DRAFT Phase IV Implementation of the Selected Remedial Action Alternative

Cape Cod Gateway Airport
Hyannis, Massachusetts

RTN 4-26347

November 2022

Prepared for:
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1.0 INTRODUCTION

The Horsley Witten Group, Inc. (HW) has been retained by the Cape Cod Gateway Airport (the "Airport") to prepare the DRAFT Phase IV Remedy Implementation Plan (the "Draft Phase IV RIP") for its property located at 480 Barnstable Road, Hyannis, Massachusetts. For the purpose of this report, the term "Airport" specifically refers to the Cape Cod Gateway Airport property located at 480 Barnstable Road, as set forth above, and the term "Disposal Site" refers to the area impacted by the release of oil and/or hazardous material (OHM) subject to Release Tracking Number (RTN) 4-26347. A Site Locus Map and the Estimated Disposal Site Map are provided as Figures 1 and 2.

The Draft Phase IV RIP focuses on the implementation of the chosen remedial action alternative to address the release of per- and poly-fluoroalkyl substances (PFAS) in soil and groundwater relating to the Airport's historic use of a fluorotelomer based aqueous film forming foam (AFFF). As documented in the *Revised Phase II Comprehensive Site Assessment* prepared by HW and electronically submitted to the Massachusetts Department of Environmental Protection (MassDEP) on January 28, 2021 (the "Revised Phase II Report"), 1,4-dioxane detected in groundwater at the Airport is the result of an unknown upgradient source. Considering that the Airport is not the cause of the 1,4-dioxane release, remedial efforts will only be focused on the release of PFAS relating to the Airports historic AFFF operations. The Airport intends to submit a Downgradient Property Status report in the future for the 1,4-dioxane plume that is impacting the Airport as the result of an off-site, unknown source. Historic 1,4-dioxane results are depicted on Figure 3.

A majority of the PFAS impacted soil at the Airport relating to the historic use of AFFF was covered with an engineered barrier (a "cap") consisting of either a 30-mil geomembrane (Deployment Area) or asphalt (Airport Rescue and Firefighting/Snow Removal Equipment [ARFF/SRE] Building Area) in 2020. The cap installation was required by the MassDEP to "*reduce infiltration of precipitation through PFAS-impacted soil, such as temporarily capping the source areas; excavating and properly disposing of the PFAS-impacted soil; or some equivalent approach".* Details of the cap installations are documented in the report titled *Immediate Response Action Plan Status Report 8*, prepared by HW (October 2020). The location of the two caps is indicated on Figure 4.

As detailed below in Section 4.1 and indicated on Table 1, the installation of the two caps have resulted in a significant decrease (47 to 62 percent) in the concentration of the six regulated PFAS analytes and total PFAS (73 to 78 percent) beneath the capped areas. These results

indicate that the caps are working to reduce the leaching of PFAS from the soil in these areas into the underlying groundwater. A depiction of the concentration of total PFAS, the Sum of Six PFAS, 6:2 FTS and depth to groundwater over time for select wells located in the Deployment Area and ARFF/SRE Building Area are included in Appendix A. The cap engineering plans for the two areas are included in Appendix B. It should be noted that PFAS concentration within the caps area will fluctuate for several years as groundwater elevation rises and falls in this area and contaminants are flushed from the capillary fringe zone. After flushing is complete, concentrations are expected to decline.

The Revised Phase II Report also provides documentation on PFAS that has been detected in areas hydraulically upgradient, cross-gradient, and downgradient of the Airport. Environmental forensic techniques, along with groundwater hydrology, were employed to distinguish if these PFAS detections were related to the Airport's historic use of AFFF (from circa 1991 to 2016) or other non-Airport related sources. The environmental forensic review of the groundwater data provided a clear signature that distinguished the Airport's PFAS from others. As such, remedial efforts for PFAS in groundwater will focus on the areas hydraulically downgradient of the Airport's disposal sites that have been affected by the historic use of AFFF.

Based upon the investigations described in the Revised Phase II Report and the evaluation of remediation technologies set forth in the Final Phase III Identification, Evaluation, and Selection of Comprehensive Remedial Action Alternatives (the "Final Phase III Report") treatment at the Maher Wells is the most technologically and economically feasible remedial alternative to achieve a Permanent Solution with respect to groundwater. Implementation of caps and soil cap maintenance managed under a potential future AUL will achieve a Permanent Solution with respect to soil. Groundwater monitoring will continue to be conducted to verify the effectiveness of the caps and to monitor the extent of the Airport PFAS plumes until a Permanent Solution can be obtained.

Consistent with the *Final Public Involvement Plan* for the Airport dated September 16, 2019 (the "Final PIP"), all persons identified on Table 2, Community Notification List, have been notified of the availability of the Draft Phase IV Report. The Airport is providing a 21-day review period to allow for comments from the public and MassDEP. The Airport will accept comments on the Draft Phase IV Report until December 6, 2022. Comments received by the public and MassDEP will be documented and addressed in the Final Phase IV Report which will be submitted to the MassDEP by January 16, 2023.

A Comprehensive Response Action Transmittal Form (BWSC-108) is being submitted concurrently with this Phase IV Report.

2.0 SITE BACKGROUND

The Airport is located in Hyannis, Massachusetts, and provides scheduled airline service, general aviation services, and other aviation related activities. The Airport is owned by the Town of Barnstable and is managed through the Barnstable Municipal Airport Commission

("BMAC"). The Airport began as a private airport consisting of a single grass runway before being given to the Town of Barnstable in the 1930's. With the outbreak of World War II, the Airport was taken over by the federal government for wartime training and defense purposes. During the 1940's, the United States Navy used the Airport and expanded the airfield to include three runways. In 1946, the Airport was returned to a two-runway municipal airport (each runway has a designation at each end, being 15-33 and 6-24). In 1948, the Airport was conveyed by the United States government (pursuant to the Surplus Property Act of 1944) to the Town of Barnstable, acting by and through its Airport Commission.

Currently, the Airport is comprised of approximately 645 acres of land, with approximately 140 acres that are impervious (e.g., paved areas such as parking lots, runways, taxiways, aircraft parking aprons, concrete walkways, and building rooftops). The Airport's structures include the main terminal and the Air Traffic Control Tower ("ATCT"), which are located south of the runways and taxiways, as well as several hangars used for general aviation and operations services. In addition, the current Airport Rescue and Fire Fighting/Snow Removal Equipment (ARFF/SRE) Building is located in the southeast corner of the property. The Airport is situated in an area of Hyannis zoned for Business and Industrial uses.

2.1 Disposal Site Regulatory History

The evaluation for PFAS began in August 2016, when the Airport conducted an initial round of groundwater sampling at the request of MassDEP. Subsequently, a Notice of Responsibility (NOR), dated November 10, 2016, was issued to the Airport by the MassDEP. The NOR requested that the Airport conduct additional field investigations to evaluate:

- The source(s) of PFAS including PFOS and PFOA detected in groundwater at the Airport;
- The source(s) of 1,4-dioxane detected in a monitoring well downgradient of the Airport on the Maher Well field property[1]; and
- To identify potential impacts to public water supply wells operated by the Hyannis Water District at the Mary Dunn and Maher Well fields.

1. *As indicated above, the Airport is not the source of 1,4-dioxane detected at the Maher Wells and as such the remedial efforts described herein will focus only on PFAS.*

A proposed Immediate Response Action (IRA) plan was submitted to the MassDEP for approval in response to the NOR. Subsequently, a meeting was held by MassDEP at the Airport that included other stakeholders including the Barnstable Department of Public Works, the Hyannis Water District, and Barnstable County representatives (representing the Fire Training Academy). At the meeting, IRA plans were coordinated between the Airport and Fire Training Academy including sampling locations, type of analysis, groundwater modeling, goals, and next steps. The IRA plan served as the guide for the soil and groundwater testing conducted since November 2016 to follow up on the results of the previous analyses.

In June 2019, the MassDEP issued a Request for Modified Immediate Response Action Plan/Interim Deadline dated June 18, 2019 (the "Modified IRA Request") to the Airport. The Modified IRA Request asked that the Airport propose response actions to *"reduce infiltration of precipitation through PFAS-impacted soil, such as temporarily capping the source areas; excavating and properly disposing of the PFAS-impacted soil; or some equivalent approach".* The Airport's response is documented in the report titled "*Final Immediate Response Action Plan Modification",* prepared by HW and dated December 2019 (the "IRA Modification"). The IRA Modification included details for the installation of a cap in two select areas to reduce precipitation infiltration. The two areas are identified as the Deployment Area and the ARFF/SRE Building Area as indicated on Figure 2. The two capped areas total approximately 94,100-square feet and represent a majority of the known PFAS source areas at the time of the report relating to the historic use of AFFF. The caps were completed in September 2020 and are documented in the report titled "*Immediate Response Action Plan Status Report 8".* The surficial extent of the two capped areas is indicated on Figure 4.

To date, the Airport has collected the following environmental samples to document the nature and extent of PFAS at and surrounding the Airport:

- 131 soil samples for laboratory analysis of PFAS;
- Three surface water samples for laboratory analysis of PFAS;
- 198 groundwater samples for laboratory analysis of PFAS;
- Eight fire truck spray water samples;
- 13 groundwater and one surface water samples for Stable Isotope Analysis; and,
- 1 aqueous film-forming foam ("AFFF") sample.

Refer to Figures 5 and 6 for the PFAS sampling locations and to the Revised Phase II Report for additional details on the Disposal Site regulatory history and investigations.

3.0 PROJECT CONTACTS

3.1 Relevant Contacts

Pursuant to 310 CMR 40.0874(3)(a), the relevant contacts are as follows:

3.1.1 Responsible Party

The project contact for the entity responsible for the submission of the Draft Phase IV RIP is:

The Cape Cod Gateway Airport
480 Barnstable Road
Hyannis, Massachusetts 02601

Contact : Katie Servis, Airport Manager
(508) 775-2020

3.1.2 Licensed Site Professional

The Licensed Site Professional (LSP) -of-record is:

Bryan Massa, LSP
Horsley Witten Group, Inc.
90 Route 6A
Sandwich, MA 02563
508-833-6600
License No. 3412

3.1.3 Remedial System Operators

Those persons who will own, operate and/or maintain the selected Comprehensive Remedial Alternative are as follows:

Soil Caps on Airport Property

The Cape Cod Gateway Airport
480 Barnstable Road
Hyannis, Massachusetts 02601

Contact : Katie Servis, Airport Manager
(508) 775-2020

Maher Wells Groundwater Treatment System located off-Airport Property

Town of Barnstable Department of Public Works-Water Supply Division
47 Old Yarmouth Road
Hyannis, Massachusetts 02601

Contact : Hans Keijser, Water Supply Division Supervisor
(508) 775-0063

Contact : Dan Santos, P.E., Director of Public Works
(508) 790-6400

4.0 REMEDY IMPLEMENTATION PLAN ENGINEERING DESIGN

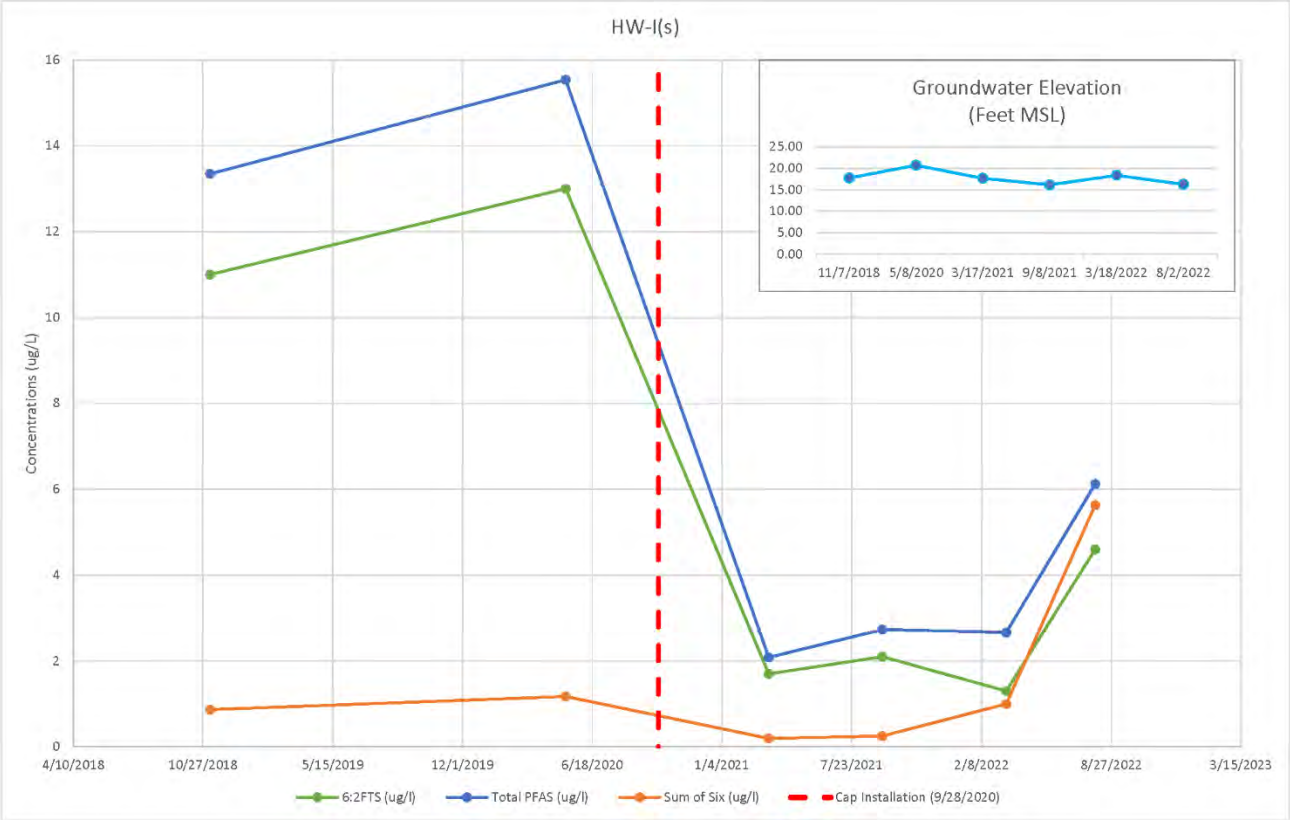
Pursuant to 310 CMR 40.0874(3)(b), engineering concepts and design criteria used for the design and construction of the Comprehensive Remedial Alternative shall be documented in the Phase IV RIP.

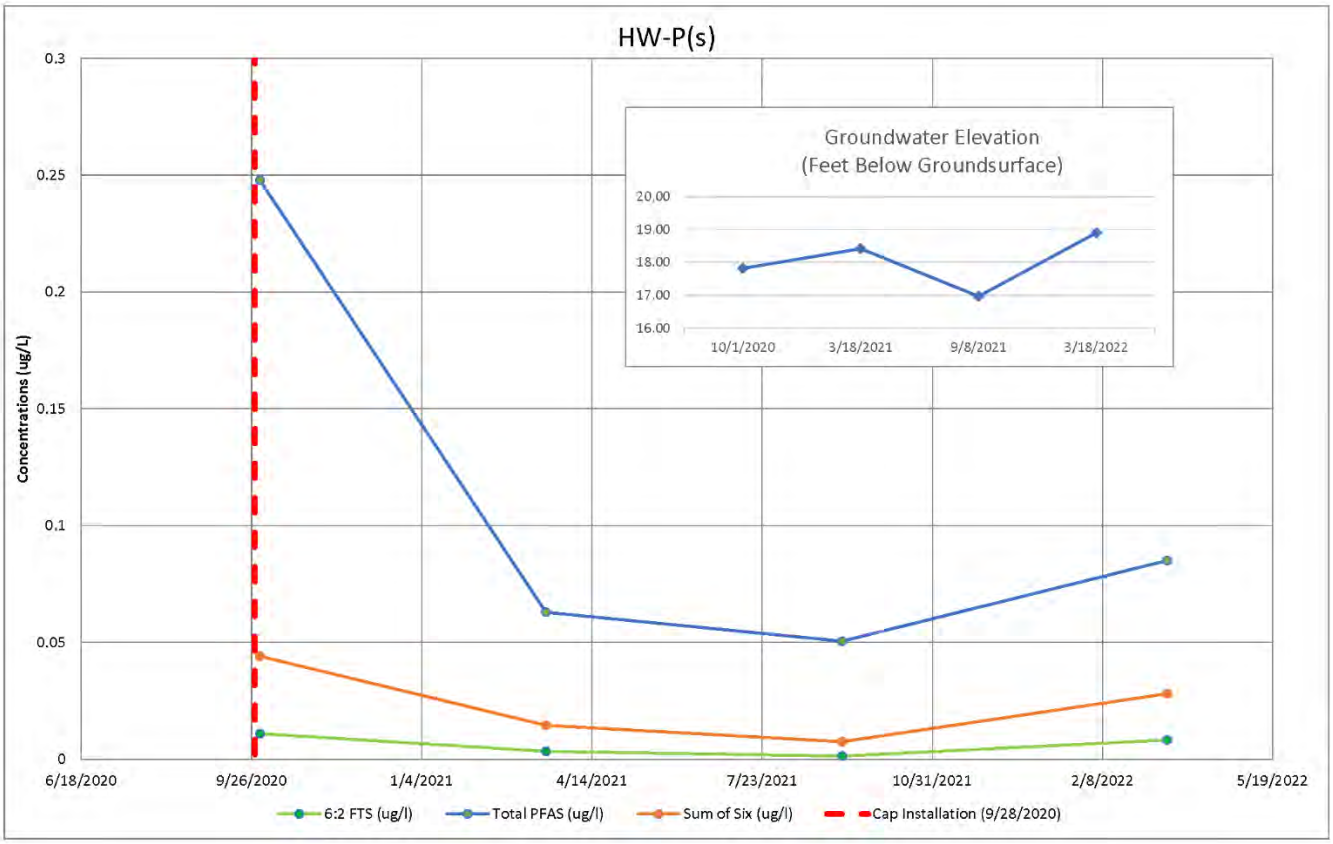
4.1 Goals of the Remedial Action

Pursuent to 310 CMR 40.0874(3)(b)(1) the goals of the remedial action, including performance requirements of the remedial systems, the requirements for achieving a Permanent or Temporary Solution (whichever is applicable) under 310 CMR 40.1000 and the projected timeframe, based on available information, for achieving such Permanent or Temporary Solution is set forth below.

<u>Soil Caps</u>

The goal of the soil caps is to reduce the infiltration of PFAS from soil into groundwater. The caps were installed in 2020 at the locations indicated on Figure 4. The caps have drastically reduced the construction of total PFAs in the vicinity of the Deployment Area and ARFF/SRE Area as indicated on Table 1 and the time plots presented below and also included in Appendix A.





Fluctuations in the concentration of PFAS is expected as the groundwater level rises and falls over the next serval years and contaminants are flushed from the capillary fringe zone. After flushing is complete, concentrations are expected to decline. The effectiveness of the caps will be documented through the collection of groundwater samples until a Permanent Solution can be achieved. The caps will be inspected twice annually and maintained as necessary until a Permanent Solution can be achieved. Assuming that the future Permanent Solution relies on the caps to maintain a level of no significant risk, the caps will be maintained and inspected in the future as part of an AUL.

Groundwater Treatment

The goal of the groundwater remedial action is to reduce the concentration of PFAS in groundwater, prevent the continued migration of the PFAS groundwater plume, and to provide safe drinking water to the Town of Barnstable. The Town of Barnstable began construction of the Maher Wells groundwater treatment plant in 2019 (the "plant"). The plant was designed by Tata and Howard, Inc. for the treatment of PFAS, 1,4-dioxane, iron, and manganese. The plant utilizes greensand filtration, advanced oxidation, and granular activated carbon (GAC).

The plant has a design capacity of 1,500 gallons per minute and removes PFAS with granular GAC filtration; 1,4-Dioxane by advanced oxidation with peroxide and ultraviolet light (UV); and

iron and manganese by greensand filtration. The plant was completed in 2020 with the design reviewed and approved by MassDEP. The plant has been providing the Town of Barnstable with drinking water that meets state and federal drinking water requirements as documented in the annual water quality report for 2021 (Appendix C). A copy of the plants 2022 MassDEP registration is included in Appendix D.

As part of the plant's compliance testing, samples of the treated groundwater are collected quarterly and submitted to a laboratory for analysis of multiple contaminants including PFAS. The plant also collects process control samples monthly from multiple locations throughout the plant process including the untreated groundwater, before filtration, after the lead GAC vessel, after lag GAC vessel and at the treated tap. This information is used to adjust the treatment process as necessary and to determine when GAC replacement is needed. Refer to Appendix E for the Maher Well Treatment Plant design documents. The effectiveness of the groundwater treatment system will monitored by the collection of the performance samples by Hyannis Water System and groundwater testing from select monitoring wells by the Airport.

Based on contaminate migration fate and transport mechanisms incorporated into a USGS MODFLOW Model (refer to Section 4.5.1 for addital details), it is expected that groundwater impacts from the Airports PFAS plume in all impacted areas will be less than the GW-1 standard by 2031. The model also suggests that PFAS impacts at the Maher Wells would not exceed the current GW-1 standard (0.02 ug/l) if the Airports PFAS plume was the only source of PFAS impacting them.

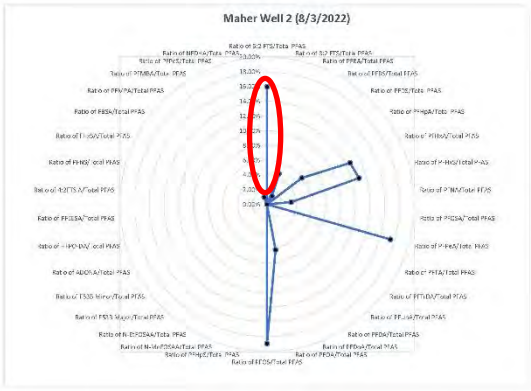
4.2 New Information Related to Disposal Site Conditions

Pursuent to 310 CMR 40.0874(3)(b)(2), new information related to the Disposal Site conditions that was not included in previous submittals is set forth below.

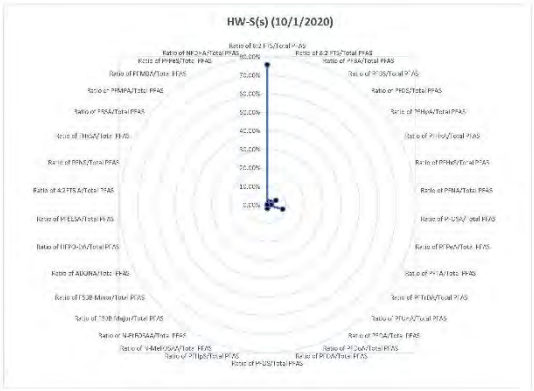
As documented in the Revised Phase II Report, based on analytical data and forensics, the Airports PFAS plume relating to historic usage of AFFF had not reached the Maher Wells. However, due to the direction of groundwater flow which is moving south/southeasterly, it is understood that the plume from both the ARFF/SRE Building Area and Deployment Area is migrating downgradient toward the Maher Wells, and will likely impact them in the near future.

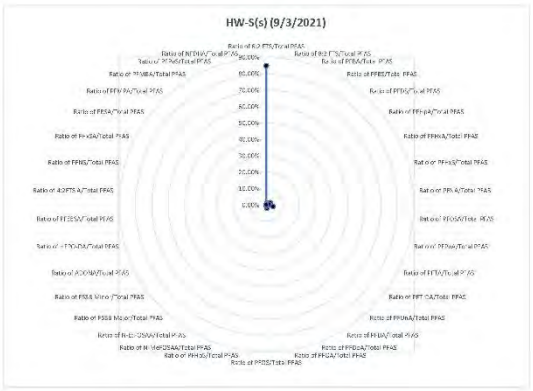
Testing of Maher Well 2 in August 2022 identified a 16 percent spike of 6:2 FTS, an analyte that is representative of the Airport's PFAS plume. This spike suggests that the Airports PFAS plume (which includes the six regulated PFAS analytes) is likely now contributing to the existing PFAS impacts the Maher Wells. It is difficult to separate the Airports contribution of PFAS to the Maher Wells considering that other unknown source(s) are also impacting the wells. Based on modeling detailed below in Section 4.5.1, it is estimated that if only the Airport's PFAS plume was impacting the Maher Wells, the Sum of Six PFAS concentration detected at the Maher Wells would most likely be below the current GW-1 standard of 0.02 ug/l.

The radar plots below show Maher Well 2 in 2019 and then again 2022. The 6:2 FTS spike is outlined in red.



The radar plots below show 6:2 FTS as it reached HW-S(s) which is upgradient of Maher Well 2 prior to August 2022.





There is no other new information related to the Disposal Site that has not been previously submitted to the MassDEP. HW plans to collect three more quarters of PFAS samples from the Maher Wells to verify the detection of 6:2 FTS and confirm the signature is consistent with the Airports PFAS plume.

4.3 Disposal Site Map

Pursuant to 310 CMR 40.0874(3)(b)(3), a Disposal Site map showing existing Disposal Site features and proposed locations of activities associated with the proposed remedial action activities is attached as Figure 2. Engineering drawings for the cap are included in Appendix B and engineering drawings for the Maher Treatment Plant is included in Appendix D.

4.4 Characteristics of Environmental Media

Pursuant to 310 CMR 40.0874(3)(b)(4), a description of the characteristics, quantity and location of environmental media or materials to be treated or otherwise managed is set forth

below. Tabulated soil and groundwater analytical data collected during previous investigations is included as Tables 3 and 4. Laboratory reports were previously submitted to the MassDEP.

Soil

The concentration of the six regulated PFAS compounds in soil is considerably less than the Method 2 Direct Contact exposure-based soil concentrations for each of the regulated PFAS analytes (300 micrograms per kilogram [ug/kg]). This indicates that direct contact with the PFAS impacted soil at the Airport is not a significant concern. However, select soil samples, as indicated on Figure 5, exceed the Method 1 S-1/GW-1 standard that is protective of groundwater. As such, the objective of soil capping is to reduce leaching of PFAS from soil into the underlying groundwater. Tabulated soil analytical data is included on Table 3.

The Airport has already implemented this technology at the request of MassDEP to contain a majority of its sources of PFAS in soil relating to the historic deployment of fluorotelomer based AFFF. The two capped areas total approximately 94,100-square feet and represent a majority of the PFAS source areas. Areas of PFAS in soil remaining above the applicable Method 1 S-1/GW-1 soil standard located outside of the caped area are indicated on Figure 5. Evaluation of these areas will be included in future response actions (i.e., capping and/or excavation) and/or included as part of a future risk assessment. The current caps are constructed from geomembrane liner (Deployment Area) and asphalt (ARFF/SRE Building Area).

The current cap installations were completed in the Fall of 2020, and additional details are included in the report titled *Immediate Response Action Plan Status Report 8* dated October 2020 which is available for direct download from the MassDEP Searchable Sites Database using RTN 4-26347. As indicated on Table 1, the installation of the two caps have resulted in a significant decrease (47 to 62 percent) in the concentration of the six regulated PFAS analytes and total PFAS (73 to 78 percent) beneath the capped areas. These results indicate that the caps are working to reduce the leaching of PFAS from the soil in these areas into the underlying groundwater. As indicated on the time plots (Appendix A), increase and decrease in the concentration of PFAS in the cap areas correlates with groundwater fluctuation. It is expected that over several years of groundwater fluctuations, the concentration of PFAS will follow a decreasing concentration pattern.

As set forth above, the Airport may extend the Deployment Area cap (Figure 5) within the wooded portion of the Disposal Site boundary during future development of this area with aircraft hangers. The Airport may also cap and/or consolidate soils (i.e., place under a cap in the Deployment Area) from the area adjacent to the ARFF/SRE Building area (Figure 5). Future capping may include geomembrane liner, asphalt, concrete, and/or building foundations. Future capping will be described in a Release Abatement Measure submitted to the MassDEP consistent with the MCP.

If necessary, institutional controls in the form of an AUL will be implemented in the future to assure maintenance and prevent damage to the cap areas. Bi-annual groundwater monitoring

and cap inspections to document the cap effectiveness and track the plume migration will continue as part of Remedy Operation Status.

Groundwater

Deployment Area Plume

The extent of the PFAS groundwater plume in the vicinity of the Deployment Area is indicated on Figure 2. The plume location is based on analytical data, environmental forensics (to distinguish PFAS sources in co-mingled plumes), PFAS related fate and transport mechanisms of the six regulated PFAS analytes and 6:2 FTS, and groundwater solute transport modeling. Based on analytical data and forensics, the PFAS plume in the Deployment Area relating to historic AFFF usage appears to have recently reached the Maher Wells as discussed above.

Bi-annual groundwater monitoring is currently being conducted as part of an IRA to track the plume migration. A majority of the PFAS impacted soil within the Deployment Area has been capped to reduce infiltration as indicated on Figure 4. Stormwater has also been redirected away from this area to reduce PFAS migration.

ARFF/SRE Building Area Plume

The current ARFF/SRE Building was constructed in 1996, and PFAS is assumed to have been released in this area through incidental spillage, drips from fire hoses that are hung to dry, and/or cleaning of equipment in the event of accidentally engaging the foam pump button. Interior floor drains within the ARFF/SRE Building historically discharged to the adjacent grass area that was capped in the Fall of 2020 to reduce infiltration of stormwater. The interior floor drains were closed in the 2000's and connected to a permitted discharge to the Barnstable Wastewater Treatment Plant.

The extent of the PFAS plume in the vicinity of the ARFF/SRE Building area is indicated on Figure 2. Again, this projected plume location is based on analytical data, environmental forensics (to distinguish PFAS sources in co-mingled plumes), PFAS related fate and transport mechanisms of the six regulated PFAS analytes and 6:2 FTS, and the results of modeling. The Airport's AFFF PFAS plume in the vicinity of the ARFF/SRE Building does not appear to have impacted the Maher Wells with PFAS yet. However, due to the direction of groundwater flow which is moving south/southeasterly, it is understood that the Airport's PFAS Plume is migrating downgradient toward the Maher Wells and will likely impact them in the near future. The plume in this area has been extended to account for future migration as predicted by the model.

Bi-annual groundwater monitoring is being conducted as part of an IRA to track the plume migration. A majority of the PFAS impacted soil within the ARFF/SRE Building Area has been capped to reduce infiltration as indicated on Figure 4. Stormwater has also been redirected away from this area to reduce PFAS migration.

4.5 Remediation System Design

Pursuant to 310 CMR 40.0874(3) (b) 5, 6 and 7, a conceptual plan of activities, relevant design and operation parameters, and design features to avoid system malfunctions and accidental releases of OHM are set forth below.

As set forth above, the soil caps and groundwater treatment system were previously designed and installed in 2020. Engineering design details for the cap are included in Appendix B and details of the Maher Treatment Plant is included in Appendix E. Both design documents were previously submitted to the MassDEP before construction. A copy of the Maher Treatment Plant 2022 MassDEP registration is included in Appendix D.

Monitoring of the remedial actions will continue annually with collection of select groundwater samples for PFAS analysis by the Airport and bi-annual inspections of the cap. The Town of Barnstable through the Hyannis Water System will continue to operate the Maher Wells treatment plant and will collect quarterly compliance and monthly process samples for PFAS analysis. The MassDEP periodically inspects the Maher Treatment plant under the water supply/drinking water program.

4.5.1 Groundwater Modeling

Computational groundwater modeling was utilized to estimate the behavior of PFAS released at the ARFF/SRE Building Area and the Deployment Area. The primary goal was to evaluate how long it will take the plumes from the two source areas to dissipate now that the source areas have been capped to prevent/minimize further recharge of contaminated water into the aquifer at these sites. In general, the model included the following details:

<u>General Model Details and Assumptions</u>

- The modeling utilized a refined version of the regional groundwater model of the Sagamore flow lens on Cape Cod, produced by USGS (Walter and Whealan, 2005). The regional model was then updated using Groundwater Vistas (version 8.07, Environmental Simulations, Inc.). **<u>The model does not consider regional PFAS impacts that are related to unknown and non-Airport related sources. For the purpose of this model, PFAS from these areas are considered to be background and are given a value of zero.</u>**

- Hydrologic calculations were completed with MODFLOW-2005 (Harbaugh, 2005) and contaminant transport calculations were completed using MT3DMS (Zheng and Wang, 1999). The steady-state model of the Sagamore lens was utilized and pumping rates at the Maher wellfield were updated to reflect their current long-term average condition (281 gallons per minute [GMP] at ME-1, 330 GPM at ME-2, and 308 GPM at ME-3).

- Well screened interval elevations in the model were adjusted based on elevations provided by the Town of Barnstable, adjusted from NAVD88 vertical datum to NGVD29 (the original datum of the USGS model) by a constant value of 0.9 feet (NGVD29 = NAVD88 + 0.9).

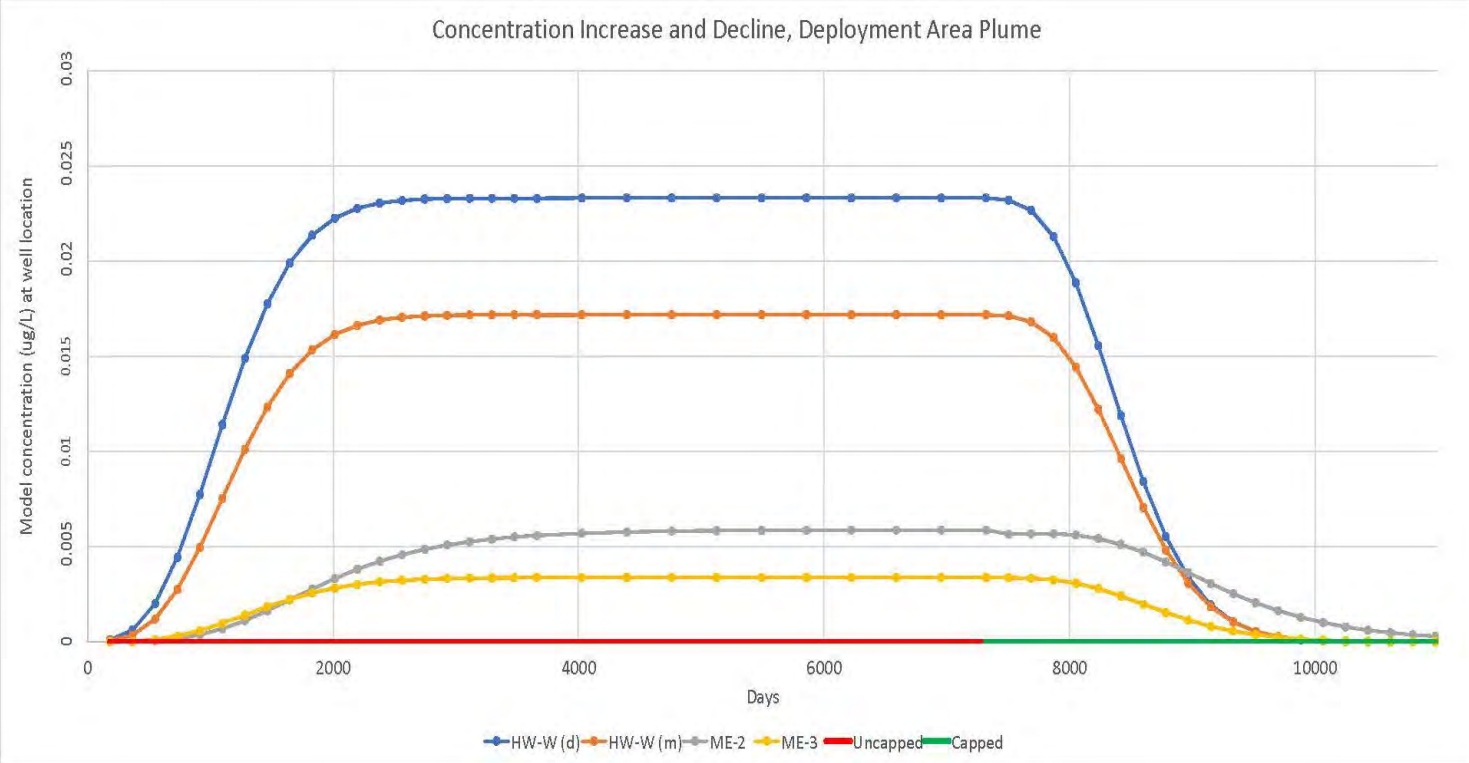
- As provided by USGS, the Sagamore lens groundwater model domain is bounded by Cape Cod Bay to the north, Cape Cod Canal and Buzzards Bay to the west, Vineyard Sound to the south and the Bass River to the east. To reduce the computational demand of repeated modeling runs, telescopic mesh refinement was performed on the model to reduce the size of the domain. Telescopic mesh refinement bounds a subset of a regional model with constant head boundary cells set equal to the heads calculated by the larger regional model. Computational requirements are reduced as heads beyond the refined perimeter no longer need be calculated.

- Refined model domains must be carefully selected to ensure that the goals of the modeling effort are not influenced by the constant head boundary conditions cells. The refined area for this effort was selected to extend far beyond the immediate area of the Airport and Maher Wells. The northern extent of the model is 11,000 feet north of the Deployment Area, beyond the hydrological divide where groundwater flow patterns shift from Nantucket Sound to Cape Cod Bay. To the East, the refined domain extends approximately 17,500 feet from the Maher Wells, beyond Plashes Brook and Swan Pond. To the West the model extends approximately 20,000 feet, to the Centerville River and Wequaquet Lake. The southern boundary of the model remains the coast at Nantucket and Vineyard Sounds. In total, the refined model extends from 2,695,200 to 2,717,600 feet north and 969,775 to 1,009,775 feet east in the Massachusetts State plane coordinate system.
- Further refinement included a reduction in grid spacing in the immediate vicinity of the contamination source sites and the Maher Wells. Cell dimensions were reduced from the regional-scale 400 by 400-foot original dimensions to 50 by 50-foot cells. Reduced cell dimensions improve the resolution at which input parameters can be entered as well as the resolution at which results are reported.
- Contaminant transport modeling using MT3D allows for the calculation of time-dependent contaminant transport within a steady state hydrological framework. Pumping, recharge, and other hydrological factors were maintained at long-term average conditions throughout modeling. The concentration of a mobile contaminant is calculated throughout the model at time steps determined by the modeler.
- A retardation factor of 1.09 was assigned throughout the model based on field-measured properties of the soil. A bulk density of 157 lb/ft^3 was utilized based on field measurements and a dispersion coefficient of 0.00018918197 was utilized to yield the target retardation coefficient. Actual retardation within the aquifer may be lower than this modeled value due to the assumed lack of organic carbon within the aquifer material.

Deployment Area Model Details and Results

- A steady state model was used to evaluate the transport of PFAS compounds in groundwater downgradient of the deployment area where PFAS contained in the AFFF sprayed at this location migrated down through the subsurface soils and entered the aquifer. The highest Sum of Six PFAS concentration detected in groundwater in the vicinity of the Deployment Area (1.172 ug/l) was used to simulate the source concentration from this location. The Deployment Area was modeled with an area of 9,000 ft^2.
- The Deployment Area plume source was capped in 2020, eliminating a substantial amount of the PFAS contribution from this area. To determine the effect of capping, a transient model was developed to simulate how long it would take the plume to dissipate given that no further recharge will migrate through the contaminated soil below the cap. The transient model simulates 11 years of recharge contaminated with t a Sum of Six PFAS concentration of 1.172 ug/l followed by 10 years of recharge without any PFAS entering the aquifer. This simulation provides information on the behavior of the plume following capping of the source.
- Concentrations in the Deployment Area show a quick decline following the elimination of source contribution (shown as the red line that transitions to blue in the graph below). The decline is most rapid nearest to the source, where stabilized concentrations were highest. The decline in concentration is most prolonged further away from the source area. The quick decline is also apparat with the post-cap groundwater monitoring results that are included on the graphs in above in Section 4.1 and also included in Appendix A.
- While the further afield wells decline in concentration more slowly after capping, concentrations at these locations stabilize at values much lower than those at nearer wells. At their peaks, concentrations at the HW-W(m) are 86% lower than peak concentrations at HW-I(s), and concentrations in the Maher Wellfield are approximately 93% lower.
- It is important to note that the contaminated soils near the water table below the cap at the Deployment Area will continue to contribute PFAS to groundwater for some time as water table elevations rise and fall, flushing additional PFAS into the aquifer. The model does not simulate this variation in groundwater elevations so the overall time for the plume to dissipate may extend beyond the timeframe discussed here. As a conservative approach, a 1.5 multiplier was applied to the model estimate for the plume to dissipate below the GW-1 standard.
- It is also important to note that the model projects that the Deployment Area plume migrates somewhat to the east of wells ME-2 and ME-3. This is based on the aquifer characteristics and the groundwater flow directions contained in the USGS model used for this assessment. If the plume migrates more to the south towards the wells, the concentration at wells ME-2 and ME-3 would increase but would most likely not exceed the 0.02 ug/l GW-1 standard for the Sum of Six PFAS compounds. Even if the

concentration at the two water supply wells exceeds the Sum of Six GW-1 PFAS standard, the treatment system is designed and operating to treat for this contaminate.



ARFF/SRE Building Area Model Details and Results

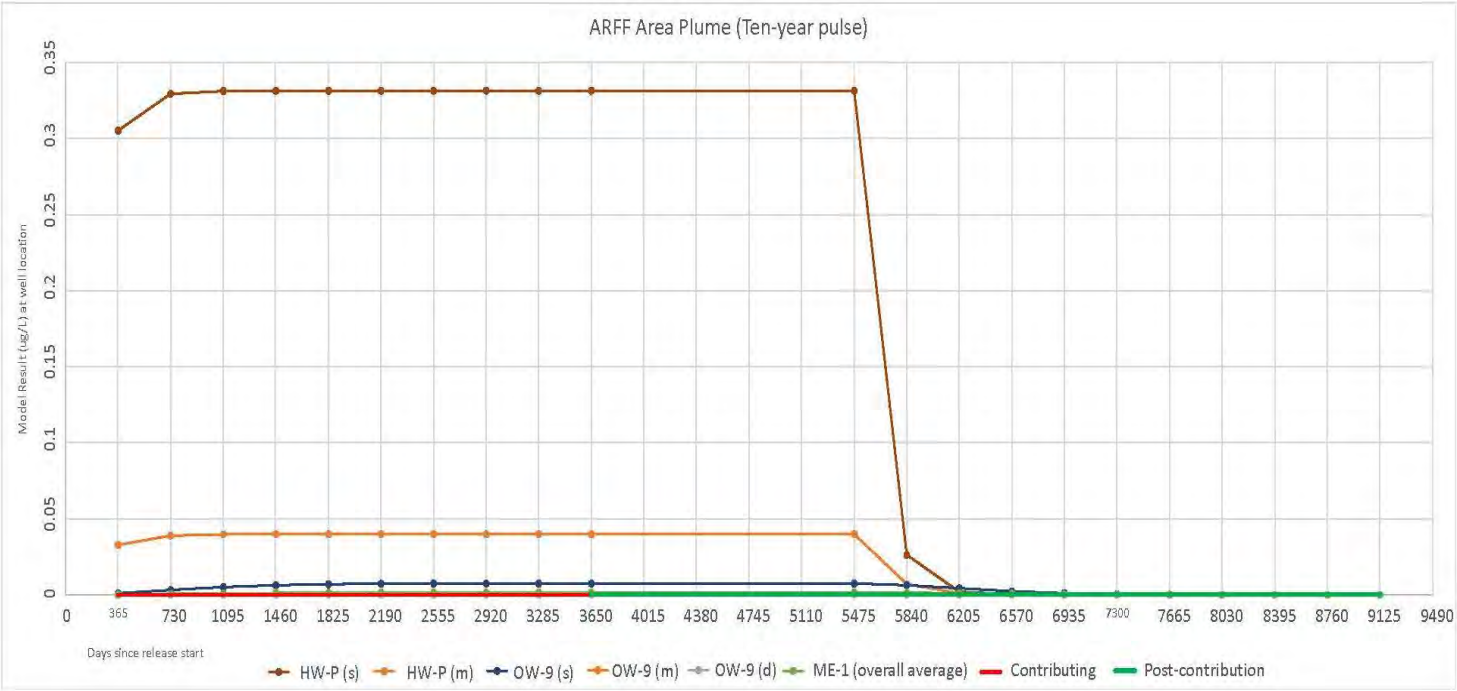
- The ARFF/SRE Building Area plume was modeled separately from the Deployment Area plume. Concentrations in the source area for this plume were assigned a value of 0.724 ug/l which is twice the highest Sum of Six PFAS value observed in the plume (HW-3, 0.362 ug/l). The concentration was doubled as a very conservative estimate considering the release at the ARFF/SRE Building Area appears to have migrated as a slug from HW-P towards HW-3.

- The source of this plume was likely a single event, or several small finite events. The PFAS contaminant was introduced in the recharge of a 2,250 ft^2 area at twice the highest observed concentration until steady state was reached (10 years). After 10 years, the final concentrations were imported to a copy of the model without additional source recharge to evaluate the behavior of the plume.

- Concentrations in the ARFF/SRE show a quick decline following the elimination of source contribution (shown as the red line that transitions to green in the graph below). The decline is most rapid nearest to the source, where stabilized concentrations were highest. The decline in concentration is most prolonged further away from the source

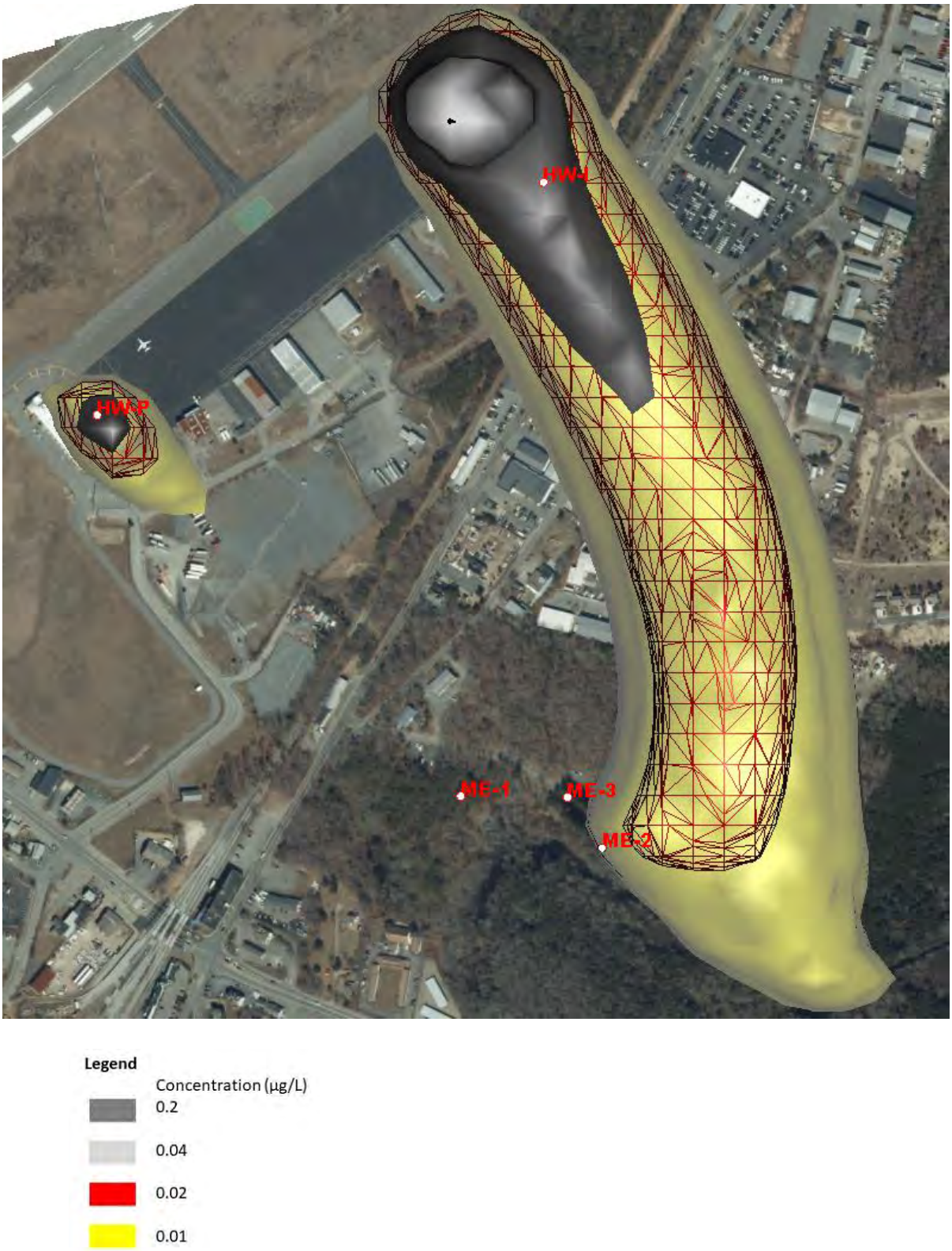
area. The quick decline is also apparat with the post-cap groundwater cap results that are included on the graphs above in Section 4.1 and in Appendix A.

- While the further afield wells decline in concentration more slowly after capping, concentrations at these locations stabilize at values much lower than those at nearer wells. Further downgradient, concentrations at well OW-9(s) begin to fall one year after the source contribution ends and decline by 68% after three years and 94.4% after five years. Peak concentrations at OW-9(s) were 97.7% lower than peak values observed at HW-P(s).

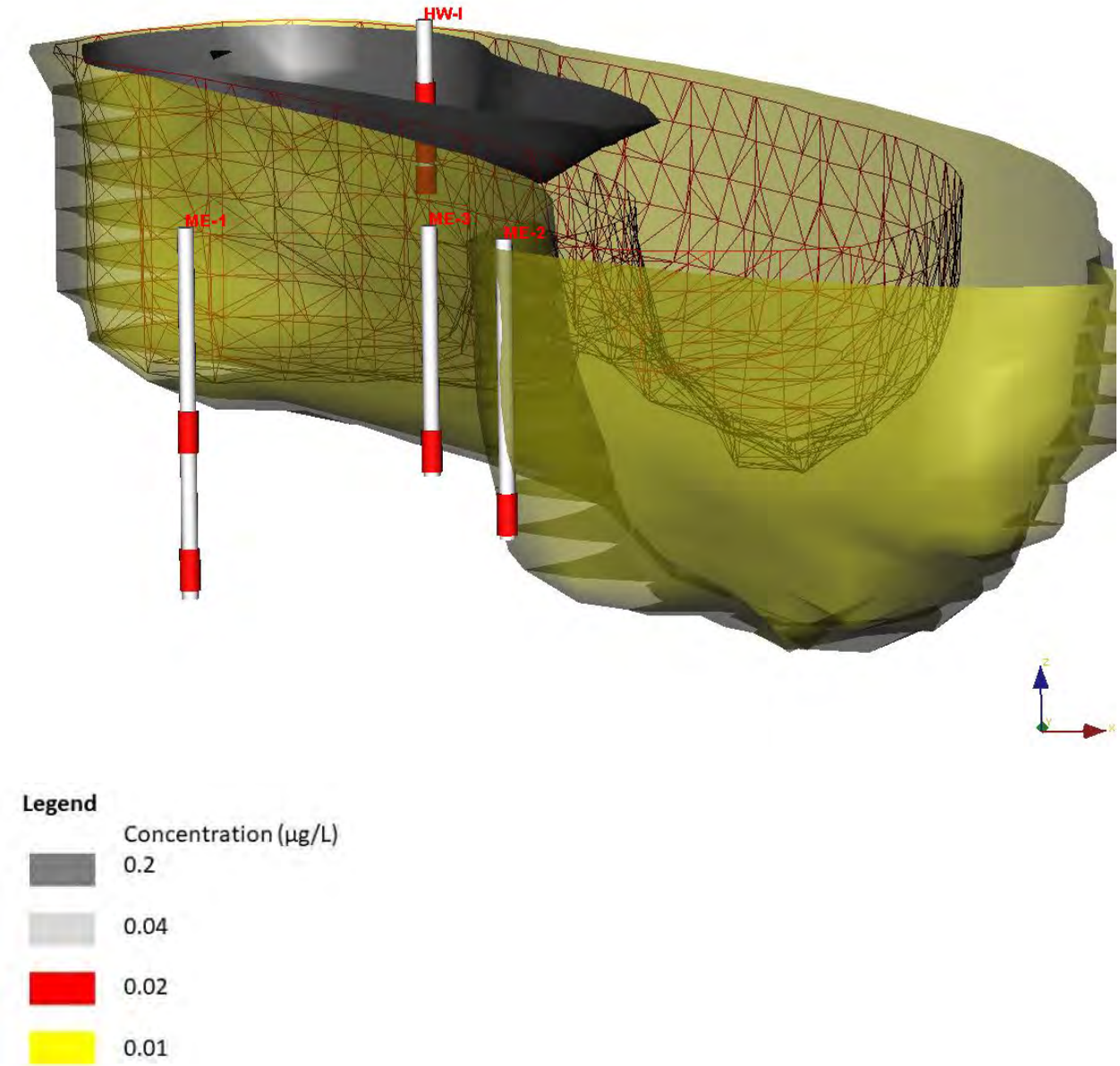


Based on the model results and incorporating a 1.5 correction value due to the uncertainty of groundwater recharge and PFAS flushing from soils relating to groundwater fluctuation, it is expected that the entire Airport groundwater plume will be less that the MassDEP Sum of Six within nine years of the cap installation (2029). This model does not include non-airport related PFAS sources in this calculation. The model predicts that the Airports Plume is less than that the current GW-1 standard by the time its peak concentration reaches the Maher Wells. Actual time for the plume to drop below the current GW-1 standard will be determined based on future analytical results and forensic evaluations. The graphic below is the maximum extent of the Airport PFAS plume.

Plan view of the Maximum Extent of the PFAS Sum of Six Plume from the Deployment Area and ARFF/SRE Area:



Side view of the Maximum Extent of the PFAS Sum of Six Plume from the Deployment Area:



Note that the model predicts that ME-1, ME-2, and ME-3 are outside the portion of the PFAS plume that exceeds the current Sum of Six PFAS GW-1 standard (0.02 ug/l).

5.0 MANAGEMENT OF REMEDIAL WASTE

Pursuant to 310 CMR 40.0874 (3)(b)(8), the remediation waste that will be generated is set forth below.

Soil

As set forth above, soil caps were previously implemented at the Site and details regarding soil management relating to the cap construction were included in the *Immediate Response Action Plan Status Report 8*. Any future soil management within the Disposal Site will be documented in a RAM Plan submitted to the MassDEP consistent with the MCP.

Groundwater

As part of the groundwater treatment process at the plant, GAC will require periodic replacement and disposal. The replacement and disposal of the GAC will be completed by the Town of Barnstable/Hyannis Water System staff consistent with its operating requirements and MassDEP registration (Appendix D).

6.0 POTENTAL IMPACTS RESULTING FROM THE REMEDY IMPLEMENATION PLAN

Pursuant to 310 CMR 40.0874(3)(b) 9 and 10, descriptions of the Site-specific characteristics which may affect or be affected by the design, construction or operation of the selected remedial action alternative and the measures incorporated to avoid deleterious impact on environmental receptors and natural resource areas are set forth below.

6.1 Existing Disposal Site Activities

The cap and groundwater treatment system have been installed and the selected remedial action is not known to have caused any significantly impact to Disposal Site activities.

6.2 Drainage Features, Natural Resource Areas, Local Planning and Development Issues

The cap and groundwater treatment system have been installed and the selected remedial action is not known to have caused any significantly impact to drainage features or significant impact to natural resource areas, or local planning and development issues.

6.3 Soil and Groundwater Characteristics

The cap and groundwater treatment system have been installed and the selected remedial action is not known to have caused any significantly impact to soil and groundwater characteristics at or near the Disposal Site.

6.4 Environmental Receptors

The cap and groundwater treatment system have been installed and the selected remedial action is not known to have caused any significantly impact to environmental receptors at or near the Disposal Site.

7.0 CONSTRUCTION PLANS AND SPECIFICATIONS

Pursuant to 310 CMR 40.0874(3)(c), construction plans, specifications, and schedules are set forth below.

7.1 Plans, Specifications and Procedures

The construction plans and specifications for the selected remedial action alternative are provided in Appendix B and E. As previously indicated, the remedial action alternatives were installed in 2020.

7.2 Remedial Action Schedule

Pursuant to 310 CMR 40.0874(3)(c), a projected schedule for implementing Phase IV activities is set forth below.

Phase IV Activity	Proposed Start Date	Estimated Completion Date
Groundwater Treatment at Maher Wells	November 2022	November 2029
Bi-annual Groundwater Monitoring	Select locations in 2020	November 2029

The actual time for treatment will be based on the collection of analytical samples for laboratory analysis. Groundwater monitoring beyond 2029 may be conducted at the Airport as part of an annual AUL inspection or if plume concentrations have not dropped below the applicable GW-1. As previously indicated, analytical data, environmental forensics and modeling will be utilized to determine Airport related PFAS impacts as opposed to those relating from non-airport related sources.

8.0 OPERATION, MAINTENANCE, AND/OR MONITORING (OMM)

Pursuant to 310 CMR 40.0874 (3) (d), the operation, maintenance, and monitoring activities for the selected remedial action alternative are set forth below.

8.1 Personnel conducting Operation, Maintenance, and/or Monitoring (OMM)

The personnel conducting operation, maintenance, and/or monitoring activities are documented above in Section 3.1.3.

8.2 Operation, Maintenance, and/or Monitoring Procedures

Soil Caps

The soil cap comprehensive remedial action does not involve a system that requires startup, testing, maintenance, shut down and emergency or contingency procedures.

Groundwater Treatment

The groundwater treatment system is managed by the Town of Barnstable/Hyannis Water System consistent with MassDEP requirements. As part of the plant's compliance testing, samples of the treated groundwater are collected quarterly and submitted to a laboratory for analysis of multiple contaminants including PFAS. The plant also collects process control samples monthly from multiple locations throughout the plant process including the untreated groundwater, before filtration, after the lead GAC vessel, after lag GAC vessel and at the treated tap. This information is used to adjust the treatment process as necessary and to determine when GAC replacement is needed. In addition, the plan has an emergency generator in the event of a power failure. A copy of the 2021 water quality report and registration is included in Appendix C and D, respectively.

8.3 Inspection and Monitoring Reports

Groundwater monitoring and bi-annual cap inspections will be completed to document the cap effectiveness and track the plume migration as part of Remedy Operation Status until a Permanent Solution can be achieved. The Maher Well Treatment plant will continue to be operated by the Town of Barnstable/Hyannis Water System consistent with its permit requirements.

8.4 Health and Safety Plan (HASP)

Pursuant to 310 CMR 40.874(3)(e), a Health and Safety Plan ("HASP") was developed for the construction and implementation of the caps. The HASP is consistent with the requirements of the Occupational Safety and Health Administration ("OSHA") 29 CRF 1910.120 and is included in Appendix F.

8.5 Permits, Licenses, and/or Approvals

- Massachusetts Department of Environmental Protection Drinking Water Program Certificate of Registration PWS 402004 (Appendix D)

- Local building permits for Cap construction
- Presumptive approval of Cap construction by MassDEP December 23, 2019

8.6 Access Agreements

The comprehensive remedial alternatives have been implemented and property access issues are not a concern.

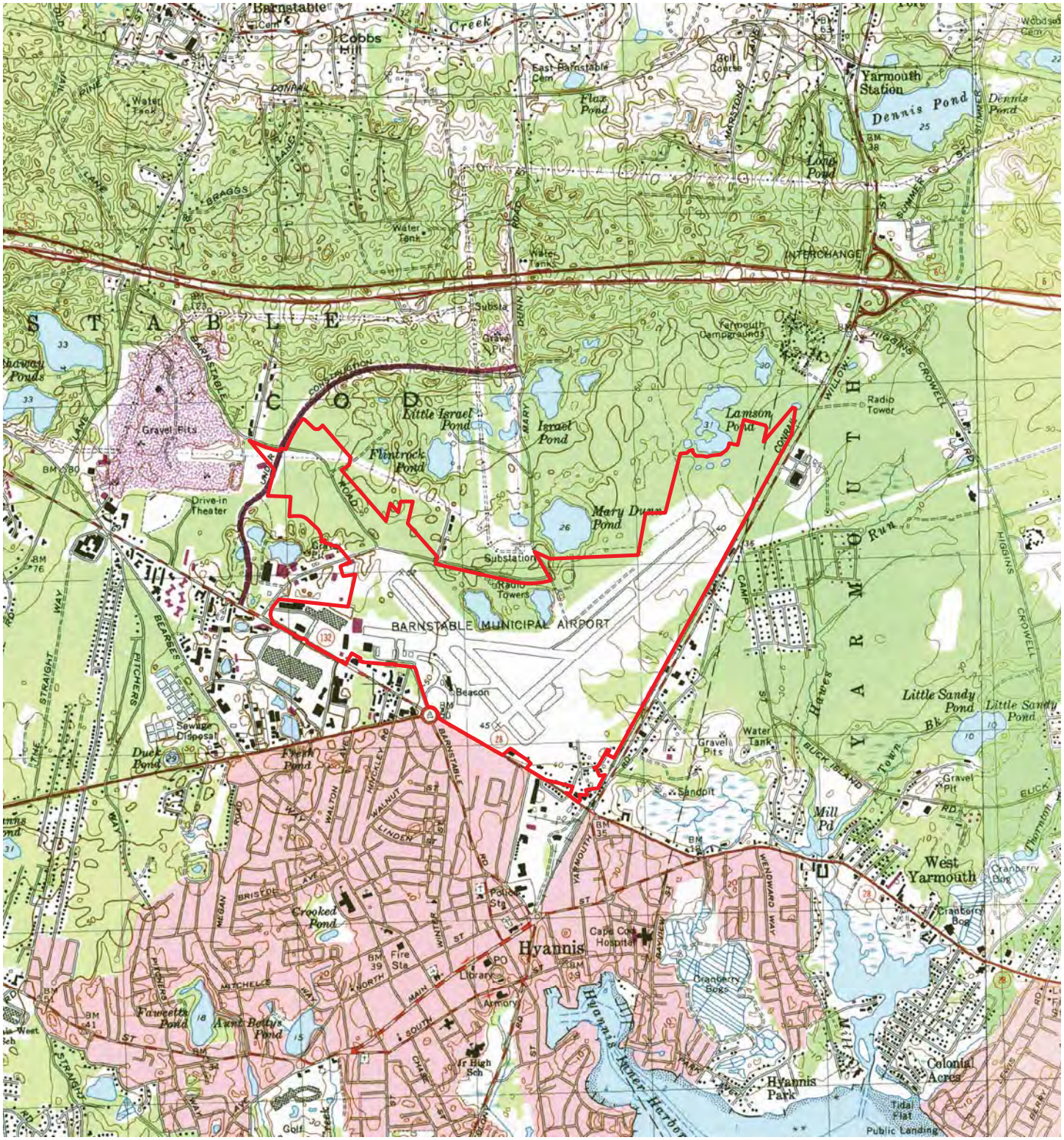
9.0 PUBLIC INVOLVEMENT

Pursuant to 310 CMR 40.1403 and the Final PIP dated September 16, 2019, notification of the Draft Phase III will be provided to all individuals on Table 1. This includes the Chief Municipal Officer and the Board of Health for both Barnstable and Yarmouth.

10.0 REFERENCES

1. Walter, D.A., and Whealan, A.T., 2005, Simulated Water Sources and Effects of Pumping on Surface and Ground Water, Sagamore and Monomoy Flow Lenses, Cape Cod, Massachusetts: U.S. Geological Survey Scientific Investigations Report 2004-5181, 85 p.
2. Zheng, C., and Wang, P., 1999, MT3DMS: A Modular Three-Dimensional Multispecies Transport Model for Simulation of Advection, Dispersion, and Chemical Reactions of Contaminants in Groundwater Systems; Documentation and User's Guide. prepared for U.S. Army Corps of Engineers ; monitored by U.S. Army Engineer Research and Development Center. 221 p.
3. Harbaugh, A.W., 2005, MODFLOW-2005, The U.S. Geological Survey modular ground-water model—the Ground-Water Flow Process: U.S. Geological Survey Techniques and Methods 6-A1.

