 tons/year. CO_2 emissions are summarized in Table 1. The emissions listed for the Build case do not include the benefit of TDMs.

While there is no scheduled bus service near the project site, the Cape Code Regional Transit Authority (CCRTA) provides a daily app-based service called SmartDART that is door-to-door anywhere in Barnstable. We expect the following TDM measures to decrease trips to the site, and which in aggregate it is estimated[3] will reduce CO_2 transportation emissions by 2%.

- ***Nearby Food Service*** – There are two restaurants within walking distance (10 minutes) of the site along W. Main Street (Barnstable Brewing Co. and The Daily Table Diner).
- ***Transportation Coordinator*** – Information regarding CCRTA public transportation services, maps, schedules, and fare information will be posted in the WTP Building control room.

[2] Kleinfelder, July 2024.
[3] Ewing, R. "TDM , Growth Management, and the Other Four Out of Five Trips," Transportation Quarterly, Vol. 47, No. 3, 1993, pp. 343-366.

TABLE 1
MOTOR VEHICLE CO_2 EMISSIONS SUMMARY (tons/year)

2031 No-Build	2031 Build without TDMs	2031 Build with TDMs
0.45	0.45	0.44

3.0 GREENHOUSE GAS (GHG) MITIGATION ANALYSIS

The GHG Policy requires that the Proponent to identify measures to avoid, minimize, or mitigate GHG emissions. Section 3.1 presents the methodology and summary of results. Sections 3.2 through 3.5 discuss the Project's site, building design, infeasible efficiency measures, and additional energy efficiency measures.

3.1 Methodology and Results

A greenhouse gas (GHG) emissions analysis was performed for a proposed 4.03 million gallon per day (mgd) drinking water treatment plant (WTP) at 228 Straightway and associated improvements at 132 Smith Street in Barnstable, MA. Four new buildings will be constructed: a 10,660-sf WTP building housing most process equipment, a 2,220-sf structure to enclose the existing outdoor granulated activated carbon (GAC) filters, a 710-sf building for the Hyannisport replacement well and pump station, and a 217-sf building for the Simmons Pond replacement well and pump station.

An important EEM for this Project is high-efficiency process equipment. Studies by the Water Research Foundation, EPRI and the American Council for an Energy Efficient Economy estimate energy efficiency design in a water supply and treatment plant can reduce electrical consumption by 10% to 30% for individual pieces of equipment.[4,5] For this analysis, we have assumed an overall 15% reduction in process electricity use for the following Design Best Practices that are included in the Straightway Water Treatment Plant design:

- Correctly sized pumps and motors to meet anticipated loads.
- High efficiency electric motors for all pumps with Variable Frequency Drive (VFD) and SCADA control to ensure electrical use is reduced with demand.
- SCADA System. The plant will connect to the Town's existing SCADA system to remotely monitor the Plant VFDs, analyzers, pressure transmitters, level instruments, and flow meters to provide complete process control and minimize electricity use.
- Recycling of decanted backwash waste reduces the volume of process wastewater, which in turn reduces the amount of water that needs to be pumped from the wells.

[4] Water Research Foundation and Electric Power Research Institute, "Electricity Use and Management in the Municipal Water Supply and Wastewater Industries," Palo Alto, CA, November 2013.
[5] ACEEE, "Energy Efficiency Opportunities in Municipal Water and Wastewater Treatment Facilities," http://aceee.org/sector/local-policy/toolkit/water.

The Base Case process electrical use is assumed to be 3,227 MWh/year and the Proposed Design is 2,743 MWh/year. As explained below, approximately 8% of these totals are assumed to convert to waste heat within the process vessels/chemical containment area, and are thus included in the eQUEST model for that area: 258 MWhr/year Base Case and 219 MWhr/year Proposed Design.

The efficiency of electrical motors, pumps and compressors is less than 100% and each piece of equipment will emit waste heat into the process vessels/chemical containment area. While high-efficiency electrical motors with VFD have efficiencies listed up to 94%, that number refers only to operation at 100% load and most motors are designed to operate at 75% to 80% load the majority of the time. Data of wire-to-shaft efficiencies for high-efficiency motors with VFD reveal overall motor efficiency, as operated, is in the 90% range,[6] representing 10% loss as waste heat at the electric motor. For this GHG analysis, we assumed combined energy losses of 8% of the process electricity converting to waste heat within the process vessels/chemical containment area.

The GHG Policy requires a project to quantify carbon dioxide (CO_2) emissions and identify measures to avoid, minimize or mitigate such emissions, quantifying the effect of proposed mitigation in terms of energy savings and emissions reduction. The GHG Policy requires quantification of GHG emissions from three sources: direct emissions from on-site stationary sources, indirect emissions from energy generated off-site (electricity), and traffic generated by the Project. The Project's GHG emissions will include: 1) indirect emissions of CO_2 from electricity generated off-site and used on-site for lighting, ventilation, the ASHP in the control room/laboratory area, electric unit heaters in the electrical/mechanical area and the operation of process equipment; and 2) transportation emissions of CO_2 from Project traffic.

The Town of Barnstable has not adopted the Stretch Code. The GHG Policy requires a project to quantify CO_2 emissions and identify measures to avoid, minimize or mitigate such emissions, quantifying the effect in terms of energy savings and emissions reduction. CO_2 emissions were quantified for: (1) the Base Case corresponding to the 10th Edition of the Massachusetts Building Code that includes the 2021 IECC Commercial Code with non-stretch code Massachusetts amendments, and (2) the Proposed Design, which includes all energy saving measures.

[6] Crowley, T. and Hart, V., "Maximizing Efficiency of Pump Stations for Water and Wastewater Systems," presented to the Southwestern American Water Works Association, October 14, 2014.

This analysis used the eQUEST energy design software (version 3.65.7175), which incorporates the U.S. Department of Energy's DOE-2 building energy use model, and a CO_2 emission rate of 658 lb/MWhr.[7] The eQUEST model inputs are summarized in Tables 4 and 5. The WTP Building was modeled in two parts because of the different heating and cooling design for the control room/bathroom/janitor closet area compared to the other spaces in that building.

Energy use and CO_2 emissions are detailed in Tables 2A through 2G in Section 3.3, and the eQUEST model output is provided in Appendix A. CO_2 emissions produced by project motor vehicle trips were calculated using the EPA MOVES model. Table 3 summarizes total CO_2 emissions for the Base Case, and the Proposed Design (includes all energy saving measures). The eQUEST model input files have been provided to the Massachusetts Department of Energy Resources (DOER).

The Proponent commits to the CO_2 reduction presented below, but retains the flexibility to achieve this goal using energy efficiency measures that may be refined at the stage of detailed design. Table 3 reveals that the Proposed Design will reduce CO_2 emissions (for stationary sources) by 15.2% compared to the Base Case. As discussed in Section 2.0, Transportation Demand Management (TDM) measures for this project will reduce Project-related motor vehicle CO_2 emissions by 2%. The net reduction of the Project's total CO_2 emissions (stationary sources plus transportation) is 15.2% compared to the Base Case.

[7] ISO New England Inc., 2021 ISO-NE Electric Generator Air Emissions, Annual Emission Rate, November 17, 2022.

TABLE 2A

ENERGY AND CO_2 MODELING - STRAIGHTWAY WATER TREATMENT PLANT (SWTP) BUILDING

Effects of Individual Mitigation Measures

Mitigation Measures - eQUEST Model Run	GLA (sf)	Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (MMBtu/yr)	Gas Change (%)	Gas Heat CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Change (%)
Base Case	10,660	298.95		0.00		0.00	98.35	98.35	
Lower Window Glass Area		296.77	-0.7%	0.00	0.0%	0.00	97.64	97.64	-0.7%
Higher Efficiency Process Equipment		264.71	-11.5%	0.00	0.0%	0.00	87.09	87.09	-11.5%
Lower Light Power Density		285.64	-4.5%	0.00	0.0%	0.00	93.98	93.98	-4.5%
Proposed Design - All Mitigation Measures		250.88	-16.1%	0.00	0.0%	0.00	82.54	82.54	-16.1%

Note: 8% of process electrical use is included in the eQUEST model as internal heat load (waste heat from equipment). The remaining 92% is listed in Table 2E below. The 30-kW PV system will produce 25.7 MWh/year of electricity, and this is included in both the Base Case and Proposed Design totals in this table as a reduction in demand.

TABLE 2B

ENERGY AND CO_2 MODELING - GAC FILTER BUILDING

Effects of Individual Mitigation Measures

Mitigation Measures - eQUEST Model Run	GLA (sf)	Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (MMBtu/yr)	Gas Change (%)	Gas Heat CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Change (%)
Base Case	2,220	23.92		0.00		0.00	7.87	7.87	
Lower Window Glass Area		23.96	0.2%	0.00	0.0%	0.00	7.88	7.88	0.2%
Lower Light Power Density		21.74	-9.1%	0.00	0.0%	0.00	7.15	7.15	-9.1%
Proposed Design - All Mitigation Measures		21.95	-8.2%	0.00	0.0%	0.00	7.22	7.22	-8.2%

TABLE 2C

ENERGY AND CO_2 MODELING - HYANNISPORT PUMP BUILDING

Effects of Individual Mitigation Measures

Mitigation Measures - eQUEST Model Run	GLA (sf)	Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (MMBtu/yr)	Gas Change (%)	Gas Heat CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Change (%)
Base Case	710	5.65		0.00		0.00	1.86	1.86	
Lower Window Glass Area		5.51	-2.5%	0.00	0.0%	0.00	1.81	1.81	-2.5%
Lower Light Power Density		4.52	-20.1%	0.00	0.0%	0.00	1.49	1.49	-20.1%
Proposed Design - All Mitigation Measures		4.42	-21.8%	0.00	0.0%	0.00	1.45	1.45	-21.8%

TABLE 2D

ENERGY AND CO_2 MODELING - SIMMONS POND PUMP BUILDING

Effects of Individual Mitigation Measures

Mitigation Measures - eQUEST Model Run	GLA (sf)	Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (MMBtu/yr)	Gas Change (%)	Gas Heat CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Change (%)
Base Case	217	2.38		0.00	0.0%	0.00	0.78	0.78	
Lower Window Glass Area		2.25	-5.4%	0.00	0.0%	0.00	0.74	0.74	-5.4%
Lower Light Power Density		2.03	-14.7%	0.00	0.0%	0.00	0.67	0.67	-14.7%
Proposed Design - All Mitigation Measures		1.92	-19.3%	0.00	0.0%	0.00	0.63	0.63	-19.3%

TABLE 2E

ENERGY AND CO_2 MODELING - SWTP PROCESS EQUIPMENT

Mitigation Measures - eQUEST Model Run	GLA (sf)	Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (MMBtu/yr)	Gas Change (%)	Gas Heat CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Change (%)
Base Case		2,969.00		0.00		0.00	976.80	976.80	
Proposed Design - Higher Efficiency Process Equipment		2,524.00	-15.0%	0.00	0.0%	0.00	830.40	830.40	-15.0%

TABLE 2F

ENERGY AND CO_2 MODELING -STRAIGHTWAY WATER TREATMENT PLANT

Outdoor Lighting for Parking Area and Driveway

Mitigation Measures		Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (MMBtu/yr)	Gas Change (%)	Gas Heat CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Change (%)
Base Case - Lighting Zone 2, 0.060 W/SF		19.7		0.0		0.0	6.5	6.5	
Proposed Design - LED Lights 0.035 W/SF		11.5	-41.7%	0.0	0.0%	0.0	3.8	3.8	-41.7%

TABLE 2G

ENERGY AND CO_2 MODELING -STRAIGHTWAY WATER TREATMENT PLANT

Totals for the Building, Process Equipment and Outdoor Lighting

All Buildings - Combined Mitigation	Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (MMBtu/yr)	Gas Change (%)	Gas Heat CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Change (%)
Base Case	3,319.6		0.0		0.0	1,092.2	1,092.2	
Proposed Design	2,814.7	-15.2%	0.0	0.0%	0.0	926.0	926.0	-15.2%

TABLE 3

GREENHOUSE GAS (CO_2) EMISSIONS SUMMARY
FOR THE BASE CASE AND PROPOSED DESIGN

(TONS/YEAR)

Source	Base Case	Proposed Design	Change in GHG Emissions
Direct Emissions	0.0	0.0	--
Indirect Emissions	1,092.2	926.0	-15.2%
Subtotal Direct and Indirect Emissions	1,092.2	926.0	-15.2%
Transportation Emissions	0.45	0.44	-2.0%
Total CO_2 Emissions	1,092.7	926.4	-15.2%

3.2 Site Design Mitigation Measures

The Project will adopt all reasonable and feasible site design mitigation measures. The Project is committed to the following mitigation measures:

- ***Sustainable Development*** – The Project will be constructed on Town land already used for the public water supply.

- ***No Water Used for Landscaping*** – Any landscaping at this industrial site will use drought-resistant plants that do not require a watering system.

- ***Best Practices for Stormwater Design*** –The storm management system will utilize Best Management Practices (BMP).

3.3 Building Design and Operation Mitigation Measures

The eQUEST model inputs are given in Tables 4 and 5. The Project, as proposed, incorporates the following building energy efficiency measures.