FIGURES



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Legend

Airport Property Line

*Hyannis Topographic Quadrangle

N

Miles

0.5

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USGS Locus
Cape Cod Gateway Airport
Hyannis, MA

Date: 4/17/2018

Figure 1

Flint Rock Pond
Barnstable Fire Training Academy
GP-5
MD-3
Off-Site BFTA PFAS Plume Impacting Airport and Others
Runway 15/33
MD-2
Mary Dunn Pond
MD-1
Runway 6/24
32
Off-Site PFAS Plume Impacting Airport and Others
1991 Drill Location
1981 Crash Site
Historic Deicing area
Upper Gate Pond
Air-1
Lewis Pond
30
Yarmouth Road
Deployment Area/ Deployment Area Cap
24
22
28
26
ARFF/SRE Building Area Cap
ARFF/SRE Building Area
2016 Crash Site
Historic Deicing Area
20
Oil/Water Seperator
18
16
Barnstable Road
14
12
Current Deicing Area
28
ME-1
ME-3
ME-2
Maher Treatment Plant
Off-Site 1,4-Dioxane Plume Impacting Airport and Others
28
10
Estimated Disposal Site Boundary (Based on Maximum PFAS Plume Model Migration above 0.02 ug/L in Phase IV Report)
3

Legend

- Airport Monitoring Wells
- Barnstable Fire Training Academy Monitoring Wells
- Soil Samples
- Surface Water Samples Completed by Airport
- Drinking Water Wells
- Barnstable Municipal Airport Property Boundary
- Estimated Disposal Site Boundary for Airport AFFF Release
- Groundwater Contours
- Estimated Extent of Airport AFFF PFAS Plume
- Estimated Extent of Off-Site BFTA Plume
- Estimated Extent of Off-Site 1,4-Dioxane Plume
- Estimated Extent of Off-Site 1,4-Dioxane Plume

N

0 750

1 in = 779 feet

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Estimated Airport AFFF Disposal Site Boundary
Cape Cod Gateway Airport
Hyannis, MA

Date: 11/8/2022 Figure 2

* Cape Cod Commission (CCC) Groundwater Contours

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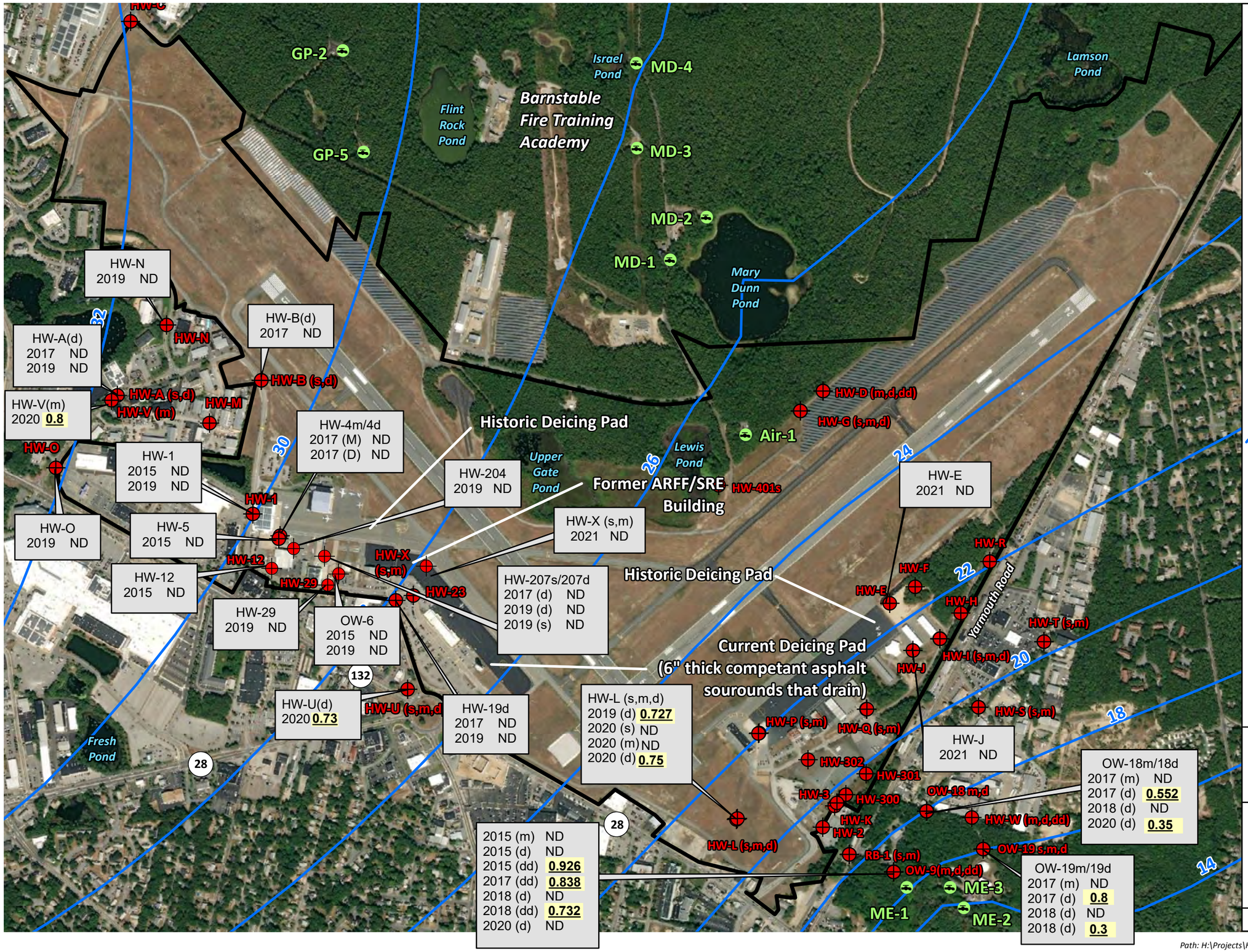

Legend

- Monitoring Wells
- ND — Not detected by the laboratory above the reporting limit
- 0.2 — 1,4 Dioxane Below MassDEP Limit (0.3 ug/L)
- **0.8** — 1,4 Dioxane Above Method 1 GW-1 Standard (0.3 ug/L)
- Drinking Water Wells
- Barnstable Municipal Airport Property Boundary
- Groundwater Contours

N

0 750

1 inch = 750 feet

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1,4 Dioxane Results In Groundwater Cape Cod Gateway Airport Hyannis, MA

Date: 10/1/2021

Figure 3

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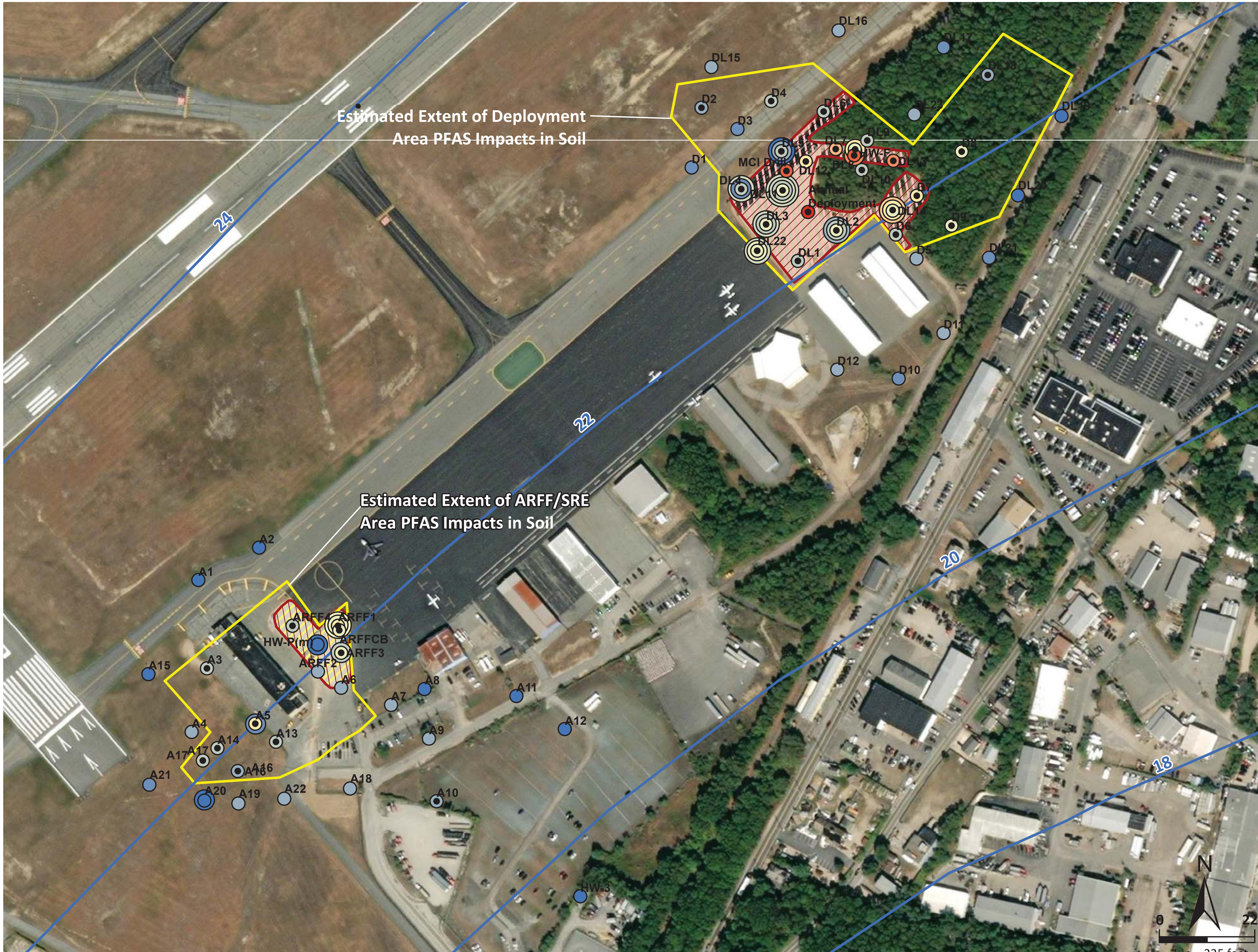

Legend

- Groundwater Contours*
- • Samples exceeding MassDEP S-1/GW-1 Standard
- ARFF Asphalt Cap
- Deployment Area Liner Cap

Maximum Concentration of Total PFAS Detected in Soil (ug/kg)

0 - 0.5	100 - 200
0.5 - 1	200 - 500
1 - 5	500 - 1000
5 - 20	1000 - 2000
20 - 100	2000 - 6000

Notes:
1. Multiple circles indicates samples at different depths. The larger the circle, the deeper the sample.

2. Total PFAS is the sum of all laboratory reported PFAS analytes.

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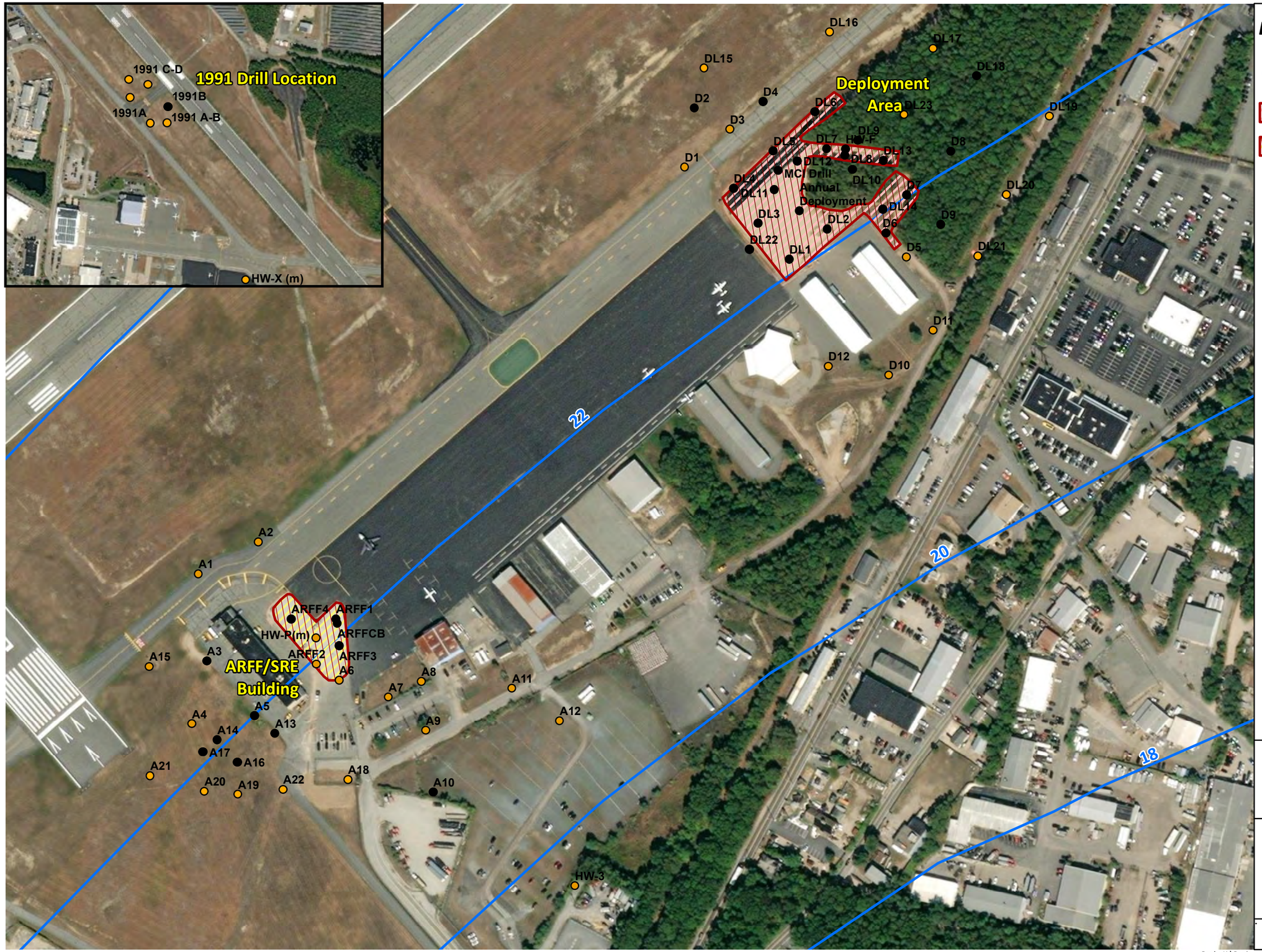
Sum of Six PFAS in Soil
Cape Cod Gateway Airport
Hyannis, MA

Date: 8/11/2021 Figure 4

Path: H:\Projects\HYA\21084 PFOS Phase III\GIS\Maps\201030_SoilPFASTotalZoom.mxd

* Cape Cod Commission (CCC) Groundwater Contours



Legend

- Groundwater Contours*
- Deployment Area Liner Cap
- ARFF Asphalt Cap
- Soil Sample Location below Method 1 S-1/GW-1 Standard for all Six PFAS Compounds
- Soil Sample Exceeding Method 1 S-1/GW-1 for at least one of the six regulated PFAS compounds

Method
PFHpA = 0.5 ug/kg
PFHxS = 0.3 ug/kg
PFOA = 0.72 ug/kg
PFNA = 0.32 ug/kg
PFOS = 2 ug/kg
PFDA = 0.3 ug/kg

Soil Sample Location for TOC

N

0 225

1 in = 225 feet

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Soil Sample Locations
Barnstable Municipal Airport
Hyannis, MA

Date: 10/4/2021 Figure 5

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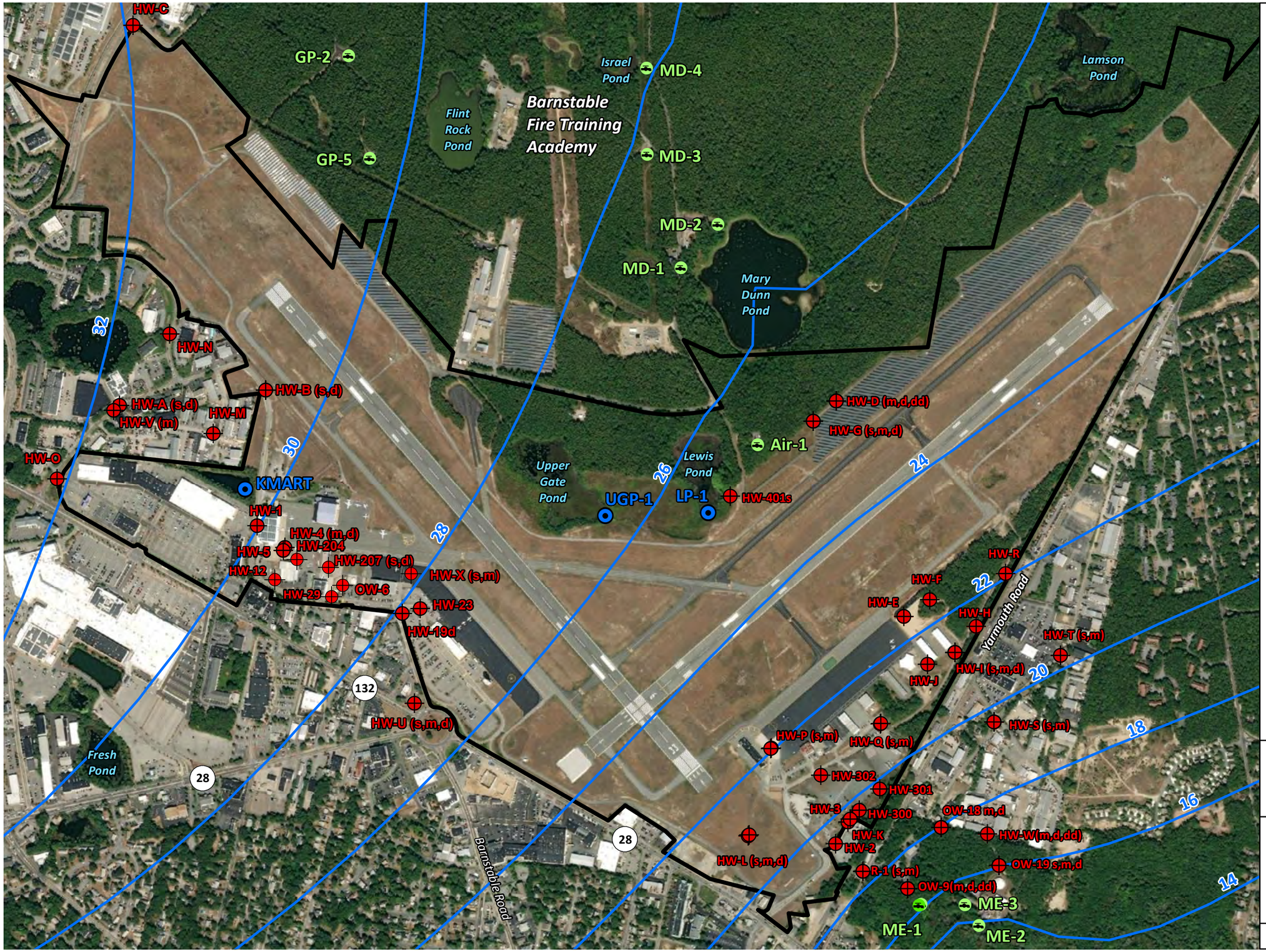
** Cape Cod Commission (CCC) Groundwater Contours*



Legend

- PFAS Monitoring Wells
- Surface Water Samples Completed by Airport
- Drinking Water Wells
- Barnstable Municipal Airport Property Boundary
- Groundwater Contours*

N

0 750

1 inch = 750 feet

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Surface Water and Monitoring Well Locations
Barnstable Municipal Airport
Hyannis, MA

Date: 10/4/2021 Figure 6

* Cape Cod Commission (CCC) Groundwater Contours

Path: K:\Projects\HYA\17027 BMA PFOS 1-4 IRA\GIS\Maps\200408_Well Locations.mxd

TABLES

Table 1. Pre and Post Cap Groundwater Results for PFAS Compounds in ARFF/SRE Building Area and Deployment Area (ug/L)

Sample Location	**ARFFF/SRE Area**				**Deployment**				
Sample ID	HW-P (s)				HW-I (s)				
Sample Type	Pre-Cap	Post-Cap	Post-Cap	Post-Cap	Pre-Cap	Post-Cap	Post-Cap	Post-Cap	Post-Cap
Sample Date	10/1/2020	3/18/2021	9/8/2021	3/18/2022	5/8/2020	3/17/2021	9/8/2021	3/18/2022	8/2/2022
Depth to Groundwater	22.69	22.09	23.54	21.61	15.39	18.42	19.94	17.72	19.81
Groundwater Elevation	17.82	18.42	16.97	18.90	20.69	17.66	16.14	18.36	16.27
Perfluoroheptanoic acid (PFHpA)	0.026	0.0067	0.004	0.01	0.54	0.032	0.097	0.098	0.2
Perfluorohexanesulfonic acid (PFHxS)	0.0018 J	0.00074 J	0.00056 J	0.0012 J	0.22	0.021	0.036	0.06	0.11
Perfluorononanoic acid (PFNA)	0.0061	0.002	0.0013 J	0.0039	0.082	0.065	0.033	0.21	0.12
Perfluorooctanoic acid (PFOA)	0.0084	0.0042	0.0017 J	0.012	0.29	0.05	0.063	0.11	0.17
Perfluorooctane sulfonate (PFOS)	0.00097	0.00049 J	0.00054 U	0.00098 J	0.04	0.028	0.02	0.52	0.43
Perfluorodecanoic Acid (PFDA)	0.00085	0.0004 J	0.00048 U	0.00043 U	<0.002	0.0038 U	0.00047 U	0.00043 U	0.0018 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	0.011	0.0034	0.0014 J	0.0083	13	1.7	2.1	1.3	4.6
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six									
Total PFAS	0.2478	0.06294	0.05055	0.08508	15.5383	2.082	2.73304	2.66512	6.1201
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	**0.04412**	0.01453	0.00756	**0.02808**	**1.172**	**0.196**	**0.249**	**0.998**	**1.03**
Statistics									
Percent Total PFAS Increase or Decrease	-73.29%				-78.12%				
Percent Sum of 6 Increase or Decrease	-62.10%				-47.25%				

Notes
Results in ug/L, micrograms per liter.
U= Not detected by the Laboratory above the method detection limit. Method detection limit shown.
Bold results above Method 1 GW-1 standard (0.02 ug/L).
Sum of six includes estimated values and does not include non-detects (U or <).
Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).
The Method 1 GW-3 Standard for the individual analytes in the Sum of Six ranges from 500 to 40,000 ug/l.
Percent increase or decrease is calculated as follows: [(Post Cap− Pre Cap)/(Pre Cap)]*100 then each event is average together to determine the percent increase or decrease

Table 2
Community Notification List
Barnstable Municipal Airport Public Involvement Plan

NAME	ADDRESS
Brad Schiff	bschiff@pierce-cote.com
Bronwen Walsh	bwalsh@barnstablepatriot.com
Chanda Beaty	chanda123@yahoo.com
David Dow	ddow420@comcast.net
Geoff Spillane	gspillane@capecodonline.com
Gerard Martin	gerard.martin@mass.gov
Gordon Starr	gordon.m.starr@gmail.com
Keith Lewison	keith.lewison@gmail.com
Lisa Connors	lconnors@pierce-cote.com
Paul Neary	nearyprecinct6@gmail.com
Steve Seymour	steveseymour@comcast.net
Tom Cambareri	tomcambareri@gmail.com
Sue Phelan	suephelan@comcast.net
Chris Greeley	greeleyc@comcast.net
Amanda Rose	504 Pitchers Way Hyannis, MA 02601
Angela Gallagher	MassDEP Southeast Regional Office Bureau of Waste Site Cleanup 20 Riverside Drive Lakeville, MA 02347
Anthony Alva	184 Mockingbird Lane Marstons Mills, MA 02646
Araceli Alcantara	67 Coolidge Road West Yarmouth, MA 02673
Arthur Beatty	699 Cotuit Road Marstons Mills, MA 02648
Bruce Murphy	Health Department Town of Yarmouth 1146 Route 28 South Yarmouth, MA 02664
Ronald Beaty	245 Parker Rd. West Barnstable, MA 02668
Rong Jian Liu	5 Fishing Brook Road Yarmouth, MA 02664
Scott Beaty	29 Washington Avenue West Yarmouth, MA 02673
Sue Phelan	Green Cape - PO Box 631 West Barnstable, MA 02668
Sylvia Laselva	358 Sea Street Hyannis, MA 02673
Vilson Kote	106 Betty's Path West Yarmouth, MA 02673

NAME	ADDRESS
Charlie Bloom	29 Oak Street Hyannis, MA 02601
Cheryl Osimo	MBCC PO Box 202 Franklin, MA 02038
Christian Cook	37 Maple Avenue Hyannis, MA 02601
Daniel Knapik	Town Administrator Town of Yarmouth 424 Rte. 28 West Yarmouth, MA 02673
Daniel Santos	Department of Public Works Town of Barnstable 397 Main Street Hyannis, MA 02601
Darcy Karie	Conservation Commission Town of Barnstable 397 Main Street Hyannis, MA 02601
David Beaty	137 Harbor Bluff Road Hyannis, MA 02601
Eric Kristofferson	Hyannis Fire Department 95 High School Road Ext. Hyannis, MA 02601
Hans Keijser	Department of Public Works Town of Barnstable 397 Main Street
Janine Voiles	67 Coolidge Road West Yarmouth, MA 02673
Jeanny Fichter	1640 Old Stage Rd. West Barnstable, MA 02668
Karl Von Hone	Yarmouth Natural Resources Town of Yarmouth 424 Route 28 West Yarmouth, MA 02673
Luiz Gonzaga	92 High School Rd. Hyannis, MA 02601
M. Curley	39 Oak Ridge Road Osterville, MA 02655
Maia Fitzstevens	Silent Spring Institute 320 Nevada Street, Suite 302 Newton, MA 02460
Mainur Kote	106 Betty's Path West Yarmouth, MA 02673
Mainur Kote	106 Betty's Path West Yarmouth, MA 02673
Margo Pisacano	73 Harbor Bluff Road Hyannis, MA 02601
Mark Ells	Town Manager Town of Barnstable 397 Main Street Hyannis, MA 02601
Mark Forest	Board of Selectmen c/o Town Administrator's Office 1146 Route 28 South Yarmouth, MA 02664
Mr. Michael Gorenstein	Department of Public Works Town of Barnstable 397 Main Street
Nancy Wentzel-Johnson	PO Box 342 Hyannis, MA 02601
Peter Burke	Hyannis Fire Department 95 High School Road Ext. Hyannis, MA 02602
Richard A. Zoino	92 High School Road Hyannis, MA 02601
Richard Rougeau	306 Longbeach Road Centerville, MA 02632
Thomas McKean	Board of Health Town of Barnstable 397 Main Street Hyannis, MA 02601

Table 3. Soil Results for PFAS Compounds ug/kg

Sample Location				ARFF Building																																		
Sample ID	Method 1 Standard		UCL	ARFF1 (0-1')	ARFF1 (2')	ARFF1 (4')	ARFF2 (0-1')	ARFF3 (0-1')	ARFF3 (10-12)	ARFF4 (0-1')	ARFFCB (0-1)	A1 (0-1')	A2 (0-1')	A3 (0-1')	A4 (0-1')	A5 (0-1')	A5 (2-4')	A6 (0-1')	A7 (0-1')	A8 (0-1')	A9 (0-1')	A10 (0-1')	A11 (0-1')	A12 (0-1')	A13 (0-1')	A13 (0-1')	A14 (0-1')	A14 (0-1')	A15 (0-1')	A15 (0-1')	A16 (0-1')	A17 (0-1')	A18 (0-1)	A19 (0-1)	A20 (0-1)	A20 (2-4)	A21 (0-1)	A22 (0-1)	HW-P(M) [8-10]	HW-P(M) [18-20]	DL1(0-1')
Sample Date	S-1/GW-1	S-1/GW-3		6/20/2017	9/26/2017	9/26/2017	6/20/2017	9/26/2017	10/9/2018	9/26/2017	9/26/2017	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	9/24/2020	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	2/27/2019	9/29/2020	2/27/2019	5/13/2020	2/27/2019	5/13/2020	9/17/2020	9/17/2020	9/29/2020	9/24/2020	9/24/2020	9/24/2020	9/24/2020	9/29/2020	9/18/2020	9/18/2020	6/20/2017
Perfluoroheptanoic acid (PFHpA)	0.5	300	4,000	**0.82 J**	**1.8**	**0.66 J**	0.17 U	**0.60 J**	0.32 J	**0.75 J**	**0.60 J**	0.19 U	0.19 U	0.38 J	0.19 U	**1.1**	0.089 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	**<2.0**	0.396 J	**<1.9**	**0.51 J**	**<2.0**	0.21 U	0.067 J	**1.07**	0.076 J	0.101 J	0.09 U	0.09 U	0.045 U	0.096 J	0.044 U	0.043 U	0.30 J
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	4,000	0.23 U	0.23 U	0.23 U	0.23 U	**0.64 J**	0.24 U	0.23 U	0.23 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.12 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	**<2.0**	0.058 U	**<1.9**	0.24 U	**<2.0**	0.21 U	0.085 J	0.058 U	0.054 U	0.059 U	0.121 U	0.121 U	0.06 U	0.055 U	0.059 U	0.058 U	0.23 U
Perfluorooctanoic acid (PFOA)	0.72	300	4,000	**0.75 J**	**2.6**	**0.75 J**	0.26 U	**0.78 J**	**1.9**	**0.97 J**	**0.90 J**	0.25 U	0.25 U	0.37 J	0.30 J	**1.9**	0.228 J	0.25 U	0.25 U	0.34 J	0.25 U	0.25 U	0.25 U	**<2.0**	0.67 J	**<1.9**	0.68 J	**<2.0**	0.14 U	0.088 J	**0.989**	0.111 J	0.129 J	0.196 J	0.147 J	0.042 U	0.069 J	0.089 J	0.046 J	0.26 U
Perfluorononanoic acid (PFNA)	0.32	300	4,000	**2.5**	**5.7**	**1.4**	0.20 J	**0.91 J**	**3.1**	**2.9**	0.17 U	0.22 U	0.22 U	**0.51 J**	0.22 U	**0.87 J**	0.148 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	**<2.0**	**1.2**	**<1.9**	**0.54 J**	**<2.0**	0.15 U	0.119 J	**0.774 J**	0.281 J	0.246 J	0.15 U	0.15 U	0.075 U	0.11 J	0.073 U	0.072 U	0.17 U
Perfluorooctane sulfonate (PFOS)	2	300	4,000	**4.5**	**2.7**	1.1	0.29 J	**4.4**	1.1	1.0	1.1	0.26 U	0.26 U	0.29 J	0.26 U	0.26 U	0.257 U	0.26 U	0.38 J	0.26 U	0.85 J	0.26 U	0.26 U	0.26 U	<2.0	1.3	<1.9	0.32 J	<2.0	0.29 J	**2.02**	0.573 J	1.15	0.611 J	0.259 U	0.26 U	0.276 J	0.559 J	0.0127 U	0.0124 U	0.40 J
Perfluorodecanoic Acid (PFDA)	0.3	300	4,000	**4.4**	**1.2**	**0.62 J**	0.13 U	**1.6**	0.28 U	**0.85 J**	0.13 U	0.28 U	0.28 U	**0.42 J**	0.28 U	**1.4**	0.133 U	0.28 U	0.28 U	0.28 U	0.28 U	**0.33 J**	0.28 U	**<2.0**	**0.34 J**	**<1.9**	**0.95 J**	**<2.0**	0.15 U	0.074 J	0.147 J	0.146 J	0.066 U	0.134 U	0.134 U	0.067 U	0.119 J	0.065 U	0.064 U	**0.63 J**
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	NA	0.93 J	0.74 J	1	0.23 U	0.61 J	4.2	0.65 J	2.2	0.26 U	0.26 U	0.26 U	0.26 U	18	0.355 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	<2.0	0.173 U	<1.9	0.25 U	<2.0	0.22 U	0.17 U	0.172 U	0.161 U	0.175 U	0.358 U	0.359 U	0.179 U	0.164 U	0.221 J	0.172 U	0.39 J
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six																																								
Total PFAS	NA	NA	NA	120.06	41.75	46.85	1.16	23.72	11.03	11.9	95.43	0	0	6.2	1.14	161.07	0.613	1.5	1.35	0.48	1.92	1.1	0.43	0	0.0	5.2	0	13.15	0.0	0.45	3.131	11.267	2.652	1.409	0.316	0.147	0.571	1.412	0.411	0.09	11.14
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	NA	12.97	14	4.53	0.49	8.93	6.42	6.47	2.6	0	0	1.97	0.3	5.27	0.228	0	0.38	0	1.19	0.33	0	0	0	3.916	0	3	0	0.29	2.453	3.553	1.764	1.087	0.196	0.147	0.276	0.953	0.089	0.046	1.33

Sample Location				Deployment Area																																				
Sample ID	Method 1 Standard		UCL	DL2 (0-1')	DL2 2'	DL2 4'	DL3 (0-1')	DL3 2'	DL3 4'	DL4 (0-1')	DL4 2'	DL4 4'	DL5 (0-1')	DL5 2'	DL5 4'	DL6 (0-1')	DL7 (0-1')	DL8 (2')	DL8 (4')	DL9 (0-1')	DL10 (0-1')	DL11 (0-1')	DL11 (4-6')	DL11 (10-12')	DL11 (14-16')	DL12 (0-1')	DL13 (0-1')	DL14 (0-1')	DL14 (4-6')	DL14 (10-12')	DL14 (14-16')	DL15 (0-1)	DL16 (0-1)	DL17 (0-1)	DL18 (0-1)	DL19 (0-1)	DL20 (0-1)	DL21 (0-1)	DL22 (2-4)	DL22 (6-8)
Sample Date	S-1/GW-1	S-1/GW-3		6/20/2017	9/26/2017	9/26/2017	6/20/2017	9/26/2017	9/26/2017	6/20/2017	9/26/2017	9/26/2017	6/20/2017	9/26/2017	9/26/2017	6/20/2017	6/20/2017	6/20/2017	9/26/2017	6/20/2017	6/20/2017	9/26/2017	8/20/2019	10/4/2018	10/4/2018	10/4/2018	9/26/2017	9/26/2017	9/26/2017	10/4/2018	10/4/2018	10/4/2018	9/30/2020	9/30/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020
Perfluoroheptanoic acid (PFHpA)	0.5	300	4,000	**1.9**	**1.2**	0.48 J	**0.84 J**	0.17 U	0.17 U	0.31 J	0.17 U	0.17 U	**2.5**	0.40 J	0.50 J	**5.0**	**2.5 J**	**2.9 J**	**4.7 J**	**0.66 J**	**1.3**	**2.1**	**1.8**	**1.3**	0.31 J	0.23 J	**1.2**	**1.6**	**4.9**	0.36 J	0.19 U	**1.4**	0.175 U	0.138 J	0.167 U	0.319 J	0.145 U	0.157 U	0.158 U	0.109 J	0.481 J
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	4,000	**1.8**	**1.3**	**0.59 J**	**0.34 J**	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	**0.49 J**	**0.49 J**	0.23 U	0.23 U	**2.3 U**	**2.3 U**	**2.3 U**	**0.35 J**	**0.94 J**	**0.82 J**	**<0.9**	0.24 U	0.24 U	0.24 U	0.23 U	**0.71 J**	0.24 U	0.24 U	**0.74 J**	0.235 U	0.057 U	0.224 U	0.159 J	0.194 U	0.21 U	0.212 U	0.057 U	0.07 J
Perfluorooctanoic acid (PFOA)	0.72	300	4,000	**1.6**	**4.1**	**0.74 J**	**0.80 J**	0.26 U	0.26 U	**0.83 J**	0.26 U	0.26 U	**3.7**	**1.6**	0.26 U	0.26 U	**4.2 J**	**25**	**22**	0.68 J	**1.7**	**4.7**	**5.2**	**2.9**	**1.9**	0.50 J	**4.6**	**2.4**	**23**	0.58 J	0.32 J	**2.9**	0.334 J	0.223 J	0.166 J	**0.979 J**	0.135 U	0.146 U	0.159 J	0.447 J	**1.32**
Perfluorononanoic acid (PFNA)	0.32	300	4,000	**0.81 J**	**2.5**	0.17 U	**0.55 J**	0.17 U	0.17 U	**2.7**	0.17 U	**3.7**	0.19 J	0.17 U	0.17 U	0.19 J	**9.6 J**	**46**	**1.7 U**	0.22 J	0.17 U	**16**	**2.4**	**2.5**	0.22 U	0.22 U	**7.3**	**1.5**	**10**	0.22 U	0.22 U	**10**	0.292 U	0.285 J	0.277 U	0.296 J	0.241 U	0.261 U	0.263 U	**5.46**	**2.66**
Perfluorooctane sulfonate (PFOS)	2	300	4,000	**12**	1.5	0.21 U	0.51 J	0.21 U	0.21 U	2.0	0.21 U	0.50 J	0.21 U	0.21 U	0.21 U	0.21 U	**3.9 J**	**14**	**2.1 U**	0.38 J	0.26 J	**29**	1.5	0.26 U	0.26 U	0.26 U	**23**	0.66 J	**7.4**	**9.6**	0.28 U	0.28 U	0.28 U	0.26 U	0.181 J	0.248 U	0.167 J	0.215 U	0.233 U	0.235 U	**0.834 J**	**0.383 J**
Perfluorodecanoic Acid (PFDA)	0.3	300	4,000	0.13 U	0.13 U	0.13 U	**1.4**	0.13 U	0.13 U	**1.3**	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	**1.3 U**	**1.3 U**	**1.3 U**	0.13 U	0.13 U	**1.8**	**8.7**	0.28 U	0.28 U	0.28 U	**0.66 J**	**7.4**	**9.6**	0.28 U	0.28 U	0.28 U	0.26 U	0.181 J	0.248 U	0.167 J	0.215 U	0.233 U	0.235 U	**0.834 J**	**0.383 J**
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	NA	0.23 U	0.23 U	0.57 J	3.1	1.5	1	0.24 J	0.23 U	1.7	0.23 U	0.23 U	0.23 U	2	290	1600	900	0.23 U	0.23 U	7.8	30	4.1	4.4	6.7	62	320	230	0.67 J	0.30 J	64	0.698 U	0.168 U	0.664 U	0.19 U	0.577 U	0.625 U	0.629 U	7.49	11.7
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six																																								
Total PFAS	NA	NA		24.41	12.17	2.38	84.86	9.56	13.81	9.6	0.88	5.9	11.03	2.49	0.5	18.59	404.4	1727.2	949.6	6.38	9.1	85.22	91.5	11.07	6.82	7.63	108.56	521.26	598.24	50.11	21.22	116.64	4.523	2.269	0.628	4.84	0	0	0.68	66.813	41.988
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	NA	18.11	10.6	1.81	4.44	0	0	7.14	0	4.2	6.88	2.49	0.5	5.19	20.2	87.9	26.7	2.29	4.2	54.42	19.6	6.7	2.21	0.73	36.76	13.56	55.81	0.94	0.32	17.34	0.334	1.402	0.166	2.97	0	0	0.159	27.15	13.764

Sample Location				Deployment Area																
Sample ID	Method 1 Standard		UCL	DL22 (18-20)	DL23 (0-1)	D1 (0-1')	D2 (0-1')	D3 (0-1')	D4 (0-1')	D5 (0-1')	D6 (0-1')	D7 (0-1')	D8 (0-1')	D9 (0-1')	D10 (0-1')	D11 (0-1')	D12 (0-1')	HW-F (10-12')	HW-F (14-16')	HW-3 (0-1')	MCI Drill (0-1)	Annual Deployment (0-1)
Sample Date	S-1/GW-1	S-1/GW-3		9/25/2020	9/29/2020	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	10/4/2018	10/4/2018	10/9/2018	12/9/2016	12/9/2016
Perfluoroheptanoic acid (PFHpA)	0.5	300	4,000	0.073 J	0.24 J	0.19 U	0.21 J	0.19 U	**0.95 J**	0.22 J	0.25 J	**7.8**	**1.0**	**2.7**	0.19 U	0.19 U	0.19 U	0.32 J	**1.3**	0.19 U	**8.4**	**20**
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	4,000	0.059 U	0.134 J	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	**0.31 J**	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	**0.5 J**	**4 U**
Perfluorooctanoic acid (PFOA)	0.72	300	4,000	0.176 J	0.471 J	0.25 U	0.33 J	0.25 U	**1.1**	0.25 U	0.28 J	**14**	**2.2**	**3**	0.25 U	0.25 U	0.25 U	0.25 U	**1.4**	0.25 U	**23**	**100**
Perfluorononanoic acid (PFNA)	0.32	300	4,000	**0.476 J**	0.176 J	0.22 U	**0.67 J**	0.22 U	**0.98 J**	0.22 U	0.22 U	**10**	**0.59 J**	**0.83 J**	0.22 U	0.22 U	0.22 U	0.32 J	0.22 U	0.22 U	**14**	**31**
Perfluorooctane sulfonate (PFOS)	2	300	4,000	1.18	0.725 J	0.26 U	0.66 J	0.38 J	**2.9**	0.26 U	0.26 U	**3.4**	**2.1**	0.67 J	0.54 J	0.91 J	0.44 J	0.26 U	0.26 U	0.26 U	**24**	1.9 J
Perfluorodecanoic Acid (PFDA)	0.3	300	4,000	0.065 U	0.266 J	0.28 U	0.28 U	0.28 U	**0.40 J**	0.28 U	**0.66 J**	**8.6**	**1.3**	**1.6**	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	**20**	**69**
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	NA	2.67	0.181 U	0.26 U	0.26 U	0.26 U	0.26 U	0.78 J	1.2	12	0.26 U	6.6	0.26 U	0.26 U	0.26 U	24	140	0.26 U	270	4300
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six																						
Total PFAS	NA	NA	NA	11.352	4.053	0.74	1.87	0.94	11.42	3.01	9.06	151.24	24.61	43.41	0.83	1.62	1.47	25.27	146.5	0	1,524	5,972.9
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	NA	1.905	2.012	0	1.87	0.38	6.33	0.22	1.19	43.8	7.5	8.8	0.54	0.91	0.76	0.32	2.7	0	89.9	221.9

Sample Location				1991 Drill Location						Old ARFF/SRE Building
Sample ID	Method 1 Standard		UCL	1991A (0-1')	1991B (0-1')	1991C (0-1')	1991D (0-1')	1991A-B (3-4')	1991C-D (2-3')	HW-X(m) [7-9]
Sample Date	S-1/GW-1	S-1/GW-3		8/14/2018	8/14/2018	8/14/2018	8/14/2018	12/14/2018	12/14/2018	9/7/2021
Perfluoroheptanoic acid (PFHpA)	0.5	300	4,000	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.043 U
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	4,000	0.24 U	**0.66 J**	0.24 U	0.24 U	0.24 U	0.24 U	0.058 U
Perfluorooctanoic acid (PFOA)	0.72	300	4,000	0.25 U	0.26 J	0.25 U	0.25 U	0.25 U	0.25 U	0.04 U
Perfluorononanoic acid (PFNA)	0.32	300	4,000	0.22 U	0.22 U	0.22 U	0.30 J	0.22 U	0.22 U	0.072 U
Perfluorooctane sulfonate (PFOS)	2	300	4,000	0.49 J	1.1	0.55 J	0.36 J	0.30 J	0.42 J	0.124 U
Perfluorodecanoic Acid (PFDA)	0.3	300	4,000	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.064 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	NA	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.171 U
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six										
Total PFAS	NA	NA	NA	0.49	3.18	0.55	0.66	0.3	0.42	0.139
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	NA	0.49	2.02	0.55	0.66	0.3	0.42	0.124 U

Notes:
< = Not detected by the laboratory above the reporting limit. Reporting limit shown.
J = Estimated concentration between the method detection limit and reporting limit.
Results in ug/kg, micrograms per kilogram.
U= Not detected by the Laboratory above the method detection limit. Method detection limit shown.
Bold results above the Method 1 S-1/GW-1 standard.
Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).
Sum of six includes estimated values and does not include non-detects (U or <).
UCL = Upper Concentration Limit

Table 4. Groundwater Results for PFAS Compounds ug/L

Sample Location		North Ramp													Lewis Pond Area	Airport Road/Iyannough Road Area											Airport Road/Iyannough Road Area	
Sample ID		HW-1	HW-1	HW-1	HW-4M	HW-4M	HW-5	HW-5	HW-5	HW-5	HW-23	HW-23	HW-19D	HW-19D	HW-X(s)	HW-X(m)	HW-401S	HW-A(S)	HW-B(S)	HW-B(S)	HW-B(D)	HW-C	HW-M	HW-N	HW-O	HW-U(s)	HW-U(s)	HW-U(s)	HW-U(m)
Sample Date	UCL	7/1/2016	6/20/2017	11/1/2018	4/5/2017	3/25/2022	7/1/2016	4/7/2017	11/1/2018	3/25/2022	6/20/2017	11/1/2018	6/20/2017	11/7/2018	9/10/2021	9/10/2021	4/7/2017	4/7/2017	4/7/2017	10/26/2018	10/26/2018	4/7/2017	6/24/2019	6/24/2019	7/2/2019	4/19/2021	9/5/2021	3/15/2022	4/19/2021
TOC Elevation		51.51	51.51	51.51	54.02	54.02	54.98	54.98	54.98	54.98	50.65	50.65	49.10	49.10	NA	NA	41.58	55.34	51.84	51.84	51.95	69.25	53.69	49.49	43.46	NA	NA	NA	NA
Depth to Groundwater		21.63	25.00	21.83	26.20	25.00	24.94	26.75	25.27	25.31	22.70	24.01	21.29	22.19	24.74	25.21	17.95	24.62	22.26	21.59	21.66	38.50	20.32	15.48	3.62	23.59	24.53	22.89	23.50
Groundwater Elevation		29.88	26.51	29.68	27.82	29.02	30.04	28.23	29.71	29.67	27.95	26.64	27.81	26.91	NA	NA	23.63	30.72	29.58	30.25	30.29	30.75	33.37	34.01	39.84	NA	NA	NA	NA
Total Well Depth		30.84	30.84	30.84	32.32	32.32	27.80	27.80	27.80	27.80	28.11	28.11	41.30	41.30	29.24	36.82	23.60	32.00	30.23	30.23	57.20	42.15	26.92	22.33	14.10	28.83	28.83	29.15	38.93
Perfluoroheptanoic acid (PFHpA)	100,000	0.01	0.0042 J	0.013 J	0.007 J	0.003	0.0041	0.0084 J	0.0074 U	0.0048	0.0045J	0.0098 J	0.0052 J	0.0080 J	0.0061	0.0034	0.0043 J	0.0048 J	0.049	0.012 J	0.0074 U	0.0033 U	0.007	0.0034	<0.002	0.002 J	0.004	0.0027	0.0018 J
Perfluorohexanesulfonic acid (PFHxS)	5,000	0.018	0.065	0.018 J	0.02	0.011	0.011	0.018 J	0.0056 U	0.013	0.021	0.023	0.046	0.045	0.047	0.0021	0.011 J	0.0079 J	0.044	0.047	0.0056 U	0.0034 U	0.016	0.033	0.0043	0.01	0.0034	0.0039	0.0043
Perfluorononanoic acid (PFNA)	100,000	<0.002	0.0057 J	0.0087 U	0.0046 U	0.0018 U	<0.002	0.0046 U	0.0088 J	0.0018 U	0.0038 U	0.0087 U	0.0065 J	0.0087 U	0.00049 J	0.002	0.0046 U	0.0046 U	0.0046 U	0.0087 U	0.0087 U	0.0046 U	<0.002	<0.002	<0.002	0.0013 J	0.0017 J	0.0013 J	0.00083 J
Perfluorooctanoic acid (PFOA)	100,000	0.033	0.022	0.031	0.011 J	0.013	0.031	0.020 J	0.011 J	0.023	0.0046 U	0.011 J	0.017 J	0.014 J	0.013	0.0062	0.0046 U	0.0026 U	0.0094 J	0.020 J	0.012 J	0.0026 U	0.027	0.0088	0.0039	0.0075	0.0047	0.0052	0.0055
Perfluorooctane sulfonate (PFOS)	5,000	0.017	0.24	0.028	0.043	0.025	0.12	0.052	0.12	0.048	0.0079 J	0.015 J	0.061	0.069	0.068	0.034	0.012 J	0.0026 U	0.026	0.019 J	0.010 J	0.0026 U	0.0074	0.004	0.017	0.06	0.029	0.012	0.0093
Perfluorodecanoic Acid (PFDA)	100,000	NA	0.0040 U	0.0061 U	0.0040 U	0.0018 U	NA	0.0040 U	0.0061 U	0.0018 U	0.0040 U	0.0061 U	0.0040 U	0.0061 U	0.00050 U	0.0042	0.0040 U	0.0040 U	0.0040 U	0.0061 U	0.0061 U	0.0040 U	<0.002	<0.002	0.0021	0.00064 J	0.0011 J	0.0006 J	0.00038 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	0.0032 U	0.0066 U	0.0038 J	0.0018 U	NA	0.0037 J	0.0066 U	0.0018 U	0.0032 U	0.0066 U	0.0032 U	0.0066 U	0.002 J	0.00035 U	0.004 J	0.0032 U	0.0032 U	0.0066 U	0.0066 U	0.0034 J	<0.002	<0.002	0.002 U	0.0011 U	0.00034 U	0.00032 U	0.0011 U
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six																													
Total PFAS	NA	0.078	0.4247	0.15	0.1162	0.0679	0.1661	3.0021	0.1507	0.1045	0.0745	0.0858	0.1758	0.16	0.18221	0.10025	0.0313	0.0779	0.4561	0.186	0.0465	0.0034	0.0927	0.0727	0.0585	0.09704	0.06596	0.04424	0.03622
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	**0.078**	**0.3369**	**0.09**	**0.081**	**0.052**	**0.1661**	**0.0984**	**0.1398**	**0.0888**	**0.0334**	**0.0588**	**0.1357**	**0.136**	**0.13459**	**0.0519**	**0.0273**	0.0127	**0.1284**	**0.098**	**0.022**	<0.0046	**0.0574**	**0.0492**	**0.0273**	**0.08144**	**0.0439**	**0.0257**	**0.02173**

Sample Location		Deployment Area																										
Sample ID		HW-I (s)	HW-I (s)	HW-I (s)	HW-I (s)	HW-I (s)	HW-I (s)	HW-I (m)	HW-I (m)	HW-I (m)	HW-I (m)	HW-I (m)	HW-I (m)	HW-I (d)	HW-I (d)	HW-I (d)	HW-I (d)	HW-I (d)	HW-I (d)	HW-J	HW-J	HW-J	HW-J	HW-E	HW-E	HW-E	HW-E	HW-E[1]	HW-E[1]
Sample Date	UCL	11/7/2018	5/8/2020	3/17/2021	9/8/2021	3/18/2022	8/2/2022	6/24/2019	5/8/2020	3/17/2021	9/8/2021	3/18/2022	8/2/2022	6/24/2019	5/8/2020	3/17/2021	9/11/2021	3/18/2022	8/2/2022	11/7/2018	3/17/2021	9/10/2021	3/16/2022	4/5/2017	11/7/2018	8/19/2019	5/5/2020	3/17/2021	9/8/2021
TOC Elevation		36.08	36.08	36.08	36.08	36.08	36.08	36.27	36.27	36.27	36.27	36.27	36.27	36.02	36.02	36.02	36.02	36.02	36.02	37.10	37.10	37.10	37.10	38.45	38.45	38.45	38.45	42.40	42.40
Depth to Groundwater		18.35	15.39	18.42	19.94	17.72	19.81	16.33	15.61	18.66	20.17	18.07	20.03	16.20	15.49	18.52	20.04	17.95	19.90	19.18	19.34	20.60	18.75	19.05	19.38	17.82	16.16	23.35	25.02
Groundwater Elevation		17.73	20.69	17.66	16.14	18.36	16.27	19.94	20.66	17.61	16.10	18.20	16.24	19.82	20.53	17.50	15.98	18.07	16.12	17.92	17.76	16.50	18.35	19.40	19.07	20.63	22.29	19.05	17.38
Total Well Depth		25.10	25.10	25.10	25.10	25.15	25.18	34.80	34.80	34.80	34.80	34.80	34.80	41.67	41.67	41.67	41.67	41.67	41.70	24.30	24.30	24.30	24.28	26.22	26.22	26.22	26.22	30.26	30.26
Perfluoroheptanoic acid (PFHpA)	100,000	0.2	0.54	0.032	0.097	0.098	0.2	0.0032	0.0012	0.00086 J	0.0014 J	0.0024	0.0017 U	0.0053	0.0046	0.0065	0.0083	0.0079	0.012	0.025	0.044	0.02	0.13	0.15	0.0074 U	0.0053	0.044	0.014	0.0018 J
Perfluorohexanesulfonic acid (PFHxS)	5,000	0.18	0.22	0.021	0.036	0.06	0.11	0.019	0.0091	0.0052	0.0078	0.0052	0.0032	0.057	0.018	0.031	0.05	0.039	0.063	0.0056 U	0.088	0.01	0.15	0.042	0.0056 U	0.0021	0.011	0.0015 J	0.00088 J
Perfluorononanoic acid (PFNA)	100,000	0.16	0.082	0.065	0.033	0.21	0.12	<0.002	0.00078	0.00048 U	0.00046 J	0.00061 J	0.0017 U	<0.002	0.00063 U	0.00075 J	0.00084 J	0.00077 J	0.0018 U	0.028	0.035 J	0.015	0.062	0.0087 J	0.0087 U	<0.002	0.0052	0.00048 U	0.00037 U
Perfluorooctanoic acid (PFOA)	100,000	0.26	0.29	0.05	0.063	0.11	0.17	0.0061	0.0018	0.0014 J	0.0016 J	0.0016 J	0.0017 U	0.0047	0.0028	0.0043	0.0053	0.0074	0.013 U	0.026	0.061	0.0091	0.13	0.053	0.0033 U	0.0047	0.027	0.00095 J	0.00094 J
Perfluorooctane sulfonate (PFOS)	5,000	0.066	0.04	0.028	0.02	0.52	0.43	0.014	0.014	0.013	0.016	0.011	0.005	0.012	0.02	0.038	0.039	0.047	0.083	0.13	0.25	0.08	0.15	0.047	0.0060 U	<0.002	0.0037	0.00082 J	0.00064 U
Perfluorodecanoic Acid (PFDA)	100,000	0.012 U	0.00062 U	0.0038 U	0.00047 U	0.00043 U	0.0018 U	<0.002	0.00062 U	0.00038 U	0.00050 U	0.00043 U	0.0017 U	<0.002	0.00062 U	0.00038 U	0.00048 U	0.00043 U	0.0018 U	0.0061 U	0.0076 U	0.00050 U	0.00044 U	0.0040 U	0.0061 U	<0.002	0.00062 U	0.00038 U	0.00052 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	11	13	1.7	2.1	1.3	4.6	<0.002	0.00039 U	0.0011 U	0.00037 U	0.00032 U	0.0017 U	<0.002	0.0016	0.0011 U	0.00054	0.00086	0.0018 U	0.68	0.44	0.13	1.6	2	0.0066 U	0.069	0.86	0.0035	0.00039 U
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six																													
Total PFAS	NA	13.346	15.5383	2.082	2.73304	2.66512	6.1201	0.0718	0.03308	0.02516	0.03254	0.02985	0.0082	0.1367	0.08985	0.15585	0.16687	0.15181	0.23	1.074	1.217	0.511	2.826	3.2257	0.0087 U	0.14	1.04526	0.04812	0.01342
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	**0.866**	**1.172**	**0.196**	**0.249**	**0.998**	**1.03**	**0.0423**	**0.02688**	**0.02046**	**0.02726**	**0.02081**	**0.0082**	**0.079**	**0.0454**	**0.08055**	**0.10344**	**0.10207**	**0.158**	**0.209**	**0.478**	**0.1341**	**0.622**	**0.3007**	0.0087 U	0.0121	**0.0909**	0.01727	0.00362

Sample Location		Yarmouth Road								Solar Field									Steamship Parking Lot									
Sample ID		RB-1 (s)	RB-1 (s)	RB-1 (s)	RB-1 (s)	RB-1 (m)	RB-1 (m)	RB-1 (m)	RB-1 (m)	HW-D (m)	HW-D (m)	HW-D (d)	HW-D (d)	HW-D (dd)	HW-D (dd)	HW-G(S)	HW-G(M)	HW-G(D)	HW-2	HW-2	HW-2	HW-2	HW-3	HW-3	HW-3	HW-3	HW-3	HW-3
Sample Date	UCL	11/5/2020	3/18/2021	9/5/2021	3/31/2022	11/5/2020	3/18/2021	9/5/2021	3/31/2022	4/7/2017	5/13/2020	6/24/2019	5/13/2020	6/24/2019	5/13/2020	12/3/2018	12/3/2018	12/3/2018	7/1/2016	5/5/2020	9/1/2021	3/25/2022	7/1/2016	4/5/2017	10/26/2018	5/5/2020	3/17/2021	9/1/2021	3/25/2022
TOC Elevation		NA	NA	NA	NA	NA	NA	NA	NA	45.20	45.20	45.08	45.08	45.05	45.05	44.99	45.11	44.93	40.41	40.41	40.41	40.41	38.74	38.74	38.74	38.74	38.74	38.74	38.74
Depth to Groundwater		17.87	16.91	18.64	16.65	17.79	16.85	18.57	16.59	18.83	18.34	18.99	18.23	20.60	19.97	20.69	20.75	20.71	27.48	25.33	30.20	27.72	25.81	25.70	26.06	23.64	26.19	28.35	26.03
Groundwater Elevation		NA	NA	NA	NA	NA	NA	NA	NA	26.37	26.86	26.09	26.85	24.45	25.08	24.30	24.36	24.22	12.93	15.08	10.21	12.69	12.93	13.04	12.68	15.10	12.55	10.39	12.71
Total Well Depth		27.80	27.80	27.80	27.81	49.85	49.85	48.85	48.82	30.32	30.32	44.94	44.94	65.05	65.05	28.45	38.25	48.28	32.80	32.80	32.80	32.35	33.08	33.08	33.08	33.08	33.12	33.11	33.70
Perfluoroheptanoic acid (PFHpA)	100,000	0.0042	0.0054	0.0077	0.0051	0.011	0.013 J	0.0073	0.0073	0.0033 U	0.00053 U	0.021	0.017	<0.002	0.00053 U	0.0074 U	0.0074 U	0.0074 U	0.0071	0.035	0.046	0.011	0.016	0.1	0.10	0.1	0.084	0.035	0.02
Perfluorohexanesulfonic acid (PFHxS)	5,000	0.0084	0.03	0.0051	0.022	0.01	0.017 J	0.0099	0.016	0.0089 J	0.00077 U	0.062	0.039	0.0092	0.008	0.0056 U	0.012 J	0.0056 U	0.0035	0.0066	0.0056 J	0.009	0.0043	0.020 J	0.012 J	0.0087	0.0064 J	0.0057 J	0.013
Perfluorononanoic acid (PFNA)	100,000	0.0047	0.0025	0.0026	0.0029	0.0068	0.0072 J	0.0044	0.0062	0.0046 U	0.00063 U	0.015	0.019	0.0041	0.0029	0.0087 U	0.011 J	0.0087 U	<0.002	0.016	0.004 J	0.0052	0.0063	0.027	0.023	0.021	0.019 J	0.014 J	0.0039
Perfluorooctanoic acid (PFOA)	100,000	0.007	0.0087	0.0093	0.0092	0.013	0.013 J	0.012	0.01	0.0046 U	0.00071 U	0.0088	0.0076	<0.002	0.00071 U	0.0033 U	0.0033 U	0.0033 U	0.0063	0.039	0.012	0.01	0.0091	0.065	0.057	0.054	0.064	0.016 J	0.0069
Perfluorooctane sulfonate (PFOS)	5,000	0.038	0.04	0.01	0.0045	0.049	0.075	0.055	0.054	0.022	0.0011	0.095	0.12	0.013	0.013	0.0060 U	0.036	0.0060 U	0.012	0.053	0.026	0.024	0.084	0.15	0.053	0.1	0.056	0.044	0.024
Perfluorodecanoic Acid (PFDA)	100,000	0.00062 U	0.00038 U	0.00045 U	0.0019 U	0.00075	0.0038 U	0.0033	0.0028	0.0040 U	0.00062 U	<0.002	0.00062 U	<0.002	0.00062 U	0.0061 U	0.0061 U	0.0061 U	NA	0.00062 U	0.0025 U	0.0018 U	NA	0.0040 U	0.0061 U	0.0014	0.0038 U	0.0052 U	0.0019 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	0.00039 U	0.0011 U	0.00034 U	0.0019 U	0.038	0.055	0.013	0.02	0.0032 U	0.00039 U	0.0022	0.00039 U	0.002 U	0.00039 U	0.0066 U	0.0066 U	0.0066 U	NA	0.15	0.071	0.052	NA	0.47	0.12	0.13	0.47	0.2	0.14
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six																													
Total PFAS	NA	0.08008	0.1175	0.06755	0.0713	0.2015	0.2642	0.1561	0.1733	0.0309	0.0011	0.2768	0.24993	0.0263	0.02444	0	0.059	0	0.0289	0.42678	0.4136	0.1563	0.1197	1.603	0.952	0.96981	1.1394	0.6867	0.4359
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	**0.0623**	**0.0866**	**0.0347**	**0.0437**	**0.09055**	**0.1252**	**0.0919**	**0.0963**	**0.0309**	0.0011	**0.2018**	**0.2026**	**0.0263**	**0.0239**	0.0087 U	**0.059**	0.0087 U	**0.0289**	**0.1496**	**0.0936**	**0.0592**	**0.1197**	**0.362**	**0.245**	**0.2851**	**0.2294**	**0.1147**	**0.0678**

Sample Location		Maher Wells																										
Sample ID		OW-9D	OW-9D	OW-9D	OW-9DD	OW-9DD	OW-9DD	ME-1*	ME-1	ME-2**	ME-2**	ME-3***	ME-3	OW-18S	OW-18S	OW-18S	OW-18M	OW-18M	OW-18M	OW-18D	OW-18D Duplicate	OW-18D	OW-18D	OW-18D	OW-19(S)	OW-19(S)	OW-19(S)	OW-19(S)	OW-19(M)
Sample Date	UCL	7/5/2016	12/3/2018	5/5/2020	4/11/2017	12/3/2018	10/2/2020	9/17/2020	8/3/2022	9/17/2020	8/3/2022	9/17/2020	8/3/2022	7/5/2016	12/7/2018	5/8/2020	7/5/2016	12/7/2018	5/8/2020	7/5/2016	7/5/2016	4/11/2017	12/7/2018	5/13/2020	11/6/2020	3/18/2021	9/2/2021	3/16/2022	11/6/2020
TOC Elevation		23.22	23.22	23.22	23.81	23.81	23.81	NA	NA	NA	NA	NA	NA	39.03	39.03	39.03	39.30	39.30	39.30	38.84	38.84	38.84	38.84	38.84	NA	NA	NA	NA	NA
Depth to Groundwater		12.48	10.82	10.15	12.10	11.30	13.04	3.60	NA	6.50	NA	6.00	NA	24.40	24.29	23.45	25.82	24.72	23.93	25.95	25.95	25.55	24.28	23.47	27.38	26.27	28.47	27.42	27.57
Groundwater Elevation		10.74	12.40	13.07	11.71	12.51	10.77	NA	NA	NA	NA	NA	NA	14.63	14.74	15.58	13.48	14.58	15.37	12.89	12.89	13.29	14.56	15.37	NA	NA	NA	NA	NA
Total Well Depth		68.63	68.63	68.63	86.75	86.75	86.75	81.20	NA	54.20	NA	50.30	NA	31.23	31.23	31.23	74.44	74.44	74.44	123.36	123.36	123.36	123.36	123.36	34.56	34.65	34.67	35.20	76.28
Perfluoroheptanoic acid (PFHpA)	100,000	0.0028	0.033	0.044	0.034	0.015 J	0.0085	0.011	0.025	0.0055	0.016	0.0036	0.0065	0.0071	0.0074 U	0.0039	0.0029	0.0074 U	0.0074	0.0071	0.0063	0.015J	0.014 J	0.012	0.0042	0.0044	0.0056	0.0062	0.03
Perfluorohexanesulfonic acid (PFHxS)	5,000	0.012	0.12	0.18	0.12	0.042	0.019	0.03	0.058	0.04	0.035	0.018	0.029	0.0068	0.0056 U	0.0085	0.016	0.073	0.07	0.01	0.011	0.13	0.13	0.03	0.0031	0.0064	0.0027	0.0044	0.027
Perfluorononanoic acid (PFNA)	100,000	0.0036	0.1	0.15	0.059	0.038	0.018	0.017	0.021	0.003	0.0089	0.004	0.0054	<0.002	0.0087 U	0.0032	0.0076	0.0087 U	0.0027	0.0065	0.0058	0.0046 U	0.0087 U	0.0028	0.0024	0.0012 J	0.0025	0.0012 J	0.002
Perfluorooctanoic acid (PFOA)	100,000	0.0052	0.057	0.088	0.055	0.020 J	0.01	0.016	0.029	0.0077	0.017	0.012	0.012	0.018	0.012 J	0.01	0.0058	0.0060 J	0.0096	0.0059	0.0059	0.025	0.019 J	0.0095	0.011	0.007	0.0066	0.0085	0.011
Perfluorooctane sulfonate (PFOS)	5,000	0.041	0.52	0.72	0.5	0.14	0.049	0.11	0.12	0.095	0.051	0.072	0.07	0.0083	0.028	0.016	0.044	0.24	0.18	0.018	0.019	0.22	0.32	0.041	0.025	0.015	0.031	0.0071	0.047
Perfluorodecanoic Acid (PFDA)	100,000	NA	0.0061 U	0.00062 U	0.0040 U	0.0061 U	0.00062 U	0.00062 U	0.0017 U	0.00062 U	0.0017 U	0.00062 U	0.0017 U	NA	0.0061 U	0.00062 U	NA	0.0061 U	0.00062 U	NA	NA	0.0040 U	0.0061 U	0.00062 U	0.0027	0.001 J	0.00048 U	0.00046 U	0.00062 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	0.19	0.23	0.13	0.062	0.02	0.034	0.046	0.00039 U	0.043	0.0071	0.0054	NA	0.0066 U	0.00039 U	NA	0.0066 U	0.00039 U	NA	NA	0.0032 U	0.0066 U	0.00039 U	0.00039 U	0.0011 U	0.00036 U	0.00034 U	0.00095
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six																													
Total PFAS	NA	0.0646	1.217	1.5845	1.02	0.39	0.169	0.2873	0.4769	0.2009	0.2702	0.14005	0.1796	0.0402	0.0573	0.05953	0.0763	0.3891	0.4357	0.0475	NA	0.506	0.5504	0.1832	0.0707	0.0634	0.07307	0.05705	0.37335
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	**0.0646**	**0.83**	**1.182**	**0.768**	**0.255**	**0.1045**	**0.184**	**0.299**	**0.1512**	**0.1709**	**0.1096**	**0.1283**	**0.0402**	**0.04**	**0.0416**	**0.0763**	**0.319**	**0.2697**	**0.0475**	**0.048**	**0.39**	**0.483**	**0.0953**	**0.0484**	**0.035**	**0.0484**	**0.0274**	**0.117**

Notes:

UCL = Upper Concentration Limit
< = Not detected by the laboratory above the reporting limit. Reporting limit shown.
J = Estimated concentration between the method detection limit and reporting limit.
Results in ug/L, micrograms per liter.
U= Not detected by the Laboratory above the method detection limit. Method detection limit shown.
Bold results above Method 1 GW-1 standard (0.02 ug/L).
Sum of six includes estimated values and does not include non-detects (U or <).
Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).
NA = Not Applicable.
* = ME-1 is screened from 37 to 47 and 70 to 80 feet below grade.
** = ME-2 is screened from 44 to 54 feet below grade.
*** = ME-3 is screened from 40 to 50 feet below grade.
The Method 1 GW-3 Standard for the individual analytes in the Sum of Six ranges from 500 to 40,000 ug/l.
1. Well elevation increased due to soil cap.

Table 4 Groundwater Results for PFAS Compounds ug/L

Sample Location		Airport Road/Iyannough Road Area					ARFF Building Area															
Sample ID	UCL	HW-U(m)	HW-U(m)	HW-U(d)	HW-U(d)	HW-U(d)	HW-V(m)	HW-L (s)	HW-L (m)	HW-L (d)	HW-L (d)	HW-P (s)	HW-P (s)	HW-P (s)	HW-P (s)	HW-P (m)	HW-P (m)	HW-P (m)	HW-P (m)	HW-Q (s)	HW-Q (s)	HW-Q (m)
Sample Date		9/5/2021	3/15/2022	10/2/2020	9/5/2021	3/15/2022	10/2/2020	10/7/2020	10/7/2020	6/19/2019	10/7/2020	10/1/2020	3/18/2021	9/8/2021	3/18/2022	10/1/2020	3/18/2021	9/8/2021	3/18/2022	10/1/2020	11/6/2020	10/1/2020
TOC Elevation		NA	NA	48.80	48.80	48.80	53.83	39.07	38.98	39.15	39.15	40.51	40.51	40.51	40.51	40.64	40.64	40.64	40.64	37.89	37.89	37.90
Depth to Groundwater		24.49	22.80	24.66	25.24	23.52	22.90	21.96	21.88	19.40	22.22	22.69	22.09	23.54	21.61	22.80	22.20	23.67	21.73	21.45	22.04	21.41
Groundwater Elevation		NA	NA	24.14	23.56	25.28	30.93	17.11	17.10	19.75	16.93	17.82	18.42	16.97	18.90	17.84	18.44	16.97	18.91	16.44	15.85	16.49
Total Well Depth		38.93	39.65	62.30	62.30	63.65	36.15	27.33	37.33	70.55	70.55	27.60	27.60	27.60	27.61	38.30	38.30	38.30	38.28	26.60	26.60	36.79
Perfluoroheptanoic acid (PFHpA)	100,000	0.0049	0.004	0.01	0.01	0.01	0.0033	0.00053 U	0.0064	0.0078	0.0065	0.026	0.0067	0.004	0.01	0.003	0.017	0.016	0.009	0.0018 J	0.0021	0.00053 U
Perfluorohexanesulfonic acid (PFHxS)	5,000	0.011	0.0098	0.018	0.022	0.017	0.0032	0.0013	0.023	0.033	0.015	0.0018	0.00074 J	0.00056 J	0.0012 J	0.00085	0.0015 J	0.0013 J	0.002	0.013	0.0087	0.0019
Perfluorononanoic acid (PFNA)	100,000	0.0011 J	0.0021	0.0016	0.005	0.0025	0.0017	0.00063 U	0.0025	0.0033	0.0022	0.0061	0.002	0.0013 J	0.0039	0.0011	0.006	0.0099	0.009	0.00063 U	0.00063 U	0.00075
Perfluorooctanoic acid (PFOA)	100,000	0.0094	0.018	0.01	0.013	0.013	0.0063	0.00071 U	0.01	0.025	0.018	0.0084	0.0042	0.0017 J	0.012	0.0018	0.0096	0.01	0.0081	0.0049	0.0062	0.00095
Perfluorooctane sulfonate (PFOS)	5,000	0.027	0.029	0.023	0.051	0.043	0.0059	0.0014	0.07	0.049	0.039	0.00097	0.00049 J	0.00054 U	0.00098 J	0.0011	0.0035	0.003	0.0026	0.0041	0.0075	0.0049
Perfluorodecanoic Acid (PFDA)	100,000	0.001 U	0.00055 J	0.00062 U	0.0025 U	0.00047 J	0.00062 U	0.00062 U	0.00062 U	<0.002	0.0019	0.00085	0.0004 J	0.00048 U	0.00043 U	0.00062 U	0.00038 U	0.00048 U	0.00043 U	0.00062 U	0.00062 U	0.00062 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	0.00075	0.00033 U	0.0012	0.04	0.00032 U	0.00039 U	0.00039 U	0.022	0.0021	0.00078	0.011	0.0034	0.0014	0.0083	0.00092	0.0011 U	0.00036 U	0.00039 U	0.00039 U	0.00039 U	0.00039 U
		Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six																				
Total PFAS	NA	0.0839	0.10395	0.0889	0.1775	0.12378	0.0543	0.0027	0.18375	0.1823	0.12348	0.2478	0.06294	0.05055	0.08508	0.02967	0.17311	0.15362	0.08697	0.0307	0.0346	0.00944
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	**0.0534**	**0.06345**	**0.0588**	**0.0987**	**0.08167**	**0.0204**	0.0027	**0.1119**	**0.1181**	**0.0826**	**0.04412**	0.01453	0.00756	**0.02808**	0.00785	**0.0376**	**0.0402**	**0.0307**	**0.0238**	**0.0245**	0.0085

Sample Location		Deployment Area				Yarmouth Road																				
Sample ID	UCL	HW-E[1]	HW-F	HW-F	HW-F	HW-F	HW-F	HW-F	HW-H	HW-H	HW-H	HW-R(s)	HW-R(s)	HW-R(s)	HW-R(s)	HW-S (s)	HW-S (s)	HW-S (s)	HW-S (s)	HW-S(s)	HW-S (m)	HW-S (m)	HW-S (m)	HW-S (m)	HW-S(m)	HW-T (s)	HW-T (s)	HW-T (m)	HW-T (m)
Sample Date		3/16/2022	4/5/2017	11/7/2018	5/5/2020	3/17/2021	9/8/2021	3/16/2022	11/7/2018	5/8/2020	5/18/2022	10/1/2020	3/17/2021	9/8/2021	3/16/2022	10/1/2020	3/18/2021	9/3/2021	3/31/2022	8/8/2022	10/1/2020	3/18/2021	9/3/2021	3/25/2022	8/8/2022	10/1/2020	5/18/2022	10/1/2020	5/18/2022
TOC Elevation		42.40	36.32	36.32	36.32	36.32	36.32	36.32	38.47	38.47	38.47	35.72	35.72	35.72	35.72	31.60	31.60	31.60	31.60	31.60	31.59	31.59	31.59	31.59	28.97	28.97	29.11	29.11
Depth to Groundwater		22.67	19.60	20.08	16.82	20.01	21.72	19.34	20.39	17.37	20.07	18.33	17.37	19.00	16.69	16.88	16.29	17.30	15.70	16.43	17.01	16.35	17.37	15.48	17.94	13.41	12.07	13.58	12.24
Groundwater Elevation		19.73	16.72	16.24	19.50	16.31	14.60	16.98	18.08	21.10	18.40	17.39	18.35	16.72	19.03	14.72	15.31	14.30	15.90	15.17	14.58	15.24	14.22	16.11	13.65	15.56	16.90	15.53	16.87
Total Well Depth		30.26	26.89	26.89	26.89	26.89	26.89	26.83	27.09	27.09	27.07	23.56	23.67	23.67	23.66	22.10	22.10	22.10	22.20	22.15	32.04	32.04	32.04	32.05	32.11	18.54	18.60	28.96	28.96
Perfluoroheptanoic acid (PFHpA)	100,000	0.023	0.34	0.0074 U	0.23	0.39	0.0051	0.36	0.077	0.28	0.015	0.021	0.005	0.021	0.03	0.11	0.14	0.11	0.061	0.16	0.00096	0.0011 J	0.0012 J	0.0018 U	0.0065	0.0039	0.0073	0.022	0.02
Perfluorohexanesulfonic acid (PFHxS)	5,000	0.0028	0.019J	0.0056 U	0.005	0.012 U	0.00037 U	0.0097	0.0056 U	0.0031	0.0021	0.02	0.01	0.0046	0.0019	0.055	0.083	0.064	0.041	0.12	0.0064	0.0073	0.0053	0.0026	0.0074	0.17	0.029	0.019	0.046
Perfluorononanoic acid (PFNA)	100,000	0.0023	0.0046 U	0.0087 U	0.00081	0.0097 U	0.00037 U	0.0025	0.0087 U	0.00063 U	0.0003 U	0.0031	0.001 J	0.00034 U	0.00031 U	0.1	0.024	0.1	0.043	0.16	0.00063 U	0.00057 J	0.00055 J	0.0018 U	0	0.00074	0.0013	0.0032	0.00031 U
Perfluorooctanoic acid (PFOA)	100,000	0.029 J	0.075	0.0033 U	0.02	0.052	0.00074 U	0.052	0.0050 J	0.002	0.0006 U	0.014	0.004	0.004	0.0014 J	0.062	0.078	0.13	0.05	0.23	0.0013	0.0018 J	0.0014 J	0.0019	0.0049	0.0067	0.01	0.011	0.0035
Perfluorooctane sulfonate (PFOS)	5,000	0.0013 J	0.0026 U	0.0060 U	0.00086	0.0076 U	0.00065 U	0.0037	0.0060 U	0.00068 U	0.00053 U	0.016	0.0023	0.0053	0.001 J	0.1	0.03	0.048	0.048	0.16	0.0058	0.006	0.0094	0.0052	0.0096	0.21	0.035	0.025	0.0059
Perfluorodecanoic Acid (PFDA)	100,000	0.00043 U	0.0040 U	0.0061 U	0.00062 U	0.0076 U	0.00053 U	0.00043 U	0.0061 U	0.00062 U	0.00043 U	0.00062 U	0.00038 U	0.00049 U	0.00044 U	0.00062 U	0.0038 U	0.012 U	0.0019 U	0.0017 U	0.00062 U	0.00038 U	0.00047 U	0.0018 U	0.0017 U	0.00062 U	0.00047	0.0014	0.00054
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	0.83	5.7	0.0066 U	1.5	4.8	0.0049	8.2	1.5	0.13	0.00032 U	0.037	0.0048	0.003	0.0053	3.7	3.1	5.2	0	0	0.0065	0.0067	0.0036	0.023	0	0.00039 U	0.00032 U	0.00039 U	0.00033 U
		Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six																											
Total PFAS	NA	0.9169	12.96	0.084	2.65637	8.422	0.159	12.18373	4.452	1.26666	0.165	0.2171	0.04878	0.2549	0.30126	4.8958	4.3105	6.1418	0.5956	1.5581	0.02471	0.03263	0.02873	0.043	0.0564	0.44114	0.1295	0.3254	0.33614
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	0.0584	**0.434**	0.0087 U	0.25667	**0.442**	0.0051	0.4279	**0.082**	**0.2851**	0.0171	**0.0741**	**0.0751**	**0.0213**	**0.0343**	**0.427**	**0.427**	**0.452**	**0.243**	**0.83**	0.01446	0.01677	0.01785	0.0097	**0.0284**	**0.39134**	**0.08307**	**0.0816**	**0.07594**

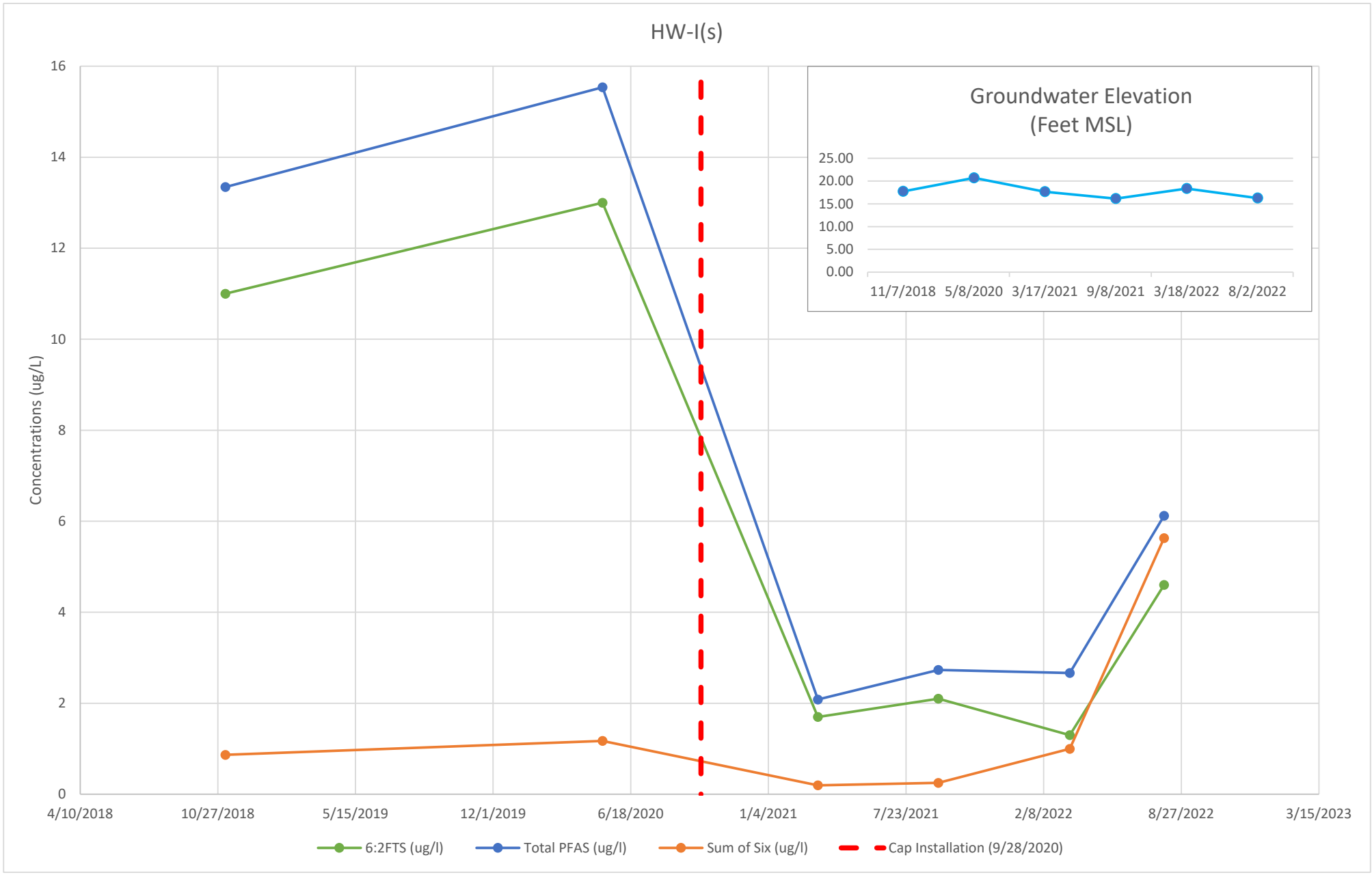
Sample Location		Steamship Parking Lot						Maher Wells											
Sample ID	UCL	HW-300	HW-300	HW-300	HW-300	HW-301	HW-302	HW-302	HW-302	HW-302	HW-302	HW-K	HW-K	HW-K	HW-K	HW-K	OW-9S	OW-9S	OW-9S	OW-9M	OW-9M
Sample Date		7/1/2016	3/17/2021	9/2/2021	3/31/2022	7/1/2016	7/1/2016	12/3/2018	3/17/2021	9/1/2021	3/25/2022	6/19/2019	5/21/2020	3/18/2021	9/2/2021	3/25/2022	7/5/2016	12/3/2018	5/8/2020	12/3/2018	5/8/2020
TOC Elevation		36.09	36.09	36.09	36.09	39.46	41.17	41.17	41.17	41.17	41.17	37.70	37.70	37.70	37.70	37.70	23.25	23.25	23.25	23.53	23.53
Depth to Groundwater		22.52	22.86	23.02	22.53	25.05	23.52	22.65	24.04	26.15	23.70	20.88	20.56	22.87	24.24	22.93	12.23	10.80	10.14	11.11	10.45
Groundwater Elevation		13.57	13.23	13.07	13.56	14.41	17.65	18.52	17.13	15.02	17.47	16.82	17.14	14.83	13.46	14.77	11.02	12.45	13.11	12.42	13.08
Total Well Depth		30.33	30.30	30.34	30.40	30.42	30.45	30.45	30.44	30.40	30.42	44.18	44.18	44.17	44.18	44.17	21.35	21.35	21.35	56.20	56.20
Perfluoroheptanoic acid (PFHpA)	100,000	0.0096	0.0028	0.0029	0.0019 U	0.002	0.019	0.015 J	0.0066	0.0062	0.0092	0.0051	0.0028	0.0044	0.0086	0.017	0.014	0.048	0.0064	0.11	0.0061
Perfluorohexanesulfonic acid (PFHxS)	5,000	0.012	0.0099	0.00066 J	0.006	0.038	0.0063	0.016 J	0.0022	0.004	0.013	<0.002	0.001	0.00066 J	0.0015 J	0.0019	<0.003	0.023	0.011	0.0056 U	0.0033
Perfluorononanoic acid (PFNA)	100,000	<0.002	0.00099 J	0.0028	0.0019 U	<0.002	0.054	0.0097 J	0.0066	0.005	0.02	<0.002	0.0012	0.0037	0.003	0.0087	0.0077	0.0087 U	0.0033	0.044	0.0037
Perfluorooctanoic acid (PFOA)	100,000	0.0052	0.0044	0.0044	0.0033	0.0037	0.033	0.03	0.005	0.0065	0.017	0.0041	0.0019	0.0036	0.0038	0.012	0.007	0.032	0.0043	0.052	0.0035
Perfluorooctane sulfonate (PFOS)	5,000	0.017	0.015	0.017	0.012	0.011	0.014	0.031	0.0041	0.015	0.0095	<0.002	0.0016	0.0015 J	0.0019	0.0037	0.0074	0.024	0.0058	0.0081 J	0.01
Perfluorodecanoic Acid (PFDA)	100,000	NA	0.00038 U	0.0006 J	0.0019 U	NA	NA	0.0061 U	0.00086 J	0.001 J	0.0019 U	<0.002	0.00062 U	0.00038 U	0.00046 U	0.0019 U	NA	0.0061 U	0.00062 U	0.0061 U	0.00062 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	0.0011 U	0.0034 U	0.00034 U	NA	NA	0.13	0.012	0.0062	0.072	0.002 U	0.00039 U	0.0011 U	0.00034 U	0.0019 U	NA	0.0066 U	0.00039 U	0.64	0.0049
		Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six																			
Total PFAS	NA	0.0438	0.05509	0.03812	0.0369	0.0547	0.1263	0.3427	0.08304	0.09793	0.2149	0.0348	0.0275	0.04486	0.09217	0.1864	0.0361	0.618	0.06678	1.7141	0.0816
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	**0.0438**	**0.03309**	**0.02832**	**0.0213**	**0.0547**	**0.1263**	**0.1017**	**0.02536**	**0.0377**	**0.0687**	0.0092	0.0085	0.01386	0.0188	0.0414	**0.0361**	**0.127**	**0.0308**	**0.2141**	**0.0266**

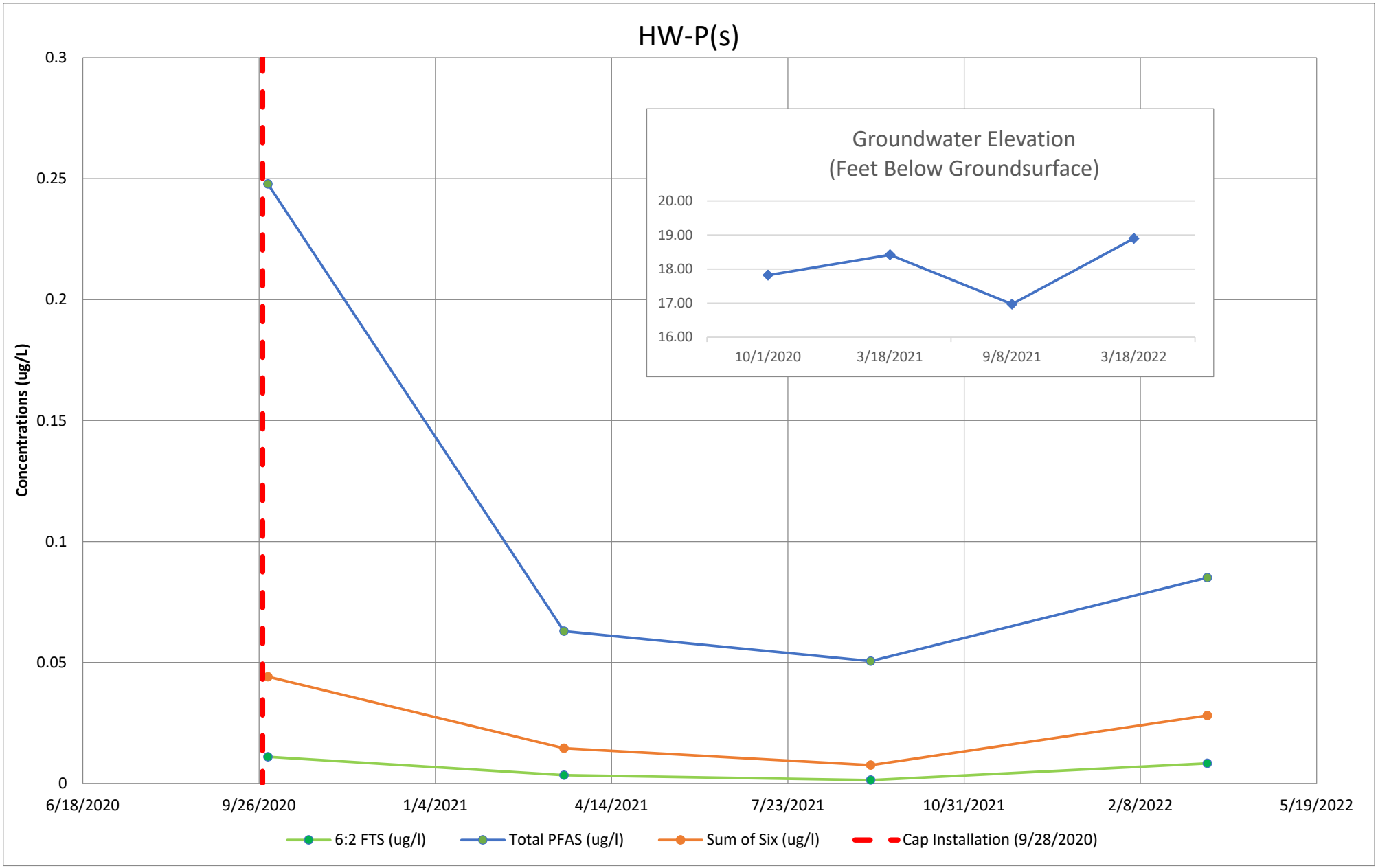
Sample Location		Maher Wells															
Sample ID	UCL	OW-19(M)	OW-19(M)	OW-19(M)	OW-19D	OW-19D	OW-19D	OW-19D	OW-19D	HW-W(m)	HW-W(m)	HW-W(m)	HW-W(d)	HW-W(d)	HW-W(d)	HW-W(dd)	HW-W(dd)	HW-W(dd)
Sample Date		3/19/2021	9/3/2021	3/18/2022	4/11/2017	5/13/2020	3/19/2021	9/11/2021	3/18/2022	4/19/2021	9/5/2021	3/16/2022	4/19/2021	9/5/2021	3/16/2022	4/19/2021	9/5/2021	3/16/2022
TOC Elevation		NA	NA	NA	39.06	39.06	39.06	39.06	39.06	NA	NA	NA	NA	NA	NA	NA	NA	NA
Depth to Groundwater		27.15	28.65	27.59	26.73	25.64	27.52	28.90	27.95	28.96	30.17	29.12	28.73	29.93	28.92	28.67	29.89	28.85
Groundwater Elevation		NA	NA	NA	12.33	13.42	11.54	10.16	11.11	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Well Depth		76.24	76.25	78.05	110.42	110.42	110.33	110.34	112.70	52.04	58.02	53.10	61.78	61.78	63.02	72.10	72.09	73.61
Perfluoroheptanoic acid (PFHpA)	100,000	0.044	0.014	0.0038	0.0051 J	0.011	0.018	0.022	0.018	0.01	0.0034	0.0041	0.0021	0.01	0.01	0.0091	0.0073	0.0077
Perfluorohexanesulfonic acid (PFHxS)	5,000	0.014 J	0.015	0.013	0.029	0.12	0.026	0.028	0.029	0.012	0.015	0.014	0.0088	0.0064	0.022	0.0086	0.0048	0.02
Perfluorononanoic acid (PFNA)	100,000	0.0048 U	0.0021	0.0022	0.006 J	0.0017	0.0029	0.00088 J	0.00042 J	0.00077 J	0.001 J	0.00055 J	0.0013 J	0.0025	0.0023	0.0014 J	0.002	0.0015 J
Perfluorooctanoic acid (PFOA)	100,000	0.0094 J	0.0037	0.0045	0.0046 U	0.023	0.0097	0.007	0.0078	0.0041	0.0024	0.0032	0.0029	0.0094	0.0097	0.0046	0.0069	0.0059
Perfluorooctane sulfonate (PFOS)	5,000	0.027	0.029	0.012	0.029	0.31	0.047	0.053	0.041	0.075	0.042	0.068	0.012	0.017	0.034	0.015	0.0081	0.035
Perfluorodecanoic Acid (PFDA)	100,000	0.0038 U	0.00046 U	0.00043 U	0.0040 U	0.00062 U	0.00038 U	0.00048 U	0.00046 U	0.00038 U	0.00046 U	0.00044 U	0.00038 U	0.00046 U	0.00043 U	0.00038 U	0.00049 U	0.00045 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	0.011 U	0.00035 U	0.00032 U	0.0032 U	0.00039 U	0.0011 U	0.00036 U	0.00034 U	0.0011 U	0.0029	0.0034	0.0011 U	0.00042	0.00059	0.0011 U	0.00036 U	0.0033 U
		Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six																
Total PFAS	NA	0.3974	0.16133	0.0571	0.0936	0.5463	0.3127	0.31489	0.28111	0.17849	0.17264	0.20725	0.04339	0.08666	0.13162	0.10469	0.0563	0.11378
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	**0.0944**	**0.0638**	**0.0355**	**0.0691**	**0.4657**	**0.1036**	**0.11088**	**0.09622**	**0.09707**	**0.06380**	**0.08985**	**0.0271**	**0.0453**	**0.078**	**0.0387**	**0.0291**	**0.0701**

Notes:

UCL = Upper Concentration Limit
< = Not detected by the laboratory above the reporting limit. Reporting limit shown.
J = Estimated concentration between the method detection limit and reporting limit.
Results in ug/L, micrograms per liter.
U= Not detected by the Laboratory above the method detection limit. Method detection limit shown.
Bold results above Method 1 GW-1 standard (0.02 ug/L).
Sum of six includes estimated values and does not include non-detects (U or <).
Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).
NA = Not Applicable.
* = ME-1 is screened from 37 to 47 and 70 to 80 feet below grade.
** = ME-2 is screened from 44 to 54 feet below grade.
*** = ME-3 is screened from 40 to 50 feet below grade.
The Method 1 GW-3 Standard for the individual analytes in the Sum of Six ranges from 500 to 40,000 ug/l.
1. Well elevation increased due to soil cap.

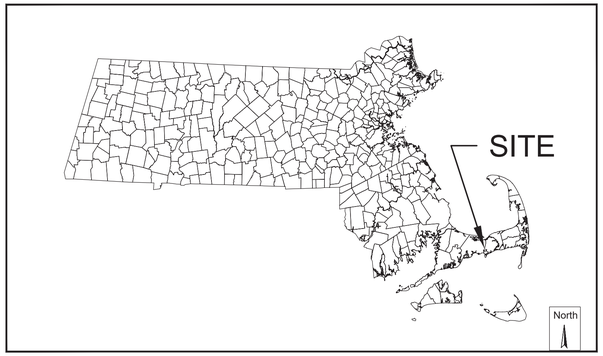
APPENDIX A
PFAS IN GROUNDWATER CONCENTRATION VS. TIME PLOTS


HW-I(s)
Concentrations (ug/L)
16
14
12
10
8
6
4
2
0
4/10/2018
10/27/2018
5/15/2019
12/1/2019
6/18/2020
1/4/2021
7/23/2021
2/8/2022
8/27/2022
3/15/2023
Groundwater Elevation
(Feet MSL)
25.00
20.00
15.00
10.00
5.00
0.00
11/7/2018
5/8/2020
3/17/2021
9/8/2021
3/18/2022
8/2/2022
6:2FTS (ug/l)
Total PFAS (ug/l)
Sum of Six (ug/l)
Cap Installation (9/28/2020)


HW-P(s)
Concentrations (ug/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
6/18/2020
9/26/2020
1/4/2021
4/14/2021
7/23/2021
10/31/2021
2/8/2022
5/19/2022
Groundwater Elevation
(Feet Below Groundsurface)
20.00
19.00
18.00
17.00
16.00
10/1/2020
3/18/2021
9/8/2021
3/18/2022
6:2 FTS (ug/l)
Total PFAS (ug/l)
Sum of Six (ug/l)
Cap Installation (9/28/2020)

HYA SOIL CAPPING & DRAINAGE FOR PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) MITIGATION
FINAL CONSTRUCTION PLANS
BARNSTABLE, MASSACHUSETTS

MAY 2020

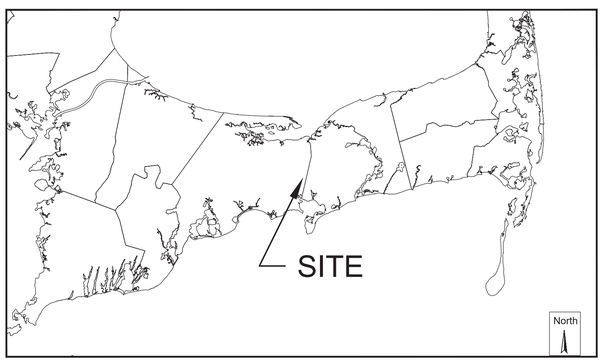


MASSACHUSETTS

Graphic Scale

0 150000

SCALE IN FEET
1:150000

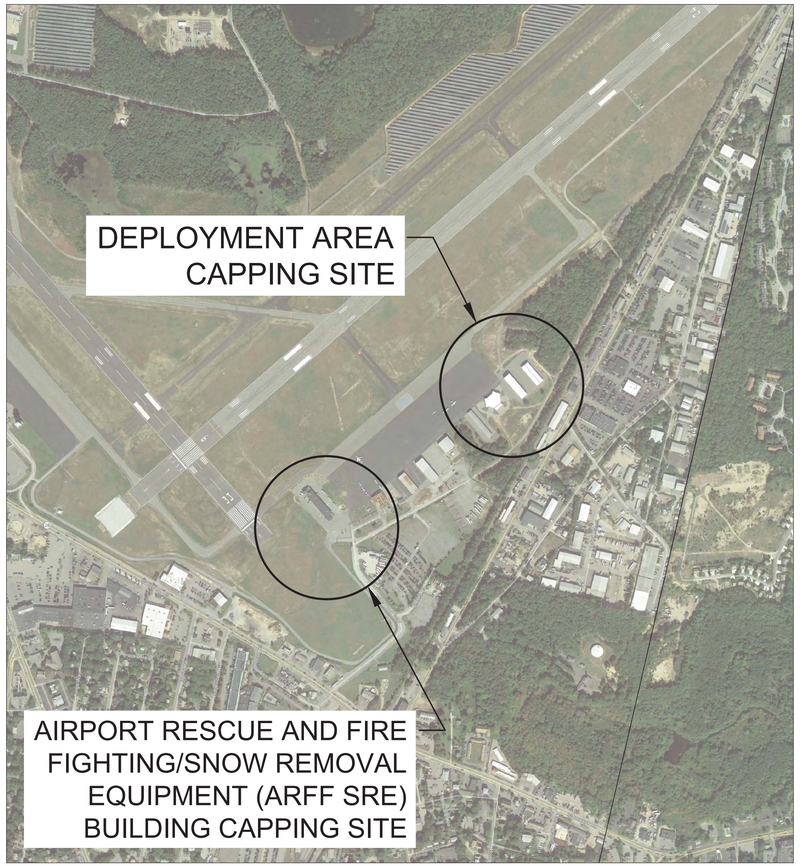


BARNSTABLE

Graphic Scale

0 12000

SCALE IN FEET
1:12000



CAPPING SITES

1 INCH = 500 FEET

0 500

SCALE IN FEET
1:500

Sheet List Table	
Sheet Number	Sheet Title
1	COVER & SHEET INDEX
2	CONSTRUCTION NOTES & DETAILS
3	EROSION & SEDIMENTATION CONTROL PLAN
4	SITE PLAN (ARFF SRE BUILDING)
5	SITE PLAN (DEPLOYMENT AREA)
6	CONSTRUCTION SAFETY AND PHASING PLAN - GENERAL NOTES
7	CONSTRUCTION SAFETY AND PHASING PLAN - DETAILS
8	CONSTRUCTION SAFETY AND PHASING PLAN - SITE PLAN
9	CONSTRUCTION SAFETY AND PHASING PLAN - WORK AREA I
10	CONSTRUCTION SAFETY AND PHASING PLAN - WORK AREA II

GENERAL NOTES:

1. THIS PLAN SET IS FOR BIDDING/PRICING AND NOT FOR CONSTRUCTION.

Plan Set:

HYA SOIL CAPPING & DRAINAGE FOR PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) MITIGATION
FINAL CONSTRUCTION PLANS
BARNSTABLE, MASSACHUSETTS

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Date Issued: MAY 2020

Designed By: MCL

Drawn By: MCL

Checked By: BM

Registration:

COMMONWEALTH OF MASSACHUSETTS
RICHARD A. CLAYTOR
CIVIL
NO. 45116
REGISTERED
PROFESSIONAL ENGINEER

5-11-2020

Revisions

Rev.	Date	By	Appr.	Description
1				
2				
3				
4				
5				
6				
7				

Project Number: 17027A

Sheet Number: 1 of 10

Drawing Number: C - 1

last modified: 03/23/20 printed: 05/11/20 by ml H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\Drawings\17027A CV.dwg

SURVEY NOTES:

1. THE EXISTING CONDITIONS DEPICTED IN THIS PLAN SET WERE TAKEN FROM THE SURVEY PLANS ENTITLED "EAST RAMP EXISTING CONDITIONS PLAN," PRODUCED BY DANIEL W. MACKENZIE, PLS OF THE HORSLEY WITTEN GROUP, INC. ON 2/7/20. THESE SURVEY PLANS WERE BASED ON A FIELD SURVEY CONDUCTED BY THE HORSLEY WITTEN GROUP ON NOVEMBER 19, AND NOVEMBER 22, 2019.
2. THIS PLAN DOES NOT SHOW ANY RECORDED OR UNWRITTEN EASEMENTS WHICH MAY EXIST. HOWEVER, THIS DOES NOT CONSTITUTE A GUARANTEE THAT NO SUCH EASEMENTS EXIST.
3. THE ELEVATIONS DEPICTED HEREON WERE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988.
4. ALL PROPERTY AND BOUNDARY LINES DEPICTED ARE APPROXIMATE ONLY.
5. EXISTING CONTOUR INTERVALS ARE EQUAL TO ONE FOOT.
6. THE ACCURACY OF MEASURED PIPE INVERTS AND PIPE SIZES IS SUBJECT TO FIELD CONDITIONS, THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS AND OTHER CONDITIONS

GENERAL CONSTRUCTION NOTES:

1. ALL SITE WORK TO COMPLETE THIS PROJECT AS INDICATED ON THE DRAWINGS AND IN THE SPECIFICATIONS IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
2. IMMEDIATELY CONTACT AND COORDINATE WITH THE ENGINEER AND OWNER IF ANY DEVIATION OR ALTERATION OF THE WORK PROPOSED ON THESE DRAWINGS IS REQUIRED.
3. UTILIZE ALL PRECAUTIONS AND MEASURES TO ENSURE THE SAFETY OF THE PUBLIC, ALL PERSONNEL AND PROPERTY DURING CONSTRUCTION IN ACCORDANCE WITH OSHA STANDARDS, INCLUDING THE INSTALLATION OF TEMPORARY FENCING BARRICADES, SAFETY LIGHTING, CONES, POLICE DETAIL AND/OR FLAGMEN AS DETERMINED NECESSARY BY THE TOWN/CITY/LOCAL MUNICIPALITY. THE CONTRACTOR IS RESPONSIBLE FOR THE COST OF POLICE DETAIL AND FOR COORDINATING WITH THE LOCAL OR STATE POLICE DEPARTMENT FOR ALL REQUIRED POLICE DETAIL.
4. MAKE ALL NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN ALL NECESSARY CONSTRUCTION PERMITS, PAY ALL FEES INCLUDING POLICE DETAILS AND POST ALL BONDS, IF NECESSARY, ASSOCIATED WITH THE SAME, AND COORDINATE WITH THE OWNER AND THE ENGINEER.
5. ALL EXISTING CONDITIONS SHOWN ARE APPROXIMATE AND ARE BASED ON THE BEST INFORMATION AVAILABLE. PRIOR TO THE START OF CONSTRUCTION VERIFY THAT THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS DO NOT CONFLICT WITH ANY KNOWN EXISTING OR OTHER PROPOSED IMPROVEMENTS. IF ANY CONFLICTS ARE DISCOVERED, NOTIFY THE OWNER AND THE ENGINEER PRIOR TO INSTALLING ANY PORTION OF THE SITE WORK WHICH WOULD BE AFFECTED.
6. THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AND STRUCTURES AS INDICATED ON THE DRAWINGS ARE BASED ON RECORDS OF VARIOUS UTILITY COMPANIES, AND WHEREVER POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED UPON AS BEING EXACT OR COMPLETE. VERIFY THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES IN THE FIELD PRIOR TO THE START OF CONSTRUCTION. CONTACT THE APPROPRIATE UTILITY COMPANY, ANY GOVERNING PERMITTING AUTHORITY IN THE TOWN, AND "DIGSAFE" (1-888-344-7233) AT LEAST THREE BUSINESS DAYS PRIOR TO ANY EXCAVATION WORK IN PREVIOUSLY UNALTERED AREAS TO REQUEST EXACT FIELD LOCATION OF UTILITIES. THE CONTRACTOR MUST RESOLVE CONFLICTS BETWEEN THE PROPOSED UTILITIES AND FIELD-LOCATED UTILITIES AND REPORT ANY DISCREPANCIES TO THE ENGINEER IMMEDIATELY. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR DAMAGES INCURRED AS A RESULT OF UTILITIES OMITTED, INCOMPLETELY OR INACCURATELY SHOWN. THE CONTRACTOR MUST MAINTAIN ACCURATE RECORDS OF THE LOCATION AND ELEVATION OF ALL WORK INSTALLED AND EXISTING UTILITIES FOUND DURING CONSTRUCTION FOR THE PREPARATION OF THE AS-BUILT PLAN.
7. COORDINATE AND MAKE ALL CONNECTION ARRANGEMENTS WITH UTILITY COMPANIES, AS REQUIRED.
8. THE CONTRACTOR MUST MAINTAIN ALL EXISTING UTILITIES IN WORKING ORDER AND FREE FROM DAMAGE DURING THE ENTIRE DURATION OF THE PROJECT. REPAIR ANY DAMAGE TO EXISTING UTILITY LINES OR STRUCTURES INCURRED DURING CONSTRUCTION OPERATIONS AT NO COST TO THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR ALL COST RELATED TO THE REPAIR OF UTILITIES. EXCAVATION REQUIRED WITHIN THE PROXIMITY OF EXISTING UTILITY LINES MUST BE DONE BY HAND.
9. COORDINATE ALL TRENCHING WORK WITHIN ROADWAYS WITH THE PROPER LOCAL & STATE AGENCY. THE CONTRACTOR IS RESPONSIBLE FOR ALL TRENCH SAFETY INCLUDING ANY LOCAL AND/OR STATE PERMITS REQUIRED FOR THE TRENCH WORK. IF THIS WORK IS REQUIRED TO OCCUR OUTSIDE THE AGREED UPON HOURS OF OPERATION FOR THE FACILITY, THE CONTRACTOR MUST PLAN ACCORDINGLY.
10. SAWCUT ALL TRENCH WORK WITHIN EXISTING PAVEMENT AS INDICATED ON THE DRAWINGS. BACKFILL AND COMPACT TRENCH WORK AS INDICATED ON THE DRAWING AND IN THE SPECIFICATIONS. IF SETTLEMENT OCCURS DUE TO INADEQUATE COMPACTION, AS DETERMINED BY THE ENGINEER, WITHIN THE WARRANTY PERIOD, CONTRACTOR IS REQUIRED TO REMOVE, PATCH AND REPAVE AFTER ONE COMPLETE 12-MONTH CYCLE.
11. IMPORT ONLY CLEAN MATERIAL. MATERIAL FROM AN EXISTING OR FORMER 21E SITE AS DEFINED BY THE MASSACHUSETTS CONTINGENCY PLAN 310 CMR 40.0000 WILL NOT BE ACCEPTED . ANALYTICAL TESTING OF BACKFILL MATERIAL FOR PFAS IS REQUIRED TO BE SUBMITTED TO THE OWNER AND ENGINEER FOR APPROVAL PRIOR TO PLACEMENT.
12. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH AND MAINTAIN ALL CONTROL POINTS AND BENCHMARKS DURING CONSTRUCTION INCLUDING BENCHMARK LOCATIONS AND ELEVATIONS AT CRITICAL AREAS. COORDINATE WITH THE ENGINEER THE LOCATION OF ALL CONTROL POINTS AND BENCHMARKS.
13. SITE LAYOUT SURVEY REQUIRED FOR CONSTRUCTION MUST BE PROVIDED BY THE CONTRACTOR AND PERFORMED BY A MASSACHUSETTS' REGISTERED PROFESSIONAL LAND SURVEYOR. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH THE SURVEYOR FOR ALL SITE SURVEY WORK.
14. MAINTAIN ALL GRADE STAKES SET BY THE SURVEYOR. GRADE STAKES ARE TO REMAIN UNTIL A FINAL INSPECTION OF THE ITEM HAS BEEN COMPLETED BY THE ENGINEER. RE-STAKING OF PREVIOUSLY SURVEYED SITE FEATURES IS THE RESPONSIBILITY (INCLUDING COST) OF THE CONTRACTOR.
15. UNLESS OTHERWISE INDICATED ON THE DRAWINGS AND/OR IN THE SPECIFICATIONS, ALL SITE CONSTRUCTION MATERIALS AND METHODOLOGIES ARE TO CONFORM TO THE MOST RECENT VERSION OF THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS (THE COMMONWEALTH OF MASSACHUSETTS DEPARTEMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGES 2020 EDITION).
16. PROVIDE ALL CONSTRUCTION SERVICE IN ACCORDANCE WITH APPLICABLE LAWS AND REGULATIONS REGARDING NOISE, VIBRATION, DUST, SEDIMENTATION CONTAINMENT, AND TRENCH WORK.
17. COLLECT SOLID WASTES AND STORE IN A SECURED DUMPSTER. THE DUMPSTER MUST MEET ALL LOCAL AND STATE SOLID WASTE MANAGEMENT REGULATIONS.
18. RESTORE ALL SURFACES EQUAL TO THEIR ORIGINAL CONDITION AFTER CONSTRUCTION IS COMPLETE PER SPECIFICATIONS. LEAVE ALL AREAS NOT DISTURBED BY CONSTRUCTION IN THEIR NATURAL STATE. TAKE CARE TO PREVENT DAMAGE TO SHRUBS, TREES, OTHER LANDSCAPING AND/OR NATURAL FEATURES. WHEREAS THE PLANS DO NOT SHOW ALL LANDSCAPE FEATURES, EXISTING CONDITIONS MUST BE VERIFIED BY THE CONTRACTOR IN ADVANCE OF THE WORK.
19. REGULARLY INSPECT THE PERIMETER OF THE PROPERTY TO CLEAN UP AND REMOVE LOOSE CONSTRUCTION DEBRIS BEFORE IT LEAVES THE SITE. PROMPTLY REMOVE ALL DEMOLITION DEBRIS FROM THE SITE TO AN APPROVED DUMP SITE.
20. ALL TRUCKS LEAVING THE SITE MUST BE COVERED.
21. DO NOT WASH ANY CONCRETE OR MORTAR ONSITE. REMOVE BY HAND ANY CEMENT OR CONCRETE DEBRIS LEFT IN THE DISTURBED AREA.
22. BURIAL OF ANY STUMPS, SOLID DEBRIS, AND/OR STONES/BOULDERS ONSITE IS PROHIBITED.
23. AT THE END OF CONSTRUCTION, REMOVE ALL CONSTRUCTION DEBRIS AND SURPLUS MATERIALS FROM THE SITE. PERFORM A THOROUGH INSPECTION OF THE WORK PERIMETER. COLLECT AND REMOVE ALL MATERIALS AND BLOWN OR WATER CARRIED DEBRIS FROM THE SITE.
24. THE WORK AREA IS A DISPOSAL SITE AS DEFINED BY THE MASSACHUSETTS CONTINGENCY PLAN 310 CMR 40.0000. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DEVELOP A SITE SPECIFIC HEALTH AND SAFETY PLAN FOR INTRUSIVE SOIL ACTIVITIES IN AN AREA WITH KNOWN PFAS CONTAMINATION. THE OWNER WILL PROVIDE OVERSIGHT AND DUST MONITORING UNDER THE DIRECTION OF A LICENSED SITE PROFESSIONAL.
25. DETAILS REGARDING PFAS CONCENTRATIONS IN SOIL ARE SET FORTH IN THE REPORT TITLED, "*FINAL IMMEDIATE RESPONSE ACTION PLAN MODIFICATION*," PREPARED BY HORSLEY WITTEN GROUP DATED DECEMBER 2019. THE MAXIMUM CONCENTRATION OF THE MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION SUM OF SIX PFAS IN SOIL IS 87.9 µg / kg. REFER TO THE ATTACHED REPORT FOR ADDITIONAL DETAILS.
26. THE CONTRACTOR IS RESPONSIBLE FOR DUST CONTROL. AT NO TIME IS VISIBLE DUST GENERATION ACCEPTABLE. DUST SUPPRESSION INCLUDING THE USE OF WATER IS CONSIDERED INCIDENTAL TO THIS PROCESS.
27. SOIL REMOVED FROM ARFF SRE AREA IS TO BE USED IN GRADING AND SHAPING WITHIN THE DEPLOYMENT AREA. AT NO TIME IS ADDITIONAL SOIL FROM THE ARFF SRE OR DEPLOYMENT AREA TO BE DISTURBED OR REMOVED WITHOUT APPROVAL FROM OWNER OR ENGINEER.

GENERAL DEMOLITION NOTES:

1. THIS PLAN SET DOES NOT INCLUDE DETAILS & SPECIFICATIONS FOR ALL DEMOLITION WORK REQUIRED WITHIN THE PROPOSED CONSTRUCTION LIMITS. UNLESS OTHERWISE NOTED, THE CONTRACTOR IS RESPONSIBLE FOR THE RELOCATION, DEMOLITION, REMOVAL AND DISPOSAL, IN A LOCATION APPROVED BY ALL GOVERNING AUTHORITIES, OF ALL EXISTING SITE ELEMENTS AND STRUCTURES INCLUDING, BUT NOT LIMITED TO: ROADWAYS, PARKING AREAS, BITUMINOUS CONCRETE, CEMENT CEMENT CONCRETE, GRAVEL, BERMS, AND ALL OTHER STRUCTURES SHOWN AND NOT SHOWN WITHIN CONSTRUCTION LIMITS, AND WHERE NEEDED, TO ALLOW FOR NEW CONSTRUCTION. ALL FACILITIES TO BE REMOVED ARE TO BE UNDERCUT TO SUITABLE MATERIAL AND BROUGHT TO GRADE WITH SUITABLE FILL MATERIAL, COMPACTED IF NECESSARY, PER SPECIFICATIONS.
2. OBTAIN ANY PERMITS REQUIRED FOR DEMOLITION AND DISPOSAL.
3. REMOVE ALL DEBRIS FROM THE SITE AND DISPOSE OF THE DEBRIS IN A PROPER AND LEGAL MANNER.
4. PRIOR TO DEMOLITION OCCURRING, ALL EROSION CONTROL DEVICES ARE TO BE INSTALLED.

BASIC CONSTRUCTION SEQUENCE:

THE FOLLOWING CONSTRUCTION SEQUENCE IS TO BE USED AS A GENERAL GUIDELINE. COORDINATE WITH THE OWNER AND ENGINEER AND SUBMIT A PROPOSED CONSTRUCTION SEQUENCE FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.

1. SURVEY AND STAKE THE PROPOSED LIMIT OF DISTURBANCE, THE PROPOSED MATERIAL/EQUIPMENT STORAGE AREA, AND SEDIMENTATION BARRIER EXTENTS.
2. PLACE SEDIMENTATION BARRIERS AS INDICATED ON DRAWINGS AND STAKED OUT IN THE FIELD. UNDER NO CIRCUMSTANCES IS THE LIMIT OF WORK TO EXTEND BEYOND THE SEDIMENTATION BARRIERS/LIMIT OF DISTURBANCE AS INDICATED ON DRAWINGS.
3. INSTALL DRAINAGE MANHOLES, CATCH BASINS, DRAINAGE PIPES, AND UNDERGROUND DRAINAGE STRUCTURES. BEGIN WORK AT THE STORMWATER MANAGEMENT AREAS AND PROGRESS UP-GRADIENT. THE STORMWATER MANAGEMENT AREA(S) AND DRAINAGE NETWORK ARE TO BE PROTECTED FROM SEDIMENTATION UNTIL ALL UN-STABILIZED AREAS ARE STABILIZED. INSTALL SEDIMENT BARRIERS AT ALL POINTS OF ENTRY INTO THE DRAINAGE NETWORK. TAKE PARTICULAR CARE TO PROTECT THE UNDERGROUND STRUCTURES FROM SEDIMENT.
4. STRIP TOPSOIL FROM THE AREA OF THE PROPOSED CAPPING AND STOCKPILE IT IN APPROVED LOCATIONS. TOPSOIL STOCKPILES MUST BE PROTECTED BY A SEDIMENT BARRIER.
5. BEGIN ROUGH GRADING AREAS FOR CAPPING. BRING ROUGH GRADING TO PROPER ELEVATIONS AS SOON AS PRACTICABLE. COORDINATE WORK TO MINIMIZE TIME SOILS ARE UN-STABILIZED.
6. PERFORM CAPPING INSTALLATION AND TRENCHING.
7. FINISH PERMANENT VEGETATIVE STABILIZATION.
8. SWEEP THE ADJACENT PAVED WORK AREAS TO REMOVE ALL SEDIMENTS. REPAIR DRAINAGE OUTLETS AND BASINS AS REQUIRED. CLEAN AND FLUSH THE DRAINAGE STRUCTURES AND PIPES AT THE END OF CONSTRUCTION AND REMOVE ALL ACCUMULATED SEDIMENTS IN THE STORMWATER MANAGEMENT AREAS. CONTRACTOR MUST INSPECT THE DRAINAGE NETWORK AND REPAIR ANY DAMAGE IMMEDIATELY.
9. ENGINEER TO APPROVE THE REMOVAL OF ALL TEMPORARY SOIL EROSION AND SEDIMENTATION CONTROL MEASURES FOLLOWING ESTABLISHMENT OF ALL DISTURBED AREAS AND DETERMINE WHEN THE CONTRIBUTING AREA HAS REACHED A MINIMUM OF 80% STABILIZATION.

GENERAL GRADING AND DRAINAGE NOTES:

1. ALL CUT AND FILL SLOPES SHALL BE 3:1 OR FLATTER UNLESS OTHERWISE NOTED.
2. ADJUST AND/OR CUT EXISTING PAVEMENT AS NECESSARY TO ASSURE A SMOOTH FIT AND CONTINUOUS GRADE.
3. PROPOSED ELEVATIONS ARE SHOWN TO FINISH PAVEMENT OR GRADE UNLESS NOTED OTHERWISE.
4. ALL EARTHWORK AND SITE PREPARATION MUST BE DONE IN STRICT ACCORDANCE WITH THE RECOMMENDATIONS OF ANY SUBSURFACE INVESTIGATION OR GEOTECHNICAL REPORTS PREPARED FOR THIS SITE.

STORMWATER FACILITY OPERATION & MAINTENANCE:

THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER INSPECTION AND MAINTENANCE OF ALL DRAINAGE/STORMWATER MANAGEMENT FACILITIES AS OUTLINED BELOW DURING CONSTRUCTION AND UNTIL SUCH TIME THAT THE PROJECT IS ACCEPTED BY THE OWNER AND THE ENGINEER.

1. INSPECT AND RESTORE/CLEAN ALL NEWLY CONSTRUCTED OR ALTERED EXISTING FACILITIES (INLETS, MANHOLES, PIPES, AND UNDERGROUND INFILTRATION STRUCTURES) OF ACCUMULATED SEDIMENT AND DEBRIS PRIOR TO THE OWNER'S ACCEPTANCE.
2. REMOVE AND DISPOSE ALL SEDIMENT AND DEBRIS TO A PRE-APPROVED LOCATION.
3. REFER TO THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) FOR ADDITIONAL INFORMATION PERTAINING TO STORMWATER FACILITY OPERATION AND MAINTENANCE REQUIREMENTS. MAINTAIN A WORKING COPY OF THE SWPPP ON SITE AT ALL TIMES.
4. AT A MINIMUM INSPECT MONTHLY AND AFTER STORM EVENTS GREATER THAN OR EQUAL TO 1" OF RAINFALL AS NECESSARY FOR THE ENTIRE DURATION OF THE CONSTRUCTION PROJECT AND THE FIRST 3 MONTHS AFTER CONSTRUCTION TO ENSURE PROPER OPERATION AND EFFECTIVE SITE STABILIZATION.
5. SPECIFIC MAINTENANCE REQUIRED DURING CONSTRUCTION:
   A. DRAINAGE STRUCTURES (INLETS, MANHOLES, CATCHBASINS, UNDERGROUND INFILTRATION STRUCTURES): MONITOR AND REGULARLY INSPECT ALL EXISTING AND PROPOSED DRAINAGE STRUCTURES. FOR PROPER OPERATION, COLLECTION OF LITTER OR TRASH, AND STRUCTURAL DETERIORATION. CLEAN AND REMOVE SEDIMENT FRO THE STRUCTURES (INCLUDING SUMPS) AS NECESSARY, AND REPAIR WHEN REQUIRED.
   B. ROUTINE MAINTENANCE: OTHER ROUTINE MAINTENANCE INCLUDES THE REMOVAL OF TRASH AND LITTER FROM PAVED AND PERIMETER AREAS, AND STREET AND PARKING LOT SWEEPING UPON COMPLETION OF CONSTRUCTION TO AVOID EXCESSIVE ACCUMULATION OF SEDIMENT IN THE DRAINAGE SYSTEM. INSPECT THE PIPES AND STRUCTURES FOR SEDIMENT ACCUMULATION AND PROPER FLOW.

LEGEND:

GENERAL

39

40

UTILITIES

G

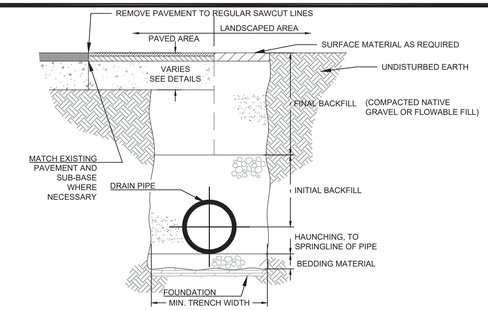
E/T/C

EROSION & SEDIMENT CONTROL

SF

SS

SYMBOLS	
CAPPING AREA	EL:98.45 EXISTING SPOT GRADE
MAJOR CONTOUR	EL.95.00 SPOT GRADE
MINOR CONTOUR	S SEWER MANHOLE
EDGE OF PAVEMENT	E ELECTRIC MANHOLE
LIMIT OF WORK	T TELEPHONE MANHOLE
PAVEMENT SAWCUT	MH MANHOLE
RECLAIMED ASPHALT MILLINGS	D DRAIN MANHOLE
STORMWATER AREA	CATCHBASIN
	INLET PROTECTION
DRAIN PIPE	W WATER VALVE
GAS LINE	G GAS VALVE
UNDERGROUND E/T/C	CO CLEAN OUT
	PIPE STUB
SILT FENCE	HYDRANT
SILT SOCK	MW MONITORING WELL



NOTES:

1. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR TO EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH A SUITABLE COMPACTED GRAVEL MATERIAL OR AS AN ALTERNATIVE AND AT THE DISCRETION OF THE ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A WOVEN GEOTEXTILE FABRIC.
2. BEDDING, HAUNCHING AND INITIAL BACKFILL: SUITABLE MATERIAL TO CONSIST OF CLEAN, HARD, PARTICLES OF GRAVEL MEETING THE FOLLOWING:

SIEVE SIZE	PERCENT PASSING
3/8"	85-95
NO. 4	5-15
NO. 8	0-2

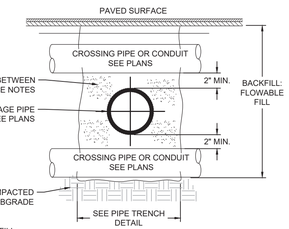
MATERIAL TO BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.

MINIMUM BEDDING THICKNESS TO BE 4" (100mm) FOR 4"-24" PIPE (100-600mm).

3. MINIMUM TRENCH WIDTHS TO BE AS FOLLOWS:

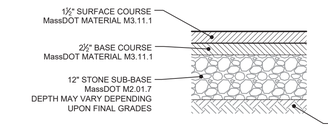
NOMINAL Ø inches	MIN. RECOMMENDED TRENCH WIDTH inches
8	36
12	36

STORM DRAIN PIPE TRENCH
NOT TO SCALE



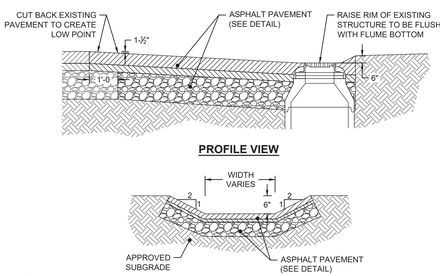
GENERAL BACKFILL:
1. WHERE TWO UTILITIES CROSS, USE FLOWABLE FILL FOR BACKFILL (INCLUDING DISTURBED AREAS SURROUNDING TRENCHES) AT THE AREA OF THE PIPE CROSSINGS.
2. THE FLOWBALE FILL MIX MUST BE FINE ENOUGH TO FILL THE VOID SPACE BETWEEN THE CROWN OF THE PIPE BELOW AND THE BOTTOM OF PIPE ABOVE.
3. THE FLOW ABLE FILL MUST ENCOMPASS THE ENTIRE SPACE BETWEEN THE PIPES AS WELL AS AROUND THE PIPES.

STORM DRAIN PIPE/UTILITY CROSSING
NOT TO SCALE



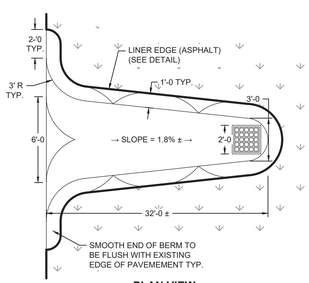
GENERAL NOTES:
1. SUB-GRADE (EXISTING MATERIAL) SHALL CONSIST OF INERT MATERIAL THAT IS HARD, DURABLE STONE AND/OR COARSE SAND, FREE FROM LOAM AND CLAY TO A DEPTH NOT LESS THAN 4 FEET BELOW THE FINISH PAVEMENT SURFACE. EXCAVATE SANDY-LOAM AND/OR LOAMY-SAND TOPSOIL MATERIAL FROM ALL PAVED AREAS PRIOR TO SUB-BASE INSTALLATION.
2. PLACE SUB-BASE IN MAXIMUM 6" LIFTS (COMPACTED TO 95%).
3. COMPACT SUB-GRADE FILL TO 95% COMPACTION.
4. SEE SITE LAYOUT PLAN FOR PAVEMENT WIDTH AND LOCATION.
5. SEE GRADING PLANS FOR PAVEMENT SLOPE AND CROSS SLOPE.

TYPICAL BITUMINOUS PAVEMENT
NOT TO SCALE

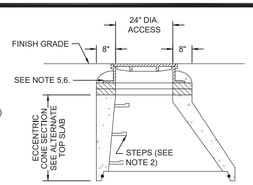


PAVED FLUME
NOT TO SCALE

CHANNEL SECTION VIEW

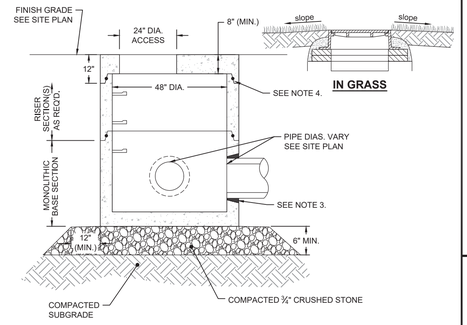


PLAN VIEW

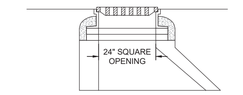


ALTERNATE TOP SLAB

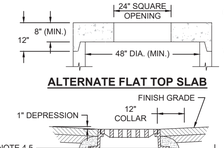
NOTES:
1. ALL SECTIONS TO BE DESIGNED FOR H-20 LOADING.
2. COPOLYMER MANHOLE STEPS TO BE INSTALLED AT 12" O.C. FOR THE FULL DEPTH OF THE STRUCTURE.
3. PROVIDE "V" KNOCKOUTS FOR PIPES WITH 2" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
4. JOINT SEALANT BETWEEN PRECAST SECTIONS TO BE PREFORMED BUTYL RUBBER.
5. DRAIN MANHOLE FRAME AND COVER TO BE SET IN FULL 12" MORTAR BED. ADJUST TO GRADE WITH PRECAST CONCRETE RISER OR BRICK.
6. DO NOT PLACE MORTAR BED AROUND STRUCTURE UNTIL IT IS AT THE REQUIRED FINISH ELEVATION AND ALIGNMENT.
7. FRAME AND COVER TO CONFORM TO MASSACHUSETTS STANDARDS HEAVY DUTY (EAST JORDAN, NEENAH, OR APPROVED EQUIVALENT).