- ***Energy Efficient Building Envelope –*** The four buildings have pitched roofs with attic and wall insulation that meets Code. The WTP Building and GAC Filter Building have attic insulation of U=0.021. Their steel-framed walls with R13+R10ci insulation meets Code of U=0.055. The small Hyannisport and Simmons Pond Pump Buildings have concrete walls and qualify for the C402.1.2 Equipment building exemption with minimal heating to 50F. The two pump buildings have attic insulation of U=0.19 and exterior wall rigid foam insulation to achieve U=0.19.

  Vertical fenestration as a percentage of wall area will be only 3.3% in the WTP Building, 3.4% in the GAC Filter Building, 1% in the Hyannisport Pump Building, and 0% in the Simmons Pond Pump Building.

- ***Space Heating and Cooling*** – The control room/bathroom/janitor closet area in the WTP Building will have a 1.5-ton ASHP for space heating and cooling, and the remainder of the industrial space in the WTP building will be heated (no cooling) with electric coil unit heaters to 55F. The GAC Filter Building will be heated (no cooling) with electric coil unit heaters to 55F. The two pump buildings will have 2-ton split-system ASHPs for heating to 50F.

  SAR Engineering states it will consider ASHP units with efficiencies 10% better than Code in the final MEP design, but because public funding is being used for this municipal facility, SAR must first confirm that at least three manufacturers provide equipment with the desired performance rating.

- ***Hot Water Heaters*** – The bathrooms in the WTP Building and Hyannisport Pump Building will each have a small electric storage tank water heater to supply domestic hot water.

- ***High Efficiency Process Equipment with SCADA System*** – As described in Section 1.1, Best Design Practices have been used to specify equipment that will use 15% less electricity than standard designs. For this analysis, process electricity use is 3,227 MWh/yr (Base Case) and 2,743 MWh/yr (Proposed Design). Eight percent of these amounts are included in the eQUEST model as plug load for the process vessels/chemical containment area to represent waste heat from the equipment. The other 92% of the process electricity amounts are added as an external electricity demand in the analysis. The total process electricity use is reflected in Table 2E totals.

- ***Energy Efficient Interior Lighting*** – High-efficiency LED fixtures will be used to reduce interior light power density (LPD) below maximum values set by the Code.

- ***Energy Efficient Exterior Lighting*** – Energy efficient LED fixtures will be used to light the parking lot and access driveway.

- ***Water Conserving Fixtures*** – The two bathrooms will have low-flow fixtures.

- ***Use Building Materials with Recycled Content, Building Materials that are manufactured in the Region, Use Rapidly Renewable Building Materials, and Use Low-VOC Building Materials*** – Whenever practical, the Project will use environmentally friendly building materials, rapidly renewable building materials, and low-VOC materials. Also, when practical, the Project will purchase building materials that are manufactured within the region.

TABLE 4A
SUMMARY OF MODELING ASSUMPTIONS FOR THE
WATER TREATMENT PLANT BUILDING

Energy Efficiency Measure (EEM)	Base Case (Code) [1]	Proposed Design
Building Envelope (Steel-Framed)	Roof U=0.021 Wall Assembly U = 0.055	Same as Base Case
Vertical Fenestration (Fixed Units)	U ≤ 0.30, SHGC ≤ 0.38 DOE Type 2667	Same as Base Case
Fenestration Area	30%	3.3%
Air Infiltration Rate (cfm/sf wall @ 75 PA)	0.40	Same as Base Case
Heat for Process Areas (no cooling)	Electric Coil Unit Heaters	Same as Base Case
Heat / Cooling for Control Room Area 1.5-ton ASHP	HSPF2 7.5 (HSPF 8.8) SEER2 14.3 (SEER 15.1)	Same as Base Case[2]
Hot Water Heater	Electric, Storage Tank	Same as Base Case
Light Power Density (W/SF)	0.74 [3]	0.40
Electric Plug Load (W/SF) [4]	Process Area 7.7 Other Areas 0.25	Process Area 6.5 Other Areas 0.25
Parking Lots Lighting Zone 2	60 W/1,000 SF	LED 35 W/1,000 SF

[1] IECC 2021 Commercial Code with Mass. Amendments.

[2] SAR Engineering states it will consider ASHP units with efficiencies 10% better than Code in the final MEP design, but because public funding is being used for this municipal facility, SAR must confirm that at least three manufacturers provide equipment with the desired performance rating.

[3] Section C405.3.2.1 Building Area Method. Since Water Treatment Plant is not a listed area type, the building area type most closely resembling it is used, Manufacturing 0.82 W/sf. Section C406.3 reduces this by 10% to 0.74 W/sf for C406.1 compliance.

[4] Equipment waste heat in the process vessels/chemical containment area of 258 MWh/yr (Base Case) and 219 MWh/yr (Proposed Design) is simulated by plug loads of 7.7 W/sf and 6.5 W/sf, respectively.

TABLE 4B
SUMMARY OF MODELING ASSUMPTIONS FOR THE
GAC FILTER BUILDING

Energy Efficiency Measure (EEM)	Base Case (Code) [1]	Proposed Design
Building Envelope (Steel-Framed)	Roof U=0.021 Wall Assembly U = 0.055	Same as Base Case
Vertical Fenestration (Fixed Units)	U ≤ 0.30, SHGC ≤ 0.38 DOE Type 2667	Same as Base Case
Fenestration Area	30%	3.43%
Air Infiltration Rate (cfm/sf wall @ 75 PA)	0.40	Same as Base Case
Space Heating (no cooling)	Electric Coil Unit Heaters	Same as Base Case
Light Power Density (W/SF)	0.74 [2]	0.40
Electric Plug Load (W/SF)	0.25	Same as Base Case
Parking Lots Lighting Zone 2	60 W/1,000 SF	LED 35 W/1,000 SF

[1] IECC 2021 Commercial Code with Mass. Amendments.
[2] Section C405.3.2.1 Building Area Method. Since Water Treatment Plant is not a listed area type, the building area type most closely resembling it is used, Manufacturing 0.82 W/sf. Section C406.3 reduces this by 10% to 0.74 W/sf for C406.1 compliance.

TABLE 4C
SUMMARY OF MODELING ASSUMPTIONS FOR THE
HYANNISPORT AND SIMMONS PUMP BUILDINGS

Energy Efficiency Measure (EEM)	Base Case (Code) [1]	Proposed Design
Building Envelope (Mass Walls)	Roof U=0.19 Wall Assembly U = 0.19	Same as Base Case
Vertical Fenestration (Fixed Units)	U ≤ 0.30, SHGC ≤ 0.38 DOE Type 2667	Same as Base Case
Fenestration Area	30%	1% Hyannisport 0% Simmons Pond
Air Infiltration Rate (cfm/sf wall @ 75 PA)	0. 40	Same as Base Case
Space Heating 2-ton ASHP	HSPF2 7.5 (HSPF 8.8) SEER2 14.3 (SEER 15.1)	Same as Base Case[2]
Hot Water Heater in Hyannisport Building	Electric, Storage Tank	Same as Base Case
Light Power Density (W/SF)	0.74 [3]	0.40
Parking Lots Lighting Zone 2	60 W/1,000 SF	LED 35 W/1,000 SF

[1] IECC 2021 Commercial Code with Mass. Amendments, and C402.1.2 Equipment building exemption..

[2] SAR Engineering states it will consider ASHP units with efficiencies 10% better than Code in the final MEP design, but because public funding is being used for this municipal facility, SAR must confirm that at least three manufacturers provide equipment with the desired performance rating.

[3] Section C405.3.2.1 Building Area Method. Since Water Treatment Plant is not a listed area type, the building area type most closely resembling it is used, Manufacturing 0.82 W/sf. Section C406.3 reduces this by 10% to 0.74 W/sf for C406.1 compliance.

TABLE 5
AGGREGATE U VALUES FOR BUILDING WALLS

Building Name	Reference Building	Proposed Design	Improvement in U-Value
Water Treatment Plant Building	70% (U=0.055 wall) + 30% (U=0.30 glass) = U = 0.1285	96.7% (U=0.055 wall) + 3.3% (U=0.30 glass) = U = 0.0631	50%
GAC Filter Building	70% (U=0.055 wall) + 30% (U=0.30 glass) = U = 0.1285	96.6% (U=0.055 wall) + 3.4% (U=0.30 glass) = U = 0.0633	50%
Hyannisport Pump Building	70% (U=0.19 wall) + 30% (U=0.30 glass) = U = 0.2230	99% (U=0.19 wall) + 1% (U=0.30 glass) = U = 0.1911	14%
Simmons Pond Pump Building	70% (U=0.19 wall) + 30% (U=0.30 glass) = U = 0.2230	100% (U=0.19 wall) + 0% (U=0.30 glass) = U = 0.1900	15%

3.4 Infeasible Efficiency Measures

Other building design and operation mitigation measures were considered for the Project, but were rejected because they are either technically/financially infeasible or inappropriate for the Project:

- ***Reduce Energy Demand by Using Peak Shaving or Load Shifting Strategies*** – These measures are not appropriate for buildings that must use power during peak periods.

- ***Construct Green Roof*** -- The proponent does not consider it economically feasible to construct and maintain a green roof. Green roofs, which consist of layers of gravel, soil and vegetation atop a rubberized waterproof membrane, are expensive to install and maintain. They typically require a steel-reinforced concrete roof that can support a dead weight of 35 lb/sf and the installation cost exclusive of roof redesign is $40/sf.[8] While green roof technology has the potential to improve stormwater management, the significant additional cost ($0.3 million for the Project) related to the required engineering, construction and installation of the green roof is not economically feasible.

3.5 Additional Energy Mitigation Measures

3.5.1 Analysis of a Second Photovoltaic (PV) System

The four buildings have pitched roofs. The project plans to install a 25-kW PV system on the WTP Building roof. Alternatively, the PV system may be ground-based on the site. The proposed 25-kW PV system will occupy approximately 2,500 sf of roof area and will generate 29 MWh/year of electricity.

The total roof area is approximated by the sum of the building footprints times a pitched-roof factor of 1.2, which is 16,630 sf, and 40% of that area, or 6,650 sf, will be made PV-ready. The remaining PV-ready roof space, after installation of the 25-kW system, is approximately 4,150 sf and could support a second PV system with a capacity of 41 kW. This feasibility analysis examines a second rooftop PV system with a design capacity of 41 kW and generating 48 MWh/year of electricity. The average installed cost for a 35- to 90-kW size installation starting commercial operation in 2016-2018 was $3.50/W.

[8] Oberndorfer, Erica, et al., "Green Roofs as Urban Ecosystems: Ecological Structures, Functions and Services," BioScience, Vol. 57, No. 10, November 2007.

DOER replaced SREC-II incentives with the Solar Massachusetts Renewable Target (SMART) Program. Under the new SMART program, a stand-alone rooftop solar system may be built and operated without net-metering, and a 20-year fixed price is set. For Eversource, Block 9 projects in the 25-100 kW range would receive a Compensation Rate of 0.18779/kWh. The generation of 48 MWh/year of electricity equates to 16 tons per year in reduced GHG emissions, an amount that is 1.7% of the Proposed Design CO_2 emissions (see Table 3).

The economics of an additional PV installation were calculated using the EEA 2015 Revised SREC II Financial Model (model output is in Appendix B), with the following assumptions:

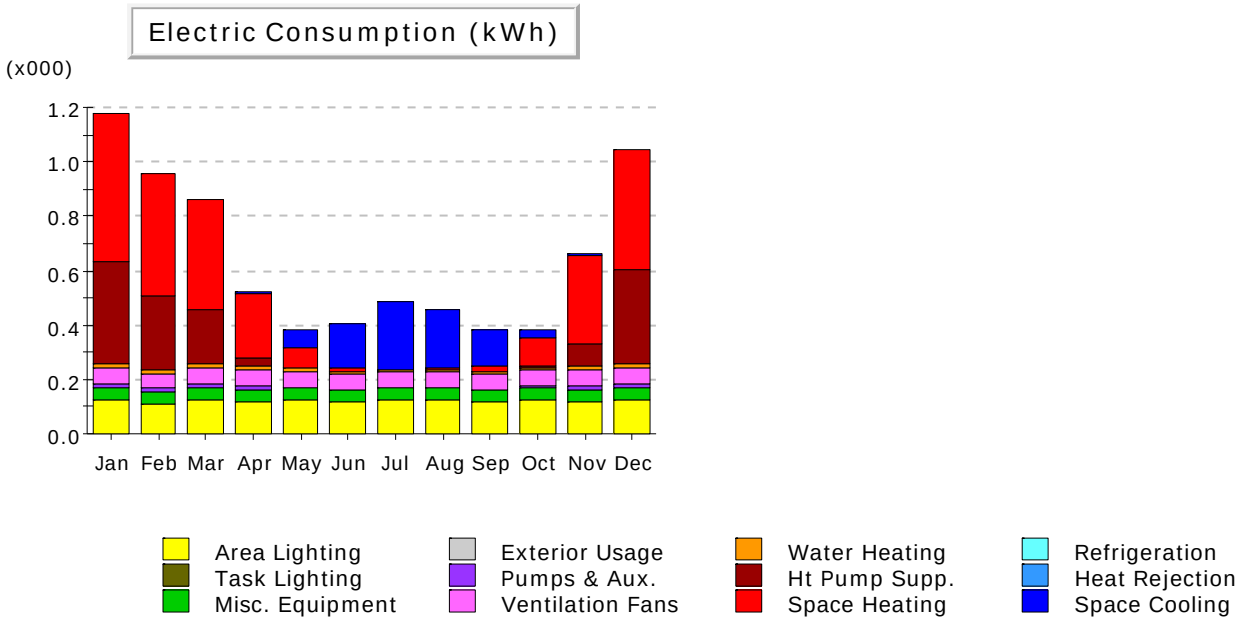
- PV system size of 41 kW
- System cost of $3.50/Watt
- Annual capacity factor of 13.6% (Mass., flush mounted on roof)
- 20-year fixed, capacity-based rate of $0.18779/kWh
- An inverter replacement cost of $0.50/W

The calculations assume a reasonable customer discount rate of 6%, federal tax credits and state tax deductions. The calculated Net Present Value of the PV system -$6,239 for an additional 41-kW system. The Simple Payback Period is 13 years. Based on market research, almost 90 percent of strong prospects would consider a payback of 4 years, but acceptance begins to drop rapidly once paybacks reach 5 years.[9] The NPV is negative, suggesting an additional 41-kW PV system for the building roofs may not be cost feasible. The project plans to install a 25-kW PV system and commits to having 40% of the pitched roof surfaces PV-ready.