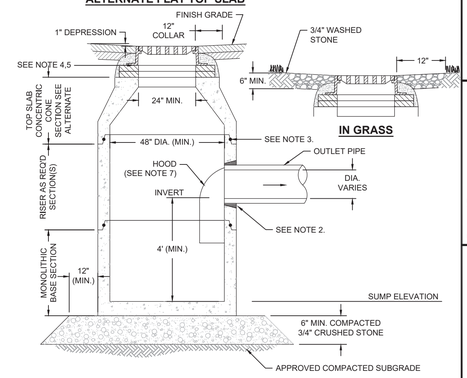
PRECAST DRAIN MANHOLE (DMH)
NOT TO SCALE



ALTERNATE ECCENTRIC CONE SECTION

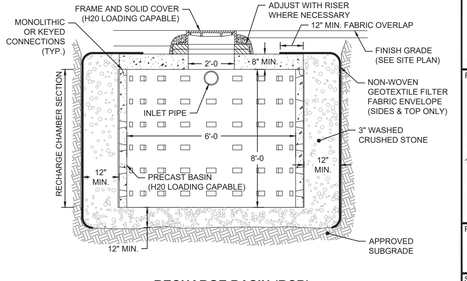


ALTERNATE FLAT TOP SLAB



IN GRASS

PRECAST CONCRETE CATCH BASIN (CB) WITH HOOD
NOT TO SCALE



RECHARGE BASIN (RCB)
NOT TO SCALE

Revisions

Rev.	Date	By	Appr.	Description

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Designed By: MDL | Drawn By: MCL | Checked By: BM | Date: MAY 2020

Plan Set: HYA SOIL CAPPING & DRAINAGE FOR PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) MITIGATION

Plan Title: CONSTRUCTION NOTES & DETAILS

Prepared For:
Barnstable Municipal Airport
480 Barnstable Road
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Phone: (508) 775-2020
Fax: —

Survey Provided By:
Horsley Witten Group, Inc.
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Fax: —
Dated: January 2019

Registration:

COMMONWEALTH OF MASSACHUSETTS
RICHARD A. CLAYTOR
CIVIL
NO. 45116
REGISTERED PROFESSIONAL ENGINEER

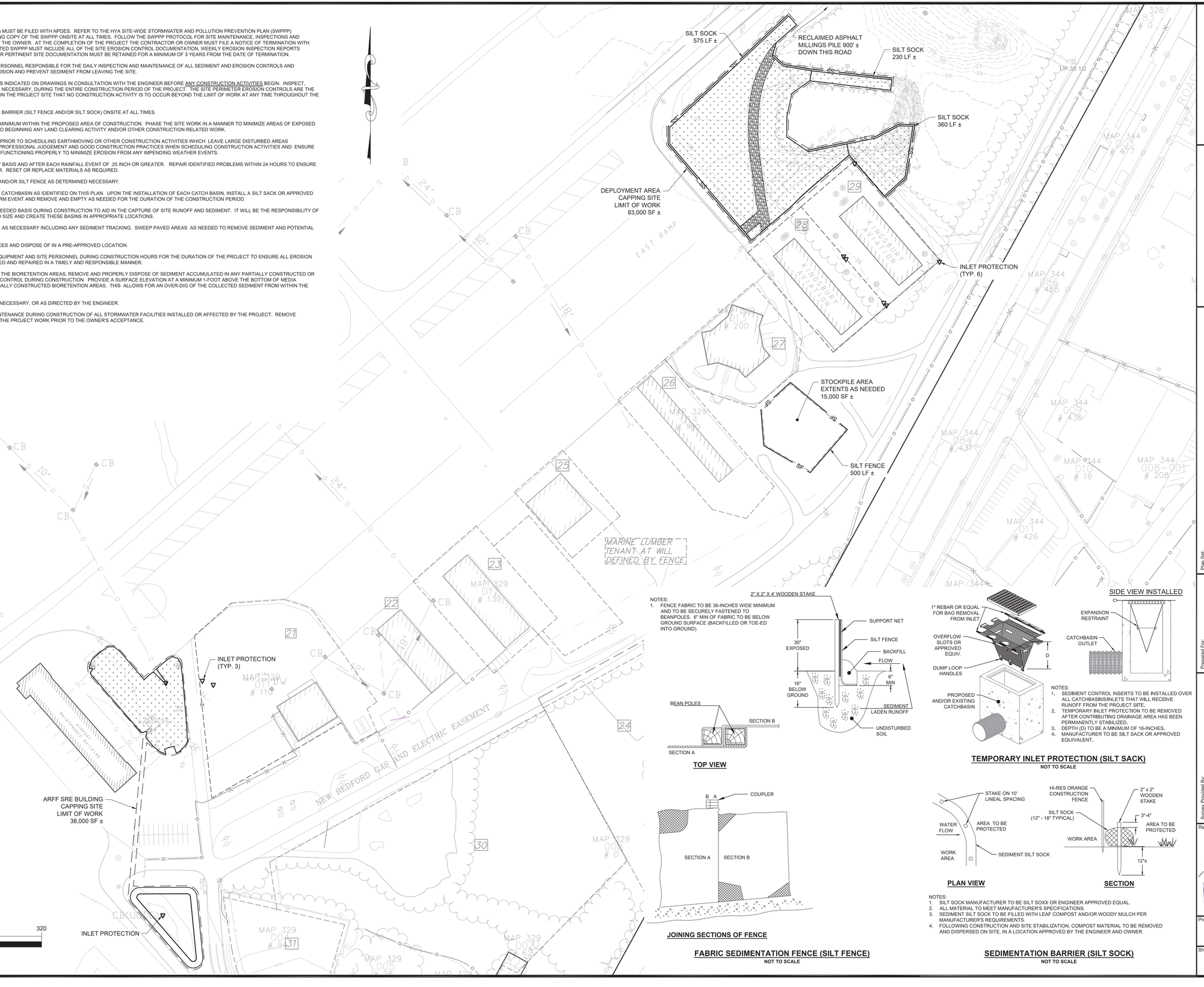
5-11-2020

Project Number: 17027A
Sheet : 2 of 10
Sheet Number: C - 2

last modified: 03/23/20 printed: 05/11/20 by ml H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\Drawings\17027A DE.dwg

EROSION & SEDIMENT CONTROL NOTES:

1. PRIOR TO THE START OF CONSTRUCTION A NOTICE OF INTENT (NOI) MUST BE FILED WITH NPDES. REFER TO THE HYA SITE-WIDE STORMWATER AND POLLUTION PREVENTION PLAN (SWPPP) REGARDING ALL EROSION CONTROL MATTERS. MAINTAIN A WORKING COPY OF THE SWPPP ONSITE AT ALL TIMES. FOLLOW THE SWPPP PROTOCOL FOR SITE MAINTENANCE, INSPECTIONS AND PROPER DOCUMENTATION UNTIL THE SITE HAS BEEN ACCEPTED BY THE OWNER. AT THE COMPLETION OF THE PROJECT THE CONTRACTOR OR OWNER MUST FILE A NOTICE OF TERMINATION WITH NPDES. IN ACCORDANCE WITH NPDES REGULATIONS, THE COMPLETED SWPPP MUST INCLUDE ALL OF THE SITE EROSION CONTROL DOCUMENTATION, WEEKLY EROSION INSPECTION REPORTS COMPLETED BY THE DESIGNATED SITE PERSONNEL, AND ANY OTHER PERTINENT SITE DOCUMENTATION MUST BE RETAINED FOR A MINIMUM OF 3 YEARS FROM THE DATE OF TERMINATION.
2. DESIGNATE THE SITE CONSTRUCTION FOREMAN AS THE ON-SITE PERSONNEL RESPONSIBLE FOR THE DAILY INSPECTION AND MAINTENANCE OF ALL SEDIMENT AND EROSION CONTROLS AND IMPLEMENTATION OF ALL NECESSARY MEASURES TO CONTROL EROSION AND PREVENT SEDIMENT FROM LEAVING THE SITE.
3. INSTALL ALL EROSION AND SEDIMENT CONTROL (ESC) MEASURES AS INDICATED ON DRAWINGS IN CONSULTATION WITH THE ENGINEER BEFORE ANY CONSTRUCTION ACTIVITIES BEGIN. INSPECT, MAINTAIN REPAIR AND REPLACE EROSION CONTROL MEASURES, AS NECESSARY, DURING THE ENTIRE CONSTRUCTION PERIOD OF THE PROJECT. THE SITE PERIMETER EROSION CONTROLS ARE THE DESIGNATED LIMIT OF WORK. INFORM ALL PERSONNEL WORKING ON THE PROJECT SITE THAT NO CONSTRUCTION ACTIVITY IS TO OCCUR BEYOND THE LIMIT OF WORK AT ANY TIME THROUGHOUT THE CONSTRUCTION PERIOD.
4. MAINTAIN A MINIMUM SURPLUS OF 100 FEET OF EROSION CONTROL BARRIER (SILT FENCE AND/OR SILT SOCK) ONSITE AT ALL TIMES.
5. KEEP THE LIMIT OF CLEARING, GRADING AND DISTURBANCES TO A MINIMUM WITHIN THE PROPOSED AREA OF CONSTRUCTION. PHASE THE SITE WORK IN A MANNER TO MINIMIZE AREAS OF EXPOSED SOIL. PROPERLY INSTALL THE SEDIMENTATION CONTROLS PRIOR TO BEGINNING ANY LAND CLEARING ACTIVITY AND/OR OTHER CONSTRUCTION RELATED WORK.
6. MONITOR LOCAL WEATHER REPORTS DURING CONSTRUCTION AND PRIOR TO SCHEDULING EARTHMOVING OR OTHER CONSTRUCTION ACTIVITIES WHICH LEAVE LARGE DISTURBED AREAS UNSTABILIZED. IF INCLEMENT WEATHER IS PREDICTED, USE BEST PROFESSIONAL JUDGEMENT AND GOOD CONSTRUCTION PRACTICES WHEN SCHEDULING CONSTRUCTION ACTIVITIES AND ENSURE THE NECESSARY EROSION CONTROL DEVICES ARE INSTALLED AND FUNCTIONING PROPERLY TO MINIMIZE EROSION FROM ANY IMPENDING WEATHER EVENTS.
7. INSPECT EROSION AND SEDIMENT CONTROL DEVICES ON A WEEKLY BASIS AND AFTER EACH RAINFALL EVENT OF .25 INCH OR GREATER. REPAIR IDENTIFIED PROBLEMS WITHIN 24 HOURS TO ENSURE EROSION AND SEDIMENT CONTROLS ARE IN GOOD WORKING ORDER. RESET OR REPLACE MATERIALS AS REQUIRED.
8. SURROUND THE PERIMETER OF SOIL STOCKPILES WITH SILT SOCK AND/OR SILT FENCE AS DETERMINED NECESSARY.
9. INSTALL A SILT SACK OR APPROVED EQUIVALENT IN EACH EXISTING CATCHBASIN AS IDENTIFIED ON THIS PLAN. UPON THE INSTALLATION OF EACH CATCH BASIN, INSTALL A SILT SACK OR APPROVED EQUIVALENT. INSPECT SILT SACKS, AFTER EACH SIGNIFICANT STORM EVENT AND REMOVE AND EMPTY AS NEEDED FOR THE DURATION OF THE CONSTRUCTION PERIOD.
10. SMALL SEDIMENTATION BASINS MAY BE CONSTRUCTED ON AN AS-NEEDED BASIS DURING CONSTRUCTION TO AID IN THE CAPTURE OF SITE RUNOFF AND SEDIMENT. IT WILL BE THE RESPONSIBILITY OF THE SITE CONTRACTOR, IN CONSULTATION WITH THE ENGINEER, TO SIZE AND CREATE THESE BASINS IN APPROPRIATE LOCATIONS.
11. CONTAIN ALL SEDIMENT ONSITE. SWEEP ALL EXITS FROM THE SITE AS NECESSARY INCLUDING ANY SEDIMENT TRACKING. SWEEP PAVED AREAS AS NEEDED TO REMOVE SEDIMENT AND POTENTIAL POLLUTANTS ACCUMULATED DURING SITE CONSTRUCTION.
12. REMOVE ACCUMULATED SEDIMENT FROM ALL TEMPORARY PRACTICES AND DISPOSE OF IN A PRE-APPROVED LOCATION.
13. PROVIDE ON SITE OR MAKE READILY AVAILABLE THE NECESSARY EQUIPMENT AND SITE PERSONNEL DURING CONSTRUCTION HOURS FOR THE DURATION OF THE PROJECT TO ENSURE ALL EROSION AND SEDIMENTATION CONTROL DEVICES ARE PROPERLY MAINTAINED AND REPAIRED IN A TIMELY AND RESPONSIBLE MANNER.
14. PRIOR TO THE INSTALLATION OF FILTER FABRIC AND MEDIA WITHIN THE BIORETENTION AREAS, REMOVE AND PROPERLY DISPOSE OF SEDIMENT ACCUMULATED IN ANY PARTIALLY CONSTRUCTED OR TEMPORARY BIORETENTION/DRAINAGE AREA USED FOR SEDIMENT CONTROL DURING CONSTRUCTION. PROVIDE A SURFACE ELEVATION AT A MINIMUM 1-FOOT ABOVE THE BOTTOM OF MEDIA ELEVATION AS SHOWN IN THE BIORETENTION SCHEDULE FOR PARTIALLY CONSTRUCTED BIORETENTION AREAS. THIS ALLOWS FOR AN OVER-DIG OF THE COLLECTED SEDIMENT FROM WITHIN THE BIORETENTION AREA PRIOR TO MEDIA/FABRIC INSTALLATION.
15. CONTROL DUST BY WATERING OR OTHER APPROVED METHODS AS NECESSARY, OR AS DIRECTED BY THE ENGINEER.
16. THE CONTRACTOR IS RESPONSIBLE FOR THE INSPECTION AND MAINTENANCE DURING CONSTRUCTION OF ALL STORMWATER FACILITIES INSTALLED OR AFFECTED BY THE PROJECT. REMOVE SEDIMENT OR DEBRIS COLLECTED WITHIN THESE FACILITIES FROM THE PROJECT WORK PRIOR TO THE OWNER'S ACCEPTANCE.



GRAPHIC SCALE

80 0 40 80 160 320

(in feet)

1 INCH = 80 FEET

NOTES:
1. FENCE FABRIC TO BE 36-INCHES WIDE MINIMUM AND TO BE SECURELY FASTENED TO BEANPOLES. 6" MIN OF FABRIC TO BE BELOW GROUND SURFACE (BACKFILLED OR TOE-ED INTO GROUND).

TOP VIEW

JOINING SECTIONS OF FENCE

FABRIC SEDIMENTATION FENCE (SILT FENCE)
NOT TO SCALE

NOTES:
1. SEDIMENT CONTROL INSERTS TO BE INSTALLED OVER ALL CATCHBASINS\INLETS THAT WILL RECEIVE RUNOFF FROM THE PROJECT SITE.
2. TEMPORARY INLET PROTECTION TO BE REMOVED AFTER CONTRIBUTING DRAINAGE AREA HAS BEEN PERMANENTLY STABILIZED.
3. DEPTH (D) TO BE A MINIMUM OF 16-INCHES.
4. MANUFACTURER TO BE SILT SACK OR APPROVED EQUIVALENT.

TEMPORARY INLET PROTECTION (SILT SACK)
NOT TO SCALE

PLAN VIEW **SECTION**

NOTES:
1. SILT SOCK MANUFACTURER TO BE SILT SOXX OR ENGINEER APPROVED EQUAL.
2. ALL MATERIAL TO MEET MANUFACTURER'S SPECIFICATIONS.
3. SEDIMENT SILT SOCK TO BE FILLED WITH LEAF COMPOST AND/OR WOODY MULCH PER MANUFACTURER'S REQUIREMENTS.
4. FOLLOWING CONSTRUCTION AND SITE STABILIZATION, COMPOST MATERIAL TO BE REMOVED AND DISPERSED ON SITE, IN A LOCATION APPROVED BY THE ENGINEER AND OWNER.

SEDIMENTATION BARRIER (SILT SOCK)
NOT TO SCALE

Revisions

Rev.	Date	By	Appr.	Description

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Drawn By: MDL
Designed By: MDL
Checked By: BM
Date: MAY 2020

Plan Set: HYA SOIL CAPPING & DRAINAGE FOR PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) MITIGATION
FINAL CONSTRUCTION PLANS
BARNSTABLE, MASSACHUSETTS

Plan Title: EROSION & SEDIMENTATION CONTROL PLAN

Prepared For:
Barnstable Municipal Airport
480 Barnstable Road
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Survey Provided By:
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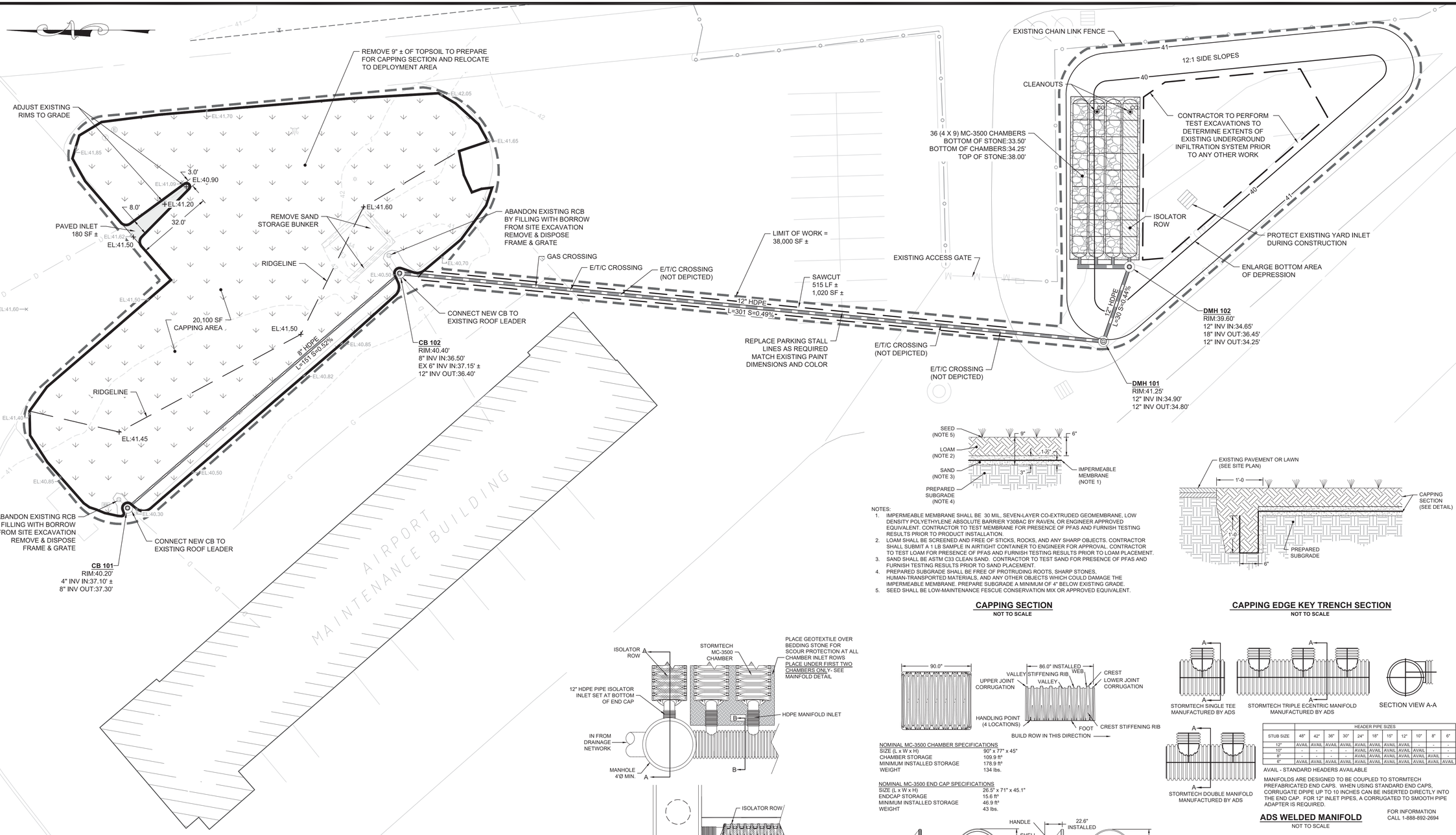
5-11-2020

Project Number: 17027A
Sheet : 3 of 10
Sheet Number: C - 3

last modified: 03/25/20 printed: 05/11/20 by ml H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\Drawings\17027A ST.dwg

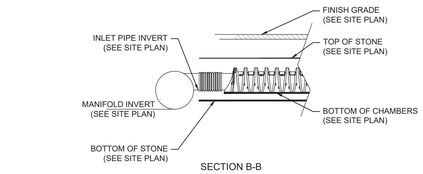


NOTES:
1. IMPERMEABLE MEMBRANE SHALL BE 30 MIL, SEVEN-LAYER CO-EXTRUDED GEOMEMBRANE, LOW DENSITY POLYETHYLENE ABSOLUTE BARRIER Y30BAC BY RAVEN, OR ENGINEER APPROVED EQUIVALENT. CONTRACTOR TO TEST MEMBRANE FOR PRESENCE OF PFAS AND FURNISH TESTING RESULTS PRIOR TO PRODUCT INSTALLATION.
2. LOAM SHALL BE SCREENED AND FREE OF STICKS, ROCKS, AND ANY SHARP OBJECTS. CONTRACTOR SHALL SUBMIT A 1 LB SAMPLE IN AIRTIGHT CONTAINER TO ENGINEER FOR APPROVAL. CONTRACTOR TO TEST LOAM FOR PRESENCE OF PFAS AND FURNISH TESTING RESULTS PRIOR TO LOAM PLACEMENT.
3. SAND SHALL BE ASTM C33 CLEAN SAND. CONTRACTOR TO TEST SAND FOR PRESENCE OF PFAS AND FURNISH TESTING RESULTS PRIOR TO SAND PLACEMENT.
4. PREPARED SUBGRADE SHALL BE FREE OF PROTRUDING ROOTS, SHARP STONES, HUMAN-TRANSPORTED MATERIALS, AND ANY OTHER OBJECTS WHICH COULD DAMAGE THE IMPERMEABLE MEMBRANE. PREPARE SUBGRADE A MINIMUM OF 4" BELOW EXISTING GRADE.
5. SEED SHALL BE LOW-MAINTENANCE FESCUE CONSERVATION MIX OR APPROVED EQUIVALENT.

CAPPING SECTION
NOT TO SCALE

CAPPING EDGE KEY TRENCH SECTION
NOT TO SCALE

SECTION A-A



SECTION B-B

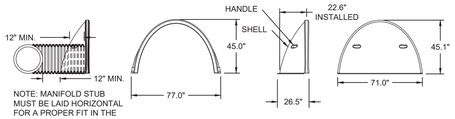
STORMTECH SYSTEM DETAIL
NOT TO SCALE

NOMINAL MC-3500 CHAMBER SPECIFICATIONS

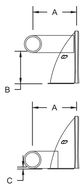
SIZE (L x W x H)	90" x 77" x 45"
CHAMBER STORAGE	109.9 ft³
MINIMUM INSTALLED STORAGE	178.9 ft³
WEIGHT	134 lbs.

NOMINAL MC-3500 END CAP SPECIFICATIONS

SIZE (L x W x H)	26.5" x 71" x 45.1"
ENDCAP STORAGE	15.6 ft³
MINIMUM INSTALLED STORAGE	46.9 ft³
WEIGHT	43 lbs.



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN THE END CAP OPENING.



PART NUMBERS ENDING WITH "B" ARE FOR STUBS AT BOTTOM OF END CAP.
PART NUMBERS ENDING WITH "T" ARE FOR STUBS AT TOP OF END CAP.

PART#	STUB	B	C
MC3500TEPE12T	12" [300 mm]	26.36" (670 mm)	N/A
MC3500TEPE12B	12" [300 mm]	N/A	1.35" [34 mm]
MC3500TEPE15T	15" [375 mm]	23.39" [594 mm]	N/A
MC3500TEPE15B	15" [375 mm]	N/A	1.50" [38 mm]
MC3500TEPE18T	18" [450 mm]	20.03" [509 mm]	N/A
MC3500TEPE18B	18" [450 mm]	N/A	1.77" [45 mm]
MC3500TEPE24T	24" [600 mm]	14.48" [368 mm]	N/A
MC3500TEPE24B	24" [600 mm]	N/A	2.06" [52 mm]

NOTE: ALL DIMENSIONS ARE NOMINAL

CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST.
INVENTORIED MANIFOLDS INCLUDE 12" - 24" SIZE ON SIZE AND
15" THROUGH 48" ECCENTRIC MANIFOLDS.

STORMTECH MC-3500 TECHNICAL DETAILS
NOT TO SCALE

	HEADER PIPE SIZES									
STUB SIZE	48"	42"	36"	30"	24"	18"	15"	12"	10"	8"	6"
12"	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	-	-	-
10"	-	-	-	-	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	-	-
8"	-	-	-	-	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	-
6"	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL

AVAIL - STANDARD HEADERS AVAILABLE

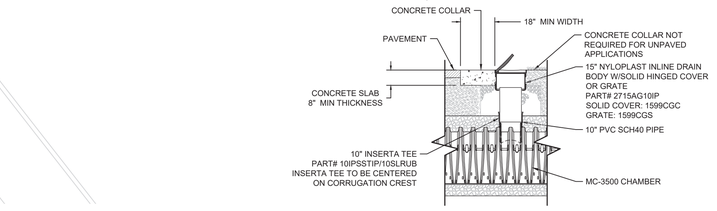
MANIFOLDS ARE DESIGNED TO BE COUPLED TO STORMTECH PREFABRICATED END CAPS. WHEN USING STANDARD END CAPS, CORRUGATE DPIPE UP TO 10 INCHES CAN BE INSERTED DIRECTLY INTO THE END CAP. FOR 12" INLET PIPES, A CORRUGATED TO SMOOTH PIPE ADAPTER IS REQUIRED.

ADS WELDED MANIFOLD
NOT TO SCALE

FOR INFORMATION
CALL 1-888-892-2694

STORMTECH GENERAL NOTES

1. STORMTECH LLC ("STORMTECH") REQUIRES INSTALLING CONTRACTORS TO USE AND UNDERSTAND STORMTECH'S LATEST INSTALLATION INSTRUCTIONS PRIOR TO BEGINNING SYSTEM INSTALLATION.
2. OUR TECHNICAL SERVICES DEPARTMENT OFFERS INSTALLATION CONSULTATIONS TO INSTALLING CONTRACTORS. CONTACT OUR TECHNICAL SERVICES REPRESENTATIVE AT LEAST 30 DAYS PRIOR TO SYSTEM INSTALLATION TO ARRANGE A PRE-INSTALLATION CONSULTATION. OUR REPRESENTATIVES CAN THEN ANSWER QUESTIONS OR ADDRESS COMMENTS ON THE STORMTECH CHAMBER SYSTEM AND INFORM THE INSTALLING CONTRACTOR OF THE MINIMUM INSTALLATION REQUIREMENTS BEFORE BEGINNING THE SYSTEM'S CONSTRUCTION. CALL 1-888-892-2694 TO SPEAK TO A TECHNICAL SERVICE REPRESENTATIVE OR VISIT WWW.STORMTECH.COM TO RECEIVE A COPY OF OUR INSTALLATION INSTRUCTIONS.
3. STORMTECH'S REQUIREMENTS FOR SYSTEMS WITH PAVEMENT DESIGN (ASPHALT, CONCRETE PAVERS, ETC.): MINIMUM COVER IS 18 INCHES NOT INCLUDING PAVEMENT; MAXIMUM COVER IS 96 INCHES INCLUDING PAVEMENT. FOR INSTALLATIONS THAT DO NOT INCLUDE PAVEMENT, WHERE RUTTING FROM VEHICLES MAY OCCUR, MINIMUM REQUIRED COVER IS 24 INCHES, MAXIMUM COVER IS 96 INCHES.
4. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE DESIGN ENGINEER.
5. AASHTO M288 CLASS 2 NON-WOVEN GEOTEXTILE (FILTER FABRIC) MUST BE USED AS INDICATED IN THE PROJECT PLANS.
6. STONE PLACEMENT BETWEEN CHAMBERS ROWS AND AROUND PERIMETER MUST FOLLOW INSTRUCTIONS AS INDICATED IN THE MOST CURRENT VERSION OF STORMTECH'S INSTALLATION INSTRUCTIONS.
7. BACKFILLING OVER THE CHAMBERS MUST FOLLOW REQUIREMENTS AS INDICATED IN THE MOST CURRENT VERSION OF STORMTECH'S INSTALLATION INSTRUCTIONS.
8. THE CONTRACTOR MUST REFER TO STORMTECH'S INSTALLATION INSTRUCTIONS FOR A TABLE OF ACCEPTABLE VEHICLE LOADS AT VARIOUS DEPTHS OF COVER. THIS INFORMATION IS ALSO AVAILABLE AT STORMTECH'S WEBSITE: WWW.STORMTECH.COM. THE CONTRACTOR IS RESPONSIBLE FOR PREVENTING VEHICLES THAT EXCEED STORMTECH'S REQUIREMENTS FROM TRAVELING ACROSS OR PARKING OVER THE STORMWATER SYSTEM. TEMPORARY FENCING, WARNING TAPE AND APPROPRIATELY LOCATED SIGNS ARE COMMONLY USED TO PREVENT UNAUTHORIZED VEHICLES FROM ENTERING SENSITIVE CONSTRUCTION AREAS.
9. THE CONTRACTOR MUST APPLY EROSION AND SEDIMENT CONTROL MEASURES TO PROTECT THE STORMWATER SYSTEM DURING ALL PHASES OF SITE CONSTRUCTION PER LOCAL CODES AND DESIGN ENGINEER'S SPECIFICATIONS.
10. STORMTECH PRODUCT WARRANTY IS LIMITED. SEE CURRENT PRODUCT WARRANTY FOR DETAILS. TO ACQUIRE A COPY CALL STORMTECH AT 1-888-892-2694 OR VISIT WWW.STORMTECH.COM.



NOTES:
1. ALL SCHEDULE 40 FITTINGS TO BE SOLVENT CEMENTED.
2. INSPECTION PORTS TO BE INSTALLED IN THE MIDDLE CHAMBER OF EACH CHAMBER ROW
3. FOR STORMTECH INFORMATION CALL 1-888-892-2694

CLEANOUT
NOT TO SCALE

GRAPHIC SCALE
20 0 10 20 40 80
(in feet)
1 INCH = 20 FEET

Revisions

Rev.	Date	By	Appr.	Description

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Checked By: BM
Drawn By: MDL
Designed By: MDL
Date: MAY 2020

Plan Set: HYA SOIL CAPPING & DRAINAGE FOR PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) MITIGATION
FINAL CONSTRUCTION PLANS
BARNSTABLE, MASSACHUSETTS

Plan Title: SITE PLAN (ARFF SRE BUILDING)

Prepared For:
Barnstable Municipal Airport
480 Barnstable Road
Hyannis, MA 02601
Phone: (508) 775-2020
Fax: —

Survey Provided By:
Horsley Witten Group, Inc.
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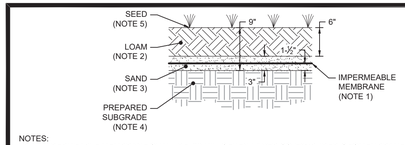
Sheet: 4 of 10

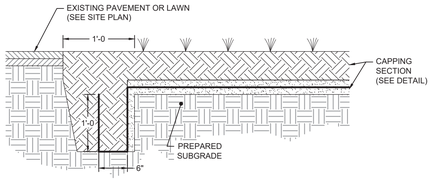
Sheet Number: C - 4

last modified: 03/25/20 printed: 05/11/20 by ml H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\Drawings\17027A ST.dwg

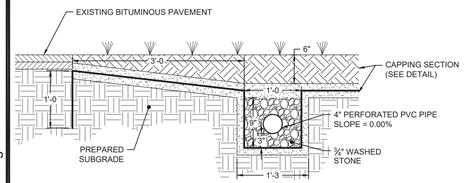


NOTES:
1. IMPERMEABLE MEMBRANE SHALL BE 30 MIL, SEVEN-LAYER CO-EXTRUDED GEOMEMBRANE, LOW DENSITY POLYETHYLENE ABSOLUTE BARRIER Y30BAC BY RAVEN, OR ENGINEER APPROVED EQUIVALENT. CONTRACTOR TO TEST MEMBRANE FOR PRESENCE OF PFAS AND FURNISH TESTING RESULTS PRIOR TO PRODUCT INSTALLATION.
2. LOAM SHALL BE SCREENED AND FREE OF STICKS, ROCKS, AND ANY SHARP OBJECTS. CONTRACTOR SHALL SUBMIT A 1 LB SAMPLE IN AIRTIGHT CONTAINER TO ENGINEER FOR APPROVAL. CONTRACTOR TO TEST LOAM FOR PRESENCE OF PFAS AND FURNISH TESTING RESULTS PRIOR TO LOAM PLACEMENT.
3. SAND SHALL BE ASTM C33 CLEAN SAND. CONTRACTOR TO TEST SAND FOR PRESENCE OF PFAS AND FURNISH TESTING RESULTS PRIOR TO SAND PLACEMENT.
4. PREPARED SUBGRADE SHALL BE FREE OF PROTRUDING ROOTS, SHARP STONES, HUMAN-TRANSPORTED MATERIALS, AND ANY OTHER OBJECTS WHICH COULD DAMAGE THE IMPERMEABLE MEMBRANE. PREPARE SUBGRADE A MINIMUM OF 4" BELOW EXISTING GRADE.
5. SEED SHALL BE LOW-MAINTENANCE FESCUE CONSERVATION MIX OR APPROVED EQUIVALENT.

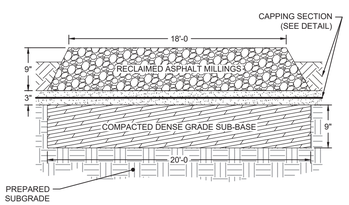
CAPPING SECTION
NOT TO SCALE



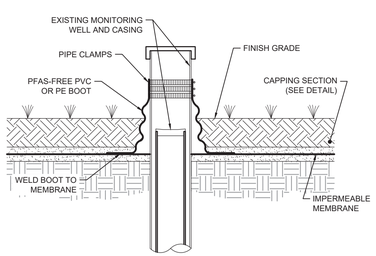
CAPPING EDGE KEY TRENCH SECTION
NOT TO SCALE



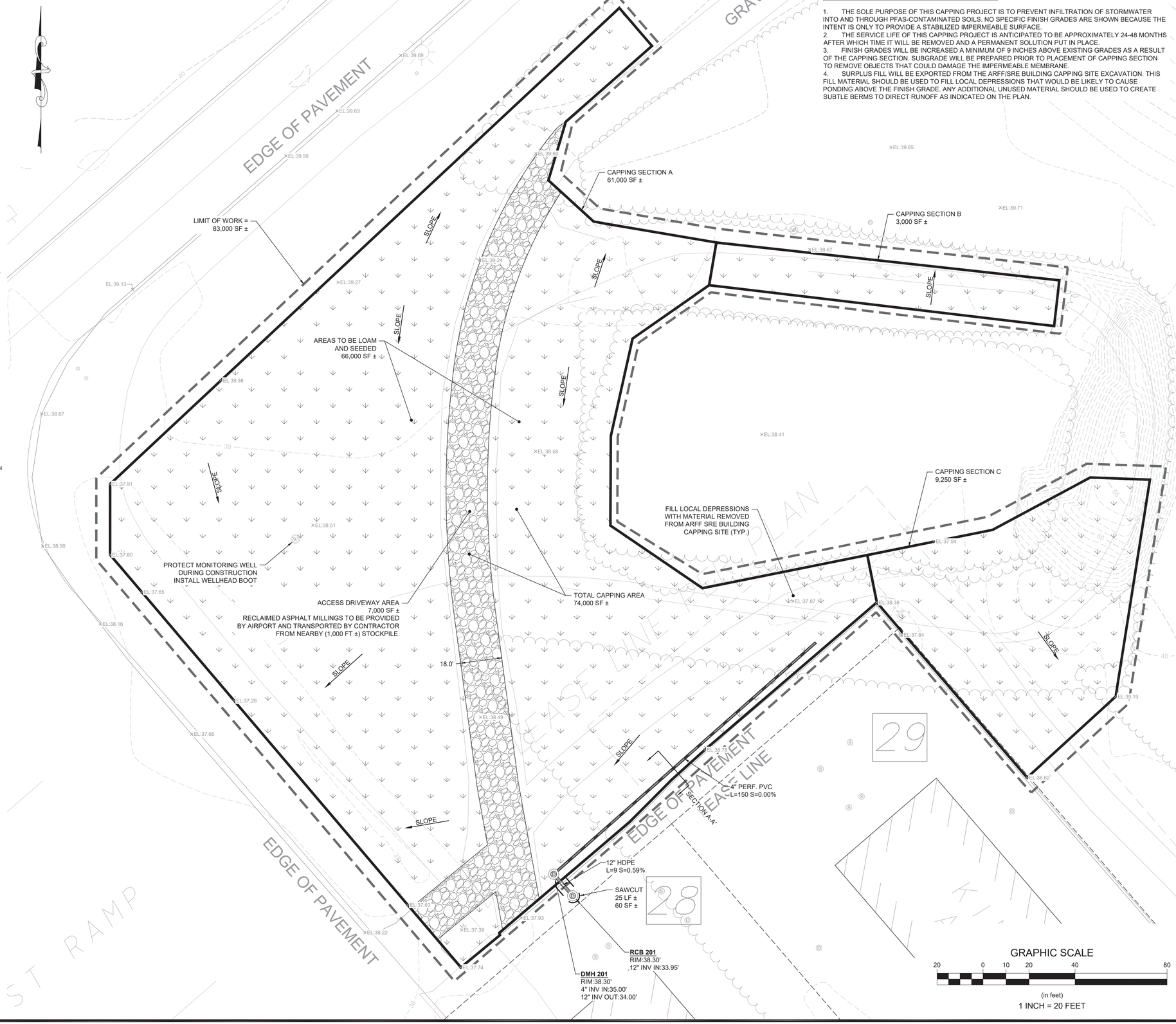
CAPPING WEEP TRENCH SECTION A-A'
NOT TO SCALE



ACCESS DRIVEWAY SECTION
NOT TO SCALE



WELLHEAD BOOT
NOT TO SCALE



DEPLOYMENT AREA GRADING AND DRAINAGE NOTES:

1. THE SOLE PURPOSE OF THIS CAPPING PROJECT IS TO PREVENT INFILTRATION OF STORMWATER INTO AND THROUGH PFAS-CONTAMINATED SOILS. NO SPECIFIC FINISH GRADES ARE SHOWN BECAUSE THE INTENT IS ONLY TO PROVIDE A STABILIZED IMPERMEABLE SURFACE.
2. THE SERVICE LIFE OF THIS CAPPING PROJECT IS ANTICIPATED TO BE APPROXIMATELY 24-48 MONTHS AFTER WHICH TIME IT WILL BE REMOVED AND A PERMANENT SOLUTION PUT IN PLACE.
3. FINISH GRADES WILL BE INCREASED A MINIMUM OF 9 INCHES ABOVE EXISTING GRADES AS A RESULT OF THE CAPPING SECTION. SUBGRADE WILL BE PREPARED PRIOR TO PLACEMENT OF CAPPING SECTION TO REMOVE OBJECTS THAT COULD DAMAGE THE IMPERMEABLE MEMBRANE.
4. SURPLUS FILL WILL BE EXPORTED FROM THE ARFF/SRE BUILDING CAPPING SITE EXCAVATION. THIS FILL MATERIAL SHOULD BE USED TO FILL LOCAL DEPRESSIONS THAT WOULD BE LIKELY TO CAUSE PONDING ABOVE THE FINISH GRADE. ANY ADDITIONAL UNUSED MATERIAL SHOULD BE USED TO CREATE SUBTLE BERMS TO DIRECT RUNOFF AS INDICATED ON THE PLAN.

Revisions

Rev.	Date	By	Appr.	Description

Horsley Witten Group, Inc.
Sustainable Environmental Solutions
www.horsleywitten.com
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Sandwich, MA 02563
508-833-6600 voice
508-833-3150 fax

Checked By: BM
Drawn By: MCL
Designed By: MDL
Date: MAY 2020

Plan Set: HYA SOIL CAPPING & DRAINAGE FOR PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) MITIGATION FINAL CONSTRUCTION PLANS
BARNSTABLE, MASSACHUSETTS

Plan Title: SITE PLAN (DEPLOYMENT AREA)

Prepared For:
Barnstable Municipal Airport
480 Barnstable Road
Hyannis, MA 02601
Phone: (508) 775-2020
Fax: —

Survey Provided By:
Horsley Witten Group, Inc.
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Sandwich, MA 02563
Phone: (508) 833-6600
Fax: —
Dated: January 2019

Registration:
COMMONWEALTH OF MASSACHUSETTS
RICHARD A. CLAYTOR
CIVIL
NO. 45116
REGISTERED PROFESSIONAL ENGINEER
5-11-2020

Project Number: 17027A
Sheet: 5 of 10
Sheet Number: C - 5

last modified: 03/25/20 printed: 05/11/20 by ml H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\Drawings\17027A ST.dwg

GENERAL NOTES

AIRPORT MANAGER

1. THE AIRPORT MANAGER AND/OR HIS/HER DESIGNEE HAVE THE AUTHORITY TO OPEN AND CLOSE AIRPORT FACILITIES, ISSUE AND CANCEL NOTAM'S AND TO COORDINATE WITH AIRPORT USERS. THE AIRPORT MANAGER IS THE SOLE AUTHORITY WITH RESPECT TO AIRPORT OPERATIONS, SAFETY AND SECURITY.

AIRPORT SAFETY AND SECURITY

2. THE CONTRACTOR SHALL INSTALL AND MAINTAIN SAFETY AND SECURITY MEASURES THROUGHOUT THE PROJECT, INCLUDING BUT NOT LIMITED TO: WORKER SAFETY, PEDESTRIAN SITE ACCESS AND SAFETY, AIRFIELD AND OFF-AIRPORT TRAFFIC SAFETY DIRECTLY IMPACTED BY THE PROJECT, PEDESTRIAN ACCESS AND SAFETY MEASURES FOR ACCESSING AIRPORT FACILITIES THAT ARE IMPACTED BY THE PROJECT.
3. THE CONTRACTOR SHALL COMPLY WITH ALL AIRPORT SECURITY REQUIREMENTS AS DIRECTED BY THE AIRPORT MANAGER OR HIS/HER DESIGNEE. THE CONTRACTOR SHALL COMPLY WITH BADGING PER AIRPORT REQUIREMENTS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTROLLING ACCESS TO THE WORK AREA AND ENSURING THAT SECURITY WITHIN THE CONTRACTOR'S LIMIT OF WORK IS MAINTAINED AT ALL TIMES. THE FAA CAN IMPOSE SIGNIFICANT FINES FOR SECURITY VIOLATIONS AND INCURSIONS INTO ACTIVE AIRCRAFT OPERATION AREAS (AOA). THE CONTRACTOR SHALL PAY ALL FINES ASSESSED AGAINST THE AIRPORT DUE TO VIOLATIONS CAUSED BY THE CONTRACTOR AND HIS/HER PERSONNEL, SUBCONTRACTORS AND VENDORS.
5. PARKING PERSONAL VEHICLES SHALL BE IN DESIGNATED LOCATIONS ONLY, BUT NOT WITHIN AN ACTIVE CONSTRUCTION AREA. THE CONTRACTOR, AS A SUBSIDIARY OBLIGATION, SHALL PROVIDE ADEQUATE AND SAFE TRANSPORTATION FOR HIS/HER EMPLOYEES, AND FOR ITS SUBCONTRACTORS AND VENDORS, BETWEEN THE WORK AREAS AND THE LOCATION OF THE PERSONAL VEHICLES. EMPLOYEES AND DRIVERS OF WORK VEHICLES SHALL BE INSTRUCTED AS TO PROPER ACCESS ROADS AND SHALL BE CAUTIONED THAT UNAUTHORIZED ACCESS AND USE OF AIRPORT PAVEMENTS OR OTHER AREAS OUTSIDE THE DESIGNATED WORK AREAS MAY LEAD TO THEIR ARREST AND SUBSEQUENT PAYMENT OF FINES. NO PERSONAL VEHICLES FOR EMPLOYEES OR REPRESENTATIVES OF THE CONTRACTOR OR ITS SUBCONTRACTORS OR VENDORS ARE ALLOWED WITHIN THE AIRCRAFT OPERATIONS AREA.
6. THE CONTRACTOR SHALL PROVIDE INSTRUCTION TO ALL OF ITS EMPLOYEES ENGAGED IN THE PROJECT AS WELL AS ALL SUBCONTRACTORS AND VENDORS INCLUDING MATERIAL SUPPLIERS REGARDING THE AIRPORT ACCESS PROCEDURES TO BE FOLLOWED BY THEIR DELIVERY DRIVERS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ESCORTS OF NON-BADGED EMPLOYEES INCLUDING BUT NOT LIMITED TO MANAGEMENT STAFF, AS WELL AS VENDORS, SUBCONTRACTORS, VISITORS, DELIVERY DRIVERS, AND OTHERS UNDER THE AUTHORITY OF THE CONTRACTOR WHILE ON THE AIRPORT.
7. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER AND THE OWNER PRIOR TO THE START OF WORK, A WRITTEN CONSTRUCTION MANAGEMENT PLAN WHICH DETAILS AMONG OTHER THINGS, THE PRECAUTIONS HE/SHE PROPOSES FOR THE CONTROL OF ITS WORK INCLUDING VEHICLE TRAFFIC INCLUDING POLICE DETAILS, FLAG PERSONS, SIGNS, BARRICADES AND ANY OTHER MEASURES HE/SHE PROPOSES. THE OWNER AND ENGINEER WILL REVIEW AND APPROVE THE PROPOSED PLAN; THE CONTRACTOR SHALL COMPLY WITH THE APPROVED DOCUMENT. STOPPAGE OF WORK BY THE OWNER FOR NON-CONFORMANCE SHALL NOT CONSTITUTE A VALID REASON FOR EXTENDING CONTRACT TIME OR FOR ANY CLAIM OF ADDITIONAL COMPENSATION BY THE CONTRACTOR.
8. THE CONTRACTOR'S PERSONNEL AND CONTRACTOR'S VEHICLES SHALL BE RESTRICTED TO AND SHALL REMAIN WITHIN THE WORK AREAS, HAUL AND ACCESS ROUTES, AND THE STAGING AREAS AS SHOWN ON THE CONTRACT PLANS.
9. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING SECURITY WHEN USING AIRPORT GATES TO ACCESS THE CONSTRUCTION SITE. GATES SHALL BE CLOSED AND LOCKED WHEN NOT IN USE. WHEN GATE(S) ARE IN USE IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE A DEDICATED GATE GUARD TO MONITOR THE CONSTRUCTION TRAFFIC, AS WELL AS VEHICULAR AND PEDESTRIAN ACCESS WHICH MAY CONFLICT WITH THE CONTRACTOR'S OPERATION. LIQUIDATED DAMAGES MAY BE APPLICABLE FOR A VIOLATION OF THIS REQUIREMENT – SEE SPECIFICATIONS.

AIRCRAFT OPERATIONS AREA (AOA)

10. IN GENERAL, THE WORK ASSOCIATED WITH THIS PROJECT WILL REQUIRE THE CONTRACTOR TO BE NEAR OR WITHIN THE AIRCRAFT OPERATIONS AREA (AOA). THE AOA IS ANY AREA OF AN AIRPORT USED OR INTENDED TO BE USED FOR LANDING, TAKEOFF, OR SURFACE MANEUVERING OF AIRCRAFT. AN AOA INCLUDES SUCH PAVED OR TURF AREAS THAT ARE USED OR INTENDED TO BE USED FOR THE UNOBSTRUCTED MOVEMENT OF AIRCRAFT IN ADDITION TO ITS ASSOCIATED RUNWAY, TAXIWAY, OR APRON.
11. FOR THIS PROJECT, THE CONTRACTOR SHALL KEEP HIS/HER PERSONNEL AND EQUIPMENT OUTSIDE OF THE TAXIWAY / RUNWAY SAFETY AREAS PER THE CONSTRUCTION SAFETY AND PHASING PLAN (CSPP).
12. THE CONTRACTOR SHALL FURNISH, INSTALL, MAINTAIN, AND RELOCATE SAFETY BARRICADES. THE CONTRACTOR SHALL MAINTAIN THE BARRICADES ON A REGULAR BASIS AND IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED CONSTRUCTION MANAGEMENT PLAN.
13. PRIOR TO THE RE-OPENING OF THE WORK AREA(S), THE CONTRACTOR SHALL RELOCATE ALL MATERIALS AND EQUIPMENT OUT OF THE AOA TO THE STAGING AREA, REMOVE STOCKPILES, BACKFILL AND COMPACT TRENCHES AND EXCAVATIONS, AND RESTORE GRADES PER THE CONTRACT DOCUMENTS, AND MECHANICALLY SWEEP ALL PAVED AREAS TO REMOVE ALL DEBRIS, MAKING SURE THAT CLEANUP AND SWEEPING OPERATIONS ARE COMPLETED WITH NO ADVERSE IMPACT TO AIRPORT OPERATIONS. STREET SWEEPING AND OTHER SOIL INTRUSIVE ACTIVITES SHALL BE CONDUCTED IN A MANNER THAT DOES NOT GENERATE FUGITIVE DUST EMISSIONS. SITE SOILS CONTAIN PFAS. APPROPRIATE DUST SUPPRESSION TECHNIQUES ARE CONSIDERED INCIDENTAL TO THE PROJECT. THE OWNER WILL PROVIDE DUST MONITORING AT THE SITE UNDER THE DIRECTION OF A LICENSED SITE PROFESSIONAL.
14. THE CONTRACTOR SHALL KEEP ACTIVE PAVED SURFACES CLEAN AND CLEAR OF CONSTRUCTION MATERIAL, FOREIGN OBJECTS, DIRT, GRAVEL, AND DEBRIS, AND SHALL REMOVE SUCH MATERIALS FROM ACTIVE PAVED SURFACES WITHIN 15 MINUTES OF VERBAL NOTICE FROM THE AIRPORT MANAGER OR HIS/HER DESIGNEE OR THE ENGINEER. THE CONTRACTOR SHALL PROVIDE A MANNED VAC SWEEPER DURING ALL TIMES WHEN ACTIVE AOA PAVEMENTS ARE CROSSED AT NO ADDITIONAL COST TO THE OWNER.
15. THE CONTRACTOR MUST STAY WITHIN THE LIMITS OF THE WORK AREA, DESIGNATED HAUL ROADS, AND STAGING AREAS AT ALL TIMES WHILE OPERATING AT THE AIRPORT. THE CONTRACTOR SHALL PAY CAREFUL ATTENTION TO WORK AREA REQUIREMENTS AND ENSURE THAT ITS OWN PERSONNEL AS WELL AS SUBCONTRACTORS AND VENDORS UNDERSTAND WHICH AREAS ARE ACTIVE (TO AIRCRAFT MOVEMENT) AND WHICH AREAS ARE CLOSED DURING CONSTRUCTION ACTIVITIES.
16. ALL OF THE CONTRACTOR'S EQUIPMENT AND VEHICLES, INCLUDING ESCORT VEHICLES, SHALL BE EQUIPPED WITH A 3' X 3' CHECKERED ORANGE AND WHITE FLAG WITH COMPANY IDENTIFICATION PLAINLY VISIBLE ON BOTH SIDES OF THE VEHICLE, AS WELL AS AMBER FLASHING ROTATING BEACONS.

OPEN TRENCHES OR EXCAVATIONS

17. THE CONTRACTOR WILL NOT BE PERMITTED TO LEAVE TRENCHES OR OTHER EXCAVATIONS OPEN AT NIGHT, ON WEEKENDS, OR AT OTHER TIMES WHEN THE CONTRACTOR IS NOT ON THE WORK SITE, UNLESS APPROVAL IS RECEIVED BY THE AIRPORT MANAGER AND THE CONTRACTOR PROTECTS THE EXCAVATION AS MAY BE APPROPRIATE TO MAINTAIN SAFETY AND SECURITY, INCLUDING BUT NOT LIMITED TO THE USE OF STEEL PLATES, BARRICADES, AND LIGHTING, AS APPROVED BY THE ENGINEER.

    IN ADDITION, NO EXCAVATION EXCEEDING 3 INCHES IN DEPTH SHALL BE LEFT OPEN WITHIN THE AOA, AS DESCRIBED ABOVE, WHILE THE WORK AREA(S) ARE IN USE UNLESS THE EXCAVATIONS ARE COVERED WITH APPROVED STEEL PLATES AND/OR OTHER MEASURES AS MAY BE REQUIRED TO MAINTAIN SAFETY AND SECURITY. STEEL PLATES SHALL BE CAPABLE OF BEARING THE HEAVIEST AIRCRAFT/VEHICLE USING THE AIRPORT OVER THE SPAN OF TIME IN WHICH THEY ARE TO BE USED.
18. ALL EXCAVATIONS SHALL BE BACK FILLED, COMPACTED AND THE PAVEMENT REPAIRED AND PROPERLY CURED PRIOR TO THE AREA BEING REOPENED TO TRAFFIC. ALL EXCAVATION REQUIRED SHALL BE CONSTRUCTED PER THE CONTRACT DOCUMENTS, INCLUDING DEPTH OF EXCAVATION, SIDEWALL STABILIZATION, BACKFILL, COMPACTION, ETC.

DEBRIS AND DUST CONTROL

19. THE CONTRACTOR SHALL STRICTLY CONTROL DEBRIS AND LITTER AT ITS WORK SITE(S) FOR THE PROJECT. MUD, STONES OR OTHER DEBRIS RESULTING FROM CONSTRUCTION OPERATIONS SHALL BE PROMPTLY AND COMPLETELY REMOVED FROM ALL PAVEMENTS TO FACILITATE DAILY AIRCRAFT OPERATIONS AND A CLEAN ENVIRONMENT. DUST CONTROL MEASURES SHALL BE TAKEN AS NECESSARY BY THE CONTRACTOR TO ENSURE THAT NO DUST PRODUCED BY CONSTRUCTION ACTIVITY IS ALLOWED TO DRIFT INTO THE AOA, INTO LOCATIONS WHERE AIRCRAFT ARE PARKED AT ANY TIME, OR SURROUNDING RESIDENCES OR BUSINESSES. THE CONTRACTOR SHALL ENSURE THAT ALL PUBLIC ROADS ARE CONTINUOUSLY MAINTAINED FREE OF MUD AND DEBRIS THAT MAY RESULT FROM ITS OPERATIONS INCLUDING OPERATIONS ASSOCIATED WITH ITS SUBCONTRACTOR AND VENDORS. DEBRIS AND DUST CONTROL MEASURES SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT. THE CONTRACTOR SHALL PROVIDE A MANNED VAC SWEEPER DURING ALL TIMES WHEN ACTIVE AOA PAVEMENTS ARE CROSSED AT NO ADDITIONAL COST TO THE OWNER.

CONTRACTOR'S STAGING AREAS

20. THE CONTRACTOR SHALL USE THE AREAS SHOWN ON THE PLANS FOR HIS/HER STAGING AREA(S). NO OTHER AREAS ARE APPROVED WITHOUT THE EXPLICIT CONSENT OF THE AIRPORT MANAGER AND THE ENGINEER. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL IMPROVEMENT AND RESTORATION OF THE DESIGNATED STAGING AREAS SUCH AS GRUBBING, GRADING, AND CONSTRUCTION OF STABILIZED ACCESS ROADS, THAT IS NECESSARY FOR THE UTILIZATION OF THE AREA. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR ANY TEMPORARY ACCESS PERMITS AND ASSOCIATED FEES FOR ACCESS TO THE ADJACENT ROAD NETWORK. THERE WILL BE NO SEPARATE PAYMENT FOR THIS WORK. THE COST FOR ALL WORK NECESSARY TO ESTABLISH, USE AND RESTORE THE STAGING AREA(S) SHALL BE DEEMED INCIDENTAL TO THE OVERALL PROJECT.
21. THE CONTRACTOR SHALL MAINTAIN THE STAGING AREA(S), AND THE PROJECT SITE, IN A NEAT MANNER AND PREVENT TRASH, DUST, AND DEBRIS FROM BLOWING INTO ABUTTING AREAS.

GENERAL NOTES

22. IF THE OWNER REQUIRES WEEKLY JOB MEETINGS, THE TIME AND DATE WILL BE DETERMINED BY MUTUAL AGREEMENT OF THE OWNER, CONTRACTOR AND ENGINEER. ENGINEER WILL CONDUCT THE MEETING. AT A MINIMUM THE CONTRACTOR SHALL PROVIDE IT'S PROJECT MANAGER, SITE SUPERINTENDENT(S) AND OTHER KEY PERSONNEL THAT THE CONTRACTOR FEELS IS NECESSARY TO ATTEND THE MEETING. THE MEETING SHALL ALSO BE ATTENDED BY A REPRESENTATIVE OF EACH SUBCONTRACTOR THAT IS PERFORMING WORK AT THE TIME OF THE MEETING, OR BY A SUBCONTRACTOR THAT MAY PLAY A CRITICAL ROLE IN ANY PARTICULAR MEETING. THE MEETING MAY ALSO BE ATTENDED BY THE AIRPORT MANAGER OR HIS/HER DESIGNEE, AND OTHER INVITED PARTIES.
23. THE CONTRACTOR SHALL PROVIDE A WRITTEN UPDATE TO THE PROJECT SCHEDULE AT EACH WEEKLY JOB MEETING; AN ELECTRONIC COPY OF THE SCHEDULE SHALL ALSO BE PROVIDED TO THE OWNER AND ENGINEER VIA EMAIL ON THE DATE OF EACH WEEKLY JOB MEETING. AT A MINIMUM, THE PROJECT SCHEDULE SHALL INCLUDE THE STATUS OF EACH PAY ITEM BY NOTING THE PERCENT COMPLETE TO DATE AND THE CORRESPONDING ANTICIPATED COMPLETION DATE. THE CONTRACTOR SHALL ALSO INDICATE THE STATUS OF THE OVERALL PROJECT INDICATING WHETHER THE PROJECT IS ON SCHEDULE, AHEAD OF SCHEDULE, OR BEHIND SCHEDULE.
24. THE CONTRACTOR SHALL SUBMIT A CONSTRUCTION MANAGEMENT PLAN FOR REVIEW AND APPROVAL BY ENGINEER. AT A MINIMUM, THIS PLAN SHALL INCLUDE, BUT NOT LIMITED TO, THE FOLLOWING ELEMENTS:
    a. PROJECT SCHEDULE – UPDATED WEEKLY
    b. 24-HOUR CONTACT INFORMATION FOR KEY PERSONNEL, INCLUDING: PROJECT MANAGER, SITE SUPERINTENDENT(S), AND 24-HOUR CONTACT INFORMATION FOR ALL SUBCONTRACTORS.
    c. SITE SECURITY PLAN
    d. DUST CONTROL
    e. CONSTRUCTION SAFETY MEASURES PURSUANT TO THE CONSTRUCTION SAFETY AND PHASING PLAN

CLOSEOUT DELIVERABLES AND FINAL PAYMENT

25. THE CONTRACTOR SHALL COMPLETE AND PROVIDE THE FOLLOWING DOCUMENTS AND DELIVERABLES BEFORE FINAL PAYMENT:
    a. AS-BUILT PLANS, STAMPED BY PLS SUBCONTRACTOR
    b. AUTOCAD DRAWING OF AS-BUILT PLANS
    c. PROJECT PHOTOGRAPHS
    d. CONTRACTOR WARRANTY
    e. LIEN WAIVERS
    f. FINAL CERTIFIED PAYROLL
    g. EQUIPMENT / O&M MANUALS, AS REQUIRED
26. THE CONTRACTOR IS RESPONSIBLE FOR THE PREPARATION OF ITS OWN HEALTH AND SAFETY PLAN CONSISTENT WITH OSHA. PFAS IS LOCATED WITHIN SITE SOILS. REFER TO DOCUMENT TITLED " FINAL IMMEDIATE RESPONSE ACTION PLAN MODIFICATION", PREPARED BY THE HORSELY WITTEN GROUP, INC. AND DATED DECEMBER 2019

NO.	DATE	DESCRIPTION	BY

PROJECT: PFAS MITIGATION

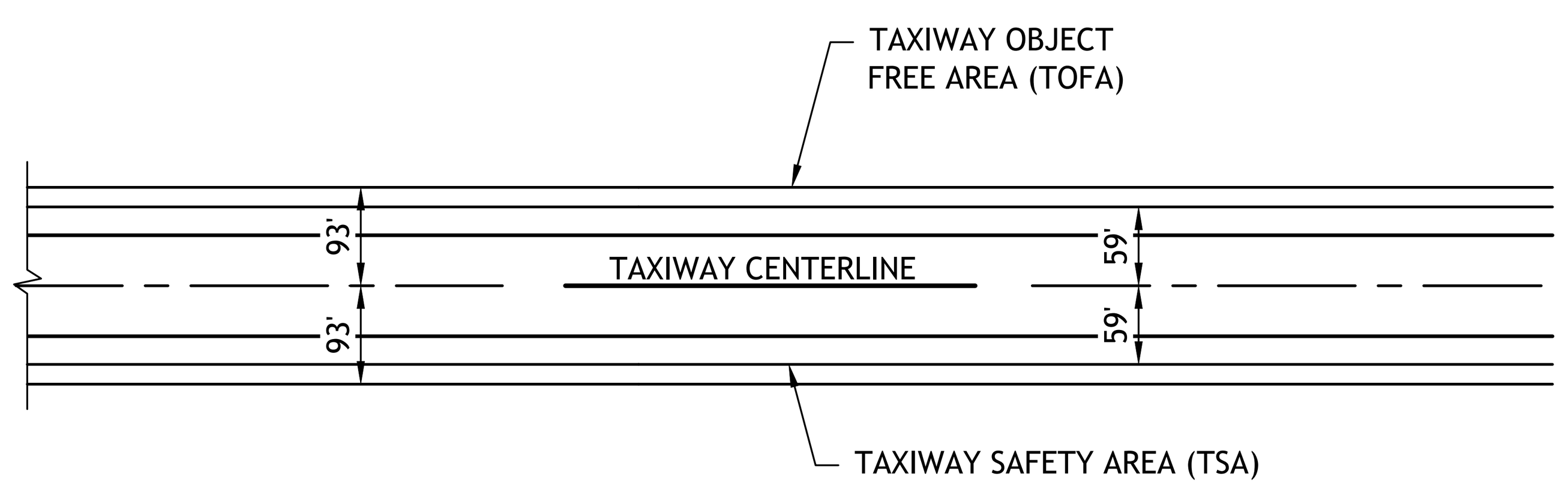
OWNER: **BARNSTABLE MUNICIPAL AIRPORT**
480 Barnstable Road • Hyannis, MA 02601
(508) 775-2020

PROJECT NO.	17027A
DESIGNED BY	PEJ
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	MARCH 2020
DRAWING SCALE	N.T.S

SHEET TITLE: CONSTRUCTION SAFETY AND PHASING PLAN - GENERAL NOTES

GRAPHIC SCALE N.T.S.

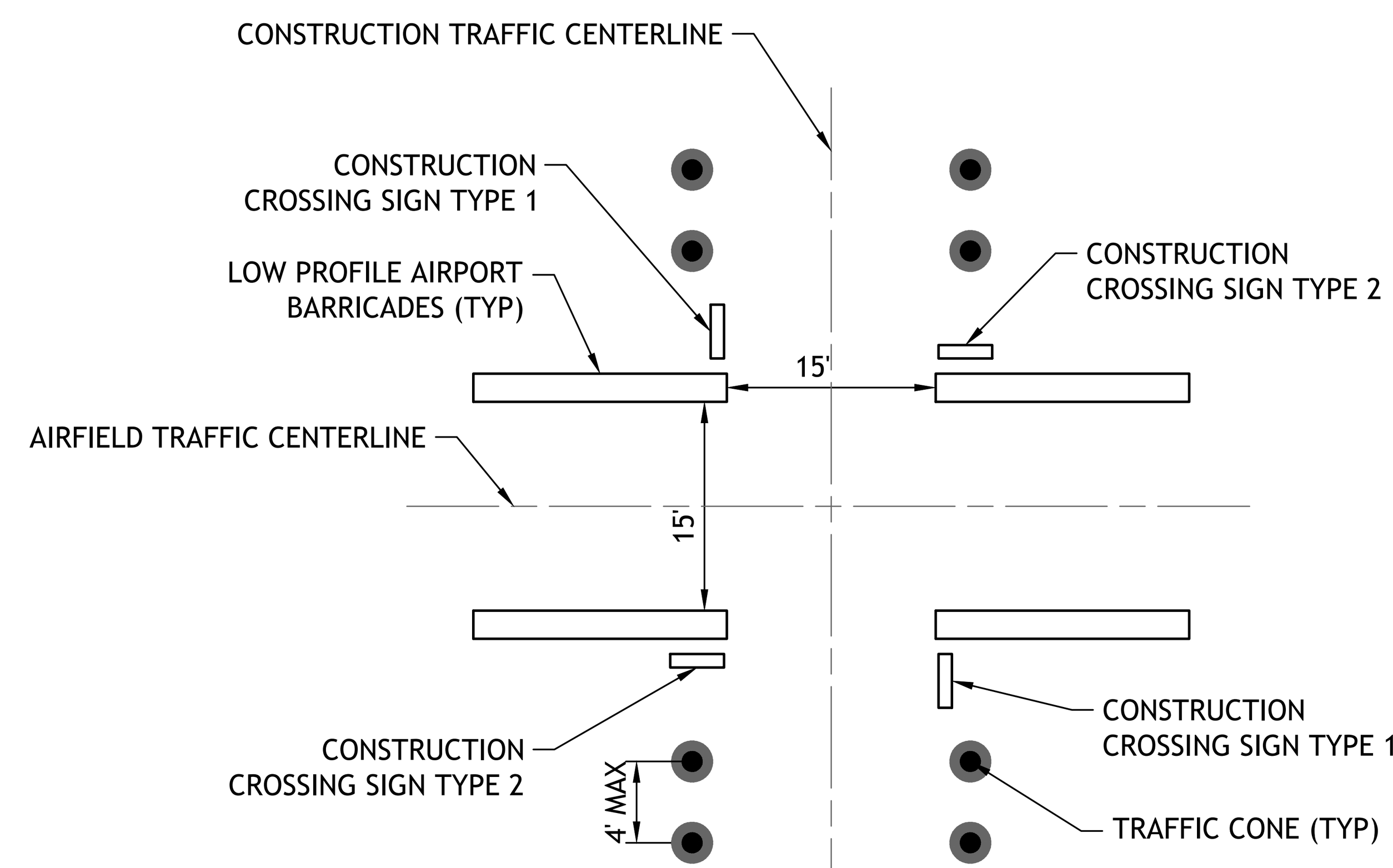
DRAWING NO.
S1.1



NOTE: NO WORK MAY OCCUR WITHIN THE TSA WITHOUT CLOSING DOWN THE TAXIWAY.

TAXIWAYS B RESTRICTED CONSTRUCTION AREAS

SCALE: N.T.S.



NOTE: CONSTRUCTION SITE CROSSING TO BE IMPLEMENTED DURING WORK AREA IB.

CONSTRUCTION SITE CROSSING

SCALE: N.T.S.

CONSTRUCTION CROSSING SIGN TYPE 1

SCALE: N.T.S.

CONSTRUCTION CROSSING SIGN TYPE 2

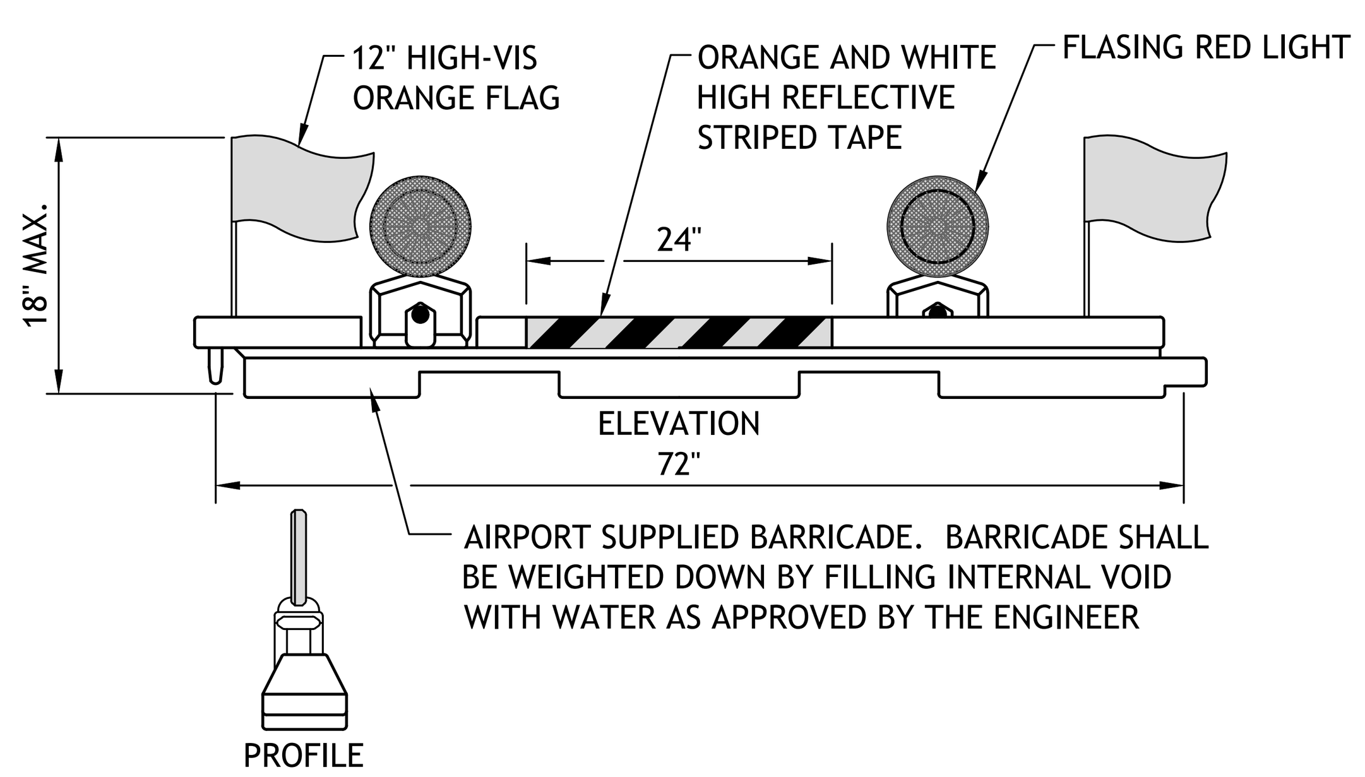
SCALE: N.T.S.

NOTES:

1. "WATCH FOR CROSSING TRAFFIC" SIGNS SHALL BE DESIGNED PER W20-1 SIGN IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), 2009 EDITION.
2. "DO NOT TURN" SIGNS SHALL BE DESIGNED PER R3-3 SIGN IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), 2009 EDITION.
3. SIGNS SHALL CONFORM TO THE DIMENSIONS AND MATERIAL REQUIRED IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), 2009 EDITION.
4. SIGN MOUNTING TO BE APPROVED BY ENGINEER.
5. SIGNS SHALL BE OF RETROREFLECTIVE MATERIAL AND MEET THE MINIMUM REQUIREMENTS LISTED IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), 2009 EDITION.
6. SIGNS SHALL BE PLACED AS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER OR AIRPORT.

TEMPORARY CONSTRUCTION SIGNS

SCALE: N.T.S.

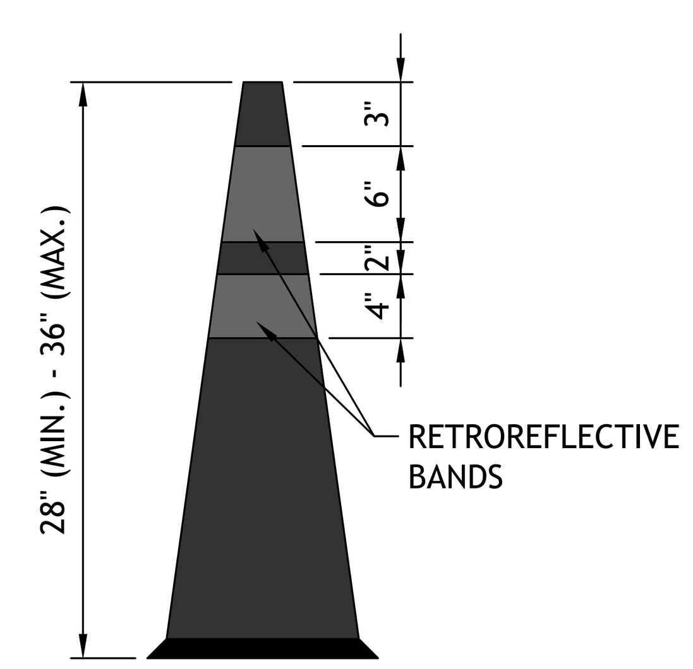


NOTES

1. THE AIRPORT WILL SUPPLY 210 BARRICADES. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT THE BARRICADES MEET FAA REQUIREMENTS FOR VISIBILITY, PER ADVISORY CIRCULAR 150/5370-2G, OR LATEST EDITION, SUCH AS PROVIDING NEW LIGHTS, REPLACEMENT OF BATTERIES, PROVIDING NEW FLAGS, ETC.
2. IT IS THE CONTRACTORS RESPONSIBILITY TO TRANSPORT AND PLACE THE BARRICADES FROM THEIR CURRENT LOCATION ON THE AIRPORT TO THE WORK AREA. IT IS ALSO THE RESPONSIBILITY OF THE CONTRACTOR TO RETURN THE BARRICADES BACK TO THEIR ORIGINAL AIRPORT STORAGE AREA UPON COMPLETION OF THE PROJECT.
3. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT THE BARRICADES ARE RETURNED IN A LIKE OR BETTER CONDITION. ANY BARRICADES DAMAGED BY THE CONTRACTOR SHALL BE REPLACED IN KIND BY THE CONTRACTOR AT THEIR COST.
4. BARRICADE LIGHTS SHALL HAVE RED LENSES AND LED LAMPS AND ORANGE FLAGS.
5. DURING CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE THE NECESSARY SAFETY BARRICADES TO ENSURE THE SAFETY OF AIRCRAFT, AIRCRAFT PASSENGERS, AIRFIELD EMPLOYEES, THE PUBLIC, AND THE CONTRACTOR'S EMPLOYEES.
6. BARRICADES SHALL BE IN PLACE EACH DAY TO DELINEATE THE WORK AREA AND TO RESTRICT ANY AIRCRAFT FROM TAXIING INTO THE ACTIVE WORK AREA. PLACEMENT AND LOCATION OF BARRICADES SHALL BE APPROVED BY THE ENGINEER ON A DAILY BASIS AND COORDINATED WITH THE AIRPORT MANAGER.
7. BARRICADES SHALL BE WEIGHTED WITH WATER TO RESIST WIND, PROP WASH, AND JET BLAST.
8. MAXIMUM ALLOWABLE HEIGHT IS 18 INCHES. STANDARD TYPE HIGHWAY BARRICADES, BARRELS, AND CONES ARE NOT ACCEPTABLE FOR AIRPORT BARRICADES.
9. THE BARRICADES SHOWN ON THE PLAN DO NOT REPRESENT THE QUANTITY OF BARRICADES BUT REPRESENTS THE LOCATION.

LOW PROFILE AIRPORT BARRICADE

SCALE: N.T.S.



NOTES:

1. TRAFFIC CONES MUST MEET THE REQUIREMENTS OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
2. DURING CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE THE NECESSARY TRAFFIC CONES TO ENSURE THE SAFETY OF AIRCRAFT, AIRCRAFT PASSENGERS, AIRFIELD EMPLOYEES, THE PUBLIC, AND THE CONTRACTOR'S EMPLOYEES.
3. CONES SHALL BE IN PLACE EACH DAY TO DELINEATE THE WORK AREA AND TO RESTRICT ANY AIRCRAFT FROM TAXIING INTO THE ACTIVE WORK AREA. PLACEMENT AND LOCATION OF CONES SHALL BE APPROVED BY THE ENGINEER ON A DAILY BASIS AND COORDINATED WITH THE AIRPORT MANAGER.
4. CONES SHALL BE WEIGHTED TO RESIST WIND, PROP WASH, AND JET BLAST.
5. MAXIMUM ALLOWABLE SPACING OF CONES IS TEN (10) FEET. SEE DRAWINGS.

TRAFFIC CONE

SCALE: N.T.S.

ASG AIRPORT SOLUTIONS GROUP, LLC
Innovation By Design
AIRPORT CONSULTANT • BURLINGTON, MASSACHUSETTS
PHONE (781) 491-0083 FAX (781) 491-0360

NO.	DATE	DESCRIPTION	BY

PROJECT
PFAS MITIGATION

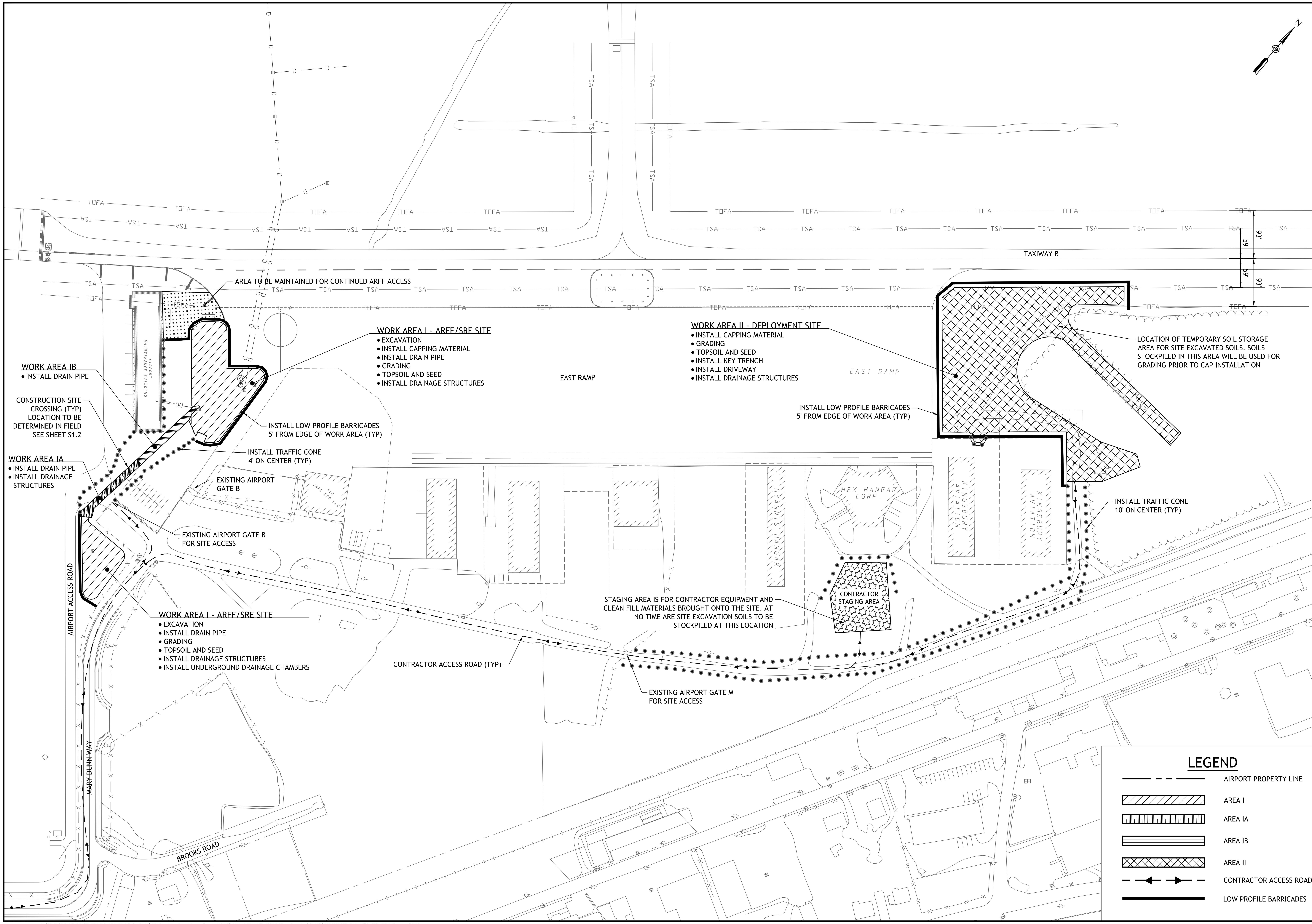
OWNER
BARNSTABLE MUNICIPAL AIRPORT
480 Barnstable Road • Hyannis, MA 02601
(508) 775-2020

PROJECT NO.	17027A
DESIGNED BY	PEJ
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	MARCH 2020
DRAWING SCALE	N.T.S

SHEET TITLE
CONSTRUCTION SAFETY AND PHASING PLAN - DETAILS

GRAPHIC SCALE
N.T.S.

DRAWING NO.
S1.2



TAXIWAY B
AREA TO BE MAINTAINED FOR CONTINUED ARFF ACCESS
WORK AREA I - ARFF/SRE SITE
• EXCAVATION
• INSTALL CAPPING MATERIAL
• INSTALL DRAIN PIPE
• GRADING
• TOPSOIL AND SEED
• INSTALL DRAINAGE STRUCTURES
EAST RAMP
WORK AREA II - DEPLOYMENT SITE
• INSTALL CAPPING MATERIAL
• GRADING
• TOPSOIL AND SEED
• INSTALL KEY TRENCH
• INSTALL DRIVEWAY
• INSTALL DRAINAGE STRUCTURES
EAST RAMP
LOCATION OF TEMPORARY SOIL STORAGE AREA FOR SITE EXCAVATED SOILS. SOILS STOCKPILED IN THIS AREA WILL BE USED FOR GRADING PRIOR TO CAP INSTALLATION
WORK AREA IB
• INSTALL DRAIN PIPE
CONSTRUCTION SITE CROSSING (TYP) LOCATION TO BE DETERMINED IN FIELD SEE SHEET S1.2
INSTALL LOW PROFILE BARRICADES 5' FROM EDGE OF WORK AREA (TYP)
INSTALL LOW PROFILE BARRICADES 5' FROM EDGE OF WORK AREA (TYP)
WORK AREA IA
• INSTALL DRAIN PIPE
• INSTALL DRAINAGE STRUCTURES
INSTALL TRAFFIC CONE 4' ON CENTER (TYP)
EXISTING AIRPORT GATE B
EXISTING AIRPORT GATE B FOR SITE ACCESS
CAPE COD AIR
HYANNIS HANGAR
HEX HANGAR CORP
KINGSBURY AVIATION
KINGSBURY AVIATION
INSTALL TRAFFIC CONE 10' ON CENTER (TYP)
AIRPORT ACCESS ROAD
WORK AREA I - ARFF/SRE SITE
• EXCAVATION
• INSTALL DRAIN PIPE
• GRADING
• TOPSOIL AND SEED
• INSTALL DRAINAGE STRUCTURES
• INSTALL UNDERGROUND DRAINAGE CHAMBERS
STAGING AREA IS FOR CONTRACTOR EQUIPMENT AND CLEAN FILL MATERIALS BROUGHT ONTO THE SITE. AT NO TIME ARE SITE EXCAVATION SOILS TO BE STOCKPILED AT THIS LOCATION
CONTRACTOR STAGING AREA
CONTRACTOR ACCESS ROAD (TYP)
EXISTING AIRPORT GATE M FOR SITE ACCESS
MARY DUNN WAY
BROOKS ROAD
LEGEND
AIRPORT PROPERTY LINE
AREA I
AREA IA
AREA IB
AREA II
CONTRACTOR ACCESS ROAD
LOW PROFILE BARRICADES

NO.	DATE	DESCRIPTION	BY

PROJECT
PFAS MITIGATION

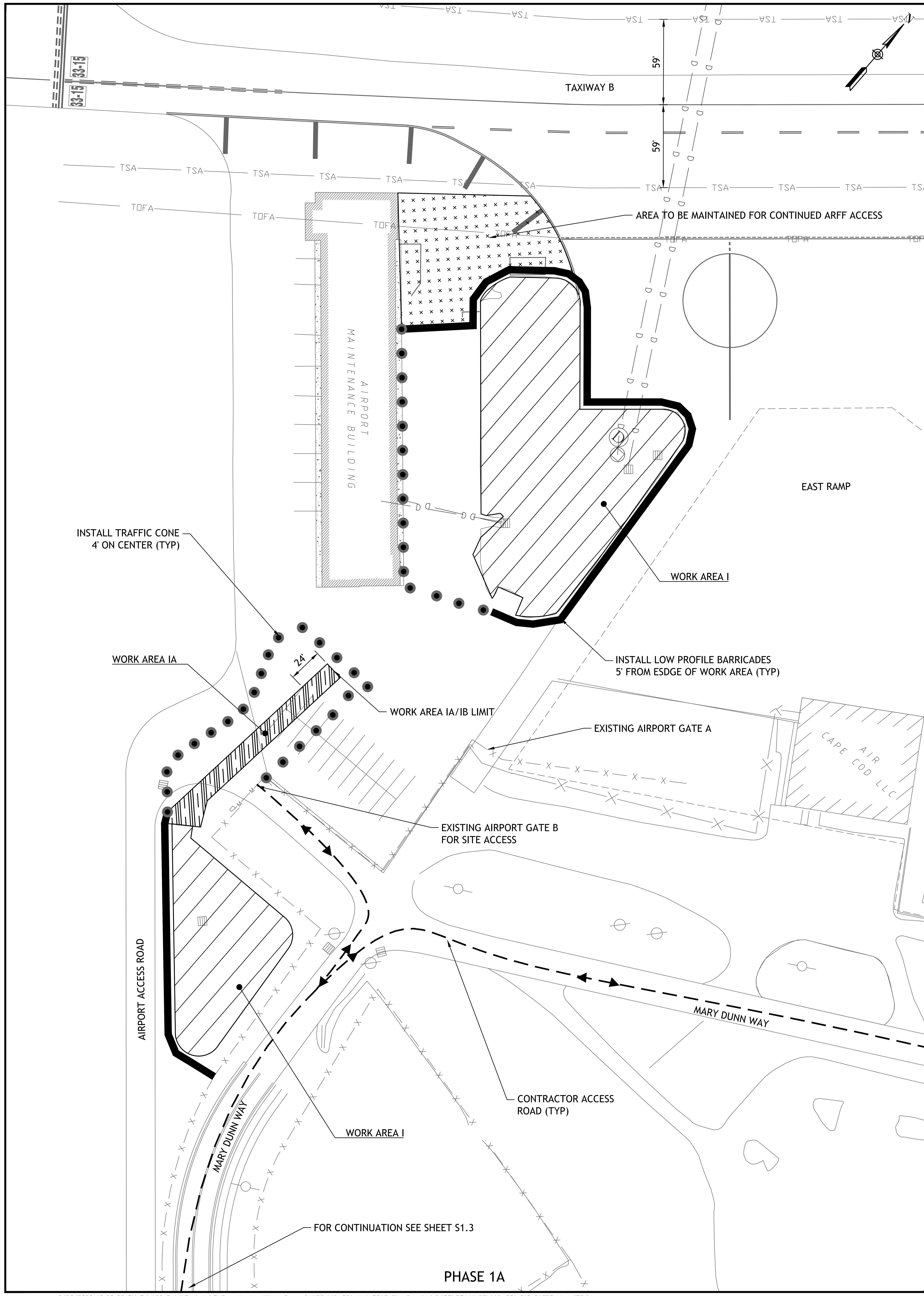
OWNER
BARNSTABLE MUNICIPAL AIRPORT
480 Barnstable Road • Hyannis, MA 02601
(508) 775-2020

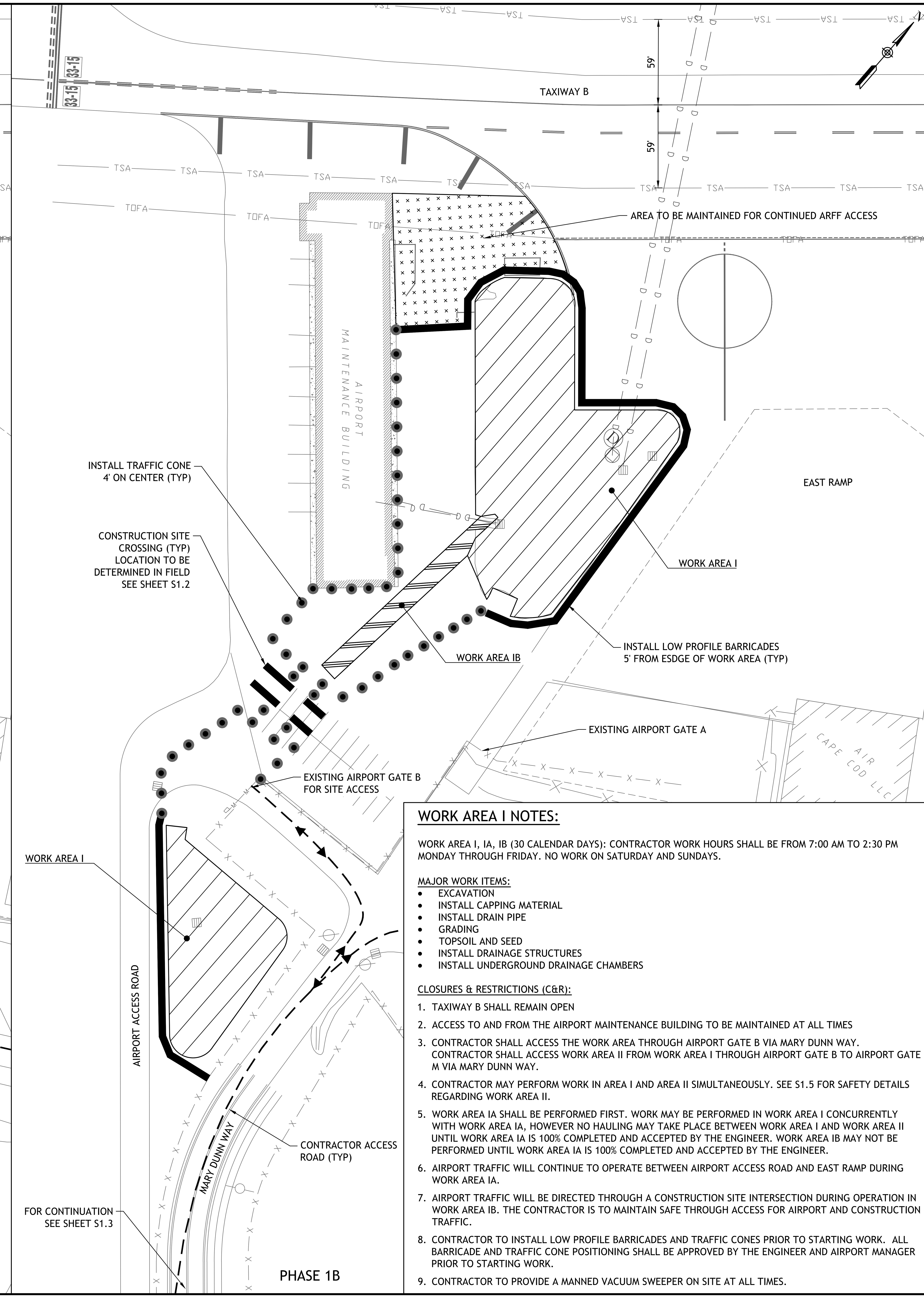
PROJECT NO.	17027A
DESIGNED BY	PEJ
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	MARCH 2020
DRAWING SCALE	1" = 80'

SHEET TITLE
CONSTRUCTION SAFETY AND PHASING PLAN - SITE PLAN

GRAPHIC SCALE 0 40' 80' 160'

DRAWING NO.
S1.3





WORK AREA I NOTES:

WORK AREA I, IA, IB (30 CALENDAR DAYS): CONTRACTOR WORK HOURS SHALL BE FROM 7:00 AM TO 2:30 PM MONDAY THROUGH FRIDAY. NO WORK ON SATURDAY AND SUNDAYS.

MAJOR WORK ITEMS:
- EXCAVATION
- INSTALL CAPPING MATERIAL
- INSTALL DRAIN PIPE
- GRADING
- TOPSOIL AND SEED
- INSTALL DRAINAGE STRUCTURES
- INSTALL UNDERGROUND DRAINAGE CHAMBERS

CLOSURES & RESTRICTIONS (C&R):
1. TAXIWAY B SHALL REMAIN OPEN
2. ACCESS TO AND FROM THE AIRPORT MAINTENANCE BUILDING TO BE MAINTAINED AT ALL TIMES
3. CONTRACTOR SHALL ACCESS THE WORK AREA THROUGH AIRPORT GATE B VIA MARY DUNN WAY. CONTRACTOR SHALL ACCESS WORK AREA II FROM WORK AREA I THROUGH AIRPORT GATE B TO AIRPORT GATE M VIA MARY DUNN WAY.
4. CONTRACTOR MAY PERFORM WORK IN AREA I AND AREA II SIMULTANEOUSLY. SEE S1.5 FOR SAFETY DETAILS REGARDING WORK AREA II.
5. WORK AREA IA SHALL BE PERFORMED FIRST. WORK MAY BE PERFORMED IN WORK AREA I CONCURRENTLY WITH WORK AREA IA, HOWEVER NO HAULING MAY TAKE PLACE BETWEEN WORK AREA I AND WORK AREA II UNTIL WORK AREA IA IS 100% COMPLETED AND ACCEPTED BY THE ENGINEER. WORK AREA IB MAY NOT BE PERFORMED UNTIL WORK AREA IA IS 100% COMPLETED AND ACCEPTED BY THE ENGINEER.
6. AIRPORT TRAFFIC WILL CONTINUE TO OPERATE BETWEEN AIRPORT ACCESS ROAD AND EAST RAMP DURING WORK AREA IA.
7. AIRPORT TRAFFIC WILL BE DIRECTED THROUGH A CONSTRUCTION SITE INTERSECTION DURING OPERATION IN WORK AREA IB. THE CONTRACTOR IS TO MAINTAIN SAFE THROUGH ACCESS FOR AIRPORT AND CONSTRUCTION TRAFFIC.
8. CONTRACTOR TO INSTALL LOW PROFILE BARRICADES AND TRAFFIC CONES PRIOR TO STARTING WORK. ALL BARRICADE AND TRAFFIC CONE POSITIONING SHALL BE APPROVED BY THE ENGINEER AND AIRPORT MANAGER PRIOR TO STARTING WORK.
9. CONTRACTOR TO PROVIDE A MANNED VACUUM SWEEPER ON SITE AT ALL TIMES.

ASG AIRPORT SOLUTIONS GROUP, LLC
Innovation By Design
AIRPORT CONSULTANT • BURLINGTON, MASSACHUSETTS
PHONE (781) 491-0083 FAX (781) 491-0360

NO.	DATE	DESCRIPTION	BY

PROJECT: PFAS MITIGATION

OWNER: ***BARNSTABLE MUNICIPAL AIRPORT***
480 Barnstable Road • Hyannis, MA 02601
(508) 775-2020

PROJECT NO.	17027A
DESIGNED BY	PEJ
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	MARCH 2020
DRAWING SCALE	1" = 40'

SHEET TITLE: CONSTRUCTION SAFETY AND PHASING PLAN - WORK AREA I

GRAPHIC SCALE 0 20' 40' 80'

DRAWING NO.
S1.4

WORK AREA II NOTES:

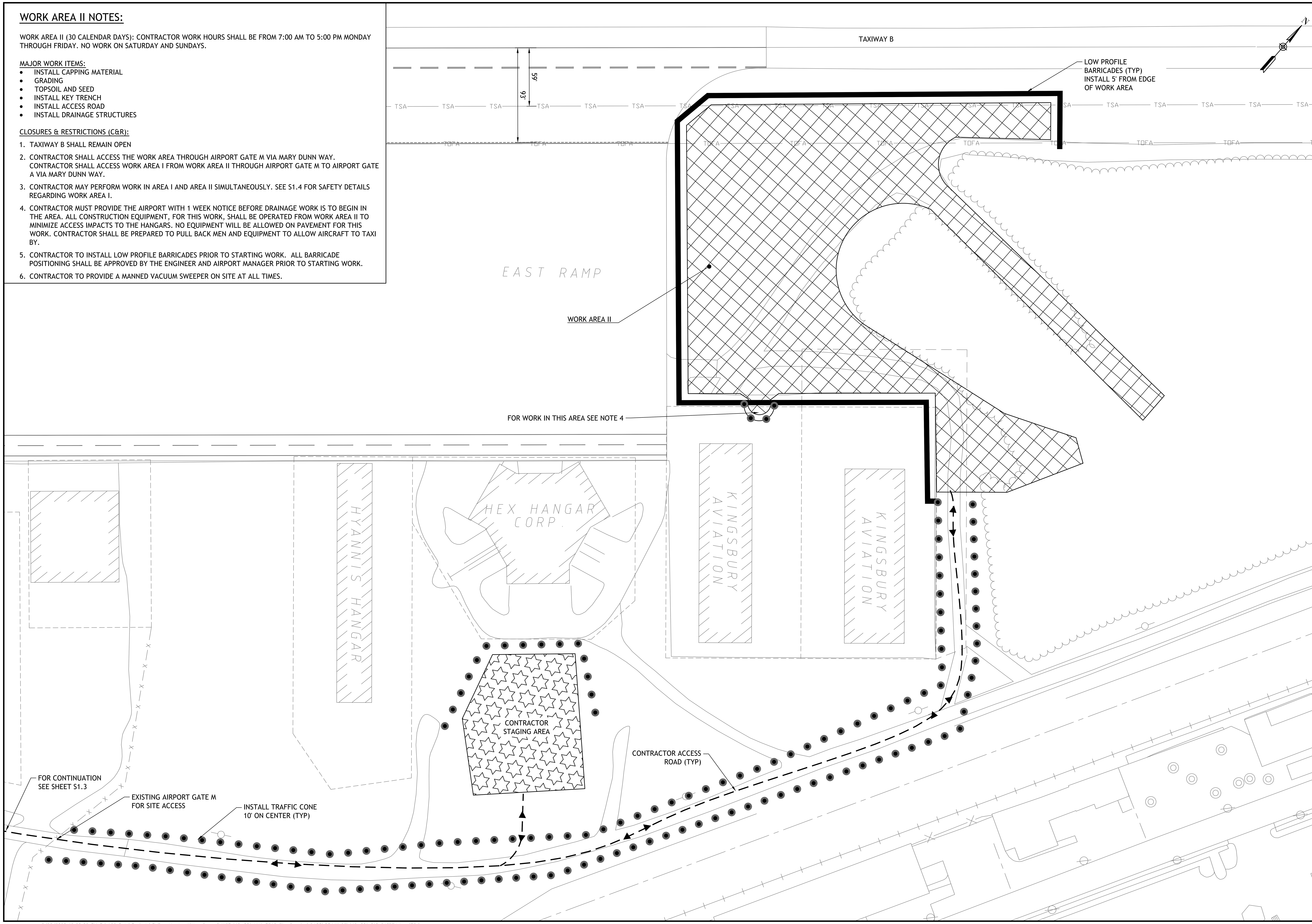
WORK AREA II (30 CALENDAR DAYS): CONTRACTOR WORK HOURS SHALL BE FROM 7:00 AM TO 5:00 PM MONDAY THROUGH FRIDAY. NO WORK ON SATURDAY AND SUNDAYS.

MAJOR WORK ITEMS:

- INSTALL CAPPING MATERIAL
- GRADING
- TOPSOIL AND SEED
- INSTALL KEY TRENCH
- INSTALL ACCESS ROAD
- INSTALL DRAINAGE STRUCTURES

CLOSURES & RESTRICTIONS (C&R):

1. TAXIWAY B SHALL REMAIN OPEN
2. CONTRACTOR SHALL ACCESS THE WORK AREA THROUGH AIRPORT GATE M VIA MARY DUNN WAY. CONTRACTOR SHALL ACCESS WORK AREA I FROM WORK AREA II THROUGH AIRPORT GATE M TO AIRPORT GATE A VIA MARY DUNN WAY.
3. CONTRACTOR MAY PERFORM WORK IN AREA I AND AREA II SIMULTANEOUSLY. SEE S1.4 FOR SAFETY DETAILS REGARDING WORK AREA I.
4. CONTRACTOR MUST PROVIDE THE AIRPORT WITH 1 WEEK NOTICE BEFORE DRAINAGE WORK IS TO BEGIN IN THE AREA. ALL CONSTRUCTION EQUIPMENT, FOR THIS WORK, SHALL BE OPERATED FROM WORK AREA II TO MINIMIZE ACCESS IMPACTS TO THE HANGARS. NO EQUIPMENT WILL BE ALLOWED ON PAVEMENT FOR THIS WORK. CONTRACTOR SHALL BE PREPARED TO PULL BACK MEN AND EQUIPMENT TO ALLOW AIRCRAFT TO TAXI BY.
5. CONTRACTOR TO INSTALL LOW PROFILE BARRICADES PRIOR TO STARTING WORK. ALL BARRICADE POSITIONING SHALL BE APPROVED BY THE ENGINEER AND AIRPORT MANAGER PRIOR TO STARTING WORK.
6. CONTRACTOR TO PROVIDE A MANNED VACUUM SWEEPER ON SITE AT ALL TIMES.



ASG

NO.	DATE	DESCRIPTION	BY

PROJECT: PFAS MITIGATION

OWNER: BARNSTABLE MUNICIPAL AIRPORT, 480 Barnstable Road • Hyannis, MA 02601, (508) 775-2020

PROJECT NO.	17027A
DESIGNED BY	PEJ
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	MARCH 2020
DRAWING SCALE	1" = 40'

SHEET TITLE: CONSTRUCTION SAFETY AND PHASING PLAN - WORK AREA II

GRAPHIC SCALE 0 20' 40' 80'

DRAWING NO.

S1.5

Report on Water Quality

The Hyannis Water Board is proud to present its annual water quality report. The statistics in this report are based on testing done throughout 2021 as well as prior years. We hope you will find it helpful to know the sources of your water and the process by which safe drinking water is delivered to your home or business. We have maintained our high standards in an effort to continue delivering the best quality drinking water possible. We remain vigilant in meeting the challenges of source water protection.

Opportunities for Public Participation

We encourage you to share your thoughts with us
on the information contained in this report.
Our meetings are open public meetings.
A schedule of these meetings is posted
on the Town of Barnstable website:
http://www.town.barnstable.ma.us/HyannisWaterBoard/?brd=Hyannis+Water+Board.
Should you ever have questions, we are available to assist you.
Call Hans Keijser, Supervisor,
Water Supply Division at **508 775-0063**

Where Does My Water Come From?

The Hyannis Water System supplies the most densely populated residential and commercial areas of Hyannis, Hyannisport, and West Hyannisport comprising approximately 9 square miles. The water is obtained from 11 groundwater wells that are located in the Town of Barnstable and draw water from the Sagamore Lens, part of the Cape Cod Aquifer. The wells are: Airport # 1 (4020004-10g), Hyannisport Well (4020004-03g), Maher Well # 1 (4020004-07g), Maher Well # 2 (4020004-02g), Maher Well # 3 (4020004-11g), Mary Dunn Well # 1 (4020004-04g), Mary Dunn Well # 2 (4020004-05g), Mary Dunn Well # 3 (4020004-08g), Mary Dunn Well # 4 (4020004-09g), Straightway Well (4020004-12g), and the Simmons Pond Well (4020004-06g).

There are also four water storage tanks. Two located on Mary Dunn Road: Mary Dunn Tank # 1 - 370,000 gallons, Mary Dunn Tank # 2 - 1 million gallons, Maher - 800,000 gallons and Straightway - 400,000 gallons.

Water system interconnections are established with the Town of Yarmouth water system and the COMM. water system to have the ability to draw water as a backup water supply.

Hyannis Water System Operations

United Water Environmental Services began operating the Hyannis Water System on July 1, 2009. As of November 16, 2015 United Water was consolidated under Suez. The operations contract includes operations and maintenance of the water treatment plants and the system's pumping stations, cross connection control services, inspection and maintenance of the distribution system, fire hydrants and gate valves, the complete rehabilitation of two system wells per year, hydrant painting, meter installation and maintenance, customer service, billing and all other duties required for the day to day operations of the public water supply treatment and distribution system. Oversight of the contract is provided by the Barnstable Department of Public Works Water Supply Division.

Office Hours

Monday through Friday 8 AM to 5 PM
Saturday 8 AM to 12 PM

In the event of any emergency call:
(508) 775-0063
Staff is available 24/7

Maintaining Water Quality

The Hyannis Water System continuously strives to produce the highest quality water that meets or surpasses water quality standards for safe drinking water. We monitor all our water sources and distribution system very closely. The standards that we operate under were enacted by the U. S. Congress as the Safe Drinking Water Act in 1974 and amended in 1986 and 1996.

To ensure tap water is safe to drink, the Massachusetts Department of Environmental Protection (DEP) and U.S. Environmental Protection Agency (EPA) prescribe regulations that limit the amount of certain contaminants in water provided by all public drinking water systems. The Food and Drug Administration (FDA) and the Massachusetts Department of Public Health regulations establish the limits for contaminants in bottled water to provide the same protection for public health.

The Hyannis Water System meets all primary Water Quality Standards set forth by the United States Environmental Protection Agency and Massachusetts Department of Environmental Protection.

Water Treatment

In our effort to supply safe, clean and healthy water to the Hyannis communities, chemicals are added in safe quantities to ensure that your water quality is consistently maintained.

Many drinking water sources in New England are naturally corrosive (pH of less than 7.0). This can cause active leaching of lead and copper into your water. To reduce this leaching, your water is chemically treated to raise the pH to neutral or slightly alkaline. Testing throughout the Hyannis Water System has demonstrated that this is an effective and safe treatment process.

Past commercial activities near the Hyannis Airport have contributed to the detection of Volatile Organic Compounds (VOCs) in the Maher well field. These chemicals are removed from the water using an aeration process and then adding a disinfectant to the water before it enters the distribution system.

All chemicals used for the corrosion control are approved for water treatment by one or more of the following organizations: National Sanitation Foundation (NSF International) or Underwriters Laboratory, both accredited by the American National Standards Institute (ANSI). Chemicals also must meet the performance standards established by the American Water Works Association.

Hyannis Water System

The Hyannis Water System is operated and
maintained by a private company, Veolia,
with oversight provided by the Town of Barnstable
Department of Public Works, Water Supply Division.

Questions about this report

Please contact:
Hans Keijser, Supervisor, Water Supply Division
at (508) 778-9617 extension 3502

This report was prepared by Veolia for the Hyannis Water System. Additional copies of this report are available upon request; please contact (508) 775-0063 for additional copies.

Information for Persons with Compromised Immune Systems

Some people are more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons, such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC (Center for Disease Control and Prevention) guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the **Safe Drinking Water Hotline (800) 426-4791 or www.epa.gov/safewater/hotline.**

The Hyannis Water System was commended by the Massachusetts DEP for posting water protection signs, acquiring and protecting land within Zone I areas, and working with the Town of Yarmouth to protect Zone II areas.

In conjunction with its certified operator, Veolia, the Hyannis Water System is addressing the concerns stated in the SWAP Report and welcomes your input to our planning. If you have questions, please contact Kevin Sampson at (508) 775-0063

A susceptibility ranking of HIGH was assigned to all wells in our system by the DEP due to the absence of hydrogeologic barriers, i.e., clay, in the Cape Cod Aquifer. There are activities and land uses within the Zone I, a 400 ft. radius around each well head, and the Zone II, the aquifer recharge area, that can contribute to drinking water contamination. Examples include local roads and lawns within the Zone II.

Source Water Assessment and Protection

The Massachusetts DEP has prepared a Source Water Assessment Program (SWAP) Report for the Hyannis Water System. The report assesses the susceptibility of public water supplies to contamination and makes recommendations. This report is available from the Hyannis Water System located at 47 Old Yarmouth Road in Hyannis, the local Board of Health and also at the DEP website: **http://www.mass.gov/dep/water/drinking/sourcewa.htm#reports.**

2021 Hyannis Water System improvements

In 2021 the Hyannis Water System's capital improvements consisted of the relocation and construction of the COMM Interconnection on Longview Drive and the extension and connection of the water main on the East side of the Airport to Yarmouth Road. The Hyannis Water System new source exploration program's test well drilling report was completed. Pilot testing and the resulting report for the Straightway Filtration plant design were finalized.

The newly constructed COMM Interconnection on Longview Drive in Hyannis

How Many Times a Day Do You Turn on the Faucet?

The average American home uses about 100 to 130 gallons of water a day. Did you know that only 1% of our in-home water use is for drinking? The majority of our daily water consumption, about 75%, is used in the bathroom. Did you know that 14% of in-home water use is wasted by leaking taps and toilets? Conserving water is as simple as repairing leaky faucets and toilets, taking shorter showers, not leaving water running while brushing teeth, washing hands, washing fruits and vegetables. Learn more about using water wisely at www.USEPA/WaterSense.

Using water wisely benefits you and the environment.

Este relatório contém informações importantes sobre a água potável. Ter alguém que traduzi-lo para você, ou falar com alguém que entende-lo.

Hyannis Water Board

Stephen O'Neil, Chair
Samuel Wilson, Vice Chair
Tom Holmes, Member
Jonathan Jaxtimer, Member

Home Depot Fire Sprinkler Break, Fall 2021

Water testing performed in calendar year 2021

Hyannis Water System
PWS ID: #4020004

WATER QUALITY REPORT

ANNUAL

Hyannis Water System
Operated by Veolia
47 Old Yarmouth Road
Hyannis, MA 02601-0326
(508) 775-0063

SEAL OF THE TOWN OF BARNSTABLE, MASS. 1639. ADOPTED MAY 4, 1889

DISTRIBUTION SYSTEM WATER QUALITY

This report summarizes only those items detected during sampling - not all contaminants that are monitored

Microbial Results	Highest % Positive in a Month	Range Detected	MCL	MCLG	Violation	Possible Source of Contamination
Total Coliform Bacteria **	0.0%	0%	>5% Monthly Samples Positive	0	No	Naturally present in the environment
Fecal Coliform or E. coli	0%	0%	*	0	No	Human and animal fecal waste

***Compliance with the Fecal Coliform / E.coli MCL is determined upon additional repeat testing.**

****Total Coliform:** Coliform are bacteria that are naturally present in the environment and are used as an indicator that other potentially harmful bacteria may be present.

Lead & Copper	Dates Collected	90th Percentile	Action Level	MCLG	# of Sites samples	# of Sites Above Action Level	Violation	Possible Source of Contamination
Lead (ppm)	04/06-08/21 & 10/18-10/20/21	0	0.015	0	120	0	No	Corrosion of household plumbing systems: Erosion of natural deposits
Copper (ppm)	04/06-08/21 & 10/18-10/20/21	0.12	1.3	1.3	120	0	No	Corrosion of household plumbing systems: Erosion of natural deposits

TESTING FOR LEAD - If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. **Hyannis Water System** is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

SUMMARY OF FINISHED WATER CHARACTERISTICS

Regulated Contaminants	Date(s) Collected	Highest Detect Value	Range Detected	MCL	MCLG	Violation	Possible Source of Contamination
Inorganic Contaminants:							
Barium (ppm)	1/5/2021	0.013	N/A	2	2	No	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Cadmium (ppm)	1/5/2021	ND	N/A	0.004	0.005	No	Corrosion of galvanized pipes;erosion of natural deposits;discharge from metal refineries;runoff from waste batteries and paints
Sodium** (ppm)	1/5/2021	36	N/A		20	No	Road salting; erosion of natural deposits
Arsenic (ppm)	1/5/2021	ND	ND	0.01	0.1	No	Run off from orchards; and from glass& electronics production wastes. Erosion of natural deposits.
Fluoride (ppm)	1/5/2021	ND	N/A	4	4	No	Discharge from fertilizer and aluminum factories; erosion of natural deposits.
Selenium (ppm)	1/5/2021	ND	ND	0.05	0.05	No	Discharge from petroleum and metal refineries;Erosion of natural deposits; Discharge from mines
Nitrate* (ppm)	10/14/2021	4.6	ND-4.6	10	10	No	Runoff from fertilizer use: leaching from septic tanks; sewage; erosion of natural deposits
Perchlorate*** (ppb)	8/11/2021	0.082	ND-0.082	2	-	No	Rocket propellants, fireworks, munitions, flares, blasting agents *(see note below)*

*Nitrate — Nitrate in drinking water at levels above 10 ppm is a health risk for infants of less than six months of age. High nitrate levels in drinking water can cause blue baby syndrome. Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity. If you are caring for an infant, you should ask for advice from your health care provider.

**Sodium — Sodium is a naturally-occurring common element found in soil and water. It is necessary for the normal functioning of regulating fluids in human systems. Some people, however, have difficulty regulating fluid volume as a result of several diseases, including congestive heart failure and hypertension. The guideline of 20mg/L for sodium represents a level in water that physicians and sodium sensitive individuals should be aware of in cases where sodium exposures are being carefully controlled. For additional information, contact your health care provider, your local board of health or the Massachusetts Department of Public Health, Bureau of Environmental Health Assessment at 617-624-5757.

***Perchlorate (Various Chemical Abstract Service Registry Numbers (CASRN) for different chemical species) — Perchlorate interferes with the normal function of the thyroid gland and thus has the potential to affect growth and development, causing brain damage and other adverse effects, particularly in fetuses and infants. Pregnant women, the fetus, infants, children up to the age of 12, and people with a hypothyroid condition are particularly susceptible to perchlorate toxicity.

'J' values are required when the results are above the MDL(0.012) and below the MRL(0.05)

Organic Contaminants:							
Tetrachloroethylene (PCE) (ppb)	1/12/2021	0.66	ND - 0.66	5	-	No	Discharge from factories and dry cleaners
Bromodichloromethane (ppb)	5/12/2021	ND	ND	NA	NA	No	By-product of drinking water chlorination
Chlorodibromomethane ppb)	1/14/2020	0.64	ND-0.64	NA	NA	No	By-product of drinking water chlorination
Dibromochloromethane	5/12/2021	ND	ND	NA	NA	No	By-product of drinking water chlorination
Bromoform (ppb)	5/12/2021	ND	ND	NA	NA	No	By-product of drinking water chlorination
Chloroform (ppb)	5/12/2021	ND	ND	ORSG 70	NA	No	By-product of drinking water chlorination
Stage 2 Disinfectants and Disinfection Byproducts							
Chlorine (ppm)	2nd Quarter	1.32	0.14-1.32	4	4	No	Water additive used to control microbes
TTHMs (Stage 2) [Total Trihalomethanes] (ppb)	Quarterly	4.6	ND-4.6	80	-	No	By-product of drinking water chlorination
HAA5s (Stage 2) Haloacetic Acids (HAA5) (ppb)	Quarterly	1.5	ND - 1.5	60	-	No	By-product of drinking water chlorination (TT)

** Note highest detected value is highest Running Annual Average (RAA). ***Local Running Annual Average

* Note: THM ,HAA and Chlorine minimum and maximum levels in the ranges of results are site specific.

Secondary Contaminants	Date(s) Collected	Highest Detect Value	Range Detected	SMCL	ORSG	Possible Source of Contamination
Magnesium (ppm)	9/8/2021	4.4	ND-4.4	-	-	Natural Mineral and Organic Matter
Chloride (ppm)	9/8/2021	80	31-80	250	NA	Natural Mineral, Road Salt
Calcium (ppm)	9/8/2021	14	2.2-14	-	-	Natural Mineral and Organic Matter
Copper (ppm)	9/8/2021	ND	ND	1	-	Naturally occurring element;corrosion of household plumbing
Iron (ppm)	9/8/2021	0.096	ND-0.096	0.3	NA	Erosion of Natural Deposits, and oxidation of iron components
Manganese (ppm)*	9/8/2021	0.064	ND-0.064	0.05	0.3	Erosion of Natural Deposits
Potassium (ppm)	9/8/2021	3.2	1.3-3.2	-	-	Natural Mineral and Organic Matter
Sulfate (ppm)	9/8/2021	18	7.3-18	250	250	Natural Sources
Alkalinity (ppm)	9/8/2021	90	16-90	-		Natural Sources
Odor (ton)	9/8/2021	2	ND-2	3		Naturally occurring organic materials that form ions when in water; seawater influence
Hardness (ppm)	9/8/2021	53	12.5-53	-		Natural Sources
Total Dissolved solids (ppm)	9/8/2021	310	120-310	500		Runoff and leaching from natural deposits; seawater influence
pH	9/8/2021	7.4	7.4	6.5-8.5		Runoff and leaching from natural deposits; seawater influence
Turbidity (NTU)	9/8/2021	ND	ND	-		Soil runoff
Zinc (ppm)	9/8/2021	0.13	0.093-0.13	5	NA	Erosion of Natural Deposits, and Industrial Discharge

*EPA has established a lifetime health advisory (HA) for manganese at 0.3ppm and an acute at 1ppm

UCMR3 EPA unregulated contaminants	Date(s) Collected	Highest Detect Value	Range Detected	Average Detected	ORSG	Possible Source of Contamination
1,4-Dioxane (ppb)	Quarterly(2021)	0.28	ND - 0.28	0.223	0.3 ppb	Solvent or stabilizer used in processing of paper, cosmetics, shampoos, coolant

Third Unregulated Contaminant Monitoring Rule (UCMR3)
IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER - Availability of Monitoring Data for Unregulated Contaminants for Hyannis Water System
As required by US Environmental Protection Agency (EPA), our water system has sampled for a series of unregulated contaminants. Unregulated contaminants are those that don't yet have a drinking water standard set by EPA. The purpose of monitoring for these contaminants is to help EPA decide whether the contaminants should have a public health protection standard. As our customers, you have a right to know that these data are available. If you are interested in examining the results, please contact Hans Keijser at (508) 775-0063 or 47 Old Yarmouth Road Hyannis, MA 02601.
This notice is being sent to you by the Hyannis Water System. State Water System ID#: 4020004.
For more information visit the AWWA FAQ UCMR 3 link: http://www.drinktap.org/home/water-information/water-quality/ucmr3.aspx

CCR Regulated Chart for PFAS detects in 2021

Regulated Contaminant	Date(s) Collected	Range Detected ppt	Average Detected ppt	MCL ppt	Possible Source of Contamination	Health Effects
PFOS, PFOA, PFNA, PFHxS, PFHpA,PFDA	Quarterly	ND	0.008 *	20	Man-made chemicals. Used as surfactants to make products stain or water resistant, in fire-fighting foam, for industrial purposes, and as a pesticide. Used in fluoropolymers (such as teflon) cosmetics, greases and lubricants, paints, adhesives and photographic films. PFOS U.S. manufacturing phased out in 2002; PFOS may still be generated incidentally or in imported products.	Long-term exposure to PFOS and PFOA in drinking water may affect the liver, cholesterol and thyroid hormone levels. Some studies indicate that exposure to elevated levels of PFOS and PFOA could cause immunological effects, developmental effects and some types of cancer in laboratory animals. Scientists are working to better understand the degree of risk to people. Based on studies of laboratory animals and chemical similarity to PFOS and PFOA depending on the level and length of exposure, PFNA, PFHxS, PFHpA and PFDA in drinking water may affect the liver, cholesteral levels, thyroid and immune system and may cause developmental effects.
PerfluoroHexanoic (PFHxA)	Quarterly	ND-0.376	2.85	**	Man-made chemical; used in products to make them stain, grease, heat and water resistant.	Based on studies of laboratory animals, people exposed to elevated levels of PFHxA for several years could experience effects on the liver. It is less toxic and is cleared from the body much faster than PFOS, PFOA and other longer-chain PFAS.

On October 2, 2020, the Massachusetts Department of Environmental Protection (MassDEP) 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 th e 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 are a family of chemicals widely used since the 1950s to manufacture common consumer produc ts. They have been linked to a variety of health risks,

SAFE DRINKING WATER ACT – WATER QUALITY STANDARD DEFINITIONS

Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

HA: Health Advisory.

Massachusetts Maximum Contaminant Levels (MMCL): The Massachusetts maximum contaminants listed in the drinking water regulations consist of promulgated US EPA MCLs which have become effective, plus a few MCLs set specifically by Massachusetts.

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Minimum Detection Limit (MDL): Is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte is greater than zero.

Secondary Maximum Contaminant Level (SMCL): These standards are developed to protect the aesthetic qualities of drinking water and are not health based.

Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of disinfectant is necessary for control of microbial contaminants

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectant to control microbial contamination.

Primary Standards: Federal drinking water regulations for substances that are health-related. Water suppliers must meet all primary drinking water standards.

Secondary Standards: Federal drinking water measurements for substances that do not have an impact on health. These reflect aesthetic qualities such as taste, odor and appearance. Secondary standards are recommendations, not mandates.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Massachusetts Office of Research and Standard Guideline (ORSG): This is the concentration of a chemical in drinking water, at or, below which, adverse, non-cancer health effects are unlikely to occur after chronic (lifetime): exposure. If exceeded, it serves as an indicator or the potential for further action.

Third Unregulated Contaminant Monitoring Rule (UCMR3): As required by US Environmental Protection Agency (EPA), our water system has sampled for a series of unregulated contaminants. Unregulated contaminants are those that don't yet have a drinking water standard set by EPA. The purpose of monitoring for these contaminants is to help EPA decide whether the contaminants should have a public health protection standard.

KEY

CU: Color unit.

NA: Not applicable.

ND: Not detected.

Ug/L: Micrograms per liter=ppb

ppb: Parts per billion. The equivalent of one second in 32 years.

ppm: Parts per million. The equivalent of one second in 12 days.

ppt: Parts per trillion.

pCi/L: Picocuries per liter. The Equivalent of one second in 32 million years.

NTU: Nephelometric Turbidity Unit.

TON: Threshold Odor Number.

TI: Treatment Technique.

Water Source Characteristics

The sources of drinking water (for both tap and bottled water) include rivers, lakes, streams, ponds, springs, reservoirs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals, and, in some cases, radioactive materials, and can pick up substances resulting from the presence of animals or human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewer treatment plants, septic systems, agricultural livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production. These contaminants can also come from gasoline storage, urban storm water runoff, and septic systems.
- Radioactive contaminants, which can be naturally occurring or be the result of oil or gas production and mining activities.

For Your Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of these contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline at (800) 426-4791.

Where to go for more information: The Massachusetts DEP at (617) 292-5885 or www.state.ma.us/dep or the Massachusetts Drinking Water Education Partnership at www.madwep.org.

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1,4-DIOXANE																	
10033	MARY DUNN & AIRPORT WELLS	M	F	S		X	X	X	X	X	X	X	X	X	X	X	X
4020004-04G	MARY DUNN WELL 1																
4020004-05G	MARY DUNN WELL 2																
4020004-08G	MARY DUNN WELL 3																
4020004-10G	AIRPORT 1																
10034	STRAIGHTWAY BOOSTER 4 WELLS	M	F	S		X	X	X	X	X	X	X	X	X	X	X	X
4020004-01G	STRAIGHTWAY WELL 1																
4020004-03G	HYANNISPORT																
4020004-06G	SIMMONS POND																
4020004-12G	STRAIGHTWAY WELL 2																
10035	MAHER FILTRATION PLANT	M	F	S					X	X	X	X	X	X	X	X	X
4020004-02G	MAHER WELL 2																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
10990	MAHER 1,3 & YARMOUTH	M	F	S		X	X	X	X								
4020004-01P	YARMOUTH																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
ASBESTOS																	
123	AC PIPE DISTRIBUTION SAMPLE	S	F	D											X		
CHLORINE																	
CL	APPROVED COLIFORM SITES	S	F	D		[20 times per Month]											
GROSS ALPHA PARTICLE ACTIVITY																	
10033	MARY DUNN & AIRPORT WELLS	M	F	S							X						
4020004-04G	MARY DUNN WELL 1																
4020004-05G	MARY DUNN WELL 2																
4020004-08G	MARY DUNN WELL 3																
4020004-10G	AIRPORT 1																

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GROSS ALPHA PARTICLE ACTIVITY																	
10034	STRAIGHTWAY BOOSTER 4 WELLS	M	F	S							X						
4020004-01G	STRAIGHTWAY WELL 1																
4020004-03G	HYANNISPORT																
4020004-06G	SIMMONS POND																
4020004-12G	STRAIGHTWAY WELL 2																
10035	MAHER FILTRATION PLANT	M	F	S					X	X	X	X					
4020004-02G	MAHER WELL 2																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
HALOACETIC ACIDS																	
10023	WEST HYANNISPORT POST OFFICE	S	F	D		FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV
10029	VETERANS PARK - OCEAN ST.	S	F	D		FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV
10030	BARNSTABLE HIGH SCHOOL	S	F	D		FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV
10031	CAPE CODDER RESORT - 1225 IYANNOUGH RD	S	F	D		FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV
INORGANICS																	
10033	MARY DUNN & AIRPORT WELLS	M	F	S	N					X							
4020004-04G	MARY DUNN WELL 1																
4020004-05G	MARY DUNN WELL 2																
4020004-08G	MARY DUNN WELL 3																
4020004-10G	AIRPORT 1																
10034	STRAIGHTWAY BOOSTER 4 WELLS	M	F	S	N										X		
4020004-01G	STRAIGHTWAY WELL 1																
4020004-03G	HYANNISPORT																
4020004-06G	SIMMONS POND																
4020004-12G	STRAIGHTWAY WELL 2																
10035	MAHER FILTRATION PLANT	M	F	S	N				X								
4020004-02G	MAHER WELL 2																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																

LEAD & COPPER SCHOOL SAMPLING

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LEAD & COPPER SCHOOL SAMPLING																	
LCCA	2 TAPS @ 2 SCHOOLS/DAYCARES (ROTATE LIST)	S	F	D			X		X		X		X		X		
LEAD AND COPPER RULE																	
	30 APPROVED TAPS	S	F	D			X		X		X		X		X		
MANGANESE																	
10033	MARY DUNN & AIRPORT WELLS	M	F	S		[Next Sampling due in 2023]											
4020004-04G	MARY DUNN WELL 1																
4020004-05G	MARY DUNN WELL 2																
4020004-08G	MARY DUNN WELL 3																
4020004-10G	AIRPORT 1																
10034	STRAIGHTWAY BOOSTER 4 WELLS	M	F	S			X				X						
4020004-01G	STRAIGHTWAY WELL 1																
4020004-03G	HYANNISPORT																
4020004-06G	SIMMONS POND																
4020004-12G	STRAIGHTWAY WELL 2																
10035	MAHER FILTRATION PLANT	M	F	S					X								
4020004-02G	MAHER WELL 2																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
NITRATE																	
10033	MARY DUNN & AIRPORT WELLS	M	F	S		X				X				X			
4020004-04G	MARY DUNN WELL 1																
4020004-05G	MARY DUNN WELL 2																
4020004-08G	MARY DUNN WELL 3																
4020004-10G	AIRPORT 1																
10034	STRAIGHTWAY BOOSTER 4 WELLS	M	F	S		X	X	X	X	X	X	X	X	X	X	X	X
4020004-01G	STRAIGHTWAY WELL 1																
4020004-03G	HYANNISPORT																
4020004-06G	SIMMONS POND																
4020004-12G	STRAIGHTWAY WELL 2																

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NITRATE																	
10035	MAHER FILTRATION PLANT	M	F	S					X				X				X
4020004-02G	MAHER WELL 2																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
10990	MAHER 1,3 & YARMOUTH	M	F	S		X											
4020004-01P	YARMOUTH																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
NITRITE																	
10033	MARY DUNN & AIRPORT WELLS	M	F	S		X											
4020004-04G	MARY DUNN WELL 1																
4020004-05G	MARY DUNN WELL 2																
4020004-08G	MARY DUNN WELL 3																
4020004-10G	AIRPORT 1																
10034	STRAIGHTWAY BOOSTER 4 WELLS	M	F	S											X		
4020004-01G	STRAIGHTWAY WELL 1																
4020004-03G	HYANNISPORT																
4020004-06G	SIMMONS POND																
4020004-12G	STRAIGHTWAY WELL 2																
10035	MAHER FILTRATION PLANT	M	F	S					X								
4020004-02G	MAHER WELL 2																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
10990	MAHER 1,3 & YARMOUTH	M	F	S		X											
4020004-01P	YARMOUTH																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
PERCHLORATE																	

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PERCHLORATE																	
10033	MARY DUNN & AIRPORT WELLS	M	F	S	N			X				X				X	
4020004-04G	MARY DUNN WELL 1																
4020004-05G	MARY DUNN WELL 2																
4020004-08G	MARY DUNN WELL 3																
4020004-10G	AIRPORT 1																
10034	STRAIGHTWAY BOOSTER 4 WELLS	M	F	S	N			X				X				X	
4020004-01G	STRAIGHTWAY WELL 1																
4020004-03G	HYANNISPORT																
4020004-06G	SIMMONS POND																
4020004-12G	STRAIGHTWAY WELL 2																
10035	MAHER FILTRATION PLANT	M	F	S	N						APR	SEP				X	
4020004-02G	MAHER WELL 2																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
10990	MAHER 1,3 & YARMOUTH	M	F	S	N			X									
4020004-01P	YARMOUTH																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
PERFLUOROCARBONS																	
10033	MARY DUNN & AIRPORT WELLS	M	F	S		X	X	X	X	X	X	X	X	JAN	APR	JUL	OCT
4020004-04G	MARY DUNN WELL 1																
4020004-05G	MARY DUNN WELL 2																
4020004-08G	MARY DUNN WELL 3																
4020004-10G	AIRPORT 1																
10034	STRAIGHTWAY BOOSTER 4 WELLS	M	F	S		X	X	X	X	X	X	X	X	JAN	APR	JUL	OCT
4020004-01G	STRAIGHTWAY WELL 1																
4020004-03G	HYANNISPORT																
4020004-06G	SIMMONS POND																
4020004-12G	STRAIGHTWAY WELL 2																

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PERFLUOROCARBONS																	
10035	MAHER FILTRATION PLANT	M	F	S					X	X	X	X	X	JAN	APR	JUL	OCT
4020004-02G	MAHER WELL 2																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
10990	MAHER 1,3 & YARMOUTH	M	F	S		X	X	X	X								
4020004-01P	YARMOUTH																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
RADIUM 226 & RADIUM 228																	
10033	MARY DUNN & AIRPORT WELLS	M	F	S							X						
4020004-04G	MARY DUNN WELL 1																
4020004-05G	MARY DUNN WELL 2																
4020004-08G	MARY DUNN WELL 3																
4020004-10G	AIRPORT 1																
10034	STRAIGHTWAY BOOSTER 4 WELLS	M	F	S							X						
4020004-01G	STRAIGHTWAY WELL 1																
4020004-03G	HYANNISPORT																
4020004-06G	SIMMONS POND																
4020004-12G	STRAIGHTWAY WELL 2																
10035	MAHER FILTRATION PLANT	M	F	S					X	X	X	X					
4020004-02G	MAHER WELL 2																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
SECONDARY CONTAMINANTS																	
10033	MARY DUNN & AIRPORT WELLS	M	F	S		[DEP recommends annual testing]											
4020004-04G	MARY DUNN WELL 1																
4020004-05G	MARY DUNN WELL 2																
4020004-08G	MARY DUNN WELL 3																
4020004-10G	AIRPORT 1																

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SECONDARY CONTAMINANTS																	
10034	STRAIGHTWAY BOOSTER 4 WELLS	M	F	S		[DEP recommends annual testing]											
4020004-01G	STRAIGHTWAY WELL 1																
4020004-03G	HYANNISPORT																
4020004-06G	SIMMONS POND																
4020004-12G	STRAIGHTWAY WELL 2																
10035	MAHER FILTRATION PLANT	M	F	S		[DEP recommends annual testing]											
4020004-02G	MAHER WELL 2																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
SYNTHETIC ORGANIC COMPOUNDS																	
10033	MARY DUNN & AIRPORT WELLS	M	F	S	N		X		X								
4020004-04G	MARY DUNN WELL 1																
4020004-05G	MARY DUNN WELL 2																
4020004-08G	MARY DUNN WELL 3																
4020004-10G	AIRPORT 1																
10034	STRAIGHTWAY BOOSTER 4 WELLS	M	F	S	N	X					X		X				
4020004-01G	STRAIGHTWAY WELL 1																
4020004-03G	HYANNISPORT																
4020004-06G	SIMMONS POND																
4020004-12G	STRAIGHTWAY WELL 2																
10035	MAHER FILTRATION PLANT	M	F	S	N				X	X	X	X					
4020004-02G	MAHER WELL 2																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
10990	MAHER 1,3 & YARMOUTH	M	F	S	N		X		X								
4020004-01P	YARMOUTH																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																
TETRACHLOROETHYLENE																	
10014	HAMDEN CIRCLE	S	F	D	N	X				X				X			
10015	OLD STRAWBERRY HILL	S	F	D	N	X				X				X			

R/F = RAW OR FINISHED WATER; D/S = DISTRIBUTION OR SOURCE SAMPLE Waiver: (Y)es, or (N)o MULT/SIN: (MULT)iple sources or a (SIN)gle source

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PWS ID **4020004** PWS Name **HYANNIS WATER SYSTEM, TOWN OF BARNSTABLE** Town: **HYANNIS** Class: **COM**

BACTERIA SAMPLING

Apr - Sep: 40 per MONTH
Oct - Mar 20 per MONTH

Season Start Date: 01/01
Season End Date: 12/31

Refer to your DEP Coliform Sampling Plan for approved coliform sample locations. Systems open before or beyond the start/end dates must collect samples during these extra months.