[9] *Assessment of California CHP Market and Policy Options for Increased Penetration*, Final Report, Co-sponsors Public Interest Energy Research Program (PIER) and California Energy Commission, July 2005.

APPENDIX A

EQUEST MODEL OUTPUT

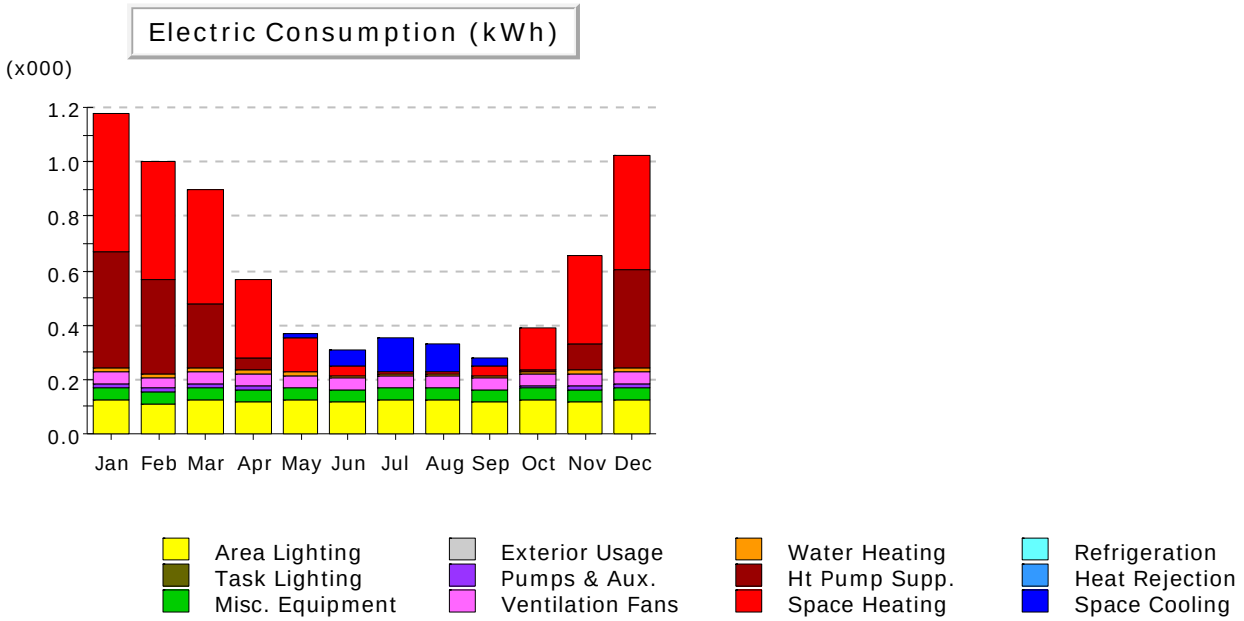


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.00	0.01	0.07	0.16	0.25	0.22	0.13	0.03	0.00	-	0.86
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	0.54	0.45	0.40	0.24	0.08	0.01	0.00	0.00	0.02	0.10	0.33	0.44	2.62
HP Supp.	0.38	0.28	0.20	0.03	0.00	-	-	-	-	0.00	0.09	0.35	1.32
Hot Water	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.15
Vent. Fans	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.68
Pumps & Aux.	0.02	0.02	0.02	0.02	0.00	-	-	-	0.00	0.01	0.02	0.02	0.12
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.51
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.12	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	1.46
Total	1.18	0.96	0.86	0.52	0.39	0.40	0.49	0.46	0.38	0.38	0.66	1.05	7.73

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

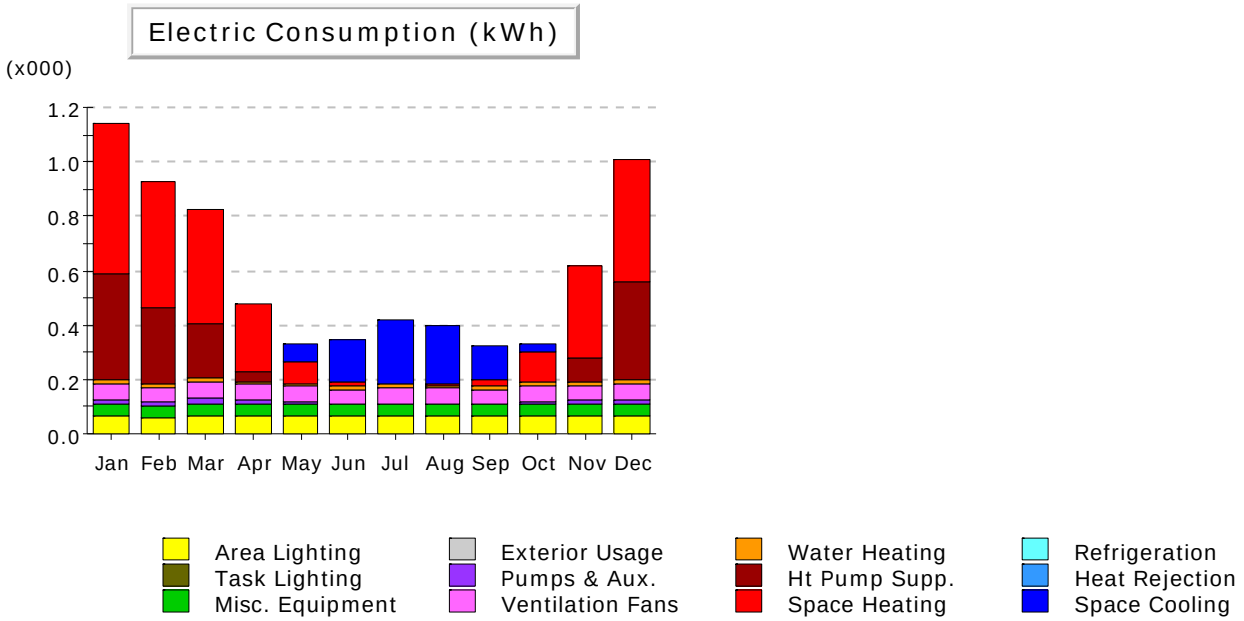


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	0.01	0.06	0.12	0.10	0.03	0.00	-	-	0.33
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	0.50	0.44	0.42	0.28	0.12	0.03	0.00	0.01	0.03	0.16	0.33	0.42	2.74
HP Supp.	0.43	0.34	0.24	0.05	0.00	-	-	-	-	0.00	0.10	0.36	1.52
Hot Water	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.15
Vent. Fans	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.52
Pumps & Aux.	0.02	0.02	0.02	0.02	0.00	-	-	-	0.00	0.01	0.02	0.02	0.11
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.51
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.12	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	1.46
Total	1.17	1.00	0.90	0.57	0.37	0.31	0.35	0.33	0.28	0.39	0.66	1.02	7.34

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

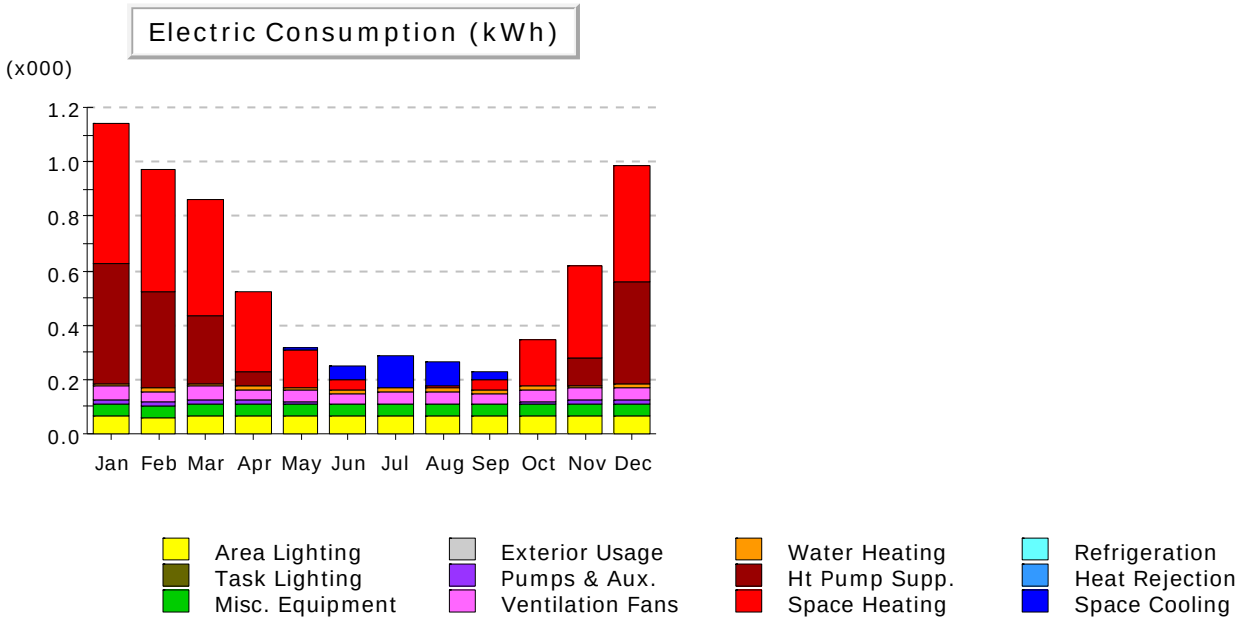


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.00	0.00	0.06	0.15	0.24	0.21	0.12	0.03	0.00	-	0.82
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	0.55	0.46	0.41	0.25	0.08	0.01	0.00	0.01	0.02	0.11	0.34	0.45	2.70
HP Supp.	0.39	0.28	0.21	0.03	0.00	-	-	-	-	0.00	0.09	0.36	1.36
Hot Water	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.15
Vent. Fans	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.69
Pumps & Aux.	0.02	0.02	0.02	0.02	0.00	-	-	-	0.00	0.01	0.02	0.02	0.12
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.51
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.07	0.06	0.07	0.06	0.07	0.06	0.07	0.07	0.06	0.07	0.06	0.07	0.79
Total	1.14	0.92	0.82	0.48	0.33	0.34	0.42	0.39	0.32	0.33	0.62	1.01	7.14

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

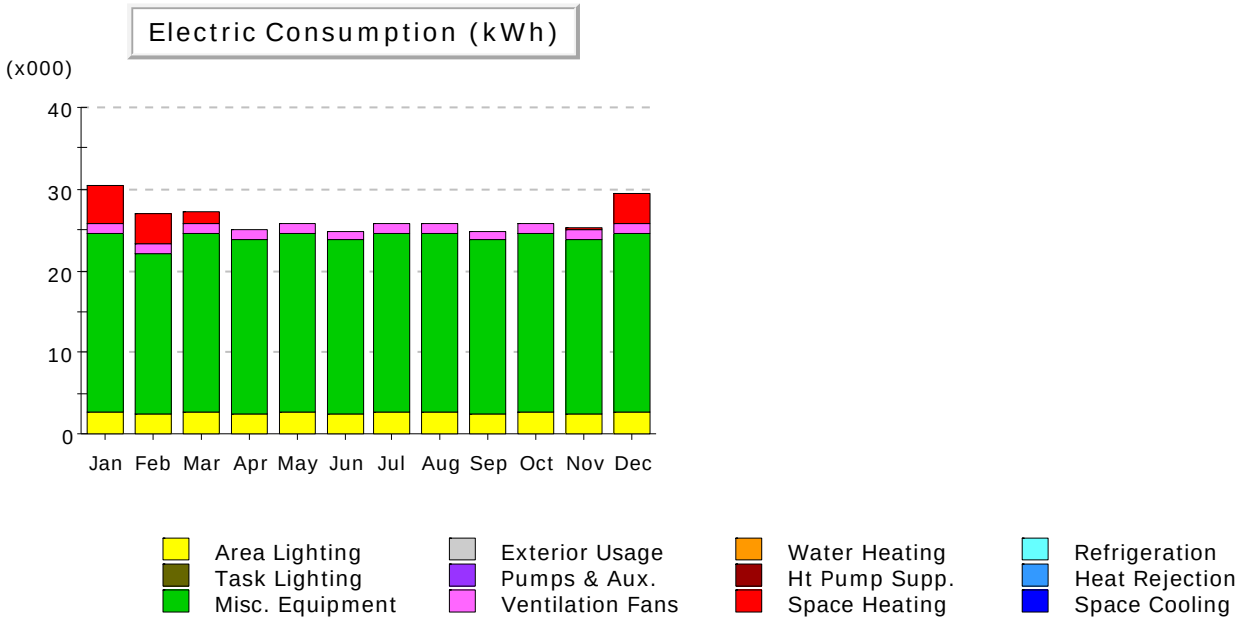


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	0.01	0.05	0.11	0.09	0.03	-	-	-	0.29
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	0.51	0.44	0.43	0.29	0.13	0.04	0.00	0.01	0.04	0.17	0.34	0.43	2.84
HP Supp.	0.44	0.35	0.25	0.05	0.00	-	-	-	-	0.00	0.10	0.37	1.57
Hot Water	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.15
Vent. Fans	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.52
Pumps & Aux.	0.02	0.02	0.02	0.02	0.00	-	-	-	0.00	0.01	0.02	0.02	0.11
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.51
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.07	0.06	0.07	0.06	0.07	0.06	0.07	0.07	0.06	0.07	0.06	0.07	0.79
Total	1.14	0.97	0.86	0.52	0.32	0.25	0.28	0.27	0.23	0.35	0.62	0.98	6.79

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

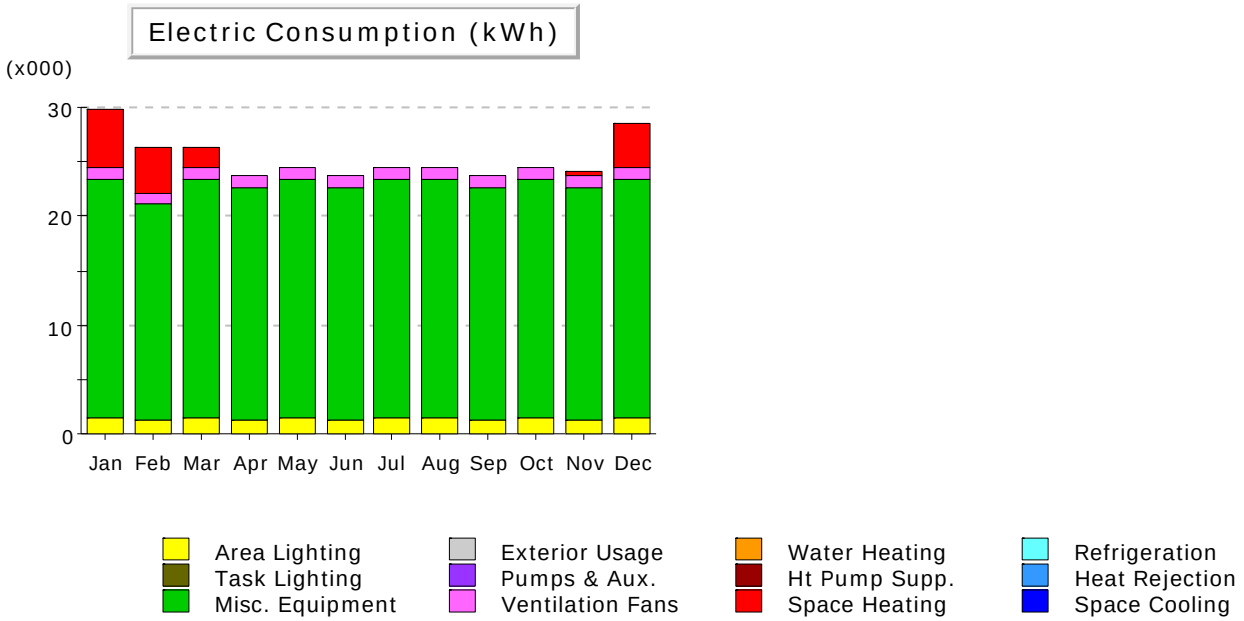


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	4.72	3.64	1.45	0.10	-	-	-	-	-	-	0.35	3.58	13.84
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	1.17	1.06	1.17	1.13	1.17	1.13	1.17	1.17	1.13	1.17	1.13	1.17	13.81
Pumps & Aux.	0.04	0.03	0.03	0.03	0.01	-	-	-	0.00	0.01	0.03	0.03	0.22
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	21.91	19.79	21.91	21.21	21.91	21.21	21.91	21.91	21.21	21.91	21.21	21.91	258.00
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	2.64	2.38	2.64	2.55	2.64	2.55	2.64	2.64	2.55	2.64	2.55	2.64	31.06
Total	30.48	26.90	27.21	25.02	25.73	24.89	25.72	25.72	24.89	25.73	25.28	29.34	316.92

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

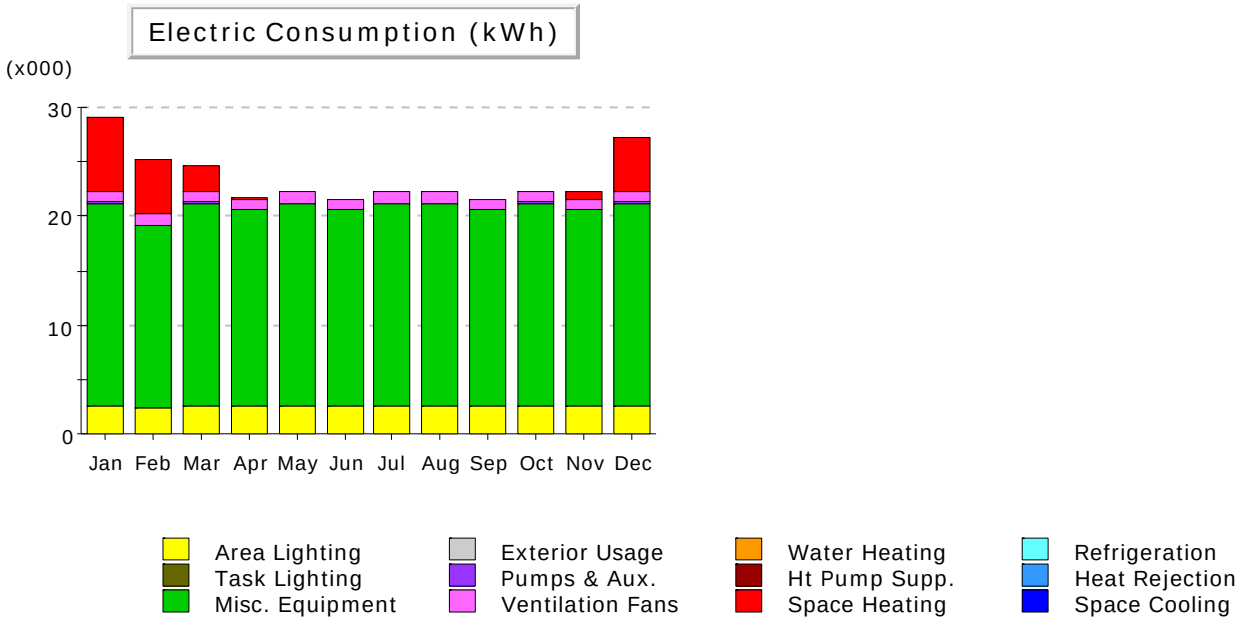


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	5.38	4.12	1.72	0.12	-	-	-	-	-	-	0.48	3.98	15.80
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	1.14	1.03	1.14	1.10	1.14	1.10	1.14	1.14	1.10	1.14	1.10	1.14	13.39
Pumps & Aux.	0.04	0.03	0.03	0.03	0.01	-	-	-	0.00	0.01	0.03	0.03	0.22
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	21.91	19.79	21.91	21.21	21.91	21.21	21.91	21.91	21.21	21.91	21.21	21.91	258.00
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	1.43	1.29	1.43	1.38	1.43	1.38	1.43	1.43	1.38	1.43	1.38	1.43	16.79
Total	29.89	26.26	26.23	23.83	24.48	23.69	24.48	24.48	23.69	24.49	24.19	28.49	304.20

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

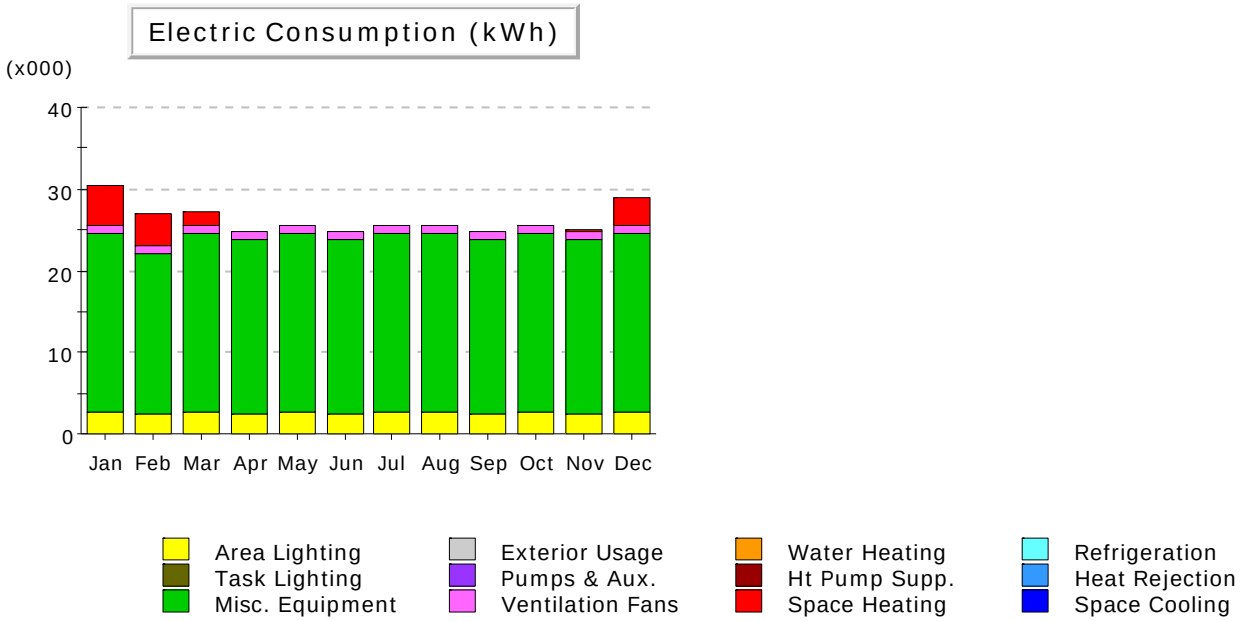


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	6.74	5.10	2.27	0.14	-	-	-	-	-	-	0.71	4.84	19.79
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	1.06	0.96	1.06	1.02	1.06	1.02	1.06	1.06	1.02	1.06	1.02	1.06	12.47
Pumps & Aux.	0.04	0.03	0.03	0.03	0.01	-	-	-	0.00	0.01	0.03	0.03	0.22
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	18.61	16.81	18.61	18.01	18.61	18.01	18.61	18.61	18.01	18.61	18.01	18.61	219.14
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	2.64	2.38	2.64	2.55	2.64	2.55	2.64	2.64	2.55	2.64	2.55	2.64	31.06
Total	29.09	25.29	24.61	21.76	22.31	21.59	22.31	22.31	21.59	22.32	22.33	27.18	282.67

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

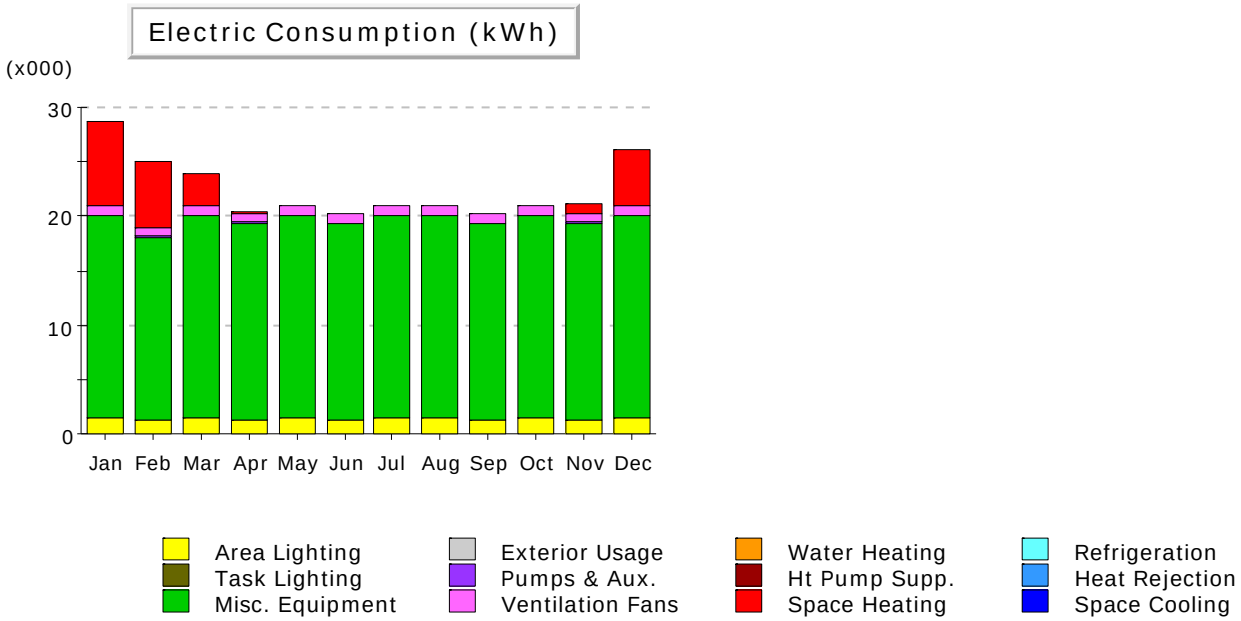


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	4.74	3.86	1.54	0.10	-	-	-	-	-	-	0.31	3.35	13.91
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	1.01	0.92	1.01	0.98	1.01	0.98	1.01	1.01	0.98	1.01	0.98	1.01	11.94
Pumps & Aux.	0.04	0.03	0.03	0.03	0.01	-	-	-	0.00	0.01	0.03	0.03	0.22
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	21.91	19.79	21.91	21.21	21.91	21.21	21.91	21.91	21.21	21.91	21.21	21.91	258.00
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	2.64	2.38	2.64	2.55	2.64	2.55	2.64	2.64	2.55	2.64	2.55	2.64	31.06
Total	30.34	26.98	27.14	24.87	25.57	24.74	25.56	25.56	24.74	25.58	25.08	28.95	315.13