Loc ID #	SAMPLE LOCATION	MULT/SIN	R/F	D/S	WAIVER Y / N	2020 QTR1	2020 QTR2	2020 QTR3	2020 QTR4	2021 QTR1	2021 QTR2	2021 QTR3	2021 QTR4	2022 QTR1	2022 QTR2	2022 QTR3	2022 QTR4
TETRACHLOROETHYLENE																	
10016	WINDSHORE DRIVE	S	F	D	N	X				X				X			
10017	WOLLEY ROAD	S	F	D	N	X				X				X			
10018	FROST LANE	S	F	D		X		X		X		X		X		X	
10019	GREENBRIAR LANE	S	F	D		X				X				X			
10020	QUAIL LANE	S	F	D		X				X				X			
10021	COOK CIRCLE	S	F	D		X				X				X			
TRIHALOMETHANES																	
10023	WEST HYANNISPORT POST OFFICE	S	F	D		FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV
10029	VETERANS PARK - OCEAN ST.	S	F	D		FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV
10030	BARNSTABLE HIGH SCHOOL	S	F	D		FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV
10031	CAPE CODDER RESORT - 1225 IYANNOUGH RD	S	F	D		FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV	FEB	MAY	AUG	NOV
VOLATILE ORGANIC COMPOUNDS																	
10033	MARY DUNN & AIRPORT WELLS	M	F	S	N			X				X				X	
4020004-04G	MARY DUNN WELL 1																
4020004-05G	MARY DUNN WELL 2																
4020004-08G	MARY DUNN WELL 3																
4020004-10G	AIRPORT 1																
10034	STRAIGHTWAY BOOSTER 4 WELLS	M	F	S	N	X						X				X	
4020004-01G	STRAIGHTWAY WELL 1																
4020004-03G	HYANNISPORT																
4020004-06G	SIMMONS POND																
4020004-12G	STRAIGHTWAY WELL 2																
10035	MAHER FILTRATION PLANT	M	F	S	N				X	X	X	X				X	
4020004-02G	MAHER WELL 2																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																

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PWS ID **4020004** PWS Name **HYANNIS WATER SYSTEM, TOWN OF BARNSTABLE** Town: **HYANNIS** Class: **COM**

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Loc ID #	SAMPLE LOCATION	MULT/SIN	R/F	D/S	WAIVER Y / N	2020 QTR1	2020 QTR2	2020 QTR3	2020 QTR4	2021 QTR1	2021 QTR2	2021 QTR3	2021 QTR4	2022 QTR1	2022 QTR2	2022 QTR3	2022 QTR4
VOLATILE ORGANIC COMPOUNDS																	
10990	MAHER 1,3 & YARMOUTH	M	F	S	N	X											
4020004-01P	YARMOUTH																
4020004-07G	MAHER WELL 1																
4020004-11G	MAHER WELL 3																

R/F = RAW OR FINISHED WATER; D/S = DISTRIBUTION OR SOURCE SAMPLE Waiver: (Y)es, or (N)o MULT/SIN: (MULT)iple sources or a (SIN)gle source

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COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DRINKING WATER PROGRAM
FIFTH FLOOR, ONE WINTER STREET, BOSTON, MA 02108 617-292-5770

2022
Certificate of Registration

The Department of Environmental Protection
Drinking Water Program
Hereby Recognizes the

HYANNIS WATER SYSTEM, TOWN OF BARNSTABLE
PWS ID # 4020004

as a Registered Public Water System in Massachusetts.
Public Water Systems must comply with
the Massachusetts Drinking Water Regulations,
310 CMR 22.00.

Yvette dePeiza, Program Director
Drinking Water Program

Certificate expires December 31, 2022
Please contact the Drinking Water Program if there are any changes in this system.
MassDEP:https:/www.mass.gov/orgs/massachusetts-department-of-environmental-protection

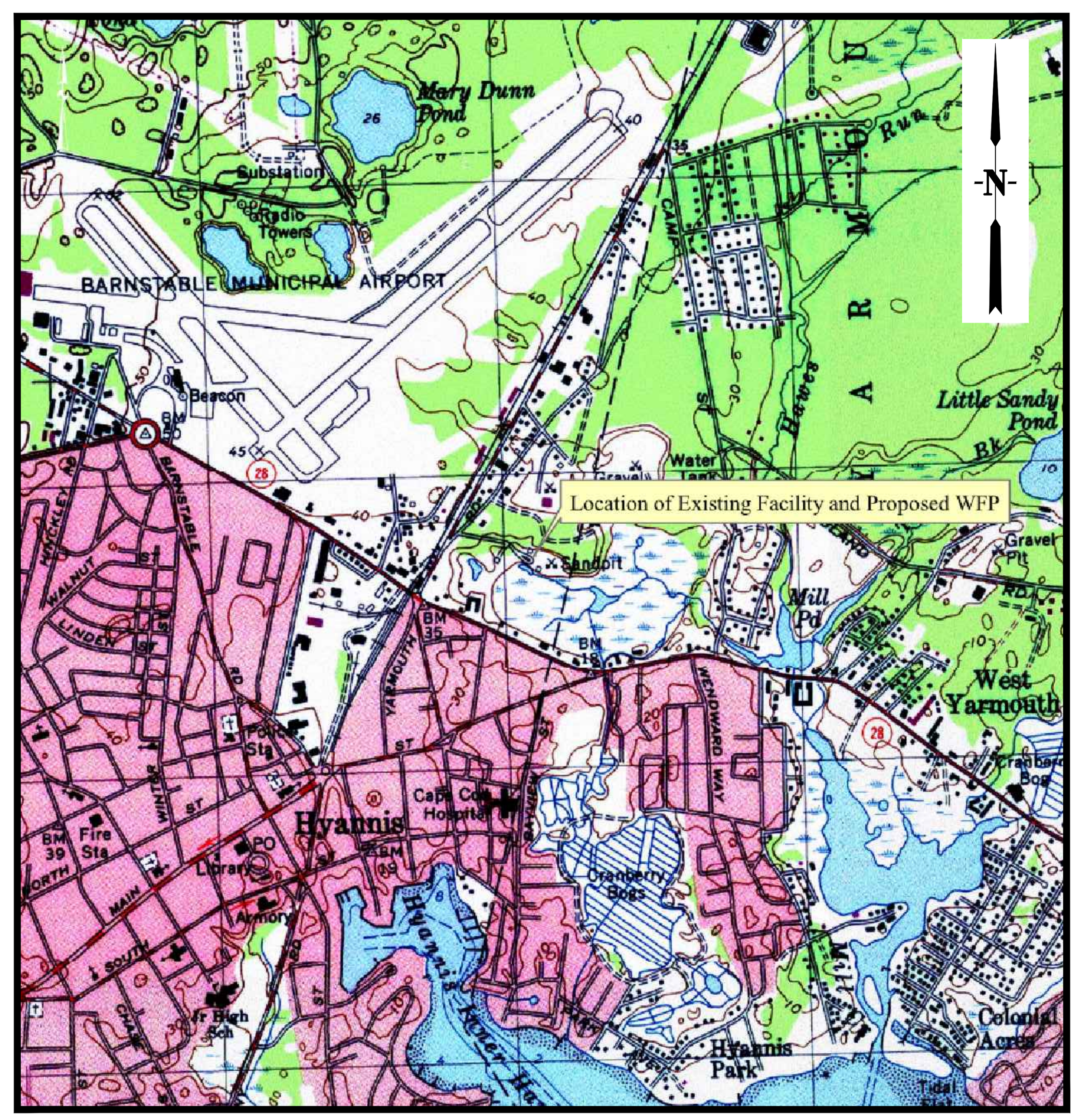
Printed on Recycled Paper

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

DWSRF ID NO. 4393

CONTRACT NO. 16-18-04



LOCATION PLAN
NO SCALE

CODE SUMMARY

Barnstable Water Treatment Facility

Code Jurisdiction	Address	Town, State	Zip	Phone	Fax	Contact
Barnstable Building Dept.	367 Main Street	Barnstable, MA	02601	508-862-4064	508-862-4784	
Barnstable Fire Dept.	3249 Main Street	Barnstable, MA	02630	508-362-3312		

Governing Codes	Title	Edition	Local Amendments
Fire Prevention Code	NFPA 1	2012	N/A
Building Code	International Building Code	2015	780 CMR 9th Edition
Accessibility Code	521 CMR		N/A
Electrical Code	NFPA 70: National Electrical Code	2017	527 CMR
Mechanical Code	International Mechanical code	2009	N/A
Plumbing Code	248 CMR		N/A

Building Summary

Building / Space	Occupancy Group(s)	Construction Type	Auto-Sprinkler (Y/N)	Building Area (sf)		Building Height (ft)		Remarks
				Provided	Allowed	Provided	Allowed	
Water Treatment Facility	S-2	II B	Y	6,650	92,000	1stry. (30')	4Stry. (75')	30' setback provided from nearest structure

Occupancy Summary

Space	Area (sf)	Factor	Allowable Occupants	Remarks
Water Treatment Area	6.650	300gross	22	Un-manned facility

Egress Summary

Space	Travel Distance (ft)		# of Exits		Exit Capacity (in)		Remarks
	Provided	Allowable	Provided	Required	Provided	Required	
Water Treatment Area	50	400	2	2	132	3.3	

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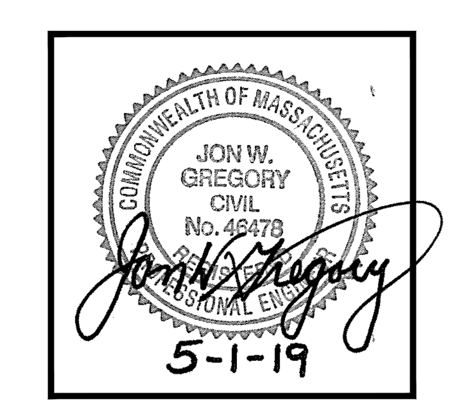


TATA & HOWARD, INC. • CONSULTING ENGINEERS • MARLBOROUGH, MA

SHEET NUMBER DESIGNATION

20–A–10

INDICATES DISCIPLINE(S)

A ARCHITECTURAL
C CIVIL
D PROCESS
E ELECTRICAL
F FIRE PROTECTION
G GENERAL
I INSTRUMENTATION
M MECHANICAL (HVAC)
P PLUMBING
S STRUCTURAL

INDICATES DRAWING NUMBER

INDICATES FACILITY NUMBER DRAWING GROUP, SEE FACILITY AND DRAWING GROUP INDEX THIS SHEET

FACILITY/DRAWING GROUP NUMBER	FACILITY/DRAWING GROUP NUMBER
01	GENERAL
02	CIVIL/SITE
04	INSTRUMENTATION
10	EXISTING TREATMENT PLANT
20	PROPOSED TREATMENT PLANT
99	STANDARD DETAILS

SHEET NUMBER	SHEET TITLE
CIVIL	
02–C–1	EXISTING CONDITIONS
02–C–2	PROPOSED SITE PLAN
02–C–3	GRADING AND LANDSCAPING PLAN
99–C–1	WATER MAIN DETAILS
99–C–2	SITE DETAILS
99–C–3	DRAINAGE DETAILS
ARCHITECTURAL	
20–A–1	FIRST FLOOR PLAN
20–A–2	BASEMENT FLOOR PLAN
20–A–3	ELEVATION VIEWS
20–A–4	ELEVATION VIEWS
20–A–5	INTERIOR SECTION VIEWS
20–A–6	STAIR SECTIONS AND DETAILS
99–A–1	EXTERIOR DETAILS
99–A–2	INTERIOR AND EXTERIOR DETAILS
99–A–3	SCHEDULES AND DETAILS
STRUCTURAL	
20–S–1	GENERAL NOTES
20–S–2	TYPICAL DETAILS
20–S–3	FOUNDATION PLAN
20–S–4	FIRST FLOOR SLAB PLAN
20–S–5	MEZZANINE FRAMING PLAN AND SECTIONS
20–S–6	SECTIONS AND DETAILS
20–S–7	SECTIONS AND DETAILS
PROCESS	
10–D–1	EXISTING TREATMENT PLANT FIRST FLOOR PLANS
10–D–2	EXISTING TREATMENT PLANT FIRST FLOOR & MAHER PUMP STATION NO. 1 UPGRADES PLAN
20–D–1	FIRST FLOOR PLAN
20–D–2	BASEMENT PLANS
20–D–3	FIRST FLOOR PARTIAL PLANS
20–D–4	CROSS SECTIONS I
20–D–5	CROSS SECTIONS II
20–D–6	CROSS SECTIONS III
20–D–7	SMALL DIAMETER PIPING PLAN
99–D–1	CHEMICAL FEED SYSTEM SCHEMATICS
99–D–2	DETAILS
HVAC	
10–H–1	EXISTING FACILITY UPGRADES
20–H–1	FIRST FLOOR PLAN
20–H–2	BASEMENT FLOOR PLAN
99–H–1	SCHEDULES, DETAILS, & NOTES
PLUMBING	
20–P–1	FIRST FLOOR PLAN
20–P–2	BASEMENT FLOOR PLAN
99–P–1	SCHEDULES, DETAILS, & NOTES
FIRE PROTECTION	
01–FP–1	LEGEND, DETAILS & NOTES
20–FP–1	FIRST FLOOR SPRINKLER PLAN
20–FP–2	BASEMENT & MEZZANINE SPRINKLER PLANS
ELECTRICAL	
01–E–1	ELECTRICAL NOTES AND LEGEND
02–E–1	MODIFIED ELECTRICAL SITE PLAN
02–E–2	ELECTRICAL DUCT BANK SCHEDULE WITH DUCT BANK SECTIONS AND DETAILS
10–E–1	EXISTING TREATMENT PLANT ELECTRICAL DEMOLITION PLAN
10–E–2	EXISTING TREATMENT PLANT ELECTRICAL MODIFICATION PLAN
20–E–1	ELECTRICAL ONE–LINE DIAGRAM
20–E–2	ELECTRICAL ONE–LINE DIAGRAM
20–E–3	ELECTRICAL EQUIPMENT ELEVATIONS
20–E–4	FIRST FLOOR POWER PLAN
20–E–5	BASEMENT & MEZZANINE POWER PLAN
20–E–6	FIRST FLOOR LIGHTING PLAN
20–E–7	BASEMENT & MEZZANINE LIGHTING PLAN
20–E–8	FIRST FLOOR FIRE & SECURITY ALARM PLAN
20–E–9	BASEMENT & MEZZANINE FIRE & SECURITY ALARM PLAN
99–E–1	LIGHTING AND PANEL SCHEDULES
99–E–2	WIRING DIAGRAMS AND DETAILS
99–E–3	WIRING DIAGRAMS AND DETAILS
99–E–4	WIRING DIAGRAMS AND DETAILS
99–E–5	WIRING DIAGRAMS AND DETAILS
99–E–6	WIRING DIAGRAMS AND DETAILS
INSTRUMENTATION	
04–I–1	PROCESS AND INSTRUMENTATION DIAGRAM I
04–I–2	PROCESS AND INSTRUMENTATION DIAGRAM II
20–I–1	FIRST FLOOR PLAN
20–I–2	BASEMENT, MAHER PUMP STATION NO. 1, AND EXISTING FACILITY PLANS
99–I–1	I/O AND CONDUIT SCHEDULES
99–I–2	DETAILS

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: MVM/MJK Designed By: RSP Checked By: PBH/RPN Approved By: JWG

SHEET INDEX

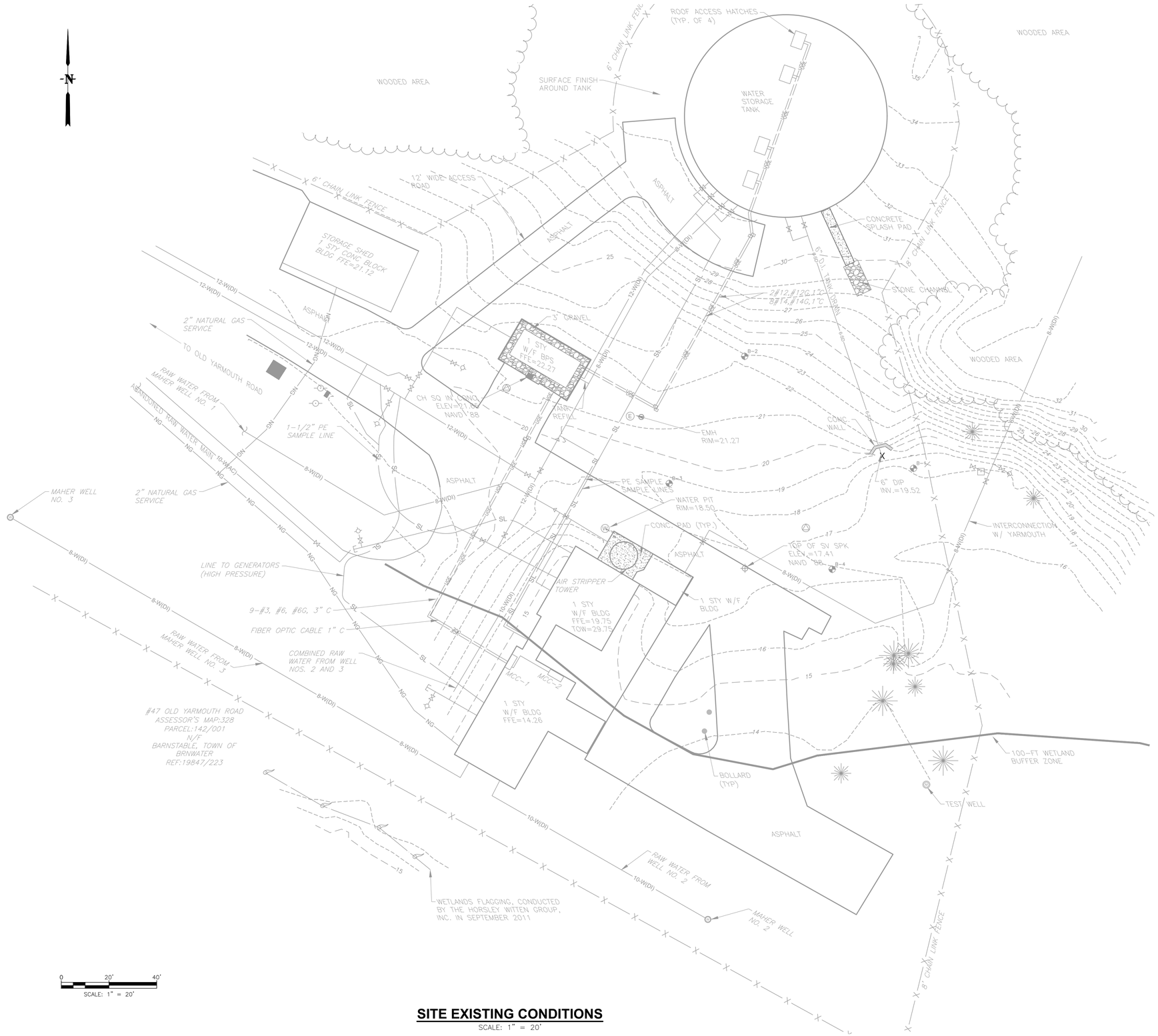
Rev.	Date	Description

5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

01-G-1



SITE EXISTING CONDITIONS

SCALE: 1" = 20'

GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THE TOWN OF BARNSTABLE. ALL EXCAVATION AND RESTORATION SHALL MEET TOWN SPECIFICATIONS.
2. THE ENGINEER MAY DIRECT THE CONTRACTOR TO VARY THE PROPOSED WORK DURING CONSTRUCTION TO MEET EXISTING CONDITIONS.
3. THE SITE IS NOT LOCATED WITHIN A FLOOD ZONE.
4. STOCKPILES SHALL BE LOCATED AS NEEDED, WITHIN THE LIMIT OF WORK, IN AREAS OF MINIMAL IMPACT.
5. IF SEASON OR ADVERSE WEATHER CONDITIONS DO NOT ALLOW THE ESTABLISHMENT OF VEGETATION, TEMPORARY MULCHING WITH HAY, TACKIFIED WOOD CHIPS OR OTHER METHODS SHALL BE PROVIDED.
6. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES AND SHALL PROVIDE ALL NECESSARY CONTINUOUS BARRIERS OF SUFFICIENT TYPE, SIZE AND STRENGTH TO PREVENT ACCESS TO ALL OPEN EXCAVATIONS AT THE COMPLETION OF EACH WORK DAY.
7. THE CONTRACTOR AT HIS EXPENSE SHALL BRACE UTILITY POLES IF REQUIRED, AND REPAIR ANY DAMAGE TO EXISTING SIDEWALKS, CURBS, PAVING, SHRUBS, TREES, STONE WALLS, LAWNS, ETC. ALL EXCAVATED MATERIALS SHALL BE RETURNED TO EQUAL OR BETTER THAN PRIOR CONDITION BY THE CONTRACTOR.
8. ALL EXISTING CONCRETE AND ASPHALT PAVEMENT SHALL BE SAW-CUT PRIOR TO EXCAVATION IN ORDER TO PROVIDE UNIFORM ASPHALT REPLACEMENT.
9. CORINGS THROUGH WALL THICKNESSES 12-INCHES AND GREATER SHALL RECEIVE A DOUBLE MECHANICAL LINK SEAL.
10. PIPE PENETRATIONS THROUGH THE WALL/FLOORS OF THE NEW FILTRATION PLANT SHALL UTILIZE A MECHANICAL JOINT END-FLANGED END WALL PIPE, WITH AN INTEGRALLY CAST COLLAR, CAST INTO THE NEW STRUCTURE.

EROSION & SEDIMENT CONTROL NOTES

1. IN THE STAGING AREA, THE CONTRACTOR SHALL HAVE A STOCKPILE OF MATERIALS REQUIRED TO CONTROL EROSION ON-SITE TO BE USED TO SUPPLEMENT OR REPAIR EROSION CONTROL DEVICES. THESE MATERIALS SHALL INCLUDE, BUT ARE NOT LIMITED TO, HAY BALES, SILT FENCE AND CRUSHED STONE.
2. IF A STOCKPILE IS LOCATED ON A SLOPE, THE RUNOFF SHALL BE DIRECTED AWAY FROM THE PILE. STOCKPILES SHALL BE CONTAINED WITHIN STRAW DIKES.
3. PRIOR TO CONSTRUCTION, AN EROSION CONTROL BARRIER (SILT FENCE, HAY BALE DIKE, OR SILTATION BARRIER) SHALL BE INSTALLED AS SHOWN ON THE SITE PLAN. THESE BARRIERS SHALL REMAIN IN PLACE UNTIL ALL TRIBUTARY SURFACES HAVE BEEN FULLY STABILIZED. THE EROSION CONTROL BARRIERS AS SHOWN ON THE SITE PLAN ARE THE MINIMUM REQUIRED TO PROTECT THE SENSITIVE AREAS.
4. AT NO TIME SHALL SILT-LADEN WATER BE ALLOWED TO ENTER SENSITIVE AREAS (WETLANDS, OFF-SITE AREA AND DRAINAGE SYSTEMS). ANY RUNOFF FROM DISTURBED SURFACES SHALL BE DIRECTED THROUGH SETTLING BASINS AND EROSION CONTROL BARRIERS PRIOR TO ENTERING ANY SENSITIVE AREAS.
5. NO MATERIALS SHALL BE DISPOSED OF INTO ANY WETLANDS OR EXISTING OR PROPOSED DRAINAGE SYSTEMS.
6. ANY REFUELING OF CONSTRUCTION VEHICLES AND EQUIPMENT SHALL TAKE PLACE OUTSIDE OF ANY 100-FOOT BUFFER ZONE TO ANY WETLANDS. CONTRACTOR SHALL DESIGNATE AN AREA OF THE SITE FOR REFUELING, AND THE SITE SUPERINTENDENT SHALL BE PRESENT DURING REFUELING OF CONSTRUCTION VEHICLES.
7. CONTRACTOR SHALL UTILIZE A VARIETY OF SLOPE STABILIZATION METHODS AND MATERIALS, WHICH SHALL BE ADJUSTED TO THE SITE CONDITIONS. EROSION CONTROL BLANKETS OR MIRAFI MIRAMAT (OR SIMILAR PRODUCTS) SHALL BE AVAILABLE ON SITE.
8. WATER SHALL NOT BE ALLOWED TO ENTER PIPES FROM UNSTABILIZED SURFACES.
9. THE DRAINAGE SYSTEM SHALL BE INSTALLED FROM THE DOWNSTREAM END UP. SEDIMENT SHALL NOT BE ALLOWED TO ENTER THE SYSTEM.
10. RIP RAP SHALL BE INSTALLED AT THE PIPE INLETS AND OUTLETS IMMEDIATELY UPON THE PLACEMENT OF THE PIPE. SILT FENCES SHALL BE INSTALLED AT THE OUTFALLS OF THE DETENTION BASIN. THEY SHALL REMAIN IN PLACE UNTIL ALL TRIBUTARY AREAS ARE STABILIZED.
11. IF INTENSE RAINFALL IS ANTICIPATED, THE INSTALLATION OF SUPPLEMENTAL STRAW DIKES, SILT FENCES, OR ARMORED DIKES SHALL BE UTILIZED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. ADDITIONAL TEMPORARY SETTLING BASINS ARE REQUIRED TO BE LOCATED WITHIN THE DISTRIBUTED AREA, TO MINIMIZE THE TRIBUTARY AREAS.

SURVEY NOTES

1. SURVEY WAS PERFORMED BY THE TOWN OF BARNSTABLE USING THE NAVD '88.
2. DELINEATION OF BORDERING VEGETATED WETLANDS, AND EDGE OF BANK MEAN ANNUAL HIGH WATER WERE DETERMINED BY THE HORSLEY WITTEN GROUP IN SEPTEMBER 2011.
3. THE LOCATION OF THE EXISTING UTILITIES AS SHOWN ON THE PLANS ARE APPROXIMATE AND ARE INTENDED ONLY TO ADVISE THE CONTRACTOR OF THEIR PRESENCE. CALL "DIG SAFE" (1-888-344-7233) FOR FIELD LOCATIONS OF ALL EXISTING UTILITIES.
4. BENCH MARKS HAVE BEEN ESTABLISHED BY THE SURVEYOR PRIOR TO THE START OF CONSTRUCTION. SEE EXISTING CONDITIONS PLAN, SHEET 02-C-1 FOR LOCATIONS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN ALL BENCHMARKS THROUGHOUT CONSTRUCTION. ANY COST TO RE-ESTABLISH THESE ITEMS WILL BE AT NO COST TO THE OWNER.

GEOTECHNICAL NOTES

1. BORINGS WERE DRILLED FOR PURPOSES OF DESIGN AND INDICATE SUBSURFACE CONDITIONS AT BORING LOCATION ONLY. SUBSURFACE CONDITIONS MAY VARY FROM THOSE SHOWN IN THE LOG.
2. BORING AND TEST PIT LOCATIONS ARE SHOWN ON THE PLANS AND BORING AND TEST PIT LOGS ARE IN THE GEOTECHNICAL DATA REPORT BOUND IN APPENDIX A OF THESE SPECIFICATIONS.

WATER MAIN NOTES

1. THE CONTRACTOR SHALL MAKE EVERY EFFORT NOT TO DISTURB THE EXISTING WATER SYSTEM. NO ADDITIONAL PAYMENT SHALL BE MADE FOR DAMAGE CREATED FOR THE CONVENIENCE OF THE CONTRACTOR.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEARING & GRUBBING TREES WHERE THEY CONFLICT WITH THE PROPOSED WATER MAIN INSTALLATION.
3. UNLESS OTHERWISE NOTED OR APPROVED BY THE ENGINEER, THE NEW WATER MAIN SHALL PASS UNDER EXISTING UTILITIES.
4. ALL WATER MAINS ARE TO BE LAID WITH A MINIMUM OF 5'-0" COVER.
5. ALL BENDS, TEE, CAPS AND HYDRANTS SHALL BE BACKED WITH CONCRETE THRUST BLOCKS AS INDICATED ON THE CONTRACT DRAWINGS. ALL BENDS, TEES, CAPS, VALVES AND MISCELLANEOUS FITTINGS SHALL BE RESTRAINED AS SPECIFIED.
6. CONTRACTOR SHALL USE A WATER TIGHT PLUG DURING THE WATER MAIN INSTALLATION. PLUG SHALL REMAIN IN PLACE AT ALL TIMES.
7. THE CONTRACTOR SHALL NOT CONNECT TO THE EXISTING WATER MAIN UNTIL THE NEW WATER MAIN HAS BEEN PRESSURE TESTED AND CHLORINATED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
8. THE CONTRACTOR SHALL PROVIDE ADDITIONAL TAPS IF REQUIRED FOR CHLORINATING AND HYDROSTATIC TESTING AT HIS EXPENSE. TAPS SHALL BE REMOVED AND THE WATER MAIN PLUGGED AFTER TESTING IS COMPLETE. CONTRACTOR SHALL FIELD MEASURE LOCATIONS OF PLUGS AND PROVIDE INFORMATION ON RECORD DRAWINGS.

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

CIVIL

EXISTING CONDITIONS

Drawn By: MVM
Designed By: RSP
Checked By: PBH /RPN
Approved By: JWG

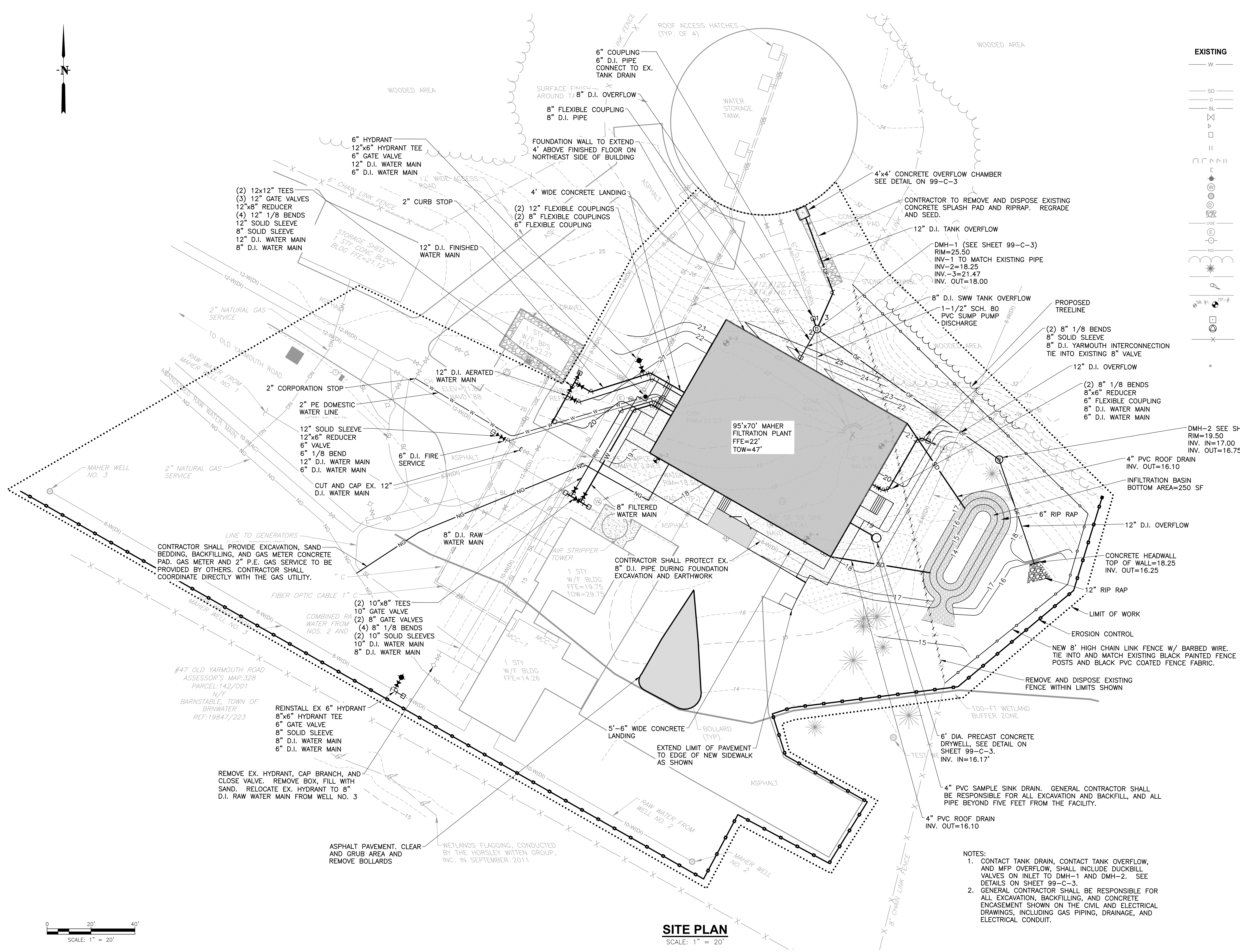
Rev.	Date	Description

COMMONWEALTH OF MASSACHUSETTS JON W. GREGORY CIVIL No. 34109 REGISTERED PROFESSIONAL ENGINEER
5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

02-C-1



SITE PLAN

SCALE: 1" = 20'

LEGEND

EXISTING	DESCRIPTION	PROPOSED
W	WATER MAIN	W
	RAW WATER LINE	RW
	TANK OVERFLOW	OF
SD	STORM DRAIN	SD
D	DRAIN LINE	D
SL	SAMPLE LINE	
	GATE VALVE	
	REDUCER	
	SOLID SLEEVE	
	TRANSITION COUPLING	
	PIPE FITTINGS	
	CAP	
	FIRE HYDRANT	
	WATER MANHOLE	
	WELL	
	DRAIN MANHOLE	
	RIP RAP	
UGE	ELEC. UNDERGROUND	
	ELEC. MANHOLE	
	UTILITY POLE	
NG	GAS LINE	NG
	TREE LINE	
	TREE	
	WETLANDS	
	WETLAND FLAG	
	WETLAND BUFFER	
	BORING/PROBE	
	STATIONING	0+00
	SURVEY MARKER	
	BENCH MARK	
	FENCE – CHAIN LINK	
	EROSION CONTROL	
	LIMIT OF WORK	
	BOLLARD	
	BITUMINOUS CONCRETE	
	CONCRETE	
	GRASS	

ABBREVIATIONS

APPROX.	APPROXIMATE
BLDG.	BUILDING
CI	CAST IRON
CONC.	CONCRETE
DI	DUCTILE IRON
DIA.	DIAMETER
DMH	DRAIN MANHOLE
DWGS	DRAWINGS
ELEV.	ELEVATION
FFE	FINISHED FLOOR ELEVATION
HYD	HYDRANT
INV.	INVERT
MAX.	MAXIMUM
MIN.	MINIMUM
MJ	MECHANICAL JOINT
PE	POLYETHYLENE
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
RD	RESIDUALS/DRAIN
SMH	SEWER MANHOLE
STY	STORY
SWW	SPENT WASHWATER
TYP.	TYPICAL
TOW	TOP OF WALL

NOTES:

1. CONTACT TANK DRAIN, CONTACT TANK OVERFLOW, AND MFP OVERFLOW, SHALL INCLUDE DUCKBILL VALVES ON INLET TO DMH-1 AND DMH-2. SEE DETAILS ON SHEET 99-C-3.
2. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EXCAVATION, BACKFILLING, AND CONCRETE ENCASEMENT SHOWN ON THE CIVIL AND ELECTRICAL DRAWINGS, INCLUDING GAS PIPING, DRAINAGE, AND ELECTRICAL CONDUIT.

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: MVM | Designed By: MVM | Checked By: PBH/RPN | Approved By: JWG

CIVIL

PROPOSED SITE PLAN

Rev.	Date	Description

COMMONWEALTH OF MASSACHUSETTS
JON W. GREGORY
CIVIL
No. 42918
5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

02-C-2

PROPOSED TREE LINE (TYP.)

REMOVE AND DISPOSE 4" DIA. (APPROX) TREES

INFILTRATION BASIN. BOTTOM AREA = 250 SF MIN.

7'-10"x6'-4" CONCRETE LANDING

6' WIDE CONCRETE STEPS RISE=7" RUN=12"

1'-10"x6' GRAVEL STRIP

7'-8"x5' CONCRETE LANDING

6" RIP RAP ALL SLOPES

LIMIT OF WORK

EROSION CONTROL

5'-4" WIDE CONCRETE RAMP, SEE STRUCTURAL DRAWINGS. S=1:12 MAX.

5' FLAT LANDING SEE STRUCTURAL DRAWINGS

5' WIDE CONCRETE WALKWAY

RETURN SOIL TO ORIGINAL CONDITION AND SEED

CONCRETE STEPS, SEE STRUCTURAL DRAWINGS RISE=7" RUN=12"

RETURN SOIL TO ORIGINAL CONDITION AND SEED

4' WIDE CONCRETE WALK

ASPHALT PAVEMENT

ASPHALT PAVEMENT

CONTRACTOR TO RESET ELEVATION BENCHMARK IF DISTURBED DURING CONSTRUCTION

5'-6" WIDE CONCRETE LANDING EL. 22.0'

CONCRETE STEPS, SEE STRUCTURAL DRAWINGS. RISE=7" RUN=12"

4' WIDE CONCRETE WALKWAY

100-FT WETLAND BUFFER ZONE

TEST WELL

ASPHALT PAVEMENT, CLEAR AND GRUB AREA AND REMOVE BOLLARDS

NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR CLEARING AND GRUBBING WITHIN THE LIMIT OF WORK AS REQUIRED FOR NEW CONSTRUCTION.

2. CONTRACTOR TO RETURN GROUND COVER TO ITS ORIGINAL CONDITION WITHIN THE LIMIT OF WORK EXCEPT WHERE OTHERWISE MARKED FOR CLEARING OR DIRECTED BY THE ENGINEER.

3. DRAINAGE INVERTS ARE SHOWN ON SHEET 02-C-2.

4. DRAINAGE DETAILS ARE SHOWN ON SHEET 99-C-3.

0 10' 20'
SCALE: 1" = 10'

GRADING AND LANDSCAPING PLAN

SCALE: 1" = 10'

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

CIVIL
GRADING AND LANDSCAPING PLAN

Rev.	Date	Description

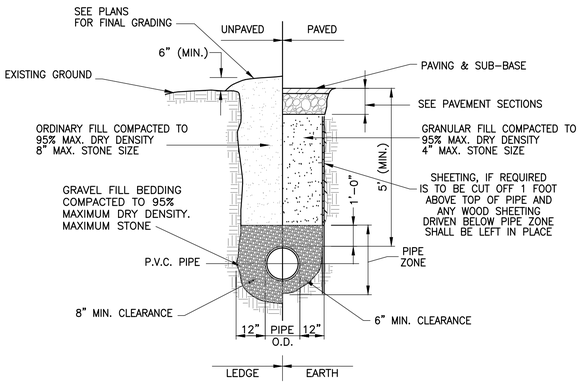
Drawn By: MVM
Designed By: MVM
Checked By: PBH /RPH
Approved By: JWG

COMMONWEALTH OF MASSACHUSETTS JON W. GREGORY CIVIL No. 45109 REGISTERED PROFESSIONAL ENGINEER
5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

02-C-3

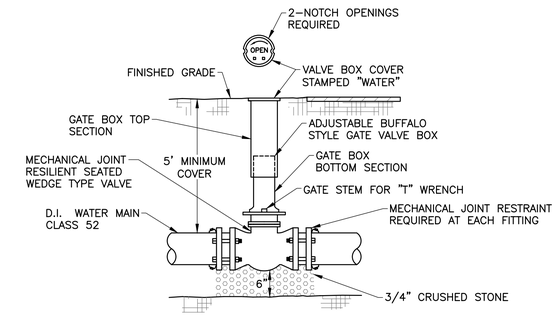


PVC PIPE TRENCH DETAIL

SCALE: NONE

NOTE:

REFER TO SPECIFICATIONS FOR GRADATION REQUIREMENTS.

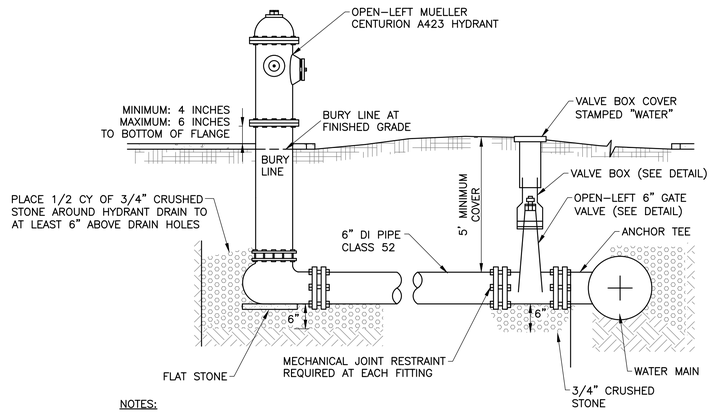


NOTES:

1. GATE VALVE SHALL BE MODEL A-2362, OPEN-LEFT, AS MANUFACTURED BY MUELLER.

GATE VALVE

SCALE: NONE

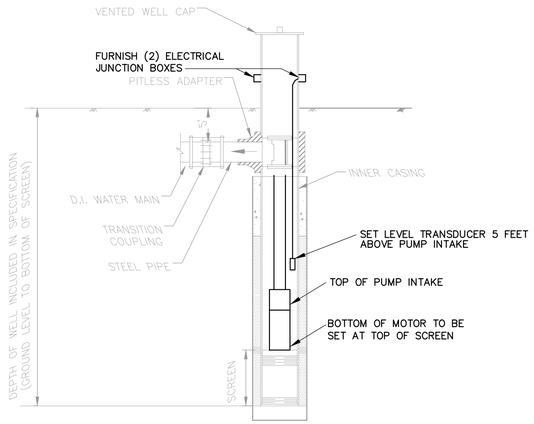


NOTES:

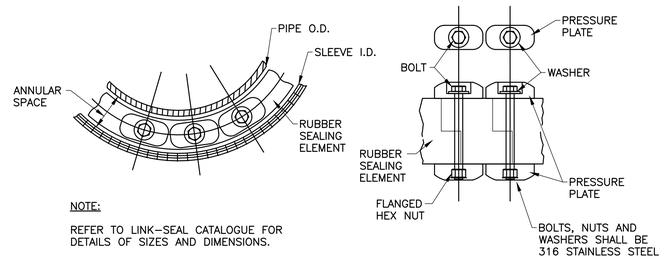
1. HYDRANT SHALL BE A MINIMUM OF 5'-0" FROM EDGE OF TRAVELED WAY (WHERE POSSIBLE).
2. ALL HYDRANT, VALVE, AND TEE JOINTS SHALL BE RESTRAINED WITH MECHANICAL JOINT AND LOCKING GASKETS ON PUSH-ON PIPE JOINTS.
3. DEPTH OF HYDRANT BURY SHALL SUIT INSTALLED DEPTH OF COVER OVER WATER MAIN. INSTALL RISERS AS NECESSARY AT NO ADDITIONAL COST TO THE OWNER.
4. FOR LONG SIDE HYDRANTS, HYDRANT SHUT-OFF VALVE SHALL BE 3' FROM HYDRANT.
5. FOR SIDEWALK LOCATIONS, INSTALL HYDRANT BARREL SO THAT STEAMER NOZZLE IS 18" OFF OF THE BACK OF THE SIDEWALK. IF THE HYDRANT CANNOT BE INSTALLED 18" OFF OF THE BACK OF THE SIDEWALK, BOLLARDS SHALL BE INSTALLED ON EITHER SIDE OF THE HYDRANT FOR PROTECTION. SEE BOLLARD DETAIL.
6. THERE SHALL BE NO OBSTRUCTIONS WITHIN 3' OF THE HYDRANT.
7. ALL COMPACTION SHALL BE BY MECHANICAL MEANS.

HYDRANT UNIT DETAIL

SCALE : NONE



SUBMERSIBLE WELL PUMP AND MOTOR REPLACEMENT

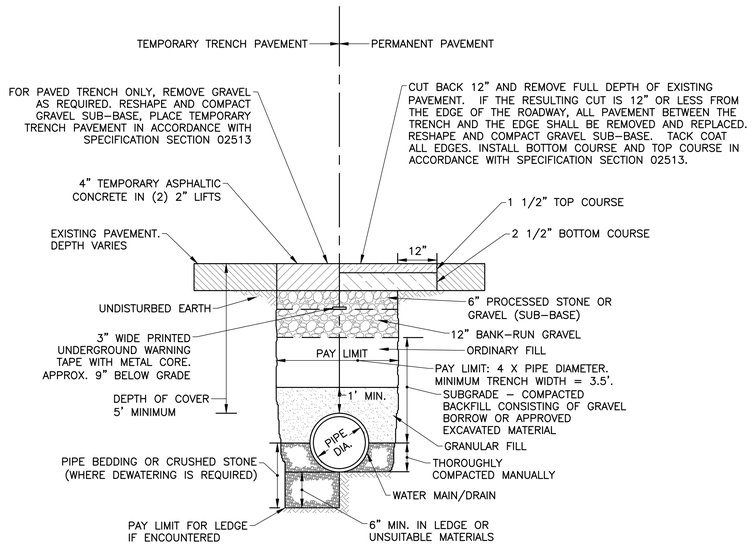


NOTE:

REFER TO LINK-SEAL CATALOGUE FOR DETAILS OF SIZES AND DIMENSIONS.

MECHANICAL LINK SEAL DETAIL

SCALE: NONE

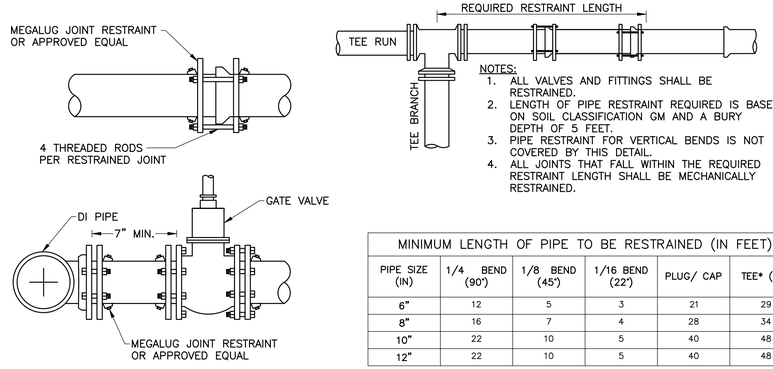


NOTES:

1. ANY GRASS AREAS DISTURBED SHALL BE GRADED, LOAMED TO A DEPTH OF 4-INCHES AND SEEDED, WHERE NO GRASS OCCURS USE 6" PROCESSED GRAVEL.
2. THE SUB-BASE LAYER SHALL BE 6" OF DENSE GRADED MATERIAL CONSISTING OF PROCESSED STONE OR GRAVEL OVER A 12" LAYER OF BANK RUN GRAVEL.

TRENCH DETAIL

SCALE : NONE



NOTES:

1. ALL VALVES AND FITTINGS SHALL BE RESTRAINED.
2. LENGTH OF PIPE RESTRAINT REQUIRED IS BASED ON SOIL CLASSIFICATION GM AND A BURY DEPTH OF 5 FEET.
3. PIPE RESTRAINT FOR VERTICAL BENDS IS NOT COVERED BY THIS DETAIL.
4. ALL JOINTS THAT FALL WITHIN THE REQUIRED RESTRAINT LENGTH SHALL BE MECHANICALLY RESTRAINED.

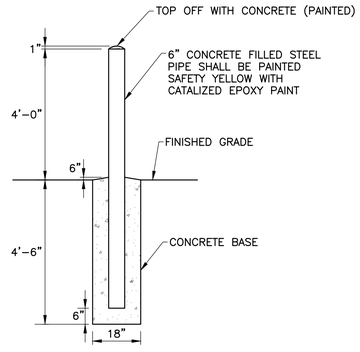
MINIMUM LENGTH OF PIPE TO BE RESTRAINED (IN FEET)

PIPE SIZE (IN)	1/4 BEND (90°)	1/8 BEND (45°)	1/16 BEND (22°)	PLUG/ CAP	TEE* (18')
6"	12	5	3	21	29
8"	16	7	4	28	34
10"	22	10	5	40	48
12"	22	10	5	40	48

*The value in parenthesis for the Tee (18') indicates the required restraint length for each side of the Tee Run.
The values in the column for the Tee are the required restraint lengths for the Tee Branch.

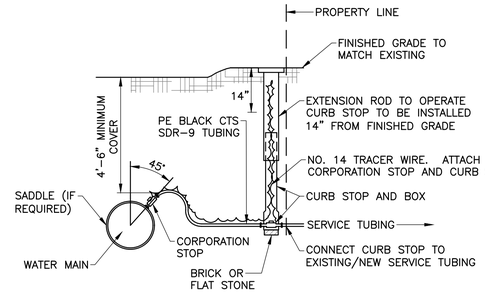
MECHANICAL JOINT RESTRAINT

SCALE: NONE



BOLLARD DETAIL

SCALE: NONE



NOTES:

1. ALL JOINTS SHALL BE COMPRESSIBLE TYPE.
2. PE TUBING SHALL BE BACKFILLED WITH SAND BY HAND TO 6" ABOVE TUBING.
3. A SADDLE WILL BE REQUIRED UNLESS THE DIRECT TAP IS FOR A 1" CORPORATION ON A DUCTILE-IRON WATER MAIN 12" IN DIAMETER OR LARGER.
4. WATER SERVICES SHALL BE INSULATED IN ALL AREAS WHERE THERE IS LESS THAN 4 FEET OF COVER.
5. CURB STOPS SHALL BE INSTALLED AT THE PROPERTY LINE.
6. ALL WATER SERVICE BRASS SHALL BE NO LEAD, WITH "NL" CAST ON THE BODY.
7. CORPORATION STOPS SHALL BE FORD FB1000 OR MUELLER H-15008.
8. CURB STOPS SHALL BE MUELLER H-15209, WITHOUT A DRAIN.

SERVICE CONNECTION

SCALE: NONE

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

CIVIL

WATER MAIN DETAILS

Drawn By: MVM
Designed By: RSP
Checked By: PBH/RPN
Approved By: JWG

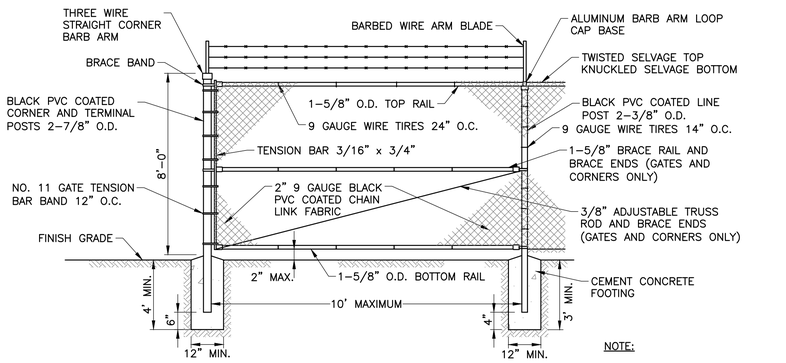
Description | Date | Rev.

COMMONWEALTH OF MASSACHUSETTS JON W. GREGORY 5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

99-C-1

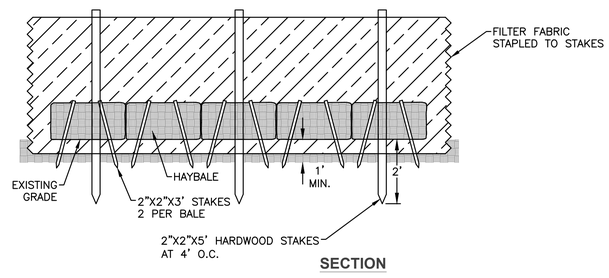


NOTE:

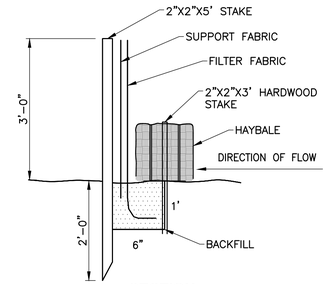
SEE SPECIFICATIONS FOR FENCE COATING AND COLOR.

CHAIN LINK FENCE WITH BARBED WIRE

SCALE: NONE



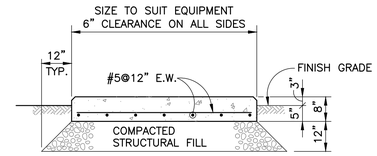
SECTION



SECTION

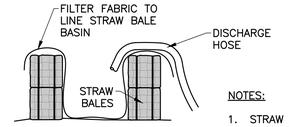
SILT FENCE/HAY BALE EROSION CONTROL

SCALE: NONE



EXTERIOR CONCRETE PAD DETAIL

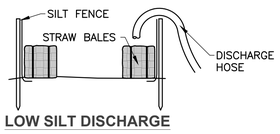
SCALE: NONE



HIGH SILT DISCHARGE

NOTES:

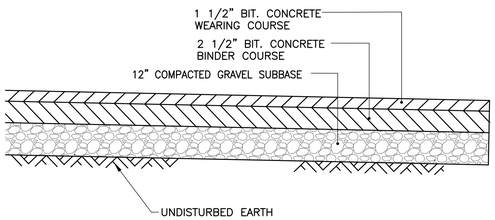
1. STRAW BALES SHALL BE STACKED 1 OR 2 ROWS HIGH AS REQUIRED TO MITIGATE THE FLOW.
2. THE BASIN SHALL BE SIZED TO FILTER THE FLOW BEING DISCHARGED TO THE BASIN.



LOW SILT DISCHARGE

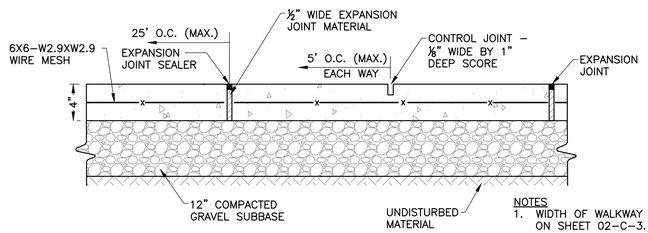
SEDIMENTATION DISCHARGE CONTROL BASIN

SCALE: NONE



BITUMINOUS ASPHALT DRIVEWAY

SCALE: NONE



NOTES

1. WIDTH OF WALKWAY SHALL BE AS CALLED OUT ON SHEET 02-C-3.

CONCRETE WALKWAY

SCALE: NONE

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

CIVIL

SITE DETAILS

Approved By: JWG
Checked By: PBH/RPN
Designed By: RSP
Drawn By: MVM

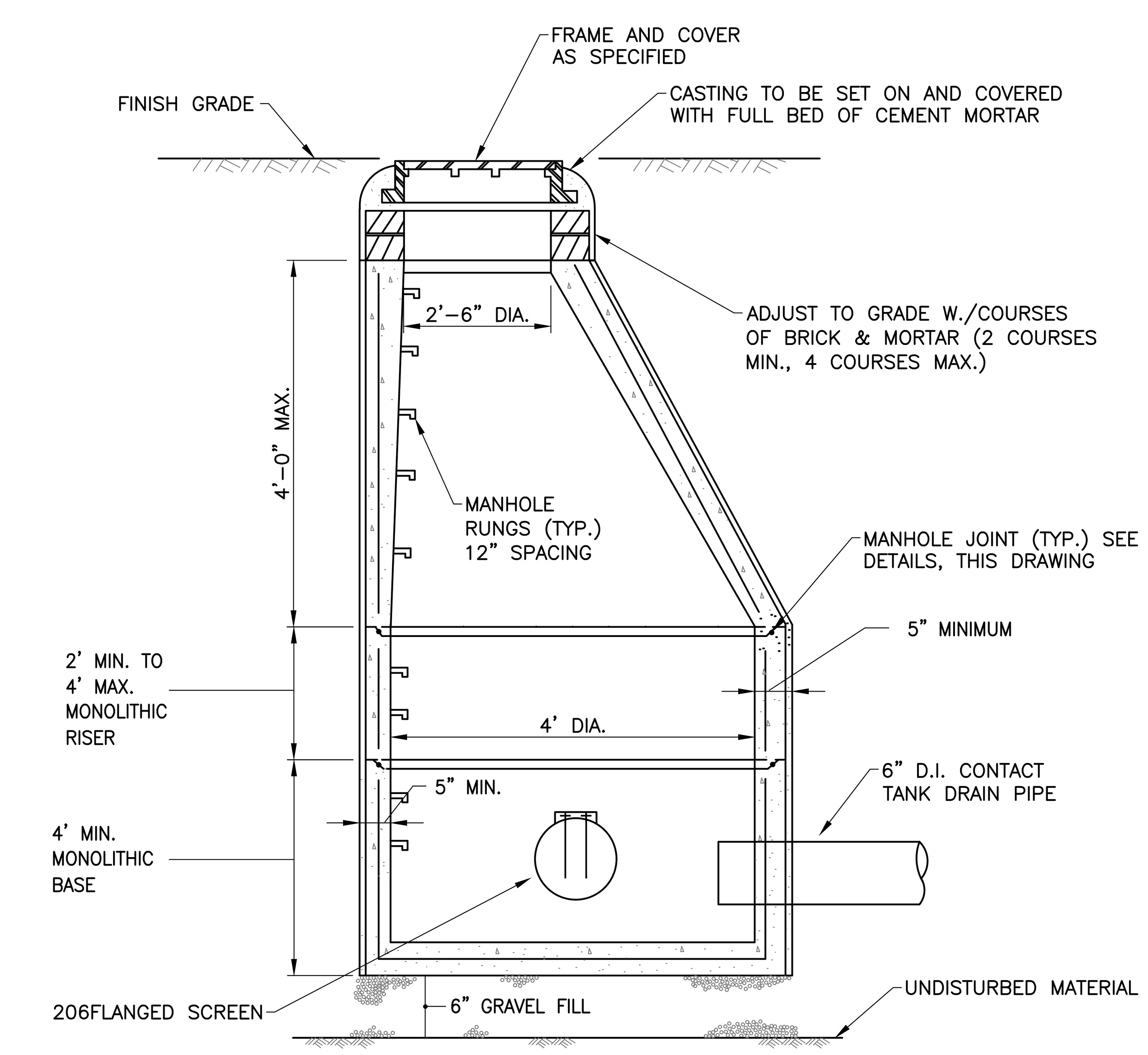
Description
Date
Rev.

COMMONWEALTH OF MASSACHUSETTS JON W. GREGORY 5-1-19

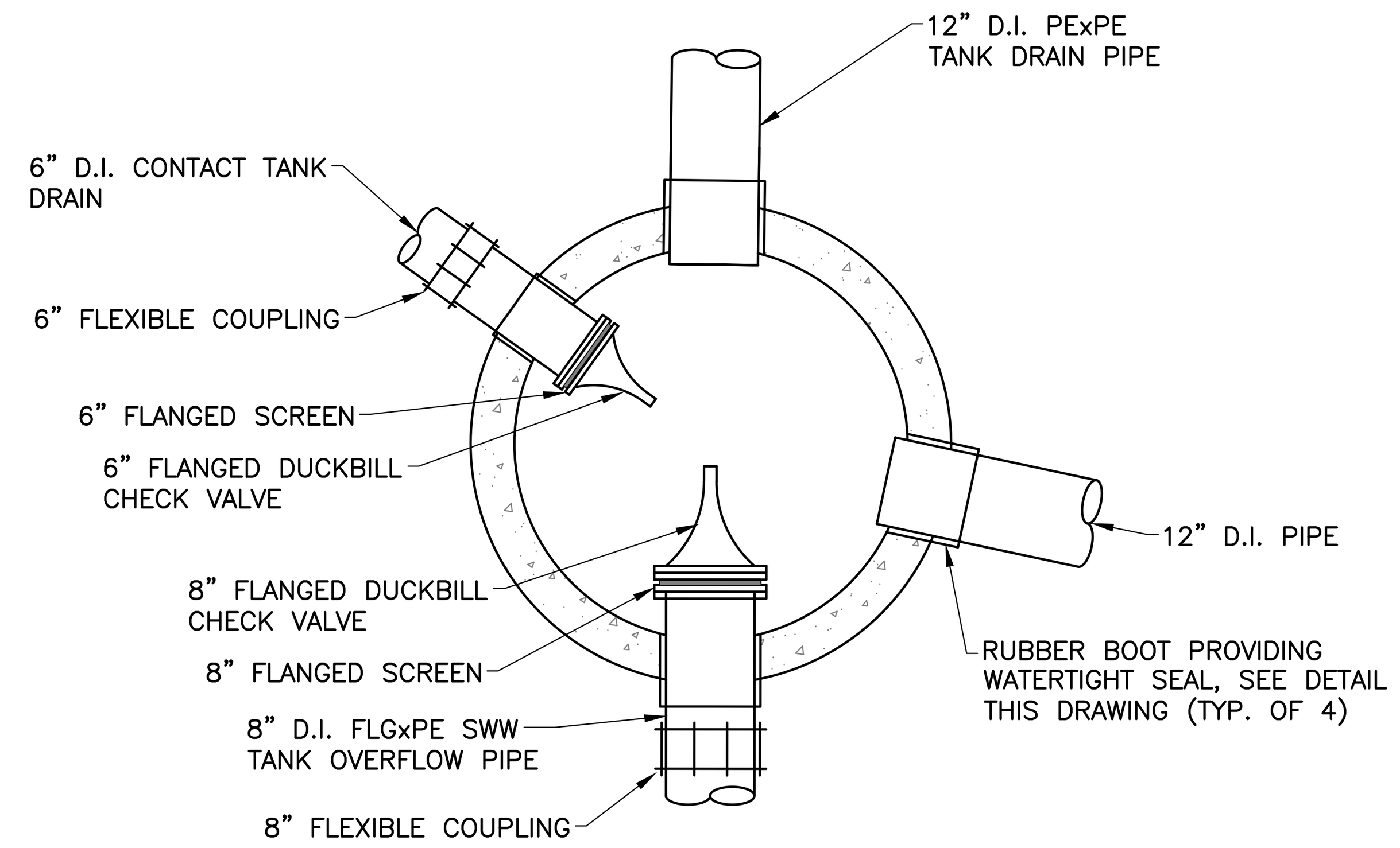
TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

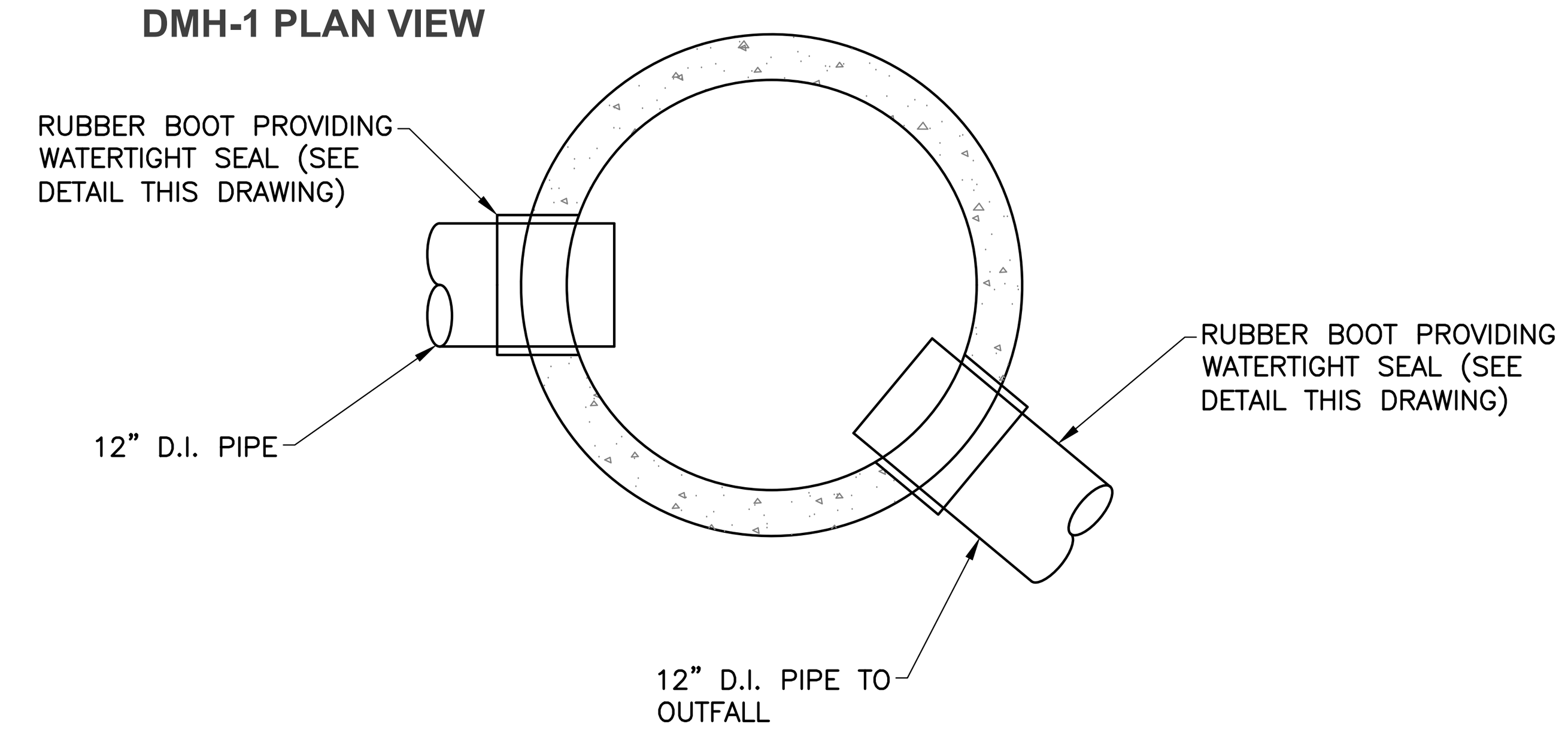
99-C-2



PROFILE VIEW



DMH-1 PLAN VIEW



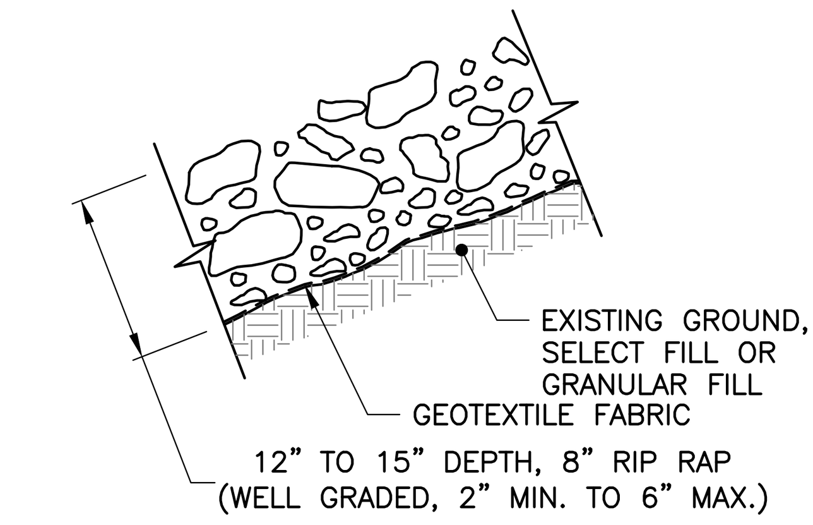
DMH-2 PLAN VIEW

NOTES:

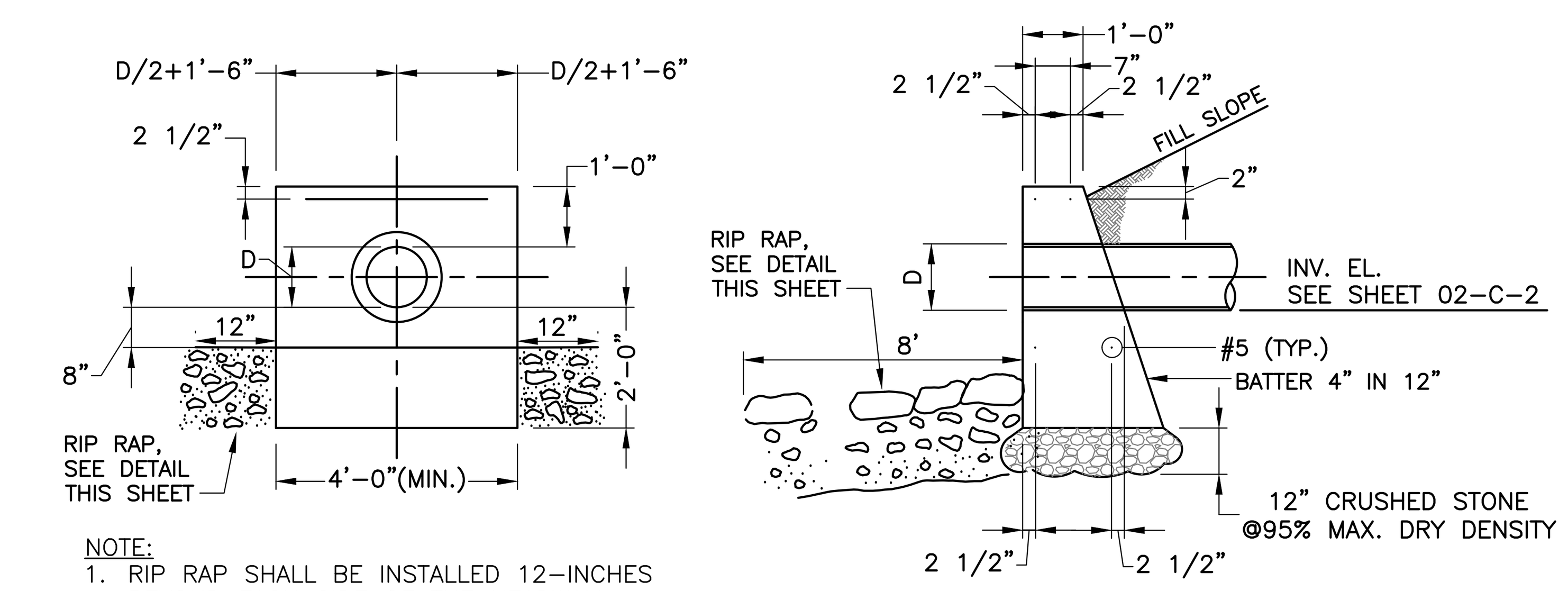
1. SEE SHEET 02-C-2 FOR PIPE INVERTS.