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

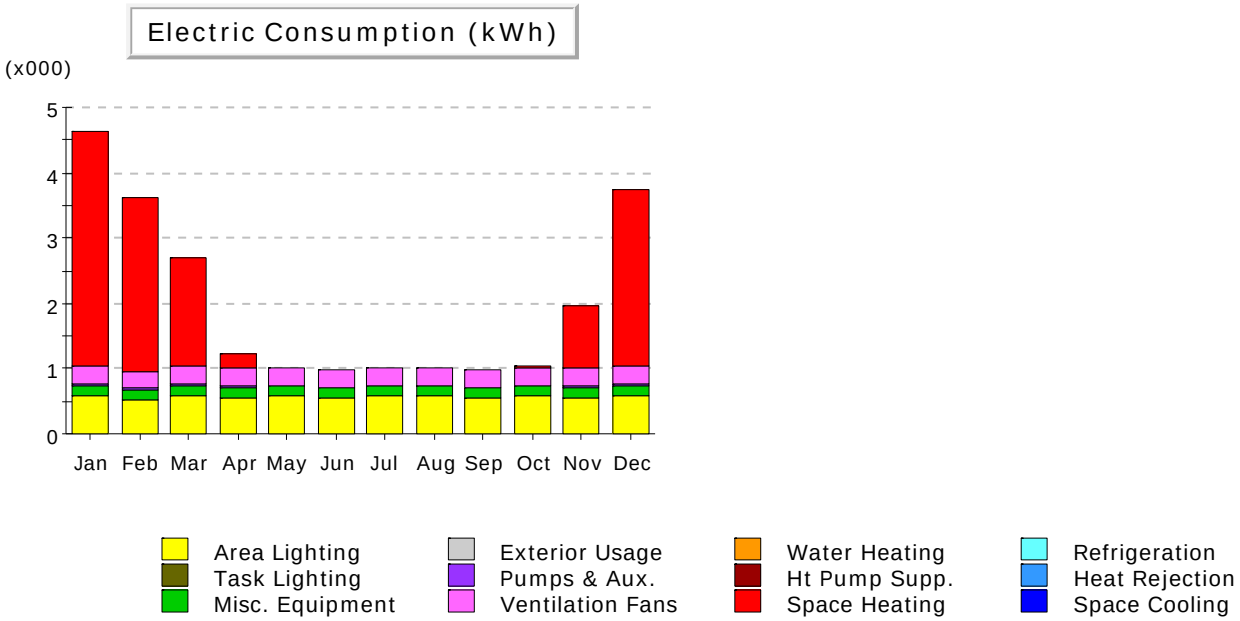


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	7.85	6.20	3.07	0.22	-	-	-	-	-	-	0.85	5.29	23.48
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.86	0.78	0.86	0.84	0.86	0.84	0.86	0.86	0.84	0.86	0.84	0.86	10.17
Pumps & Aux.	0.04	0.03	0.03	0.03	0.01	-	-	-	0.00	0.01	0.03	0.03	0.22
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	18.61	16.81	18.61	18.01	18.61	18.01	18.61	18.61	18.01	18.61	18.01	18.61	219.14
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	1.43	1.29	1.43	1.38	1.43	1.38	1.43	1.43	1.38	1.43	1.38	1.43	16.79
Total	28.79	25.11	24.00	20.48	20.91	20.23	20.90	20.90	20.23	20.91	21.11	26.22	269.79

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

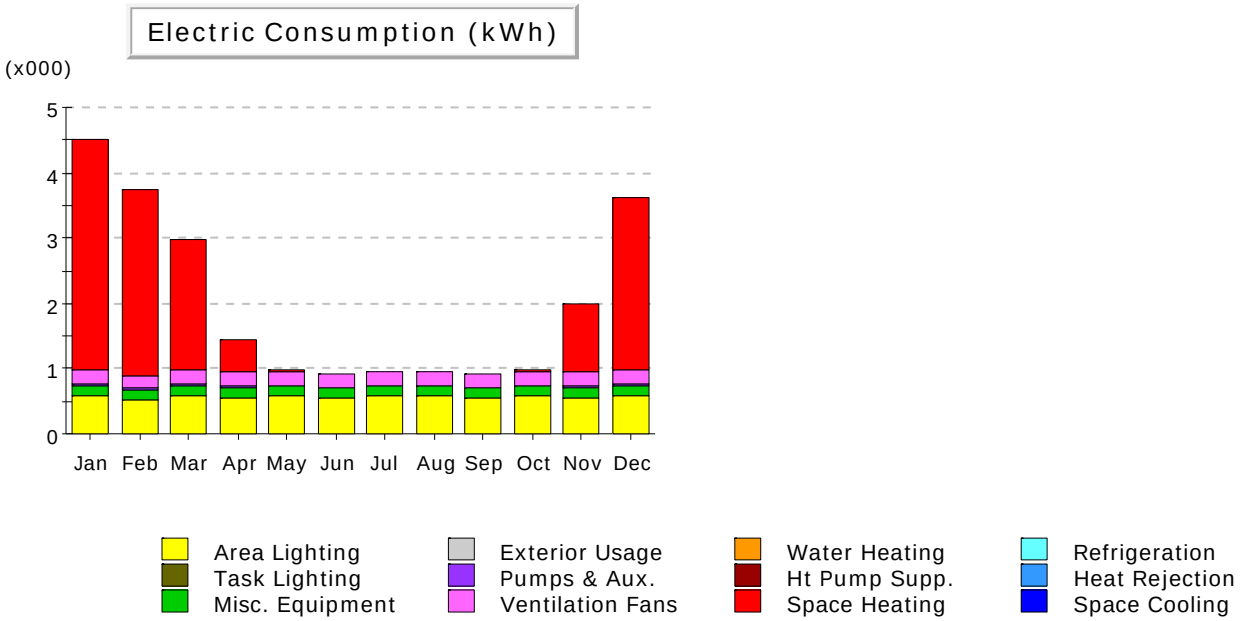


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	0.00	0.00
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	3.60	2.68	1.65	0.22	0.00	-	-	-	-	0.01	0.97	2.69	11.81
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.27	0.25	0.27	0.26	0.27	0.26	0.27	0.27	0.26	0.27	0.26	0.27	3.21
Pumps & Aux.	0.04	0.03	0.03	0.03	0.01	-	-	-	0.00	0.01	0.03	0.03	0.22
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.16	0.14	0.16	0.15	0.16	0.15	0.16	0.16	0.15	0.16	0.15	0.16	1.84
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.58	0.52	0.58	0.56	0.58	0.56	0.58	0.58	0.56	0.58	0.56	0.58	6.84
Total	4.64	3.63	2.69	1.22	1.02	0.98	1.01	1.01	0.98	1.03	1.98	3.74	23.92

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

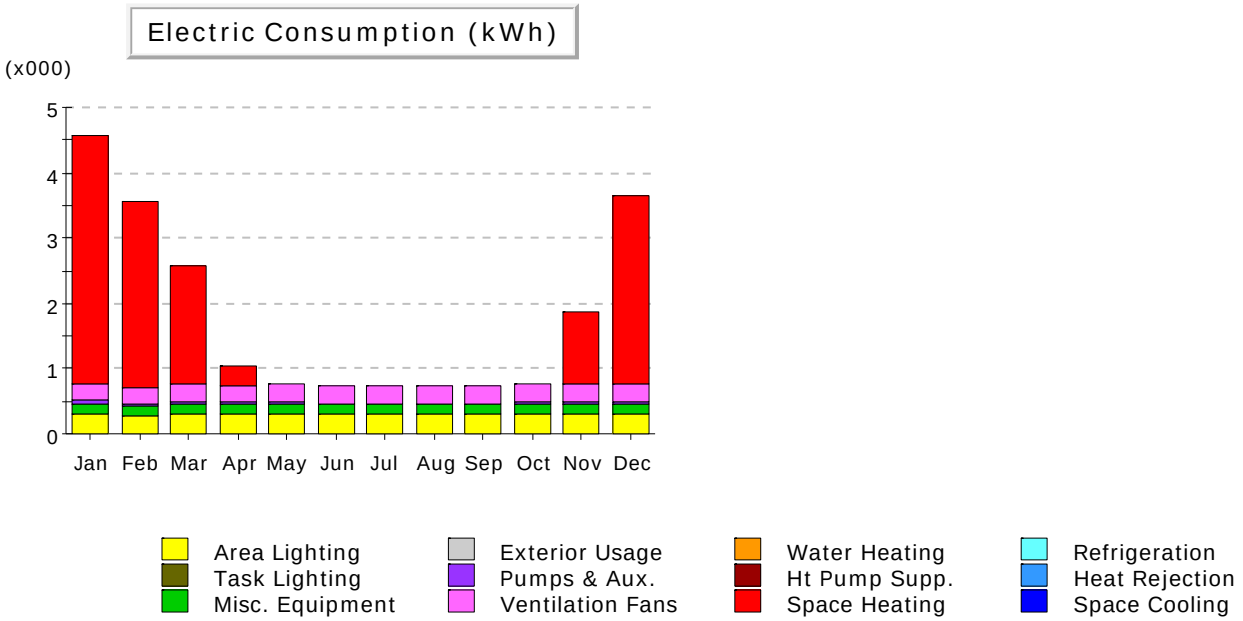


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	0.00	0.00
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	3.52	2.85	2.00	0.50	0.01	-	-	-	-	0.01	1.04	2.64	12.57
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.21	0.19	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	2.50
Pumps & Aux.	0.04	0.03	0.03	0.03	0.01	-	-	-	0.00	0.01	0.03	0.03	0.22
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.16	0.14	0.16	0.15	0.16	0.15	0.16	0.16	0.15	0.16	0.15	0.16	1.84
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.58	0.52	0.58	0.56	0.58	0.56	0.58	0.58	0.56	0.58	0.56	0.58	6.84
Total	4.51	3.74	2.98	1.44	0.97	0.92	0.95	0.95	0.92	0.97	1.99	3.62	23.96

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

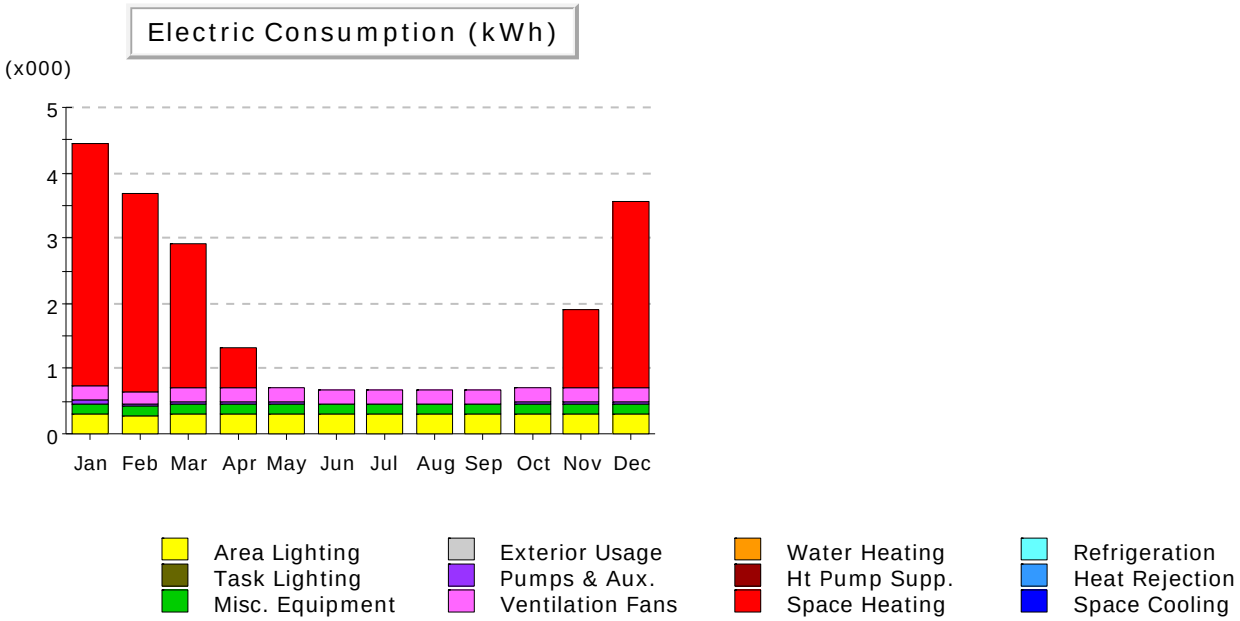


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	0.00	0.00
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	3.80	2.86	1.80	0.28	0.00	-	-	-	-	0.01	1.11	2.88	12.74
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.28	0.25	0.28	0.27	0.28	0.27	0.28	0.28	0.27	0.28	0.27	0.28	3.24
Pumps & Aux.	0.04	0.03	0.03	0.03	0.01	-	-	-	0.00	0.01	0.03	0.03	0.22
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.16	0.14	0.16	0.15	0.16	0.15	0.16	0.16	0.15	0.16	0.15	0.16	1.84
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.31	0.28	0.31	0.30	0.31	0.30	0.31	0.31	0.30	0.31	0.30	0.31	3.69
Total	4.58	3.56	2.58	1.03	0.75	0.72	0.75	0.75	0.72	0.77	1.86	3.66	21.74

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

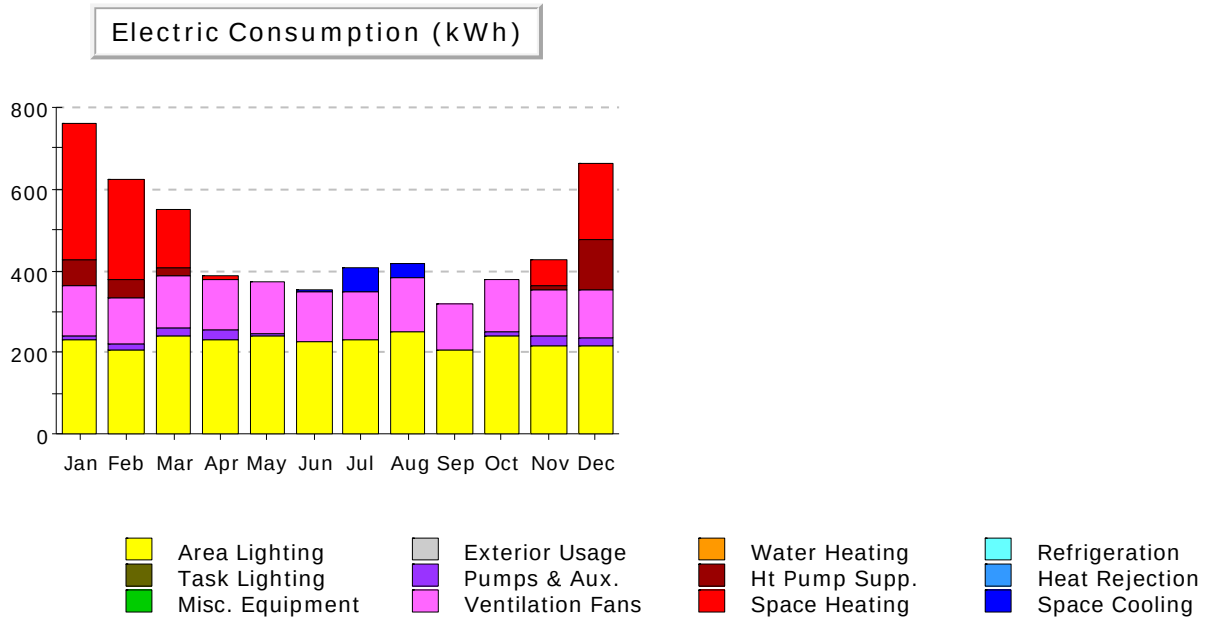


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	3.73	3.04	2.19	0.62	0.02	-	-	-	-	0.02	1.21	2.83	13.66
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.22	0.19	0.22	0.21	0.22	0.21	0.22	0.22	0.21	0.22	0.21	0.22	2.53
Pumps & Aux.	0.04	0.03	0.03	0.03	0.01	-	-	-	0.00	0.01	0.03	0.03	0.22
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.16	0.14	0.16	0.15	0.16	0.15	0.16	0.16	0.15	0.16	0.15	0.16	1.84
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.31	0.28	0.31	0.30	0.31	0.30	0.31	0.31	0.30	0.31	0.30	0.31	3.69
Total	4.45	3.69	2.91	1.32	0.71	0.66	0.69	0.69	0.66	0.72	1.90	3.55	21.95

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

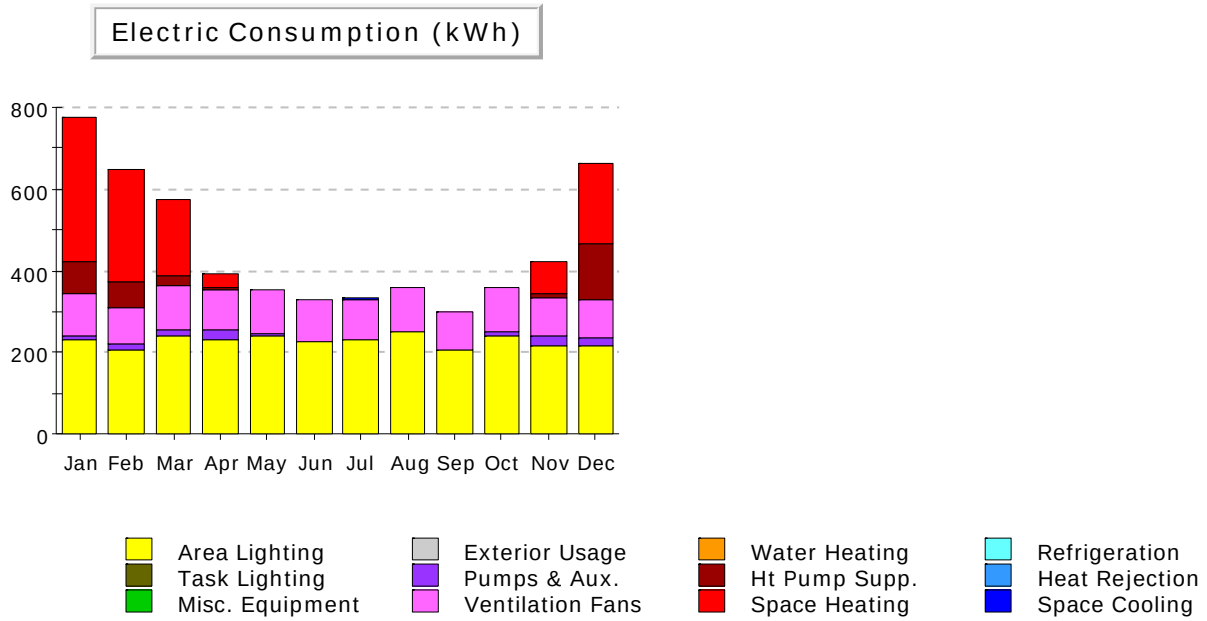


Electric Consumption (kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	6.2	55.8	33.4	3.2	-	-	-	98.6
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	334.6	244.5	142.7	10.3	-	-	-	-	-	-	64.2	181.8	978.0
HP Supp.	63.0	45.5	19.2	1.1	-	-	-	-	-	-	7.9	125.9	262.6
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	120.3	108.9	126.0	120.6	126.0	120.1	120.6	131.5	109.1	126.0	114.3	114.6	1,438.0
Pumps & Aux.	14.1	16.0	21.1	27.7	6.2	-	-	-	0.8	11.8	23.9	20.2	141.6
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	228.7	206.9	239.6	229.2	239.6	228.2	229.2	250.0	207.4	239.6	217.3	217.8	2,733.3
Total	760.7	621.8	548.6	388.8	371.8	354.4	405.5	414.9	320.5	377.4	427.6	660.2	5,652.2

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

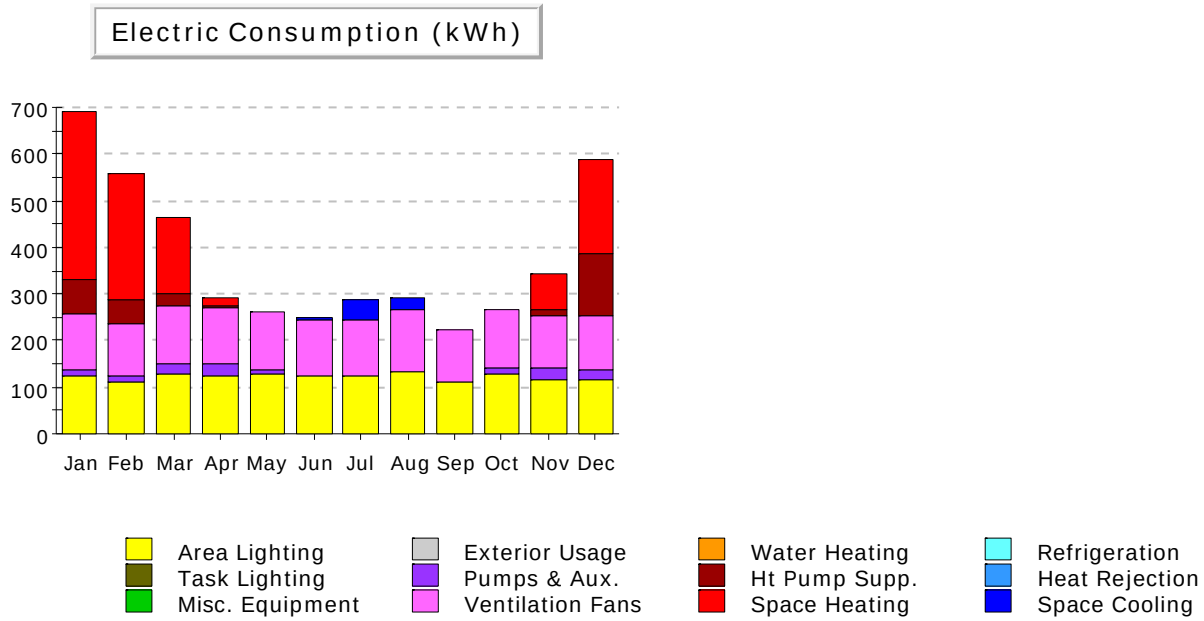


Electric Consumption (kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.0	-	-	-	-	-	2.9	-	-	-	-	-	2.9
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	354.0	278.4	187.4	34.9	-	-	-	-	-	-	79.1	198.1	1,131.9
HP Supp.	77.6	61.1	25.2	3.0	-	-	-	-	-	-	9.3	135.8	311.9
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	100.8	91.2	105.5	101.0	105.5	100.5	101.0	110.1	91.4	105.5	95.7	96.0	1,204.2
Pumps & Aux.	13.2	12.5	16.0	24.7	6.2	-	-	-	0.8	11.8	21.1	15.8	122.1
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	228.7	206.9	239.6	229.2	239.6	228.2	229.2	250.0	207.4	239.6	217.3	217.8	2,733.3
Total	774.3	650.0	573.8	392.7	351.3	328.8	333.0	360.1	299.5	356.9	422.6	663.4	5,506.3