PRECAST DRAIN MANHOLE

SCALE: NONE



DRAIN HEADWALL RIPRAP

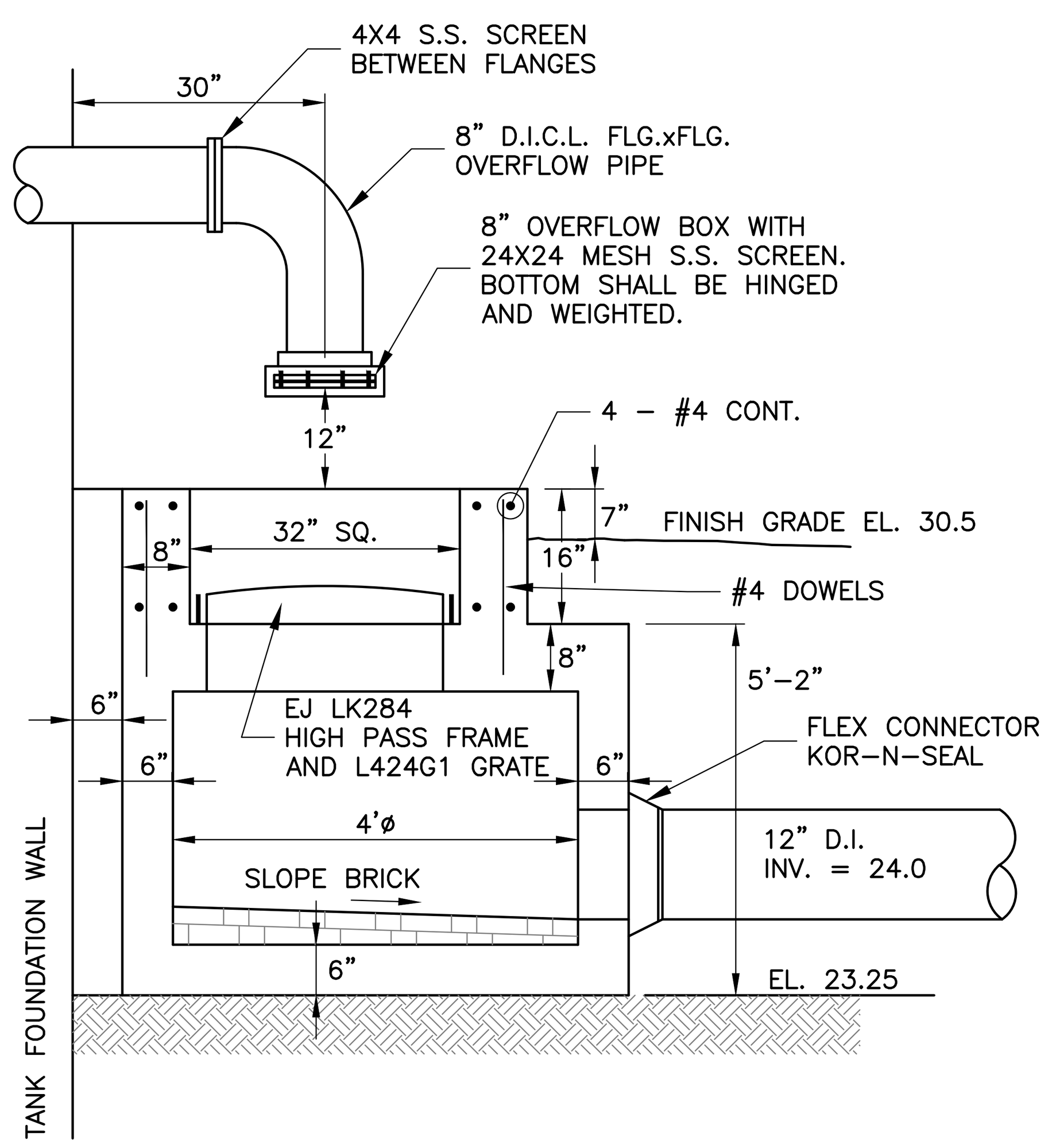


NOTE:

1. RIP RAP SHALL BE INSTALLED 12-INCHES BEYOND EACH SIDE OF THE HEADWALL.

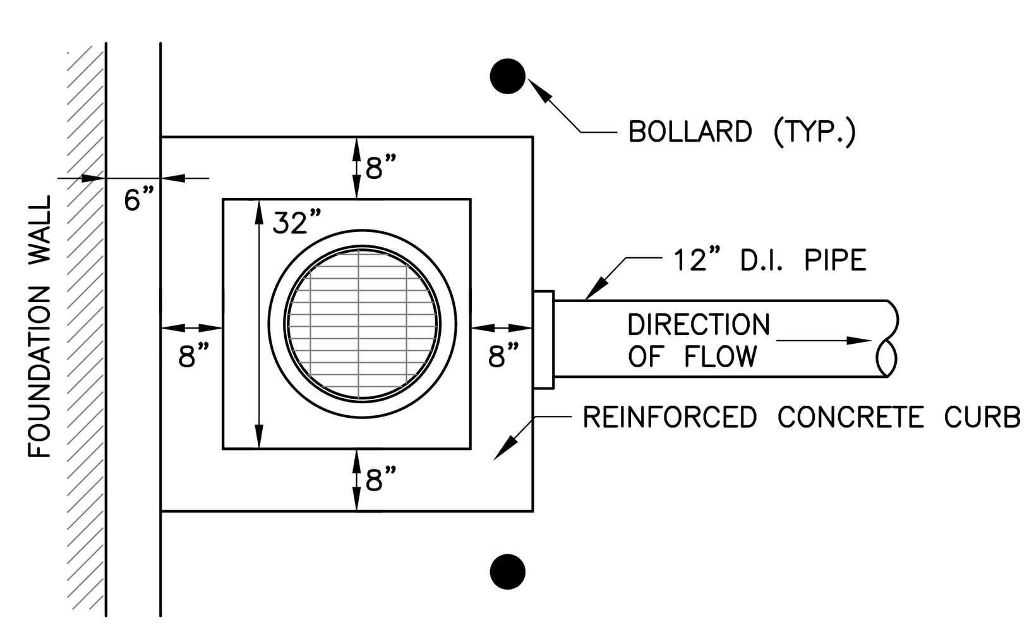
CONCRETE HEADWALL DETAIL

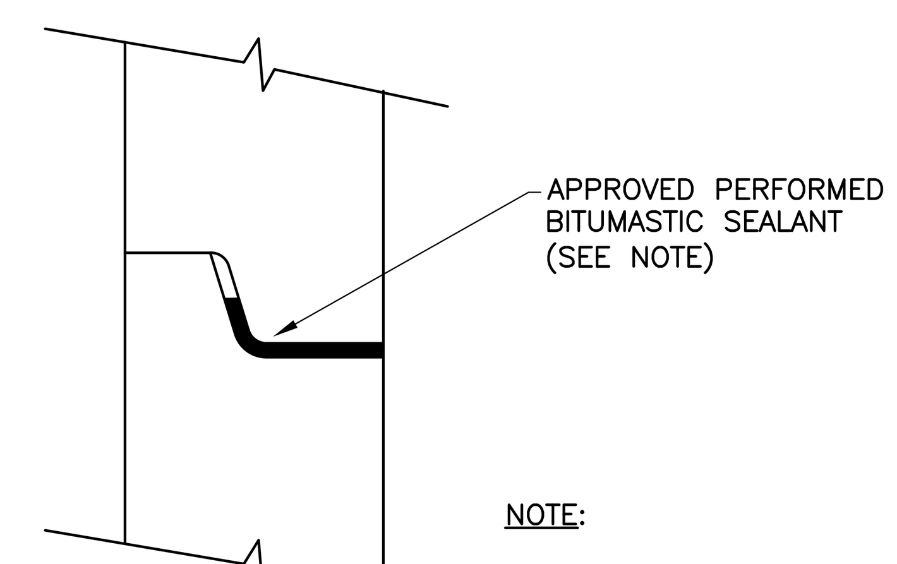
NOT TO SCALE



OVERFLOW CHAMBER

SCALE: NONE



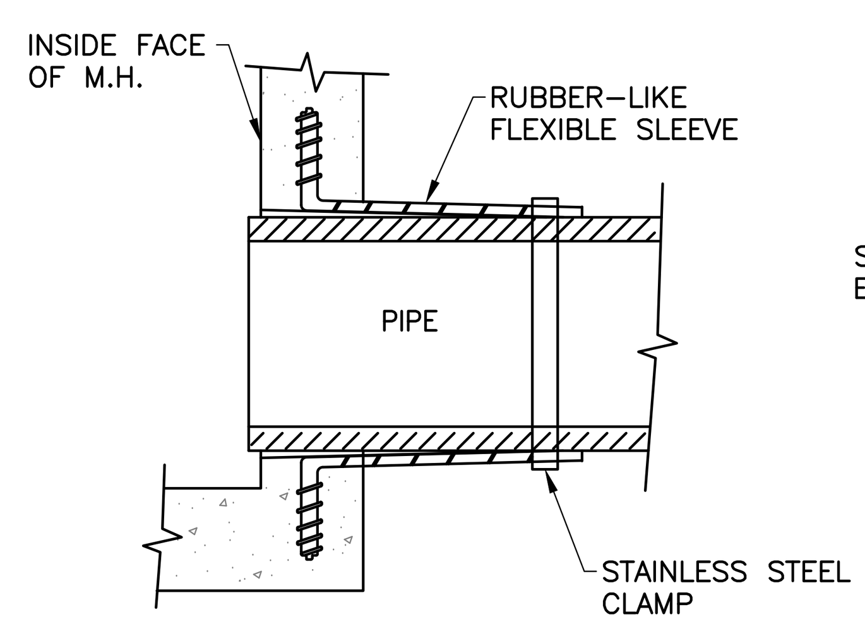


NOTE:

1. FOR BITUMASTIC-TYPE JOINTS, THE AMOUNT OF SEALANT SHALL BE SUFFICIENT TO FILL AT LEAST 75% OF THE JOINT CAVITY.

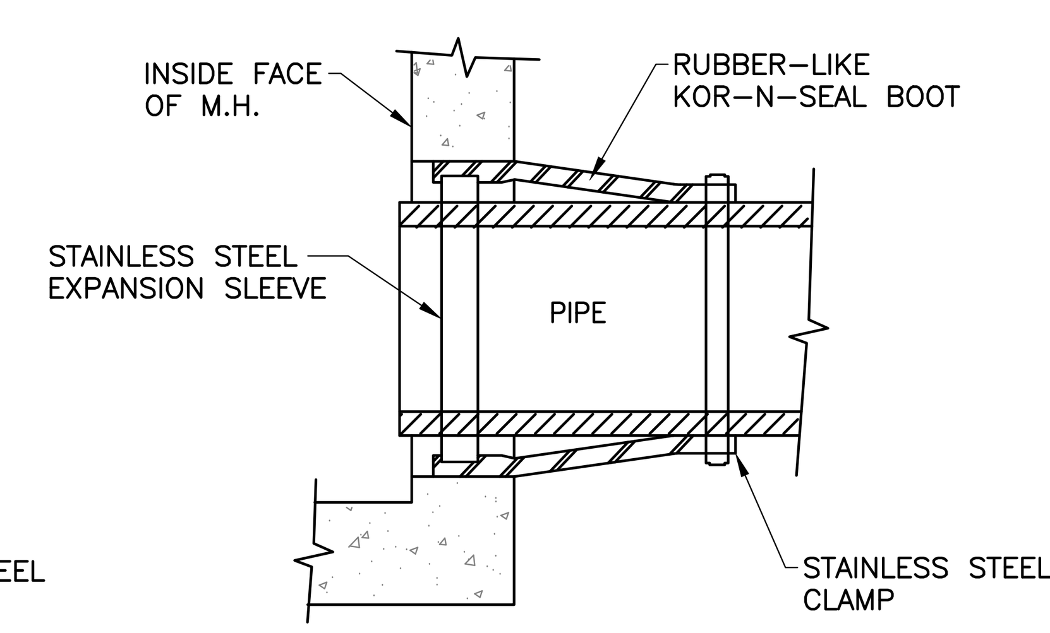
BITUMASTIC MANHOLE SEALANT/GASKET

SCALE: NONE



LOCK-JOINT FLEXIBLE M.H. SLEEVE

(OR EQUAL)

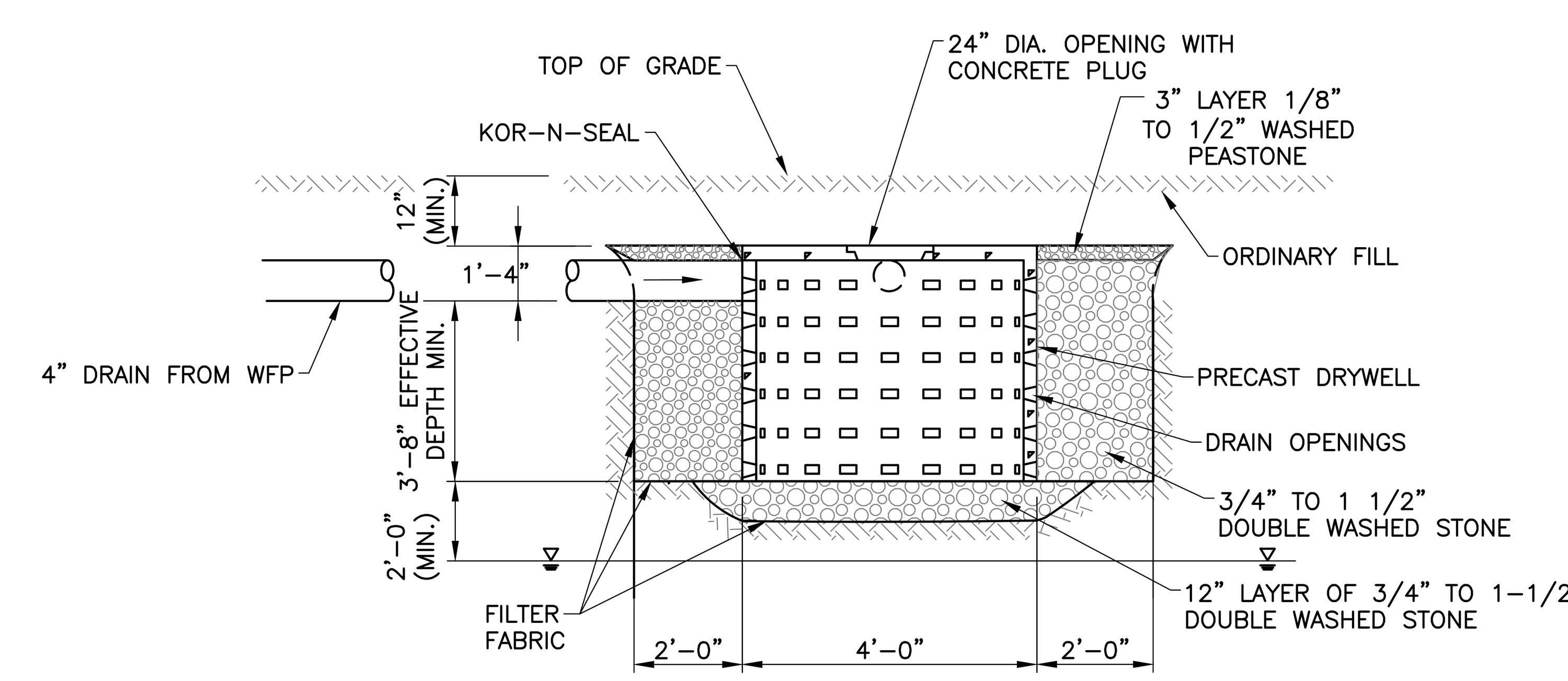


KOR-N-SEAL SLEEVE

(OR EQUAL)

SLEEVE FOR MANHOLE WALL PENETRATION

SCALE: NONE



NOTE:

1. SEE SHEET 02-C-2 FOR INVERTS.

DRYWELL

SCALE: NONE

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: MVM | Designed By: MVM | Checked By: PBH/RPN | Approved By: JWG

CIVIL

DRAINAGE DETAILS

Rev.	Date	Description

5-1-19

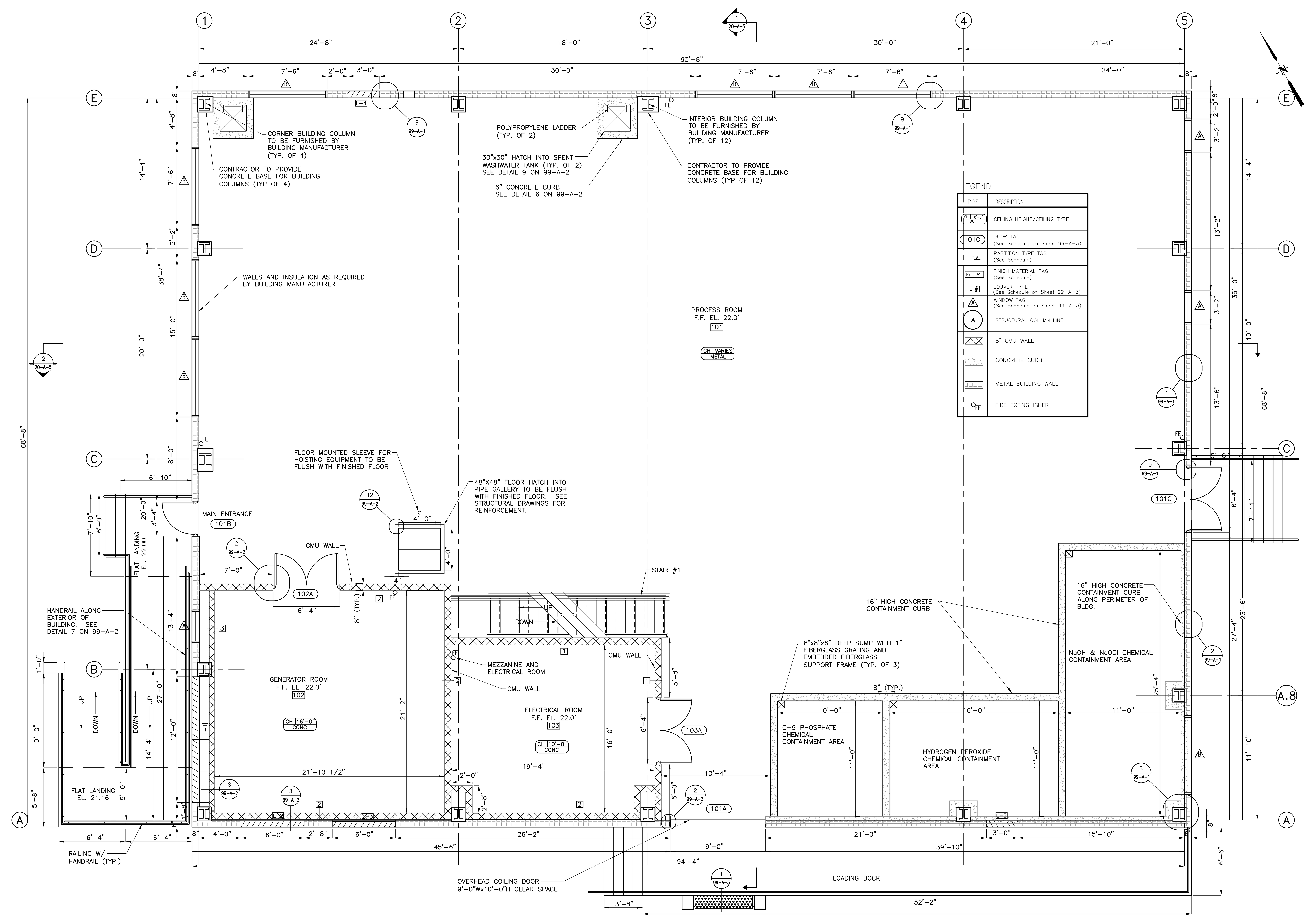
TATA & HOWARD

T&H NO.: 5241

DATE: MAY 2019

SCALE: AS NOTED

99-C-3



POLYPROPYLENE LADDER (TYP. OF 2)
30"x30" HATCH INTO SPENT WASHWATER TANK (TYP. OF 2) SEE DETAIL 9 ON 99-A-2
6" CONCRETE CURB SEE DETAIL 6 ON 99-A-2
CORNER BUILDING COLUMN TO BE FURNISHED BY BUILDING MANUFACTURER (TYP. OF 4)
CONTRACTOR TO PROVIDE CONCRETE BASE FOR BUILDING COLUMNS (TYP OF 4)
INTERIOR BUILDING COLUMN TO BE FURNISHED BY BUILDING MANUFACTURER (TYP. OF 12)
CONTRACTOR TO PROVIDE CONCRETE BASE FOR BUILDING COLUMNS (TYP OF 12)
WALLS AND INSULATION AS REQUIRED BY BUILDING MANUFACTURER
PROCESS ROOM
F.F. EL. 22.0'
101
CH VARIES METAL
LEGEND
TYPE DESCRIPTION
CEILING HEIGHT/CEILING TYPE
101C DOOR TAG (See Schedule on Sheet 99-A-3)
PARTITION TYPE TAG (See Schedule)
FINISH MATERIAL TAG (See Schedule)
LOUVER TYPE (See Schedule on Sheet 99-A-3)
WINDOW TAG (See Schedule on Sheet 99-A-3)
STRUCTURAL COLUMN LINE
8" CMU WALL
CONCRETE CURB
METAL BUILDING WALL
FIRE EXTINGUISHER
FLOOR MOUNTED SLEEVE FOR HOISTING EQUIPMENT TO BE FLUSH WITH FINISHED FLOOR
48"X48" FLOOR HATCH INTO PIPE GALLERY TO BE FLUSH WITH FINISHED FLOOR. SEE STRUCTURAL DRAWINGS FOR REINFORCEMENT.
MAIN ENTRANCE
101B
CMU WALL
102A
STAIR #1
UP
DOWN
HANDRAIL ALONG EXTERIOR OF BUILDING. SEE DETAIL 7 ON 99-A-2
FLAT LANDING EL. 22.00
GENERATOR ROOM
F.F. EL. 22.0'
102
CH 16'-0" CONC
MEZZANINE AND ELECTRICAL ROOM
CMU WALL
ELECTRICAL ROOM
F.F. EL. 22.0'
103
CH 10'-0" CONC
103A
101A
16" HIGH CONCRETE CONTAINMENT CURB
16" HIGH CONCRETE CONTAINMENT CURB ALONG PERIMETER OF BLDG.
8"x8"x6" DEEP SUMP WITH 1" FIBERGLASS GRATING AND EMBEDDED FIBERGLASS SUPPORT FRAME (TYP. OF 3)
NaOH & NaOCl CHEMICAL CONTAINMENT AREA
C-9 PHOSPHATE CHEMICAL CONTAINMENT AREA
HYDROGEN PEROXIDE CHEMICAL CONTAINMENT AREA
101C
FLAT LANDING EL. 21.16
RAILING W/ HANDRAIL (TYP.)
OVERHEAD COILING DOOR 9'-0"Wx10'-0"H CLEAR SPACE
LOADING DOCK
24'-8" 18'-0" 30'-0" 21'-0"
93'-8"
45'-6" 94'-4" 52'-2"
68'-8"

FIRST FLOOR PLAN

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

ARCHITECTURAL

FIRST FLOOR PLAN

Drawn By: MVM | Designed By: MVM | Checked By: RM | Approved By: JWG

Rev.	Date	Description

5-1-19

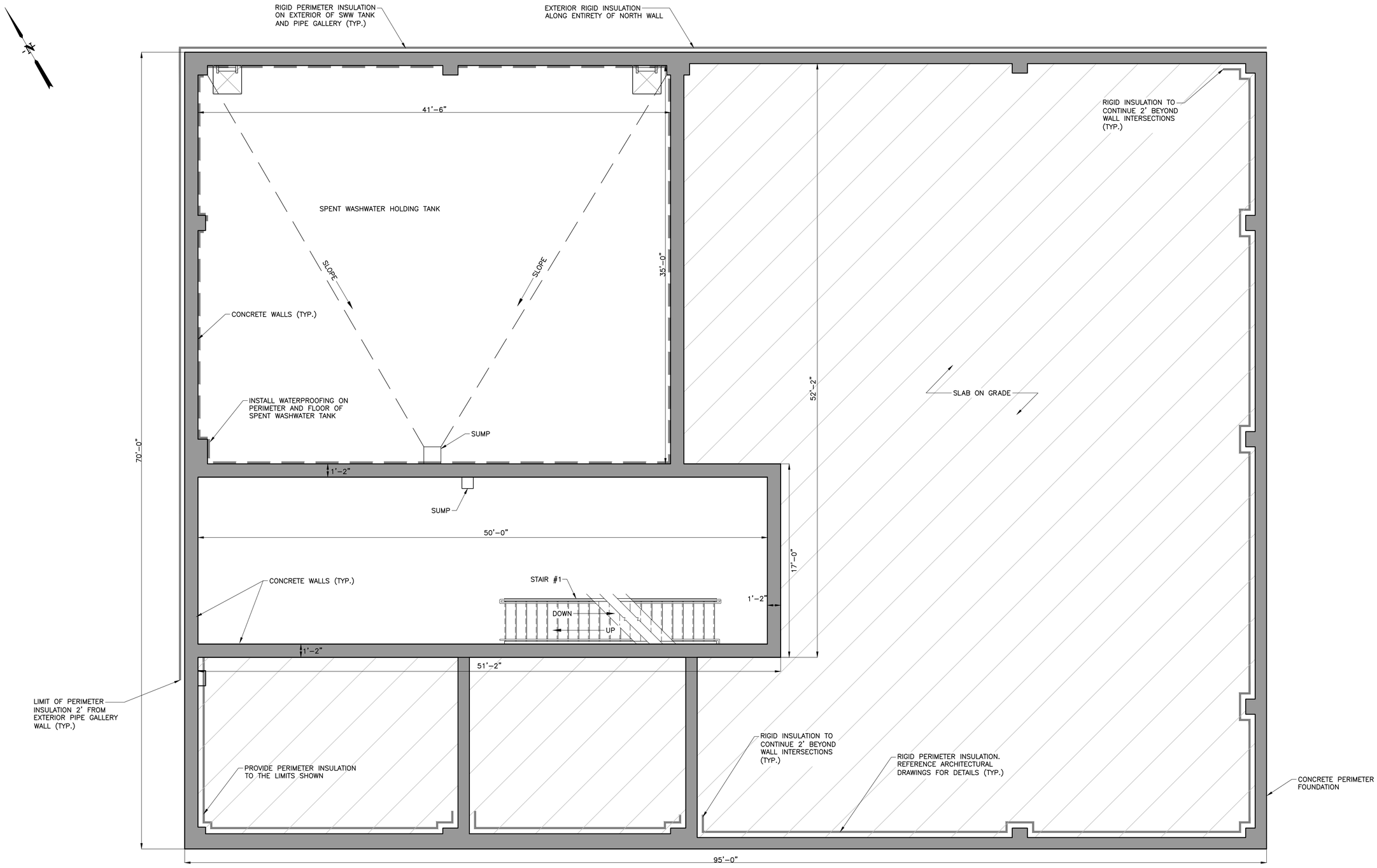
TATA & HOWARD

T&H NO.: 5241

DATE: MAY 2019

SCALE: AS NOTED

20-A-1



BASEMENT FLOOR PLAN

SCALE: 1/4" = 1'–0"

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

ARCHITECTURAL

BASEMENT FLOOR PLAN

Drawn By: MVM
Designed By: MVM
Checked By: RM
Approved By: JWG

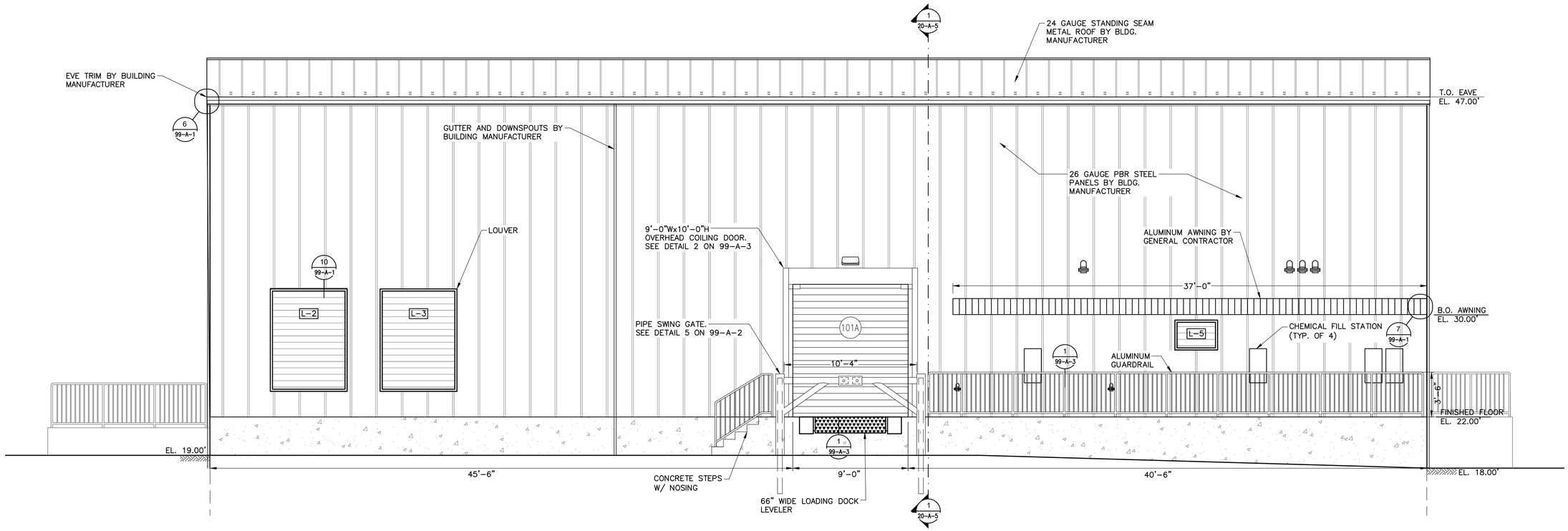
Rev. | Date | Description

COMMONWEALTH OF MASSACHUSETTS
JOHN W. GREGORY
CIVIL
No. 49078
REGISTERED PROFESSIONAL ENGINEER
5-1-19

TATA & HOWARD

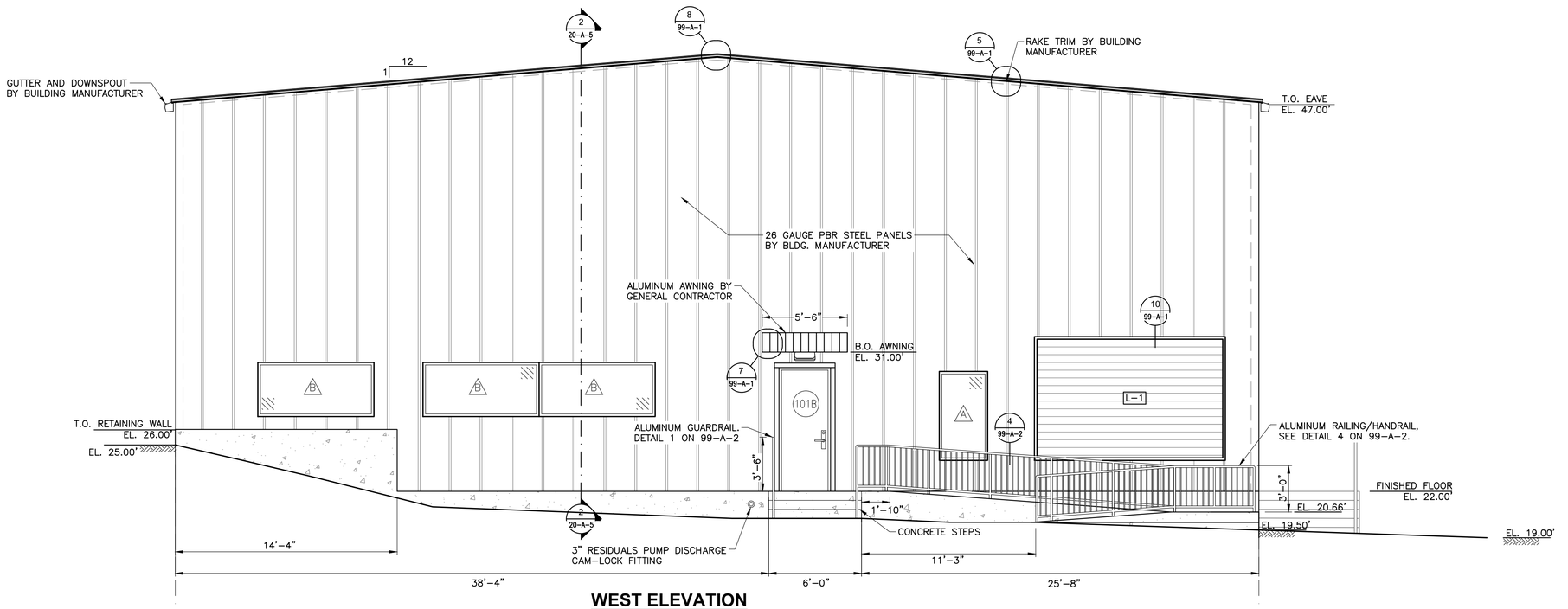
T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-A-2



SOUTH ELEVATION

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



WEST ELEVATION

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

ARCHITECTURAL

ELEVATION VIEWS

Approved By: JWG
Checked By: RM
Designed By: MVM
Drawn By: MVM

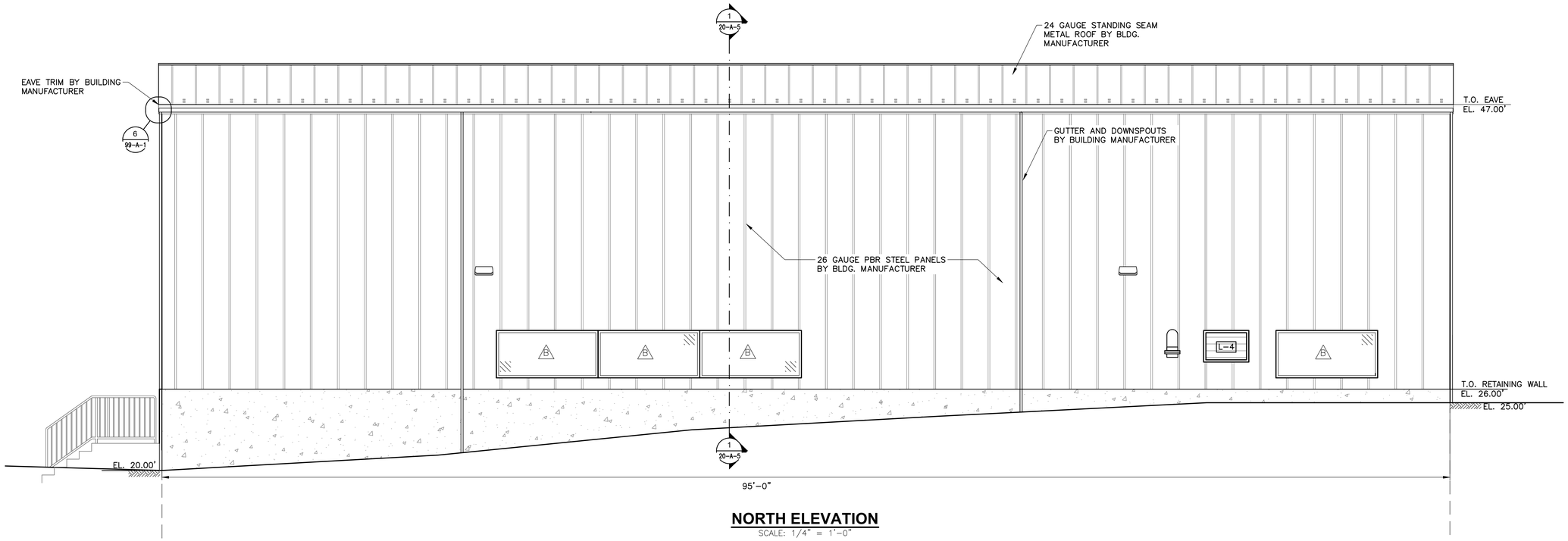
Description
Date
Rev.

COMMONWEALTH OF MASSACHUSETTS
JON W. GREGORY
CIVIL
No. 45078
REGISTERED PROFESSIONAL ENGINEER
5-1-19

TATA & HOWARD

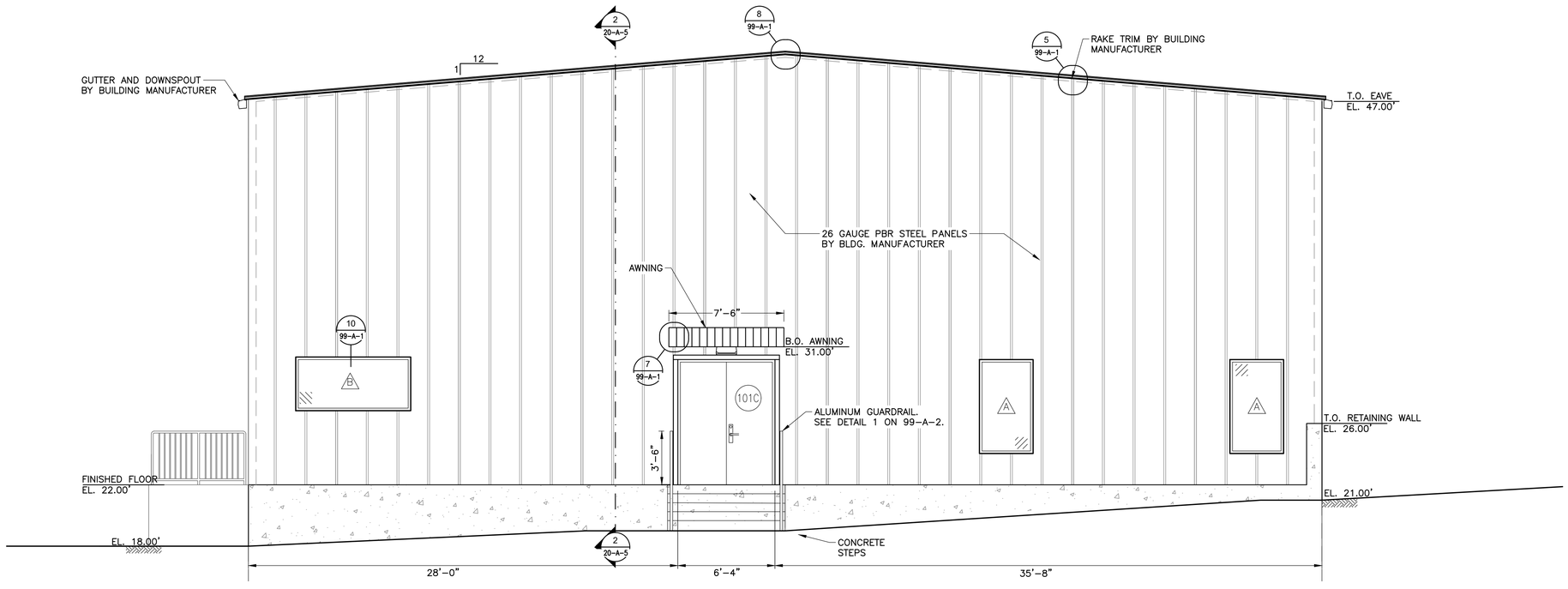
T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-A-3



NORTH ELEVATION

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



EAST ELEVATION

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

ARCHITECTURAL

ELEVATION VIEWS

Drawn By: MVM
Designed By: MVM
Checked By: RM
Approved By: JWG

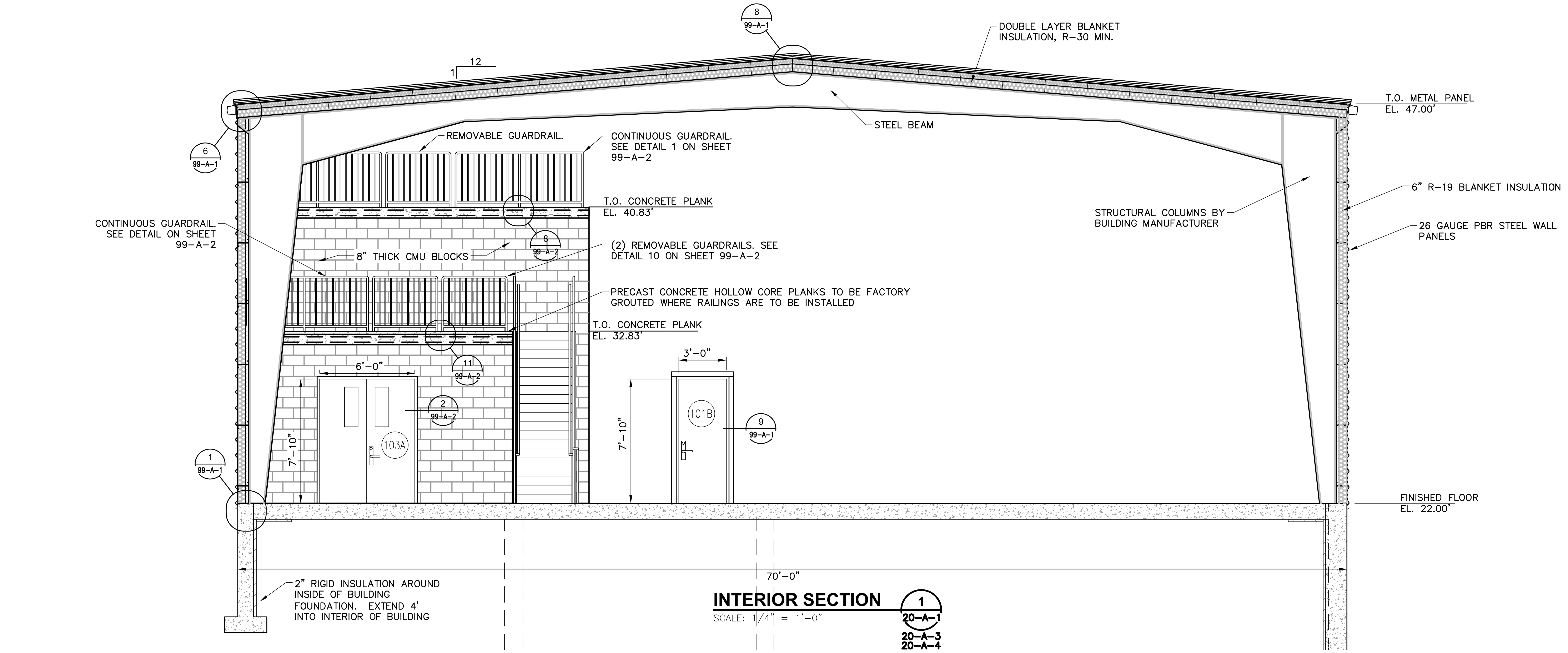
Rev. | Date | Description

COMMONWEALTH OF MASSACHUSETTS
JON W. GREGORY
No. 42373
REGISTERED ARCHITECT
5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

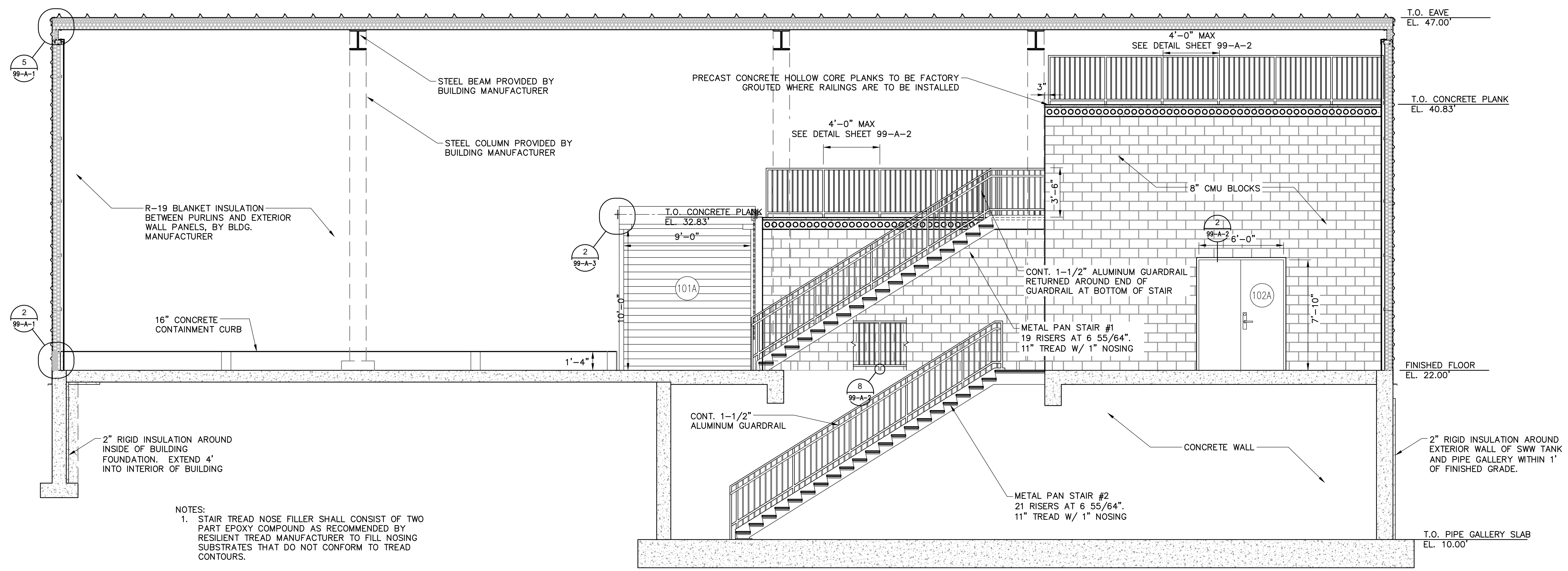
20-A-4



INTERIOR SECTION 1 20-A-1

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

20-A-3
20-A-4



NOTES:
1. STAIR TREAD NOSE FILLER SHALL CONSIST OF TWO PART EPOXY COMPOUND AS RECOMMENDED BY RESILIENT TREAD MANUFACTURER TO FILL NOSING SUBSTRATES THAT DO NOT CONFORM TO TREAD CONTOURS.

INTERIOR SECTION 2 20-A-1

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

20-A-3
20-A-4

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: MVM | Designed By: MVM | Checked By: RM | Approved By: JWG

ARCHITECTURAL

INTERIOR SECTION VIEWS

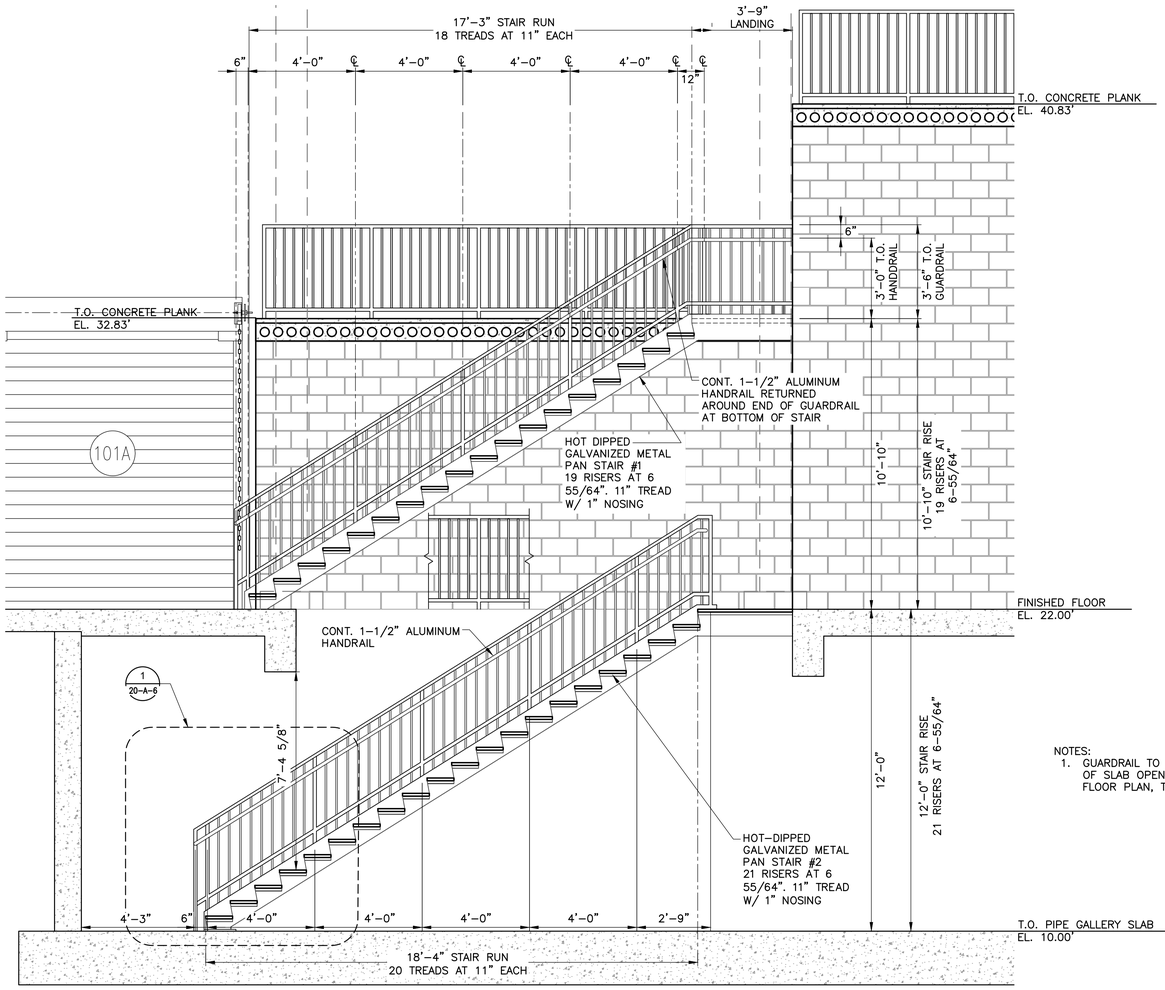
Rev.	Date	Description

5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

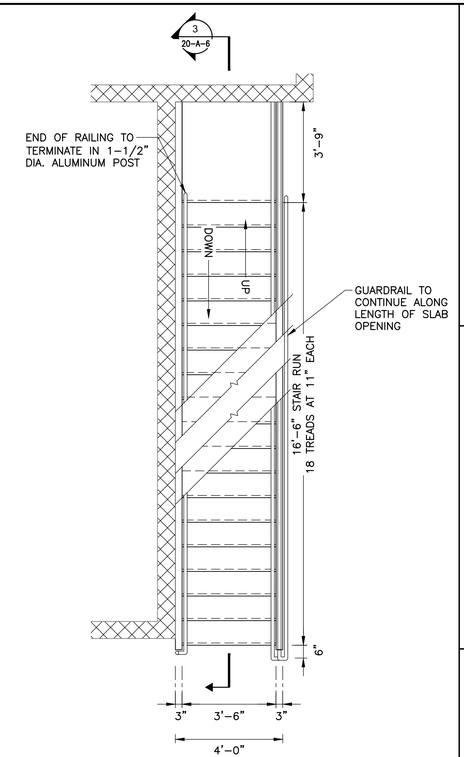
20-A-5



SECTION 3/20-A-6

SCALE: 3/8" = 1'-0"

NOTES:
1. GUARDRAIL TO BE INCLUDED ALONG LENGTH OF SLAB OPENING. SEE ENLARGED FIRST FLOOR PLAN, THIS PAGE.

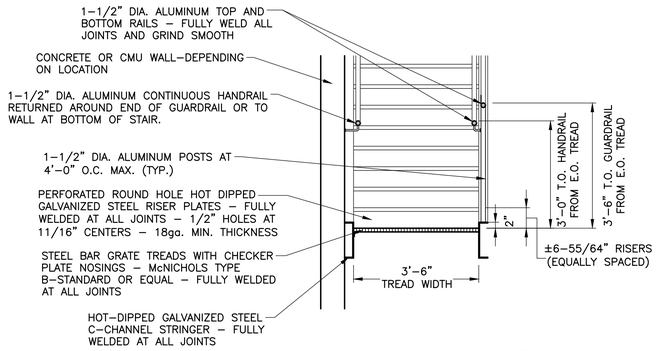


ENLARGED FIRST FLOOR STAIR PLAN

SCALE: 3/8" = 1'-0"

SECTION 1/20-A-6

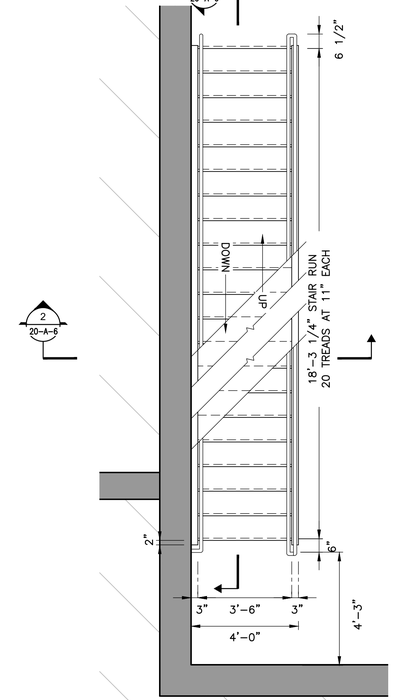
SCALE: 1/2" = 1'-0"



SECTION 2/20-A-6

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

NOTE:
STAIR STRUCTURAL DESIGN, CONNECTION DETAILS, AND SUPPORT DETAILS ARE BY OTHERS - CONTRACTOR TO PROVIDE SHOP DRAWINGS BEARING THE SEAL OF A REGISTERED PROFESSIONAL ENGINEER TO THE ARCHITECT FOR REVIEW AND APPROVAL PRIOR TO FABRICATION OR INSTALLATION



ENLARGED BASEMENT STAIR PLAN

SCALE: 3/8" = 1'-0"

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

ARCHITECTURAL

STAIR SECTIONS & DETAILS

Rev.	Date	Description

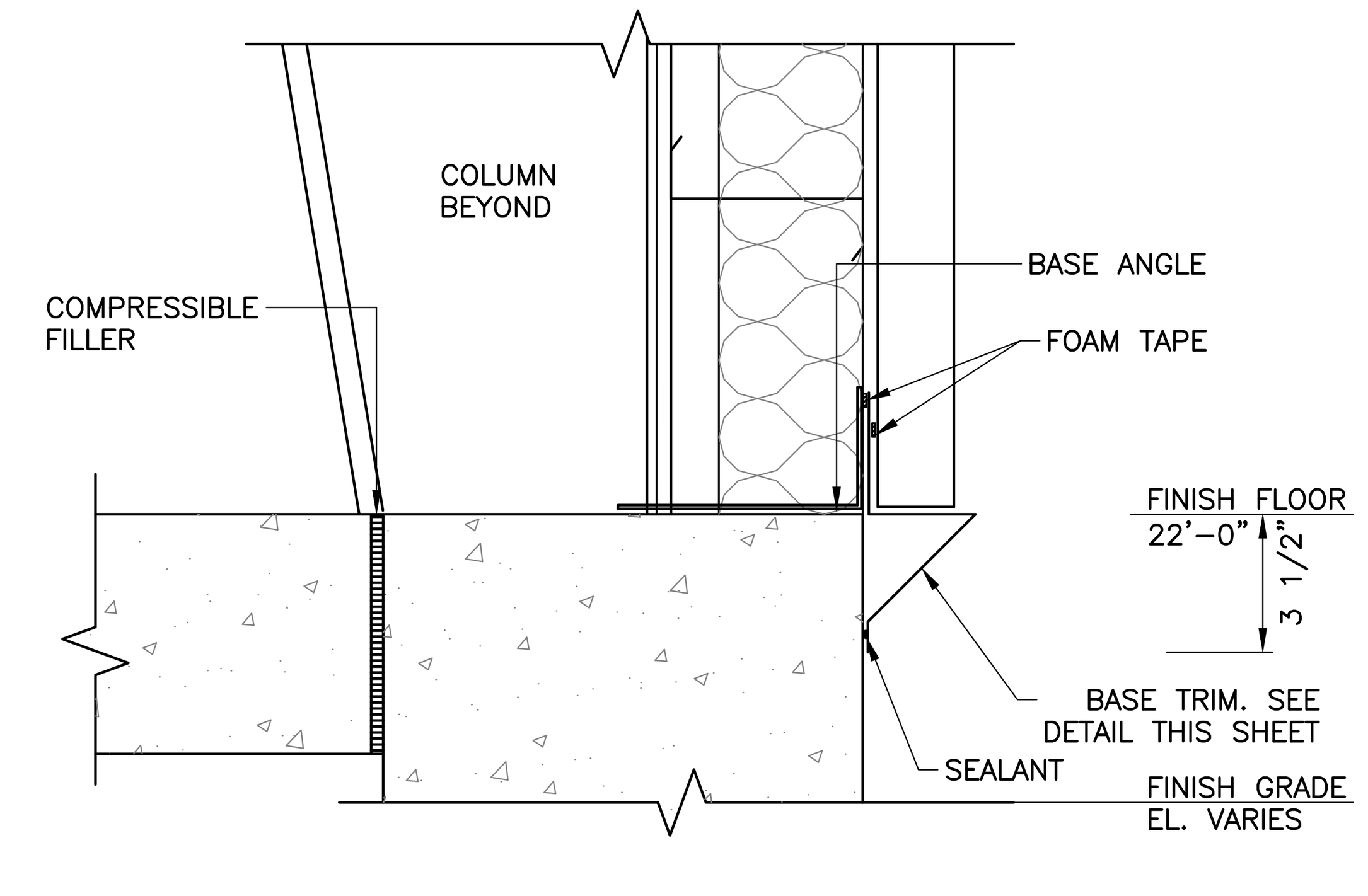
Designed By: MVM
Drawn By: MVM
Checked By: RM
Approved By: JWG

COMMONWEALTH OF MASSACHUSETTS
JON W. GREGORY
CIVIL
No. 39270
REGISTERED PROFESSIONAL ENGINEER
5-1-19

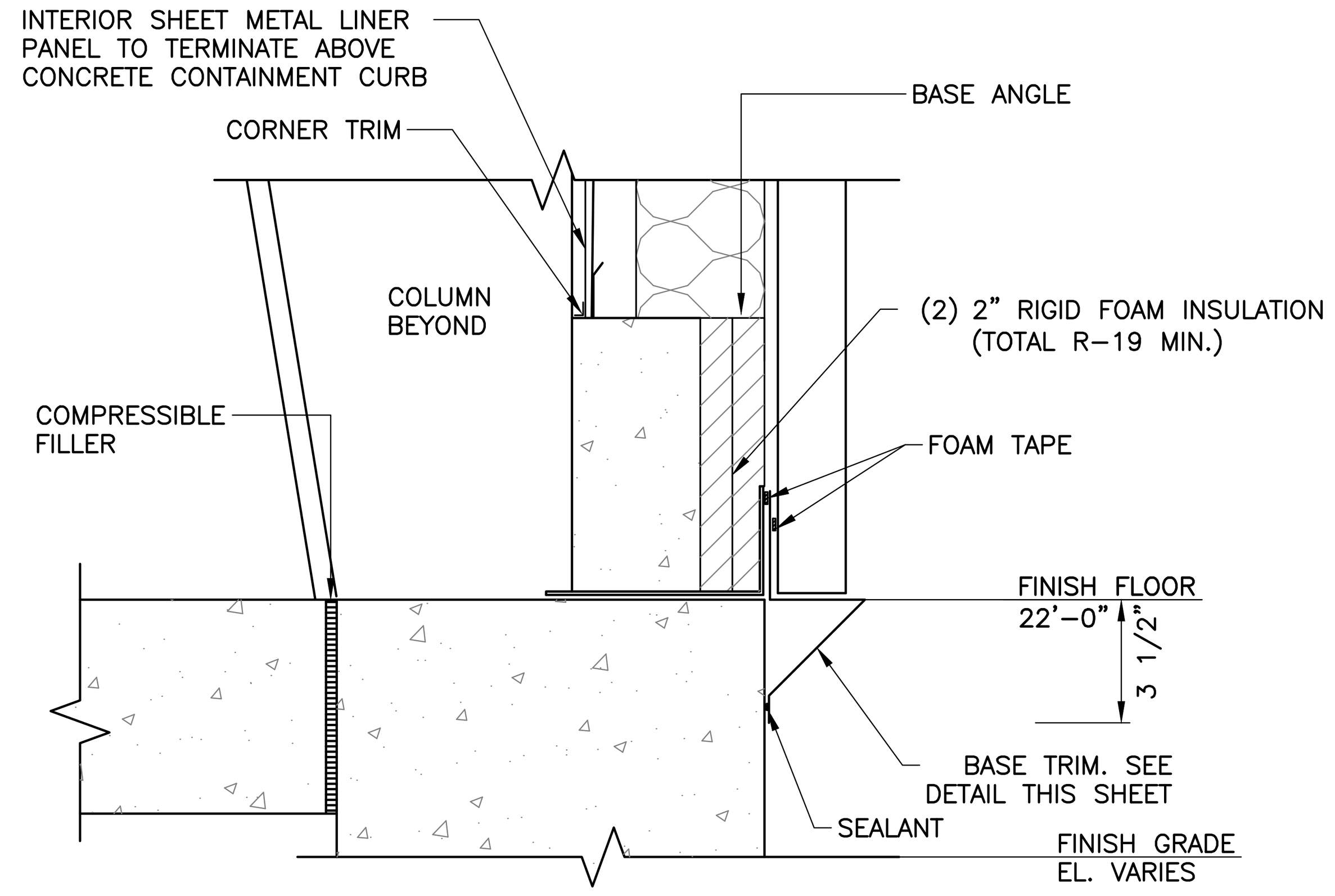
TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