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

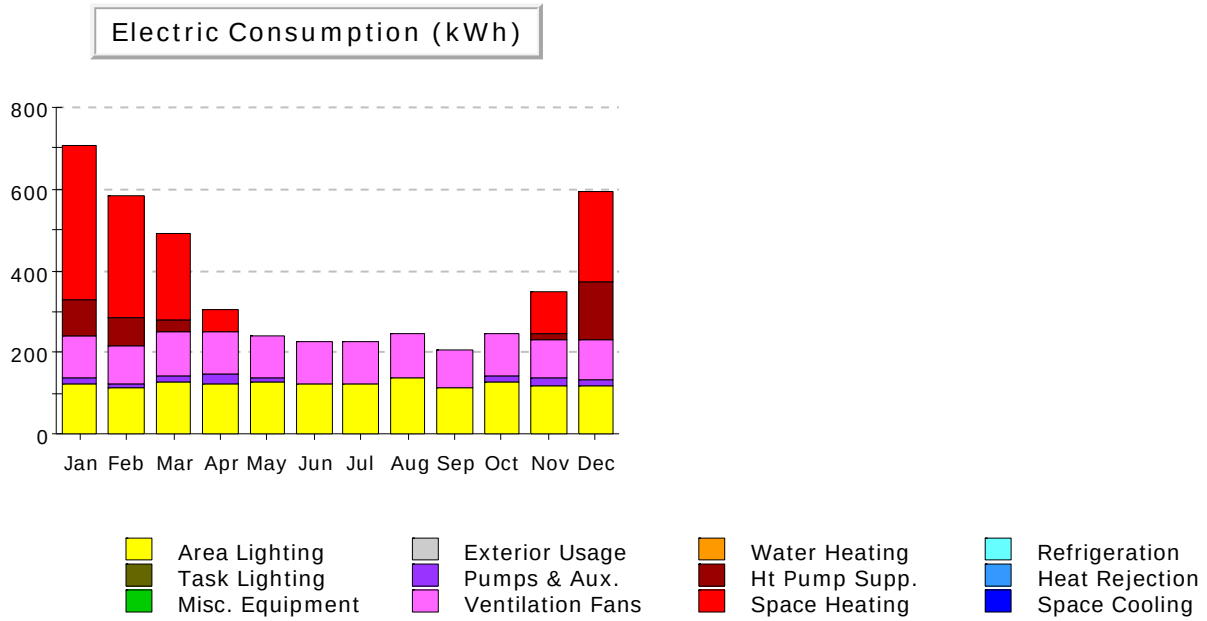


Electric Consumption (kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.1	-	-	-	-	3.6	42.6	23.8	1.5	-	-	-	71.5
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	360.9	267.5	165.0	17.5	-	-	-	-	-	-	80.3	203.7	1,095.0
HP Supp.	70.6	52.6	22.6	1.8	-	-	-	-	-	-	9.5	135.1	292.2
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	121.0	109.4	126.7	121.2	126.7	120.7	121.2	132.2	109.7	126.7	114.9	115.2	1,445.7
Pumps & Aux.	13.8	14.8	20.0	26.9	6.2	-	-	-	0.8	11.8	22.5	18.6	135.4
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	123.6	111.8	129.5	123.9	129.5	123.4	123.9	135.1	112.1	129.5	117.5	117.7	1,477.5
Total	689.9	556.3	463.9	291.3	262.4	247.6	287.6	291.2	224.0	268.0	344.7	590.3	4,517.3

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

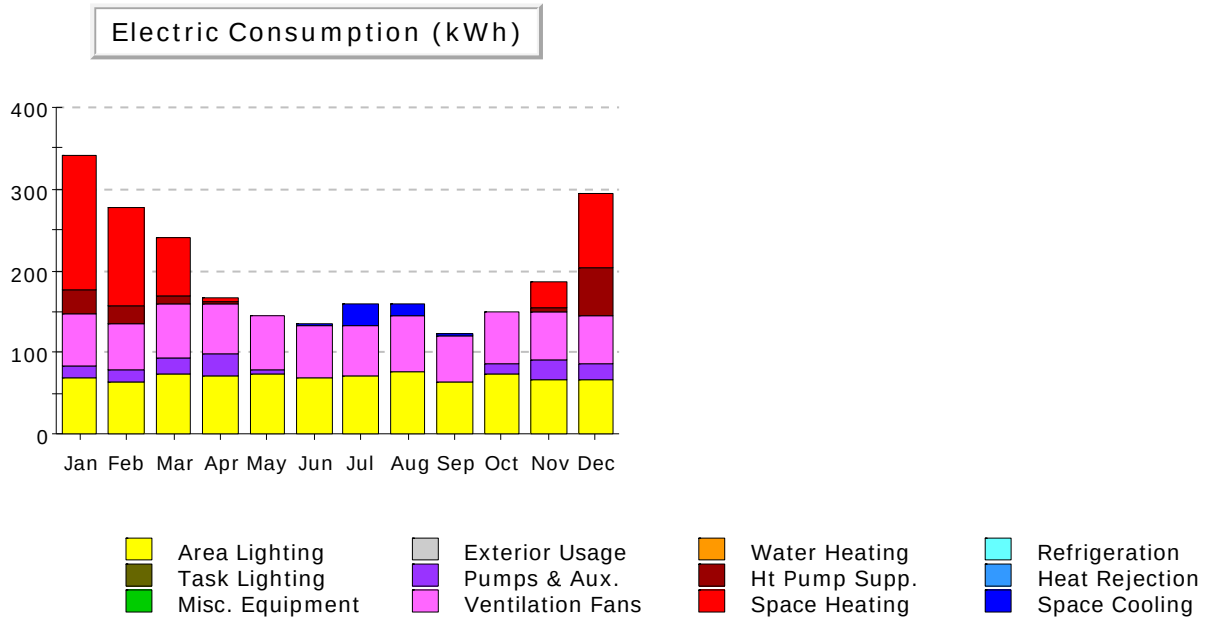


Electric Consumption (kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	0.5	-	-	-	-	-	0.5
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	378.5	299.7	210.3	51.5	0.3	-	-	-	-	-	104.3	219.4	1,263.9
HP Supp.	88.9	70.6	28.9	3.9	0.0	-	-	-	-	-	11.3	146.0	349.7
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	101.5	91.8	106.3	101.7	106.3	101.3	101.7	110.9	92.0	106.3	96.4	96.6	1,212.9
Pumps & Aux.	13.1	12.2	15.2	23.1	6.1	-	-	-	0.8	11.8	19.1	14.8	116.2
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	123.6	111.8	129.5	123.9	129.5	123.4	123.9	135.1	112.1	129.5	117.5	117.7	1,477.5
Total	705.6	586.0	490.2	304.1	242.2	224.6	226.1	246.1	204.9	247.6	348.7	594.5	4,420.6

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

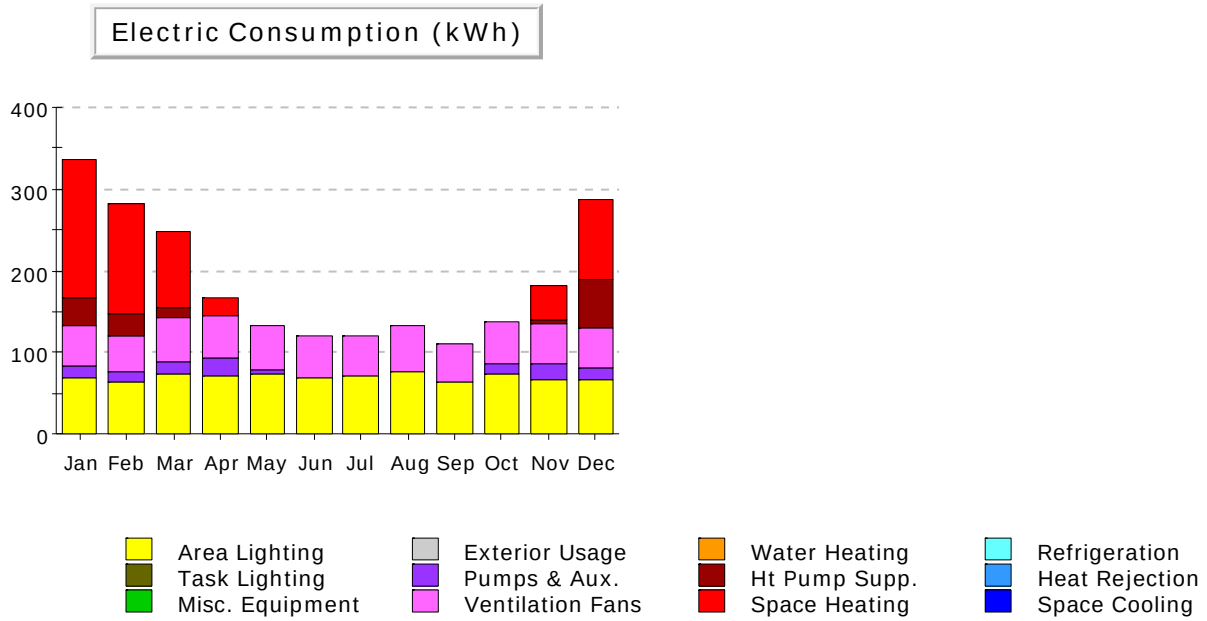


Electric Consumption (kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.1	-	-	-	-	2.8	25.6	15.1	1.3	-	-	-	44.9
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	164.4	121.2	72.3	6.4	-	-	-	-	-	-	33.8	92.5	490.6
HP Supp.	29.2	20.6	9.6	0.6	-	-	-	-	-	-	3.9	56.7	120.5
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	62.7	56.8	65.7	62.9	65.7	62.6	62.9	68.6	56.9	65.7	59.6	59.7	749.7
Pumps & Aux.	13.9	15.7	20.8	27.5	6.2	-	-	-	0.8	11.8	23.5	19.7	139.8
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	69.9	63.2	73.2	70.0	73.2	69.7	70.0	76.4	63.4	73.2	66.4	66.6	835.4
Total	340.1	277.5	241.7	167.4	145.1	135.2	158.5	160.1	122.3	150.7	187.2	295.2	2,381.0

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

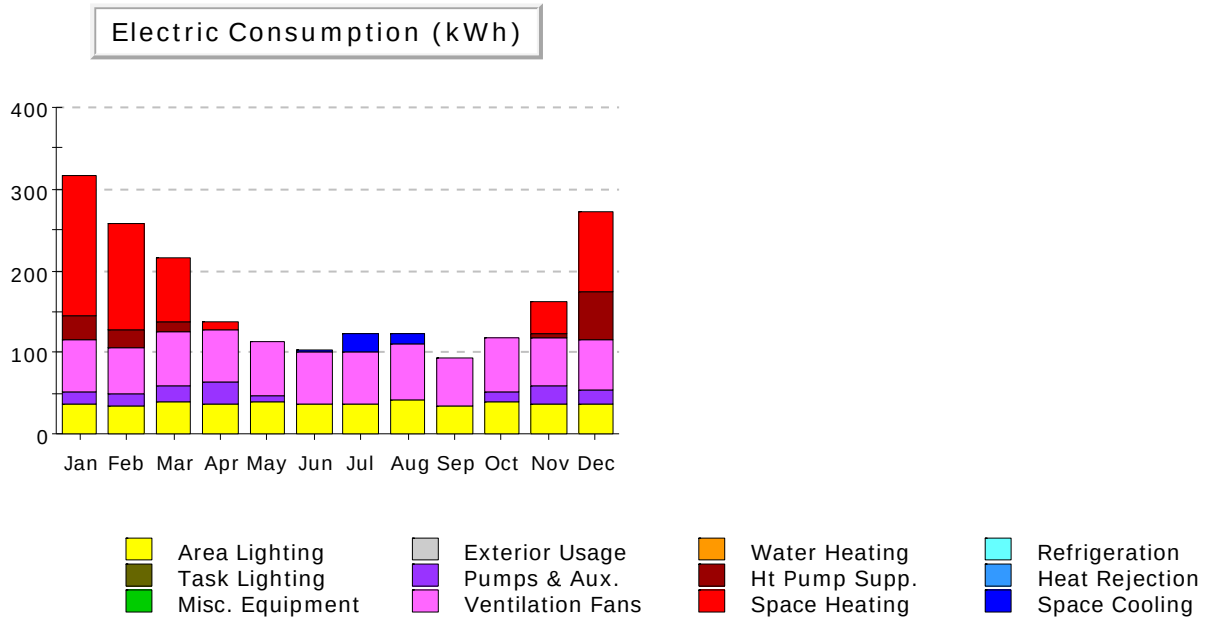


Electric Consumption (kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	0.1	-	-	-	-	-	0.1
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	169.3	135.8	94.0	21.3	-	-	-	-	-	-	42.0	98.1	560.4
HP Supp.	32.7	25.7	12.2	1.5	-	-	-	-	-	-	4.4	58.8	135.4
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	50.5	45.6	52.9	50.6	52.9	50.3	50.6	55.2	45.8	52.9	47.9	48.0	603.0
Pumps & Aux.	13.1	12.2	15.4	23.8	6.2	-	-	-	0.8	11.8	20.3	15.2	118.7
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	69.9	63.2	73.2	70.0	73.2	69.7	70.0	76.4	63.4	73.2	66.4	66.6	835.4
Total	335.4	282.6	247.7	167.2	132.2	120.1	120.7	131.6	109.9	137.9	181.0	286.7	2,253.0

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

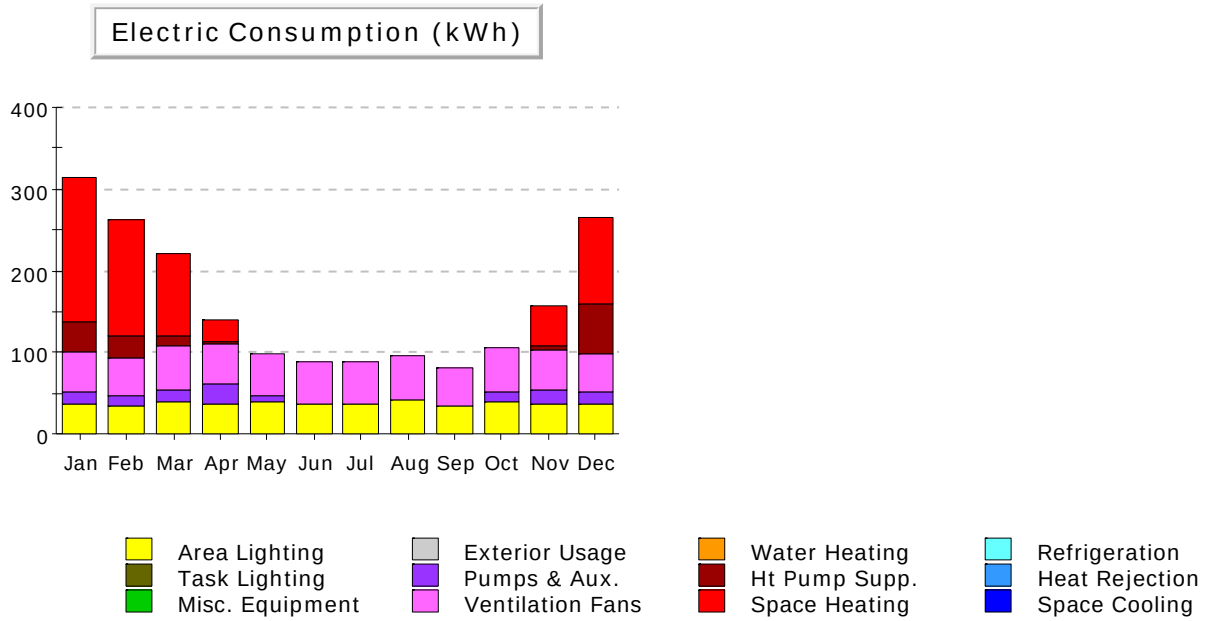


Electric Consumption (kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.0	-	-	-	-	2.0	21.5	12.3	0.8	-	-	-	36.7
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	172.0	128.3	78.6	8.2	-	-	-	-	-	-	39.8	99.1	526.0
HP Supp.	31.2	22.4	10.6	0.8	-	-	-	-	-	-	4.4	59.2	128.5
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	62.9	56.9	65.9	63.1	65.9	62.8	63.1	68.8	57.1	65.9	59.8	59.9	752.2
Pumps & Aux.	13.8	15.0	20.2	27.1	6.2	-	-	-	0.8	11.8	22.5	18.7	136.0
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	37.8	34.2	39.6	37.9	39.6	37.7	37.9	41.3	34.3	39.6	35.9	36.0	451.6
Total	317.7	256.8	214.9	137.0	111.7	102.6	122.5	122.4	92.9	117.3	162.4	272.9	2,031.0

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													



Electric Consumption (kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	176.7	142.3	100.9	27.5	0.3	-	-	-	-	-	49.5	104.8	602.0
HP Supp.	35.3	28.1	13.3	1.8	0.0	-	-	-	-	-	5.0	61.7	145.1
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	50.8	46.0	53.2	50.9	53.2	50.7	50.9	55.5	46.1	53.2	48.3	48.4	607.3
Pumps & Aux.	13.1	12.0	14.9	22.6	6.1	-	-	-	0.8	11.8	18.9	14.6	114.8
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	37.8	34.2	39.6	37.9	39.6	37.7	37.9	41.3	34.3	39.6	35.9	36.0	451.6
Total	313.6	262.6	221.9	140.7	99.2	88.4	88.8	96.8	81.1	104.6	157.6	265.5	1,920.8

Gas Consumption (Btu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool													
Heat Reject.													
Refrigeration													
Space Heat													
HP Supp.													
Hot Water													
Vent. Fans													
Pumps & Aux.													
Ext. Usage													
Misc. Equip.													
Task Lights													
Area Lights													
Total													

APPENDIX B

PV COST CALCULATION SPREADSHEETS FOR A SECOND ROOFTOP PV SYSTEM

Solar Photovoltaic Project Simple Financial Model

RPS Solar Carve-Out II Program v1.0

DATA ENTRY AND FINANCIAL SUMMARY

Key

Entry Cells →

Calculation Cells (Not for Entry)

Pre-populated entries in these cells are for sample purposes only and do not reflect information or opinions of DOER. Users should enter values that are specific to their own projects or market information.

Select Taxable or Non-Taxable Entity: Taxable

Project and Customer Cost Assumptions

Solar Photovoltaic System Size	41000	Watts (DC STC)
Total System Cost/Watt	$ 3.500	$/Watt (DC STC)
Total System Cost →	$ 143,500.00	

CEC Rebate Assumptions

Rebate$ per/Watt	$ -	$/Watt (DC STC)
Total Rebate		

Project Performance and Savings/ Cost Assumptions

Annual Net Capacity Factor	13.60%	kW (DC STC) to kWh AC
Annual Production Degradation	0.50%	%
Project Life	25	Years
Depreciation Life	20	Years
Electricity Revenue (Avoided Costs)	$ 0.19	$/kWh
Electricity Revenue (Avoided Costs) Annual Adjustor	0.0%	%
Solar Renewable Energy Certificate (SREC) Auction Price	$ -	$/kWh
SREC Factor	0.0	
SREC Term (40 Quarters)	20	Years (must be equal to or less than project life)
SREC Revenue Annual Adjustor	0.0%	%
SREC Contract Price		$/kWh
SREC Contract Term		Years (must be equal to or less than project life)
Post SREC Term REC Value	$ -	$/kWh
Annual Operations and Maintenance Cost Factor	$ 19.00	$/kW/Year
Annual Operations and Maintenance Cost	$ 779	$/Year
Annual Operations and Maintenance Adjustor	3.0%	%
Future Inverter Replacement Cost	$ 0.50	$/Watt (DC STC)
Inverter Life, Replace Every X Years	10	Year (must be equal to or less than project life)

Tax Assumptions

Federal Tax Rate	35%							
State Tax Rate	10%							
Effective Tax Rate	42%							
Federal Tax Credit	30%							
State Tax Deduction	100%							
5 Year Accelerated Depreciation Schedule (MACRS)	20.00%	32.00%	19.20%	11.52%	11.52%	5.76%		
Depreciation	20.00%	32.00%	19.20%	11.52%	11.52%	5.76%	0.00%	
Asset Basis								
Gross Cost	$ 143,500							
Rebate	$ -							
Less 50% of Federal Tax Credit	$ (21,525)							
Asset Basis	$ 121,975							

Financing Assumptions

% Financed w/ Cash	100%	
% Financed w/ Loan	0%	
Loan Interest Rate	7.00%	
Loan Period	20	Years (must be equal to or less than project life)
Net Cost	$ 143,500	
Customer Discount Rate	6.00%	
Loan	$ -	

Solar Project Financial Analysis Summary

Net Present Value	$ (6,239)
Simple Payback (100% Cash only)	Year 13
Estimated Return on Equity	4.8%

Disclaimer: This Unofficial Cash Flow Model is intended to provide non-residential entities that are considering the purchase and installation of solar energy equipment with a general understanding of possible financial implications of such purchase and installation. Those entities interested in learning more about the financial implications of the purchase and installation of solar energy equipment are urged to consult their own tax and financial experts. The information contained in the Unofficial Cash Flow Model may not be relied on by anyone for any purposes. Furthermore, the information contained in this model does not necessarily reflect the views of the Department of Energy Resources or the Commonwealth of Massachusetts, and reference to any specific method does not constitute an implied or expressed recommendation or endorsement of it. Neither the Department of Energy Resources nor the Commonwealth of Massachusetts make any warranties or representations, expressed or implied, as to the usefulness, completeness, or accuracy of any processes, methods or other information contained, described, disclosed, or referred to in this model. Finally, neither the Department of Energy Resources nor the Commonwealth of Massachusetts makes any representation that the use of any product, apparatus, process, method, or other information will not infringe privately owned property rights and assumes no liability of any kind or nature for any loss, injury, or damage directly or indirectly resulting from, or occurring in connection with, the use of information contained, described, disclosed, or referred to in this Unofficial Cash Flow Model.

Solar Photovoltaic Project Simple Financial Model
PRO FORMA AND PRODUCTION

Project Output	Start-Up 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14
Annual Generation (kWh)		48,846	48,602	48,359	48,117	47,876	47,637	47,399	47,162	46,926	46,691	46,458	46,225	45,994	45,764

FINANCIAL SCHEDULES

INCOME STATEMENT

Electricity Revenue (Avoided Cost)		$ 9,173	$ 9,127	$ 9,081	$ 9,036	$ 8,991	$ 8,946	$ 8,901	$ 8,856	$ 8,812	$ 8,768	$ 8,724	$ 8,681	$ 8,637	$ 8,594
CEC Rebate	$ -														
SREC Auction Revenue		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
SREC Contract Revenue		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Revenue (Avoided Costs)	$ -	$ 9,173	$ 9,127	$ 9,081	$ 9,036	$ 8,991	$ 8,946	$ 8,901	$ 8,856	$ 8,812	$ 8,768	$ 8,724	$ 8,681	$ 8,637	$ 8,594
Replace Inverter?	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No
Operations & Maintenance Costs		$ (779)	$ (802)	$ (826)	$ (851)	$ (877)	$ (903)	$ (930)	$ (958)	$ (987)	$ (1,016)	$ (1,047)	$ (1,078)	$ (1,111)	$ (1,144)
Inverter Replacement Cost		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (20,500)	$ -	$ -	$ -	$ -
Total Operating Expenses	$ -	$ (779)	$ (802)	$ (826)	$ (851)	$ (877)	$ (903)	$ (930)	$ (958)	$ (987)	$ (21,516)	$ (1,047)	$ (1,078)	$ (1,111)	$ (1,144)
EBITDA	$ -	$ 8,394	$ 8,325	$ 8,255	$ 8,185	$ 8,114	$ 8,043	$ 7,971	$ 7,898	$ 7,825	$ (12,748)	$ 7,677	$ 7,602	$ 7,527	$ 7,450
Federal Depreciation Expense		$ (24,395)	$ (39,032)	$ (23,419)	$ (14,052)	$ (14,052)	$ (7,026)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EBIT	$ -	$ (16,001)	$ (30,707)	$ (15,164)	$ (5,867)	$ (5,938)	$ 1,017	$ 7,971	$ 7,898	$ 7,825	$ (12,748)	$ 7,677	$ 7,602	$ 7,527	$ 7,450
Interest Expense		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EBT	$ -	$ (16,001)	$ (30,707)	$ (15,164)	$ (5,867)	$ (5,938)	$ 1,017	$ 7,971	$ 7,898	$ 7,825	$ (12,748)	$ 7,677	$ 7,602	$ 7,527	$ 7,450
Federal taxes saved/(paid)	$ -	$ 5,894	$ 11,039	$ 5,596	$ 2,340	$ 2,362	$ (74)	$ (2,511)	$ (2,488)	$ (2,465)	$ 4,462	$ (2,418)	$ (2,395)	$ (2,371)	$ (2,347)
State taxes saved/(paid) [can not deduct federal depreciation expense]	$ -	$ (839)	$ (832)	$ (825)	$ (818)	$ (811)	$ (804)	$ (797)	$ (790)	$ (783)	$ 1,275	$ (768)	$ (760)	$ (753)	$ (745)
Net Income	**$ -**	**$ (10,946)**	**$ (20,501)**	**$ (10,393)**	**$ (4,345)**	**$ (4,387)**	**$ 138**	**$ 4,663**	**$ 4,621**	**$ 4,578**	**$ (7,012)**	**$ 4,491**	**$ 4,447**	**$ 4,403**	**$ 4,358**

CASH FLOW STATEMENT

Cash From Operations															
Net Income	$ -	$ (10,946)	$ (20,501)	$ (10,393)	$ (4,345)	$ (4,387)	$ 138	$ 4,663	$ 4,621	$ 4,578	$ (7,012)	$ 4,491	$ 4,447	$ 4,403	$ 4,358
Federal Depreciation Expense	$ -	$ 24,395	$ 39,032	$ 23,419	$ 14,052	$ 14,052	$ 7,026	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash Flow From Operations	$ -	$ 13,449	$ 18,531	$ 13,026	$ 9,706	$ 9,665	$ 7,164	$ 4,663	$ 4,621	$ 4,578	$ (7,012)	$ 4,491	$ 4,447	$ 4,403	$ 4,358
Cash From Investing															
Installed PV Cost	$ (143,500)														
One Time State Solar Investment Tax Deduction (Actual Cash Value)	$ 10,045														
One Time Federal Solar Investment Tax Credit	$ 43,050														
Cash Flow From Investing	$ (90,405)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash From Financing															
Loan Disbursement	$ -														
Loan Repayment (Principle)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash Flow From Financing	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Cash Flow	**$ (90,405)**	**$ 13,449**	**$ 18,531**	**$ 13,026**	**$ 9,706**	**$ 9,665**	**$ 7,164**	**$ 4,663**	**$ 4,621**	**$ 4,578**	**$ (7,012)**	**$ 4,491**	**$ 4,447**	**$ 4,403**	**$ 4,358**
Cumulative Cash Flow	**$ (90,405)**	**$ (76,956)**	**$ (58,425)**	**$ (45,400)**	**$ (35,694)**	**$ (26,029)**	**$ (18,865)**	**$ (14,202)**	**$ (9,581)**	**$ (5,004)**	**$ (12,015)**	**$ (7,524)**	**$ (3,077)**	**$ 1,327**	**$ 5,685**

Simple Payback		$ 1	$ 2	$ 3	$ 4	$ 5	$ 6	$ 7	$ 8	$ 9	$ 10	$ 11	$ 12	$ 13	$ 14
Net Investment	$ (90,405)	$ (76,956)	$ (58,425)	$ (45,400)	$ (35,694)	$ (26,029)	$ (18,865)	$ (14,202)	$ (9,581)	$ (5,004)	$ (12,015)	$ (7,524)	$ (3,077)	$ 1,327	$ 5,685
Simple Payback Year	**13**													13	