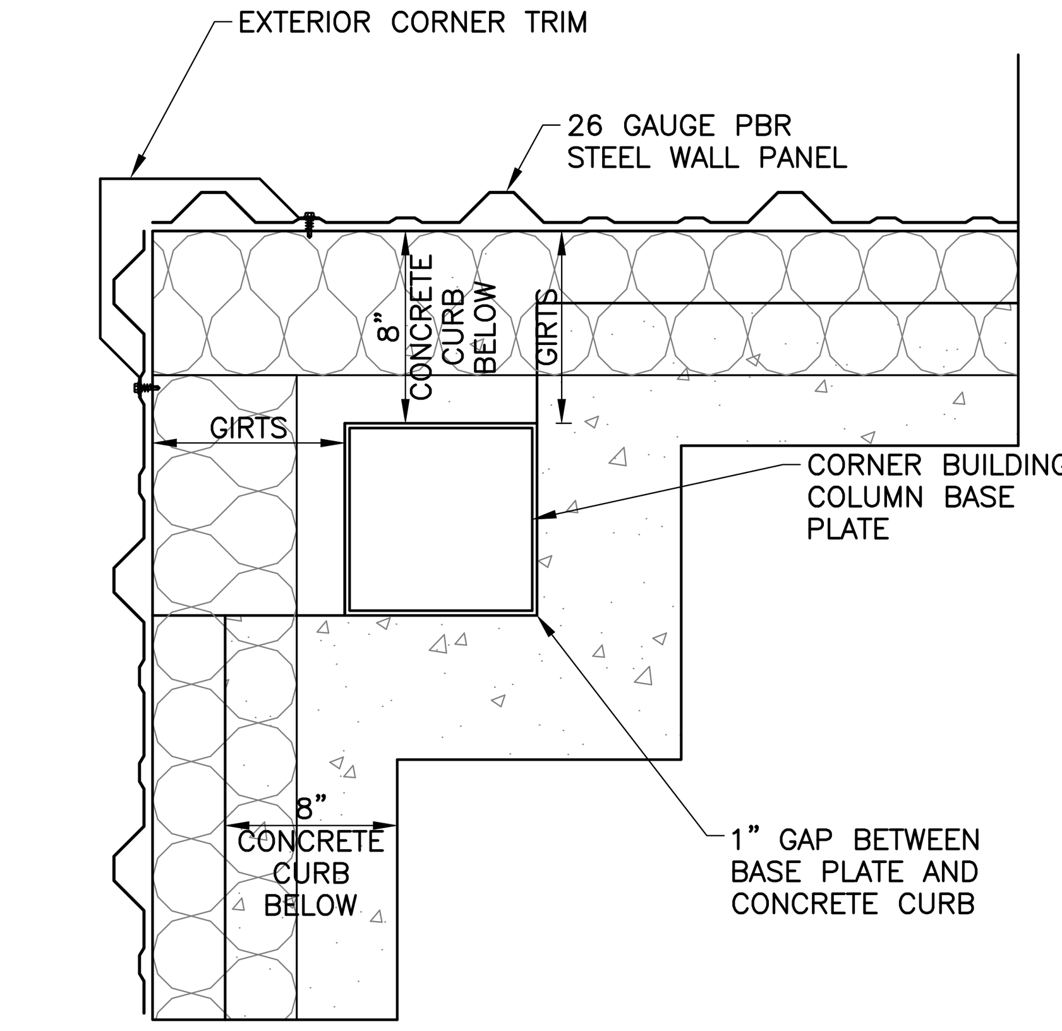
20-A-6



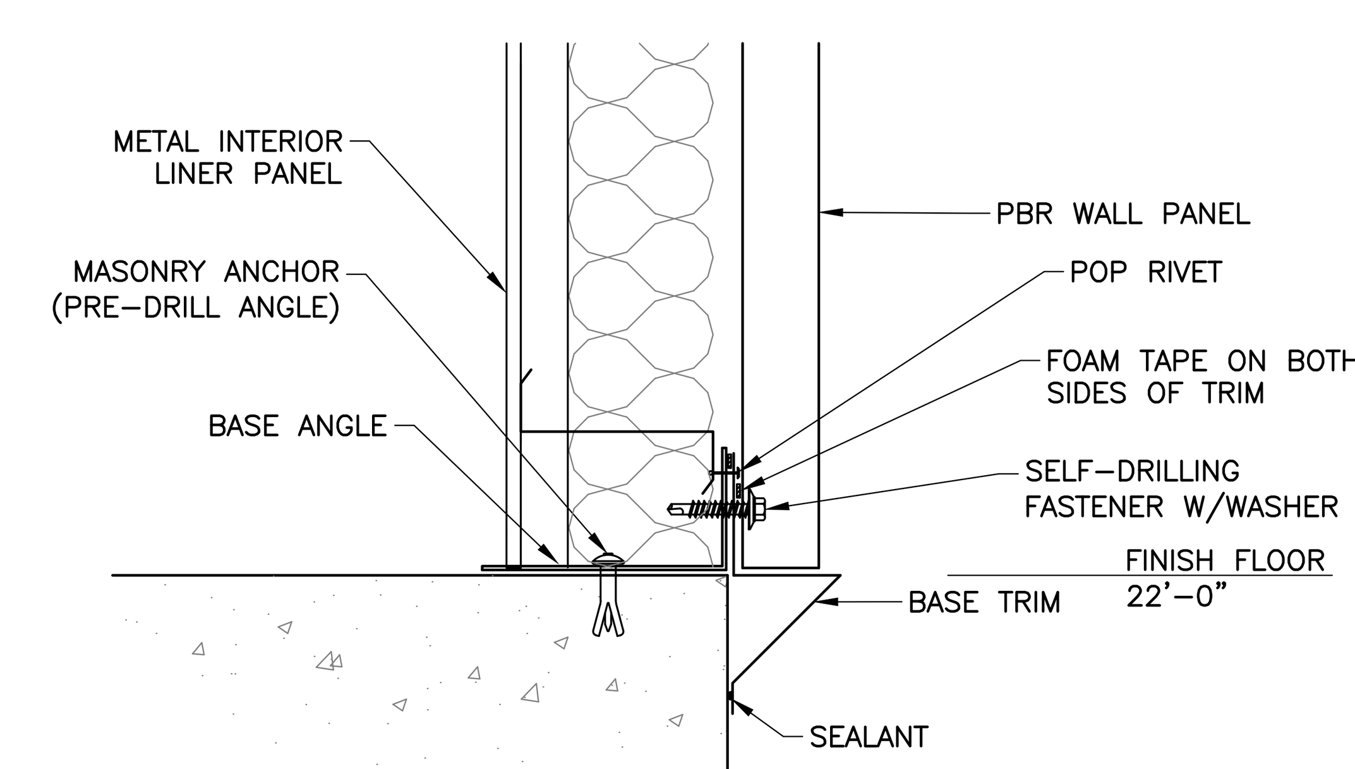
EXTERIOR DETAIL NO. 1 (1, 20-A-1, 20-A-5)
NOT TO SCALE



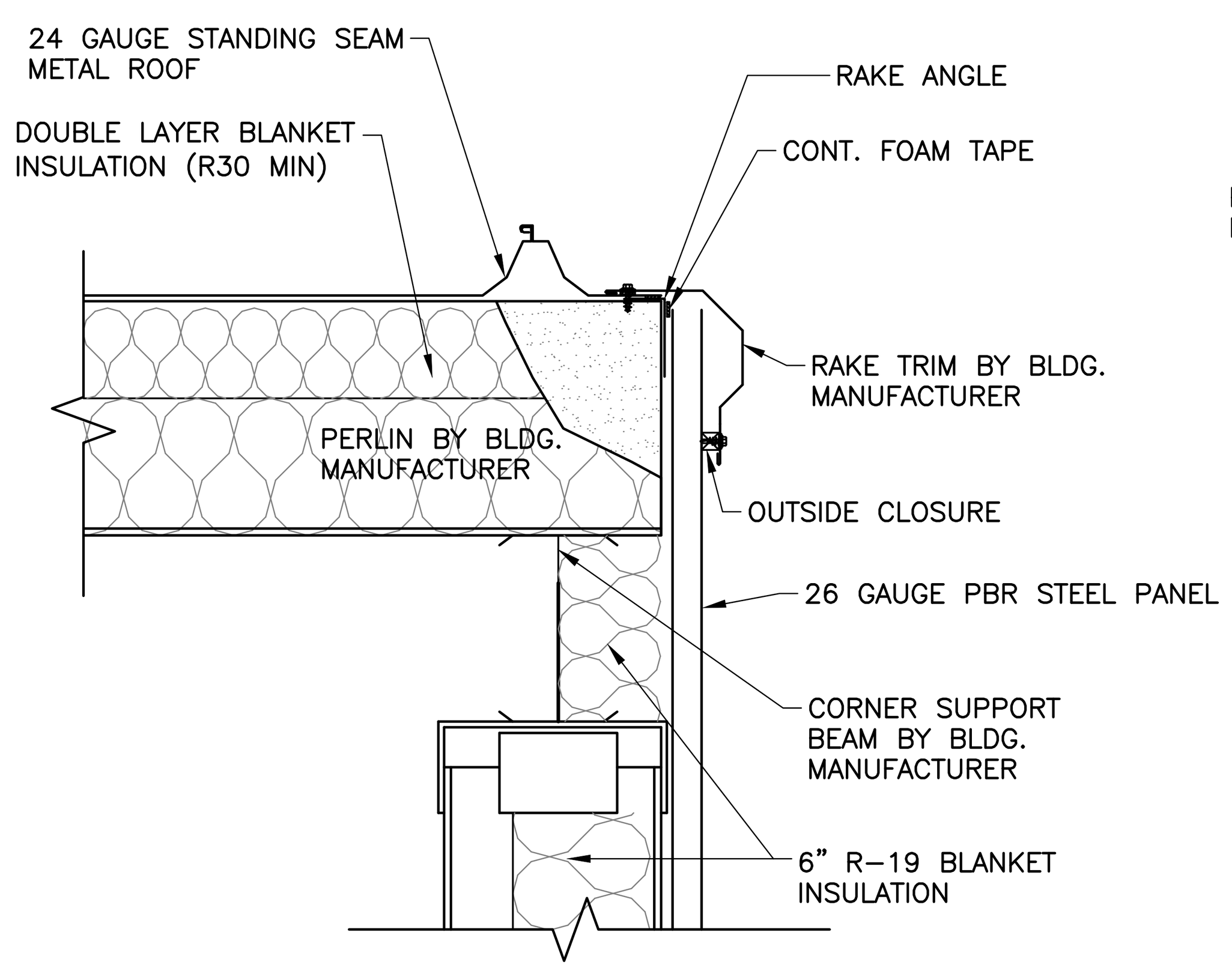
EXTERIOR DETAIL NO. 2 (2, 20-A-1, 20-A-5)
NOT TO SCALE



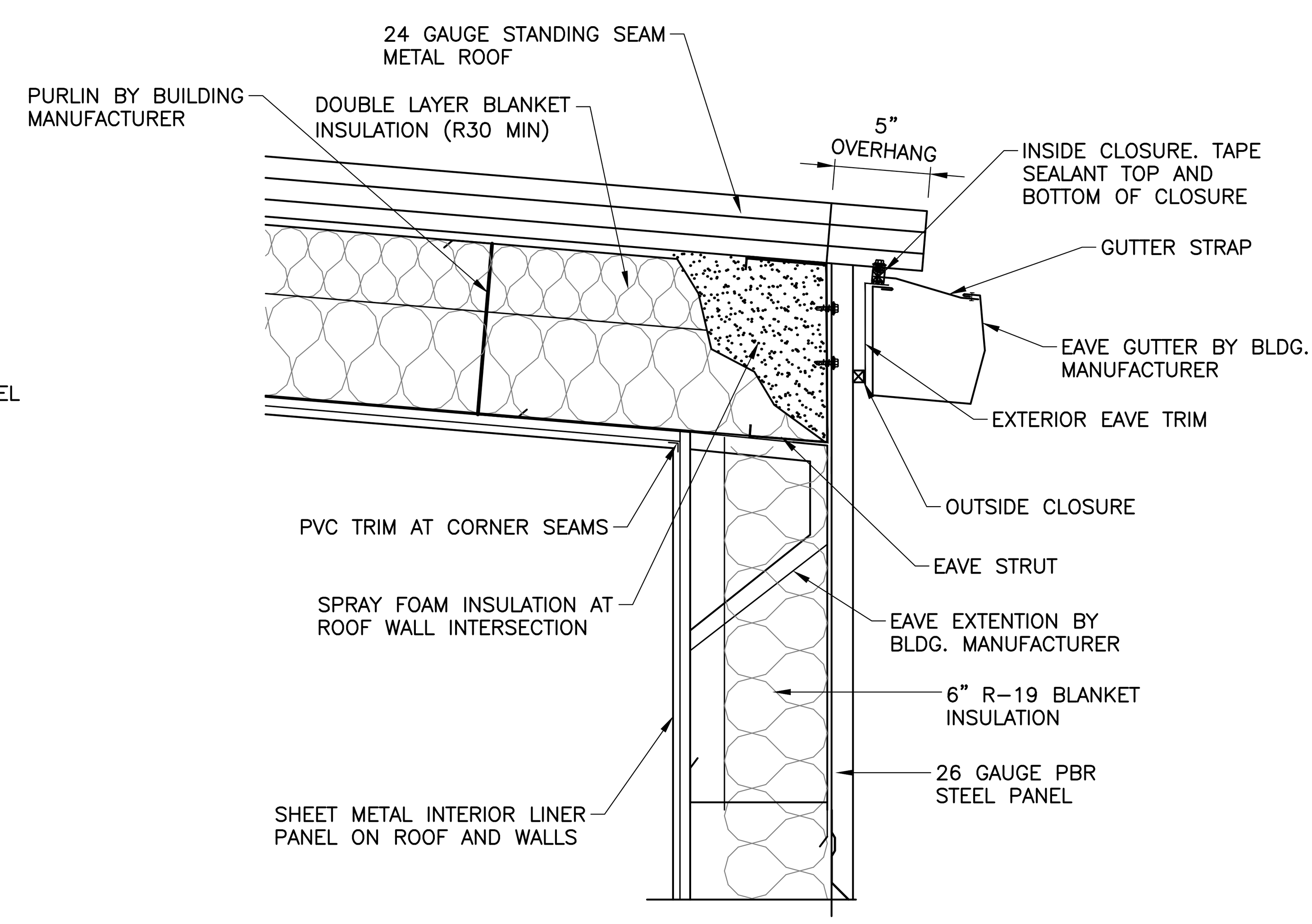
BUILDING CORNER DETAIL NO. 1 (3, 20-A-1)
NOT TO SCALE



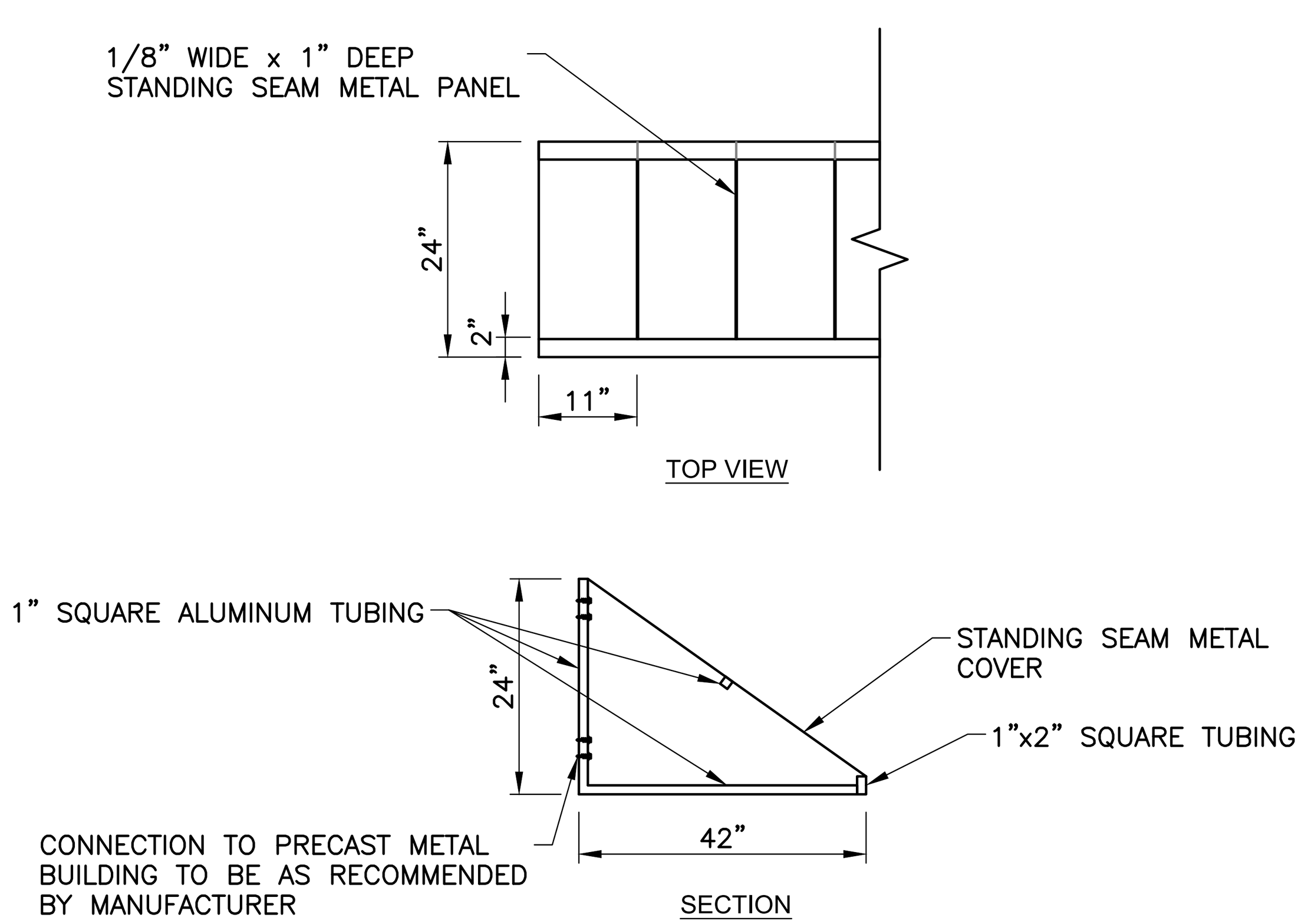
BASE TRIM DETAIL (4, 99-A-1)
NOT TO SCALE



RAKE DETAIL (5, 20-A-3, 20-A-4, 20-A-5)
NOT TO SCALE

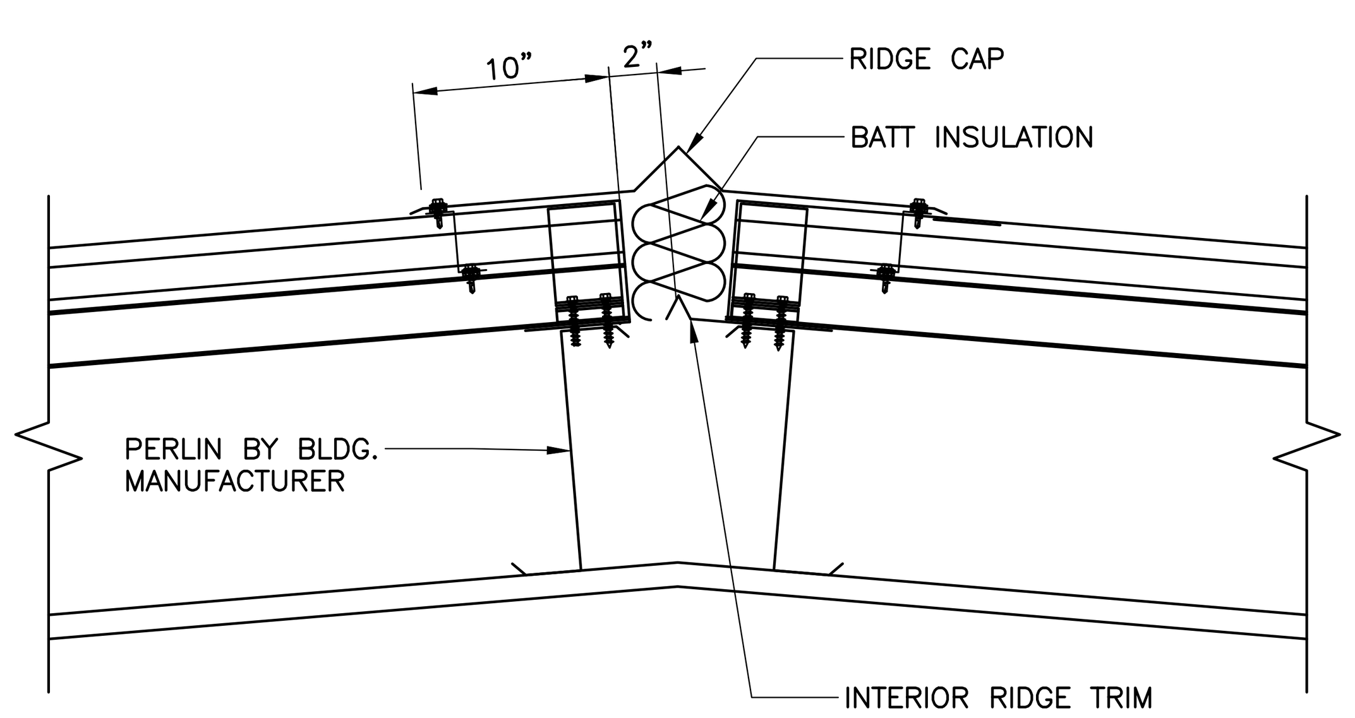


EAVE DETAIL (6, 20-A-3, 20-A-4, 20-A-5)
NOT TO SCALE

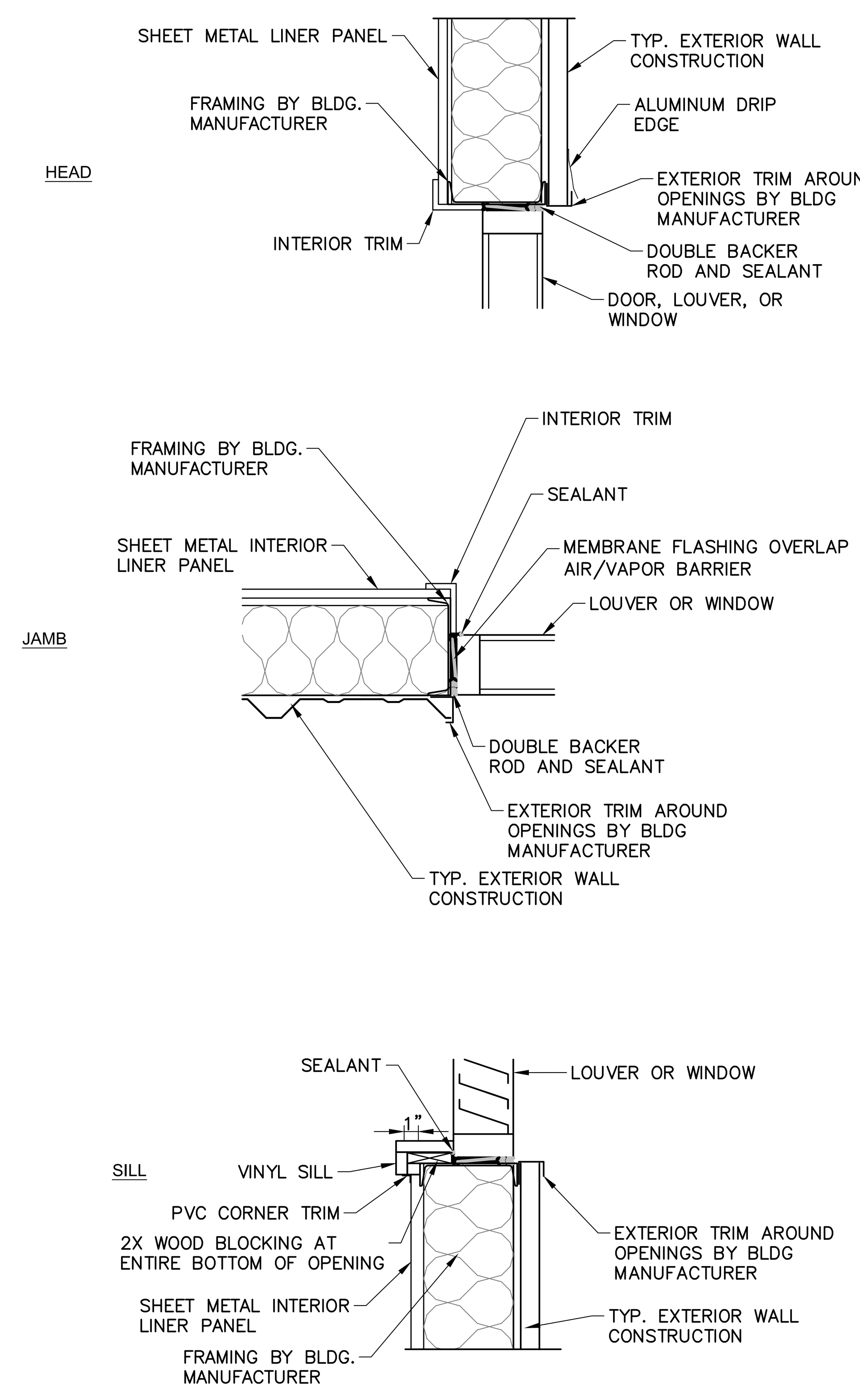


NOTES:
1. THE ABOVE DETAIL IS THAT FURNISHED BY DESIGNYOURAWNING.COM AS A REFERENCE TO THE STYLE/TYPE OF AWNING TO BE PROVIDED AS DESIRED BY THE OWNER.
2. CONTRACTOR SHALL COORDINATE DESIGN AND METHOD OF INSTALLATION OF CANOPIES BETWEEN THE METAL BUILDING MANUFACTURER AND CANOPY MANUFACTURER/SUPPLIER TO ASSURE WATERTIGHTNESS OF CANOPY COVER AT BUILDING WALL, AND METHOD OF CANOPY ATTACHMENT AND SUPPORT.
3. FINAL DESIGN SHALL BE APPROVED AND COLOR SELECTED BY THE OWNER AND ENGINEER.

METAL AWNING DETAIL (7, 20-A-3, 20-A-4)
NOT TO SCALE

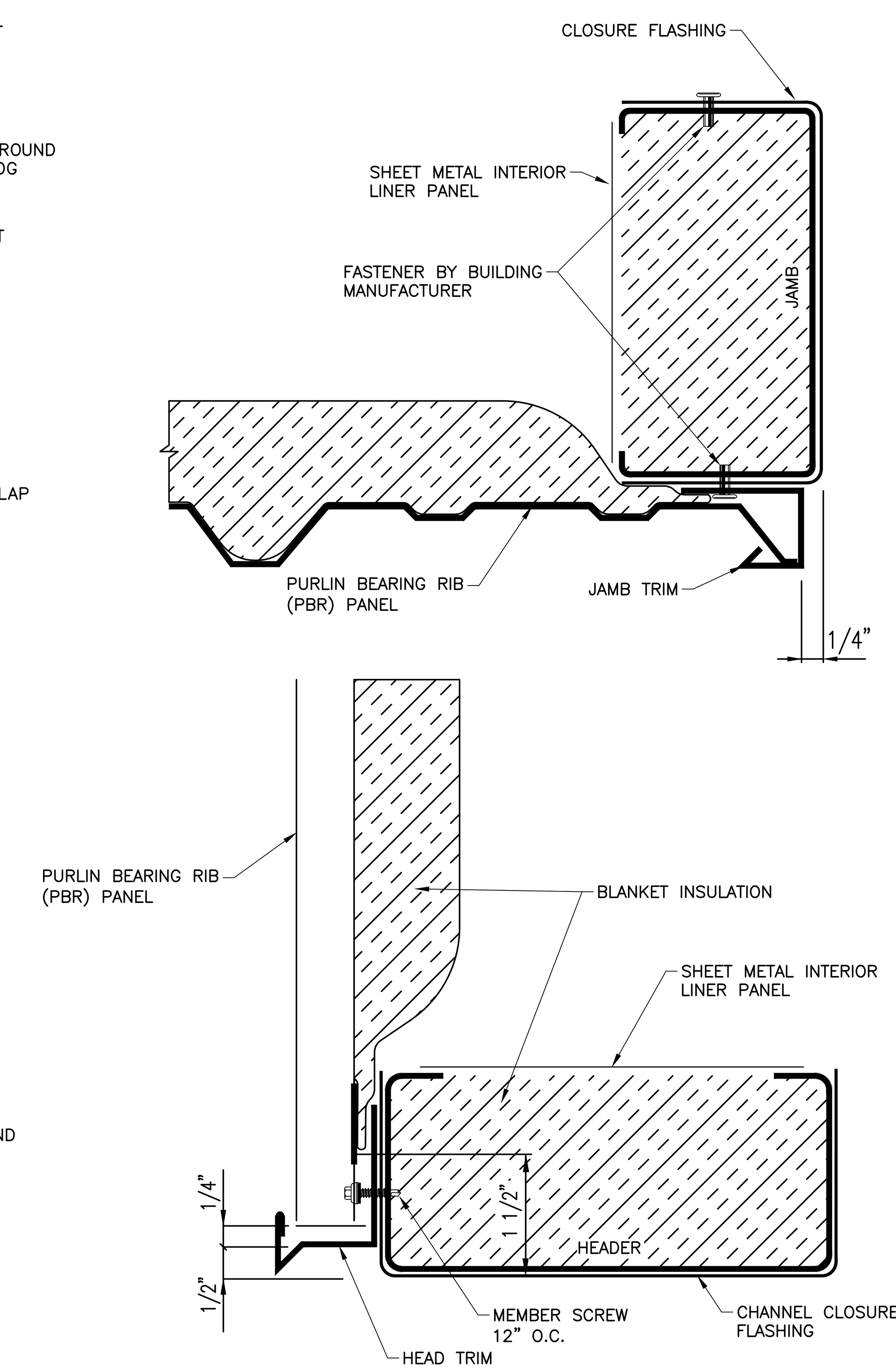


RIDGE DETAIL (8, 20-A-3, 20-A-4, 20-A-5)
NOT TO SCALE



NOTES:
1. SILL DETAIL FOR WINDOWS AND LOUVERS ONLY
2. SEE FRAMED OPENING DETAILS, THIS SHEET, FOR FRAMED OPENINGS PROVIDED BY THE BUILDING MANUFACTURER

EXTERIOR HEAD, JAMB, AND SILL DETAIL FOR DOORS, WINDOWS, AND LOUVERS (9, 20-A-1, 20-A-3)
NOT TO SCALE



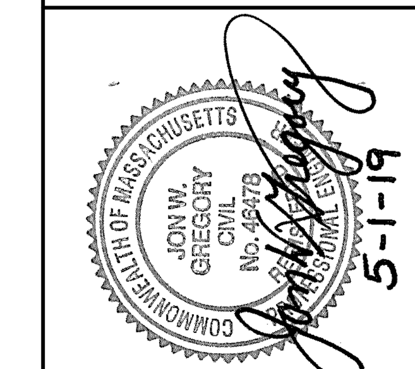
FRAMED OPENING DETAIL (10, 20-A-1, 20-A-3, 20-A-4)
NOT TO SCALE

TOWN OF BARNSTABLE, MASSACHUSETTS
MAHER FILTRATION PLANT

Drawn By: MVM | Designed By: MVM | Checked By: PBH/RPN | Approved By: JWG

ARCHITECTURAL
EXTERIOR DETAILS

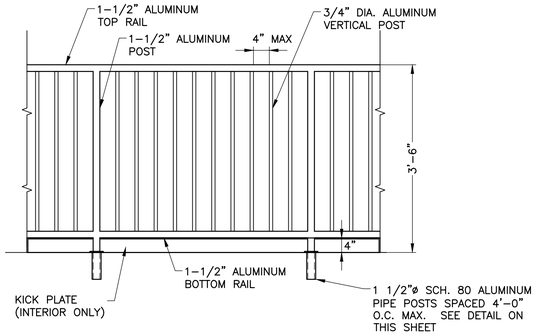
Rev.	Date	Description



TATA & HOWARD

T&H NO.:	5241
DATE:	MAY 2019
SCALE:	AS NOTED

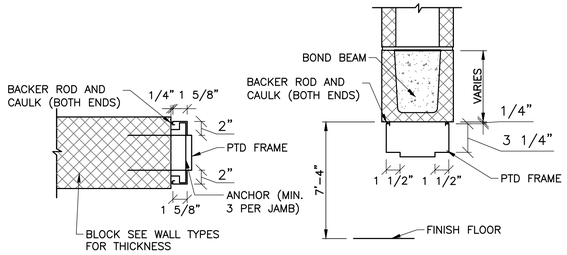
99-A-1



GUARDRAIL DETAIL

NOT TO SCALE

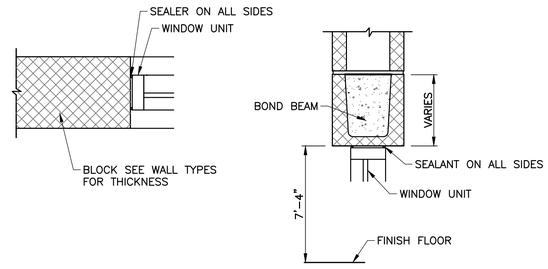
1 — 20-A-1, 20-A-3, 20-A-4, 20-A-5



INTERIOR DOOR DETAILS AT CMU WALL

NOT TO SCALE

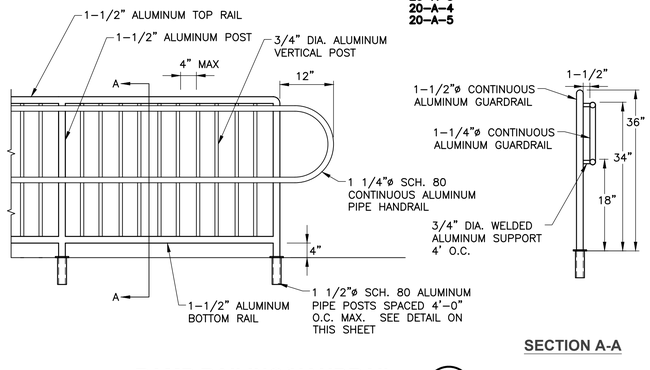
2 — 20-A-1, 20-A-5



INTERIOR WINDOW/LOUVER DETAILS AT CMU WALL

NOT TO SCALE

3 — 20-A-1, 20-A-4, 20-A-5

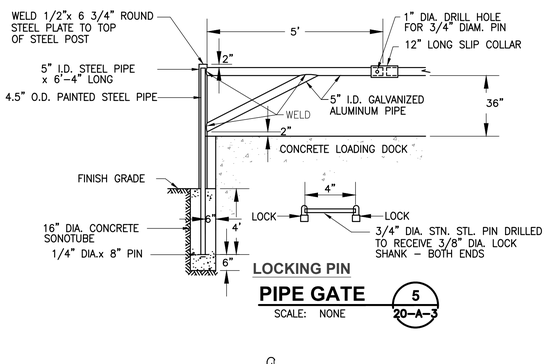


SECTION A-A

RAMP RAILING/HANDRAIL

NOT TO SCALE

4 — 20-A-1, 20-A-3

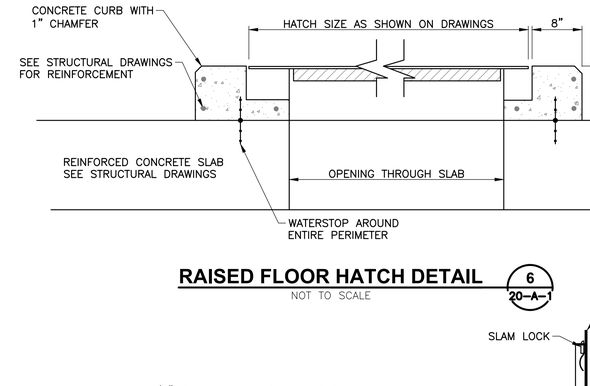


LOCKING PIN

PIPE GATE

SCALE: NONE

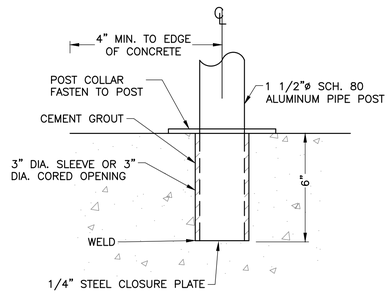
5 — 20-A-3



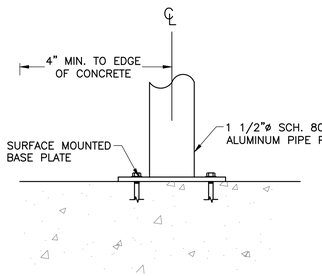
RAISED FLOOR HATCH DETAIL

NOT TO SCALE

6 — 20-A-1



EXTERIOR

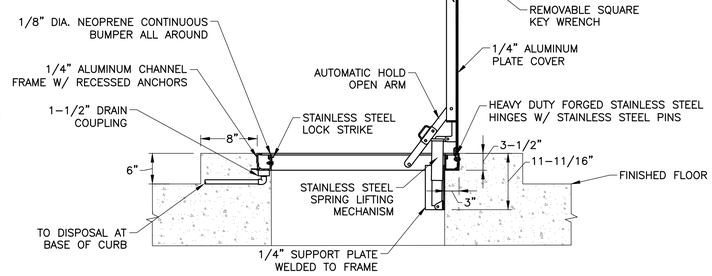


INTERIOR

PERMANENT GUARDRAIL POST ANCHOR

NOT TO SCALE

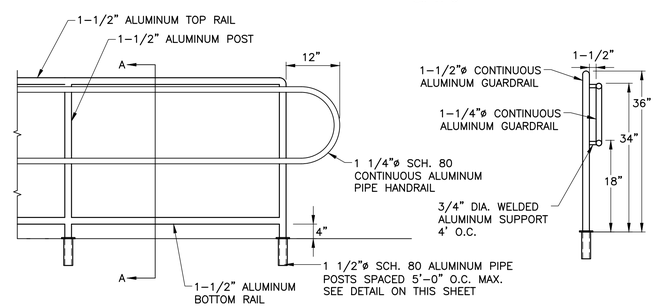
8 — 20-A-5



30" X 30" ALUMINUM FLOOR HATCH FOR SPENT WASHWATER TANK ACCESS

NOT TO SCALE

9 — 20-A-1

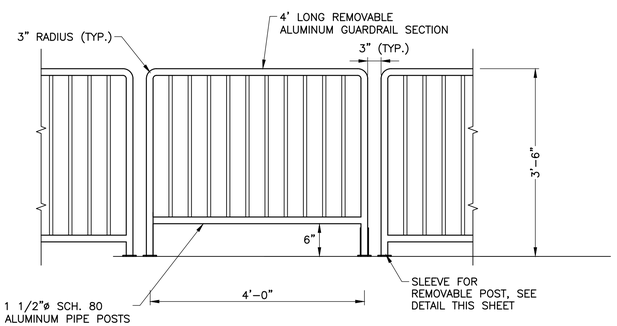


SECTION A-A

RAMP HANDRAIL

NOT TO SCALE

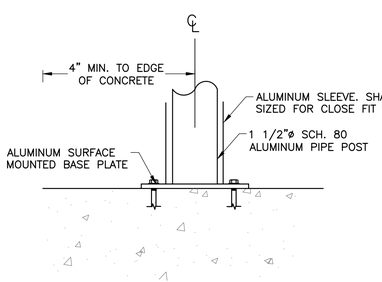
7 — 20-A-1



REMOVABLE ALUMINUM GUARDRAIL

SCALE: NONE

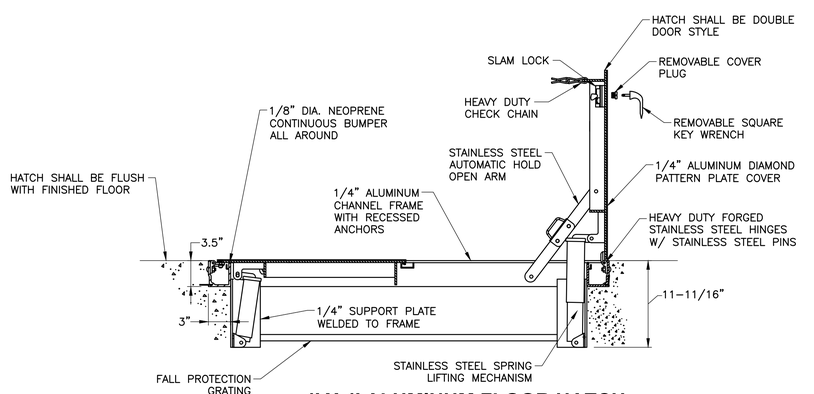
10 — 20-A-5



REMOVABLE GUARDRAIL POST ANCHOR

NOT TO SCALE

11 — 20-A-5



4' X 4' ALUMINUM FLOOR HATCH FOR PIPE GALLERY ACCESS

NOT TO SCALE

12 — 20-A-1

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

ARCHITECTURAL

INTERIOR AND EXTERIOR DETAILS

Drawn By: MVM
Designed By: MVM
Checked By: PBH/RPH
Approved By: JWG

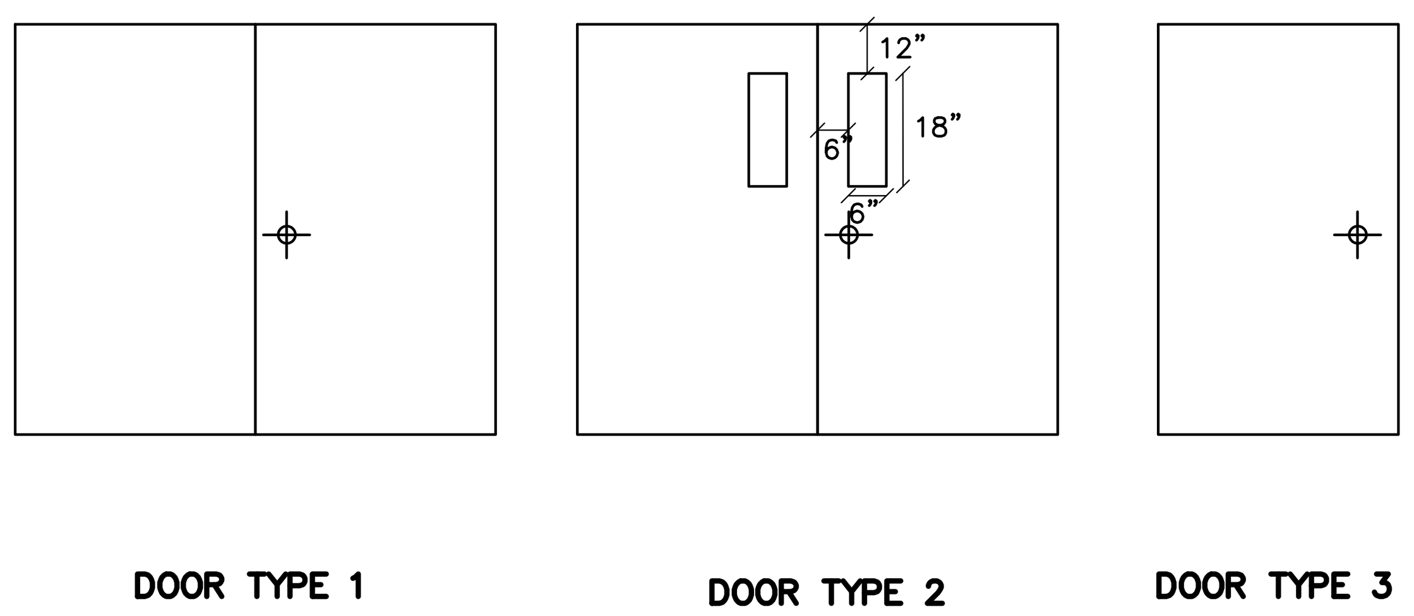
Description | Date | Rev.

COMMONWEALTH OF MASSACHUSETTS JON M. GREGORY CIVIL No. 34019 REGISTERED PROFESSIONAL ENGINEER 5-1-19

TATA & HOWARD

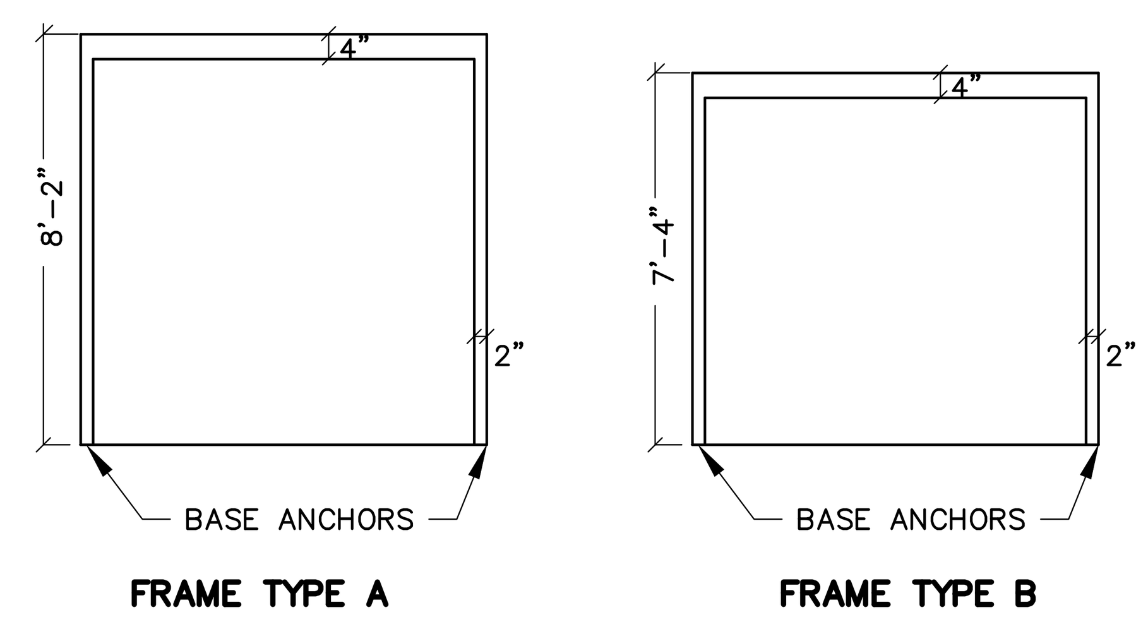
T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

99-A-2



HOLLOW METAL DOOR TYPES

SCALE: NONE



PRESSED METAL FRAMES

SCALE: NONE

D O O R S C H E D U L E

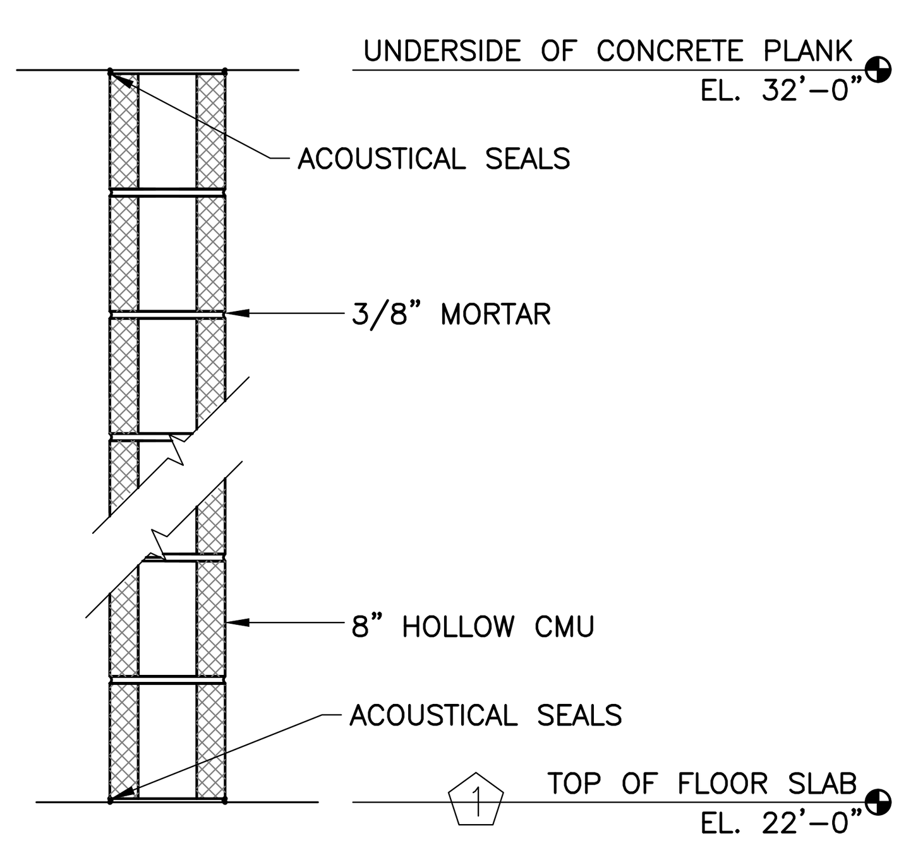
NO.	LOCATION	DOOR SIZE	DOOR TYPE	FRAME TYPE	HARDWARE	REMARKS
1	DOOR 101A – SOUTH EXTERIOR ENTRANCE OVERHEAD COILING DOOR	(1) 9'-0" X 10'-0" X 1"			PER DOOR MANUFACTURER	
1	DOOR 101B – WEST EXTERIOR ENTRANCE	(1) 2'-0" X 7'-10" X 1 3/4"	3	A	01	(SEE NOTE 1)
1	DOOR 101C – EAST EXTERIOR ENTRANCE	(1) 3'-0" X 7'-10" X 1 3/4" (1) 3'-0" X 7'-10" X 1 3/4"	1 1	A	02	
1	DOOR 102A – GENERATOR ROOM	(1) 3'-0" X 7'-10" X 1 3/4" (1) 3'-0" X 7'-10" X 1 3/4"	1 1	A	03	FIRE RATED
1	DOOR 103A – ELECTRICAL ROOM	(1) 3'-0" X 7'-10" X 1 3/4" (1) 3'-0" X 7'-10" X 1 3/4"	2 2	A	04	FIRE RATED
1	DOOR 201 – EXISTING FACILITY	(1) 1'-8" X 7'-0" X 1 3/4" (1) 2'-6" X 7'-0" X 1 3/4"	1 1	B	03	INCLUDED AS PART OF DEDUCTIBLE ALTERNATE ITEM NO. 1

NOTES:
1. ELECTRIC DOOR STRIKE AND HINGE TO BE FURNISHED UNDER SPECIFICATION SECTION 16720. CONTRACTOR SHALL MAKE PROVISIONS ON PASSIVE LEAF OF DOOR TO ACCOMODATE HARDWARE AND WIRING AS PER DETAIL IN APPENDIX G.

L O U V E R S C H E D U L E

LOUVER NO.	LOCATION	SIZE W.	SIZE H.	AIR FLOW CFM	AIR FLOW VELOCITY FPM	FREE AREA SQ. FEET	NOTES
L-1	WEST WALL	144"	96"	1	1	48	GENERATOR ROOM
L-2	SOUTH WALL	72"	96"	1	1	24	GENERATOR ROOM
L-3	SOUTH WALL	72"	96"	1	1	24	GENERATOR ROOM
L-4	NORTH WALL	24"	36"	1	1	6	PROCESS ROOM
L-5	SOUTH WALL	24"	36"	1	1	6	PROCESS ROOM

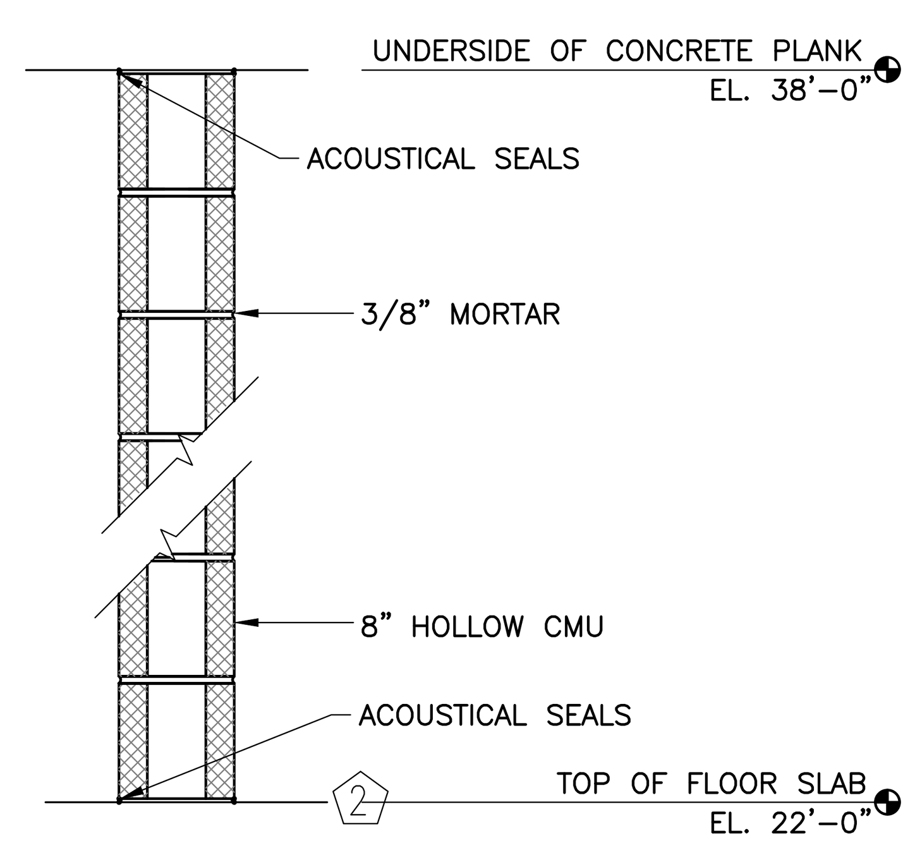
NOTES:
1. SEE HVAC DRAWINGS FOR LOUVER SIZING AND DETAILS



NOTES:
1. SEE STRUCTURAL DRAWINGS FOR REINFORCEMENT DETAILS

PARTITION TYPE 1

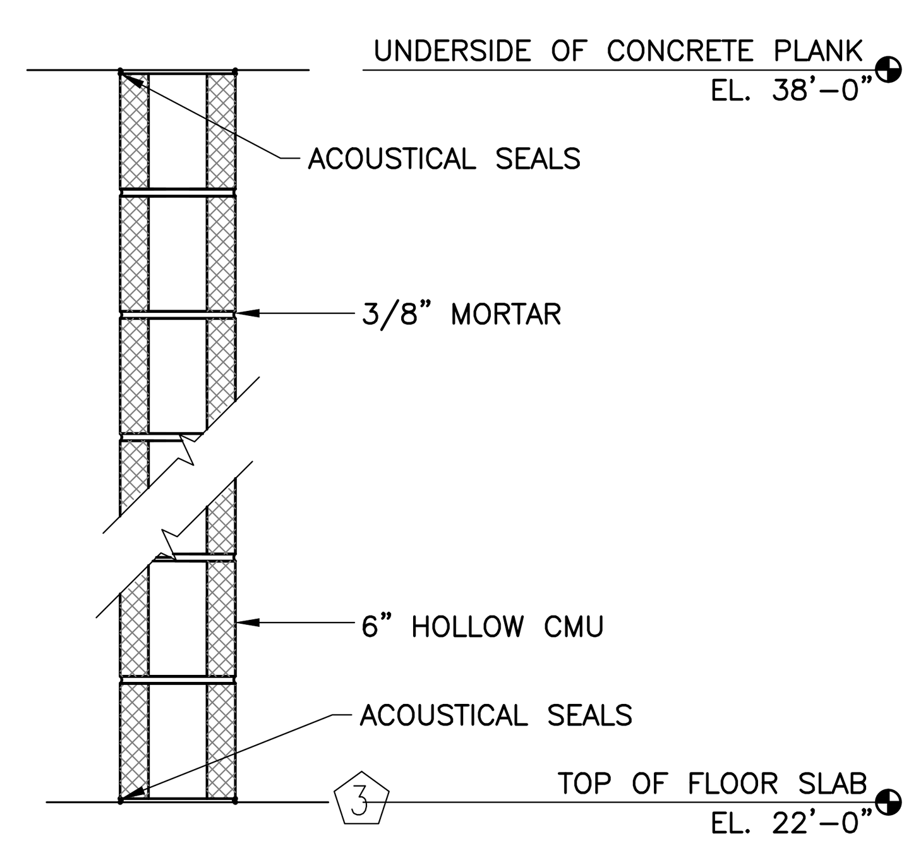
SCALE: NONE



NOTES:
1. SEE STRUCTURAL DRAWINGS FOR REINFORCEMENT DETAILS

PARTITION TYPE 2

SCALE: NONE



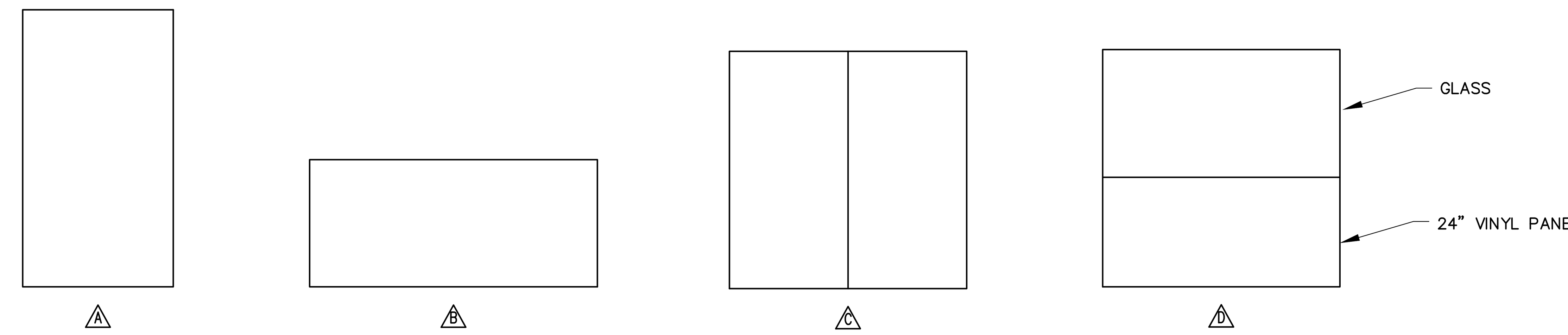
NOTES:
1. SEE STRUCTURAL DRAWINGS FOR REINFORCEMENT DETAILS

PARTITION TYPE 3

SCALE: NONE

R O O M F I N I S H S C H E D U L E

	LOCATION	FLOORS/ CURBS	BASE	WALLS NORTH	WALLS SOUTH	WALLS EAST	WALLS WEST	CEILINGS	DOORS/ FRAMES	REMARKS
101	PROCESS ROOM	CONCRETE W/ HARDENER		SHEET METAL LINER PANEL	SHEET METAL LINER PANEL	SHEET METAL LINER PANEL	SHEET METAL LINER PANEL	SHEET METAL LINER PANEL	PAINTED	
102	GENERATOR ROOM	CONCRETE W/ HARDENER		PAINTED CMU	PAINTED CMU	PAINTED CMU	PAINTED CMU	PRECAST CONC. PLANK	PAINTED	
103	ELECTRICAL ROOM	CONCRETE W/ HARDENER		PAINTED CMU	PAINTED CMU	PAINTED CMU	PAINTED CMU	PRECAST CONC. PLANK	PAINTED	
201	MEZZANINE	CONCRETE W/ HARDENER		N/A	N/A	N/A	N/A	SHEET METAL LINER PANEL	PAINTED	

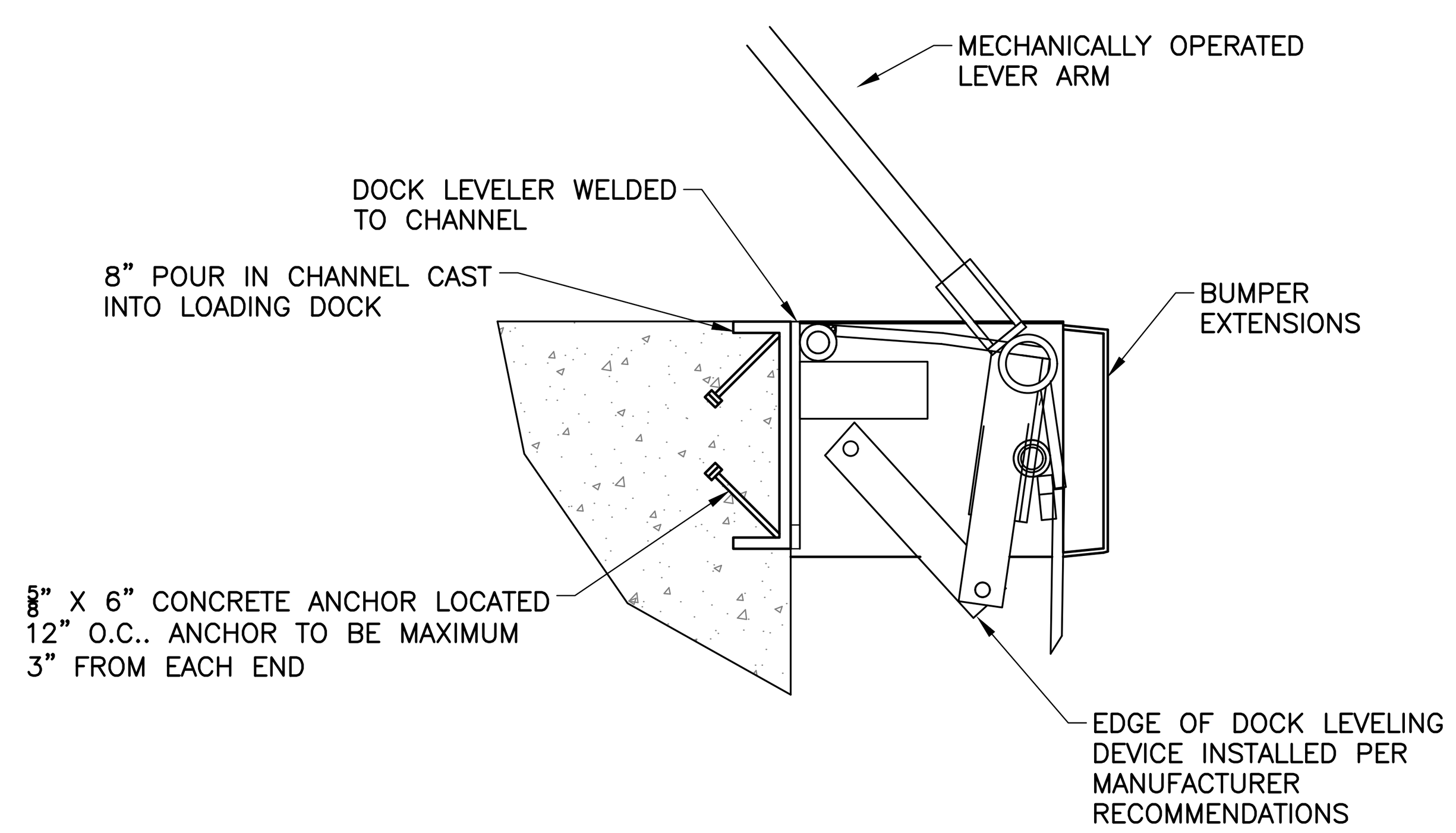


WINDOW TYPES

SCALE: NONE

W I N D O W S C H E D U L E

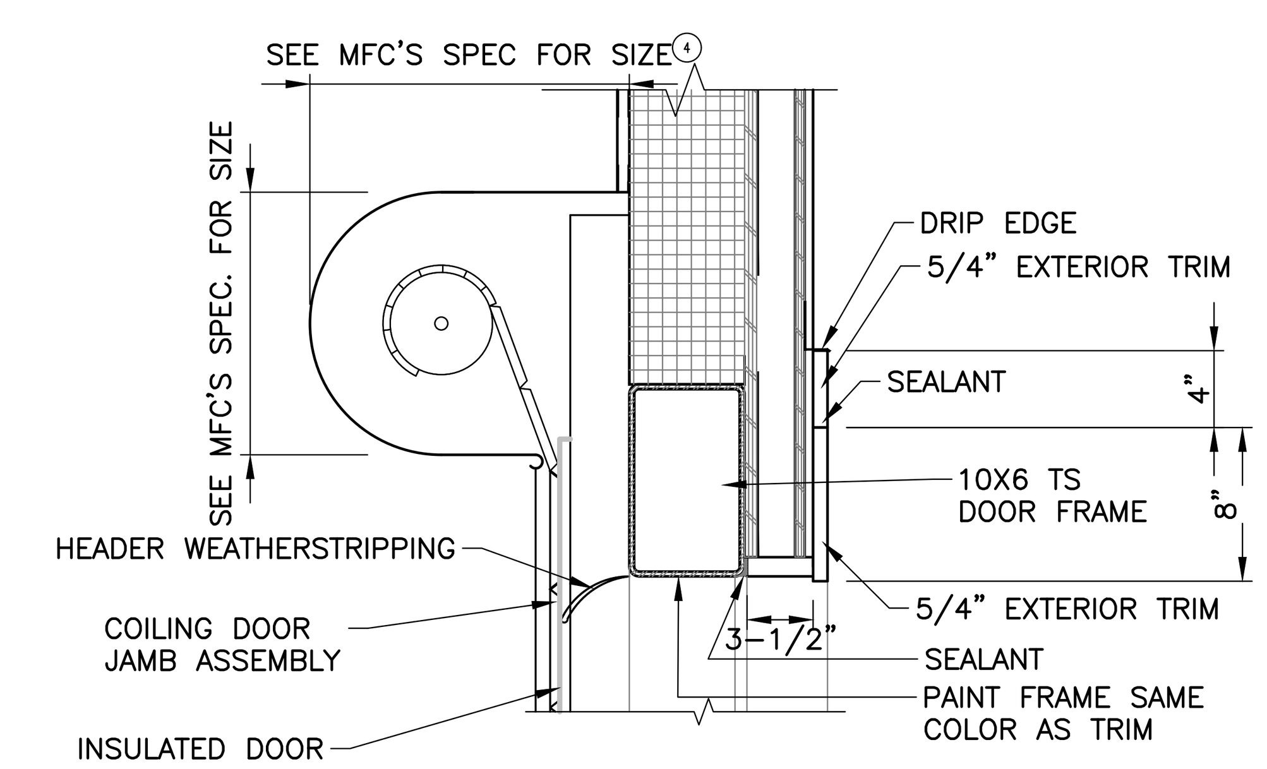
TYPE	DESCRIPTION	QTY	FRAME SIZE WIDTH	FRAME SIZE HEIGHT	ROUGH OPENING WIDTH	ROUGH OPENING HEIGHT	MANUFACTURER	STYLE	MODEL NO.	REMARKS
A	FIXED	3	3'-1 1/2"	5'-9"	3'-2"	5'-9 1/2"	EFCO OR EQUAL	FIXED	321X	
B	FIXED	8	7'-6"	3'-2"	7'-6 1/2"	3'-2 1/2"	EFCO OR EQUAL	FIXED	321X	
C	FIXED	1	4'-3 1/2"	4'-3 1/2"	4'-4"	4'-4"	EFCO OR EQUAL	FIXED	SEE SPEC.	FIXED, TWO PANELS, IN EXISTING WTP
D	FIXED ENCLOSURE	1	4'-3 1/2"	4'-3 1/2"	4'-4"	4'-4"	EFCO OR EQUAL	FIXED	SEE SPEC.	FIXED, IN EXISTING WTP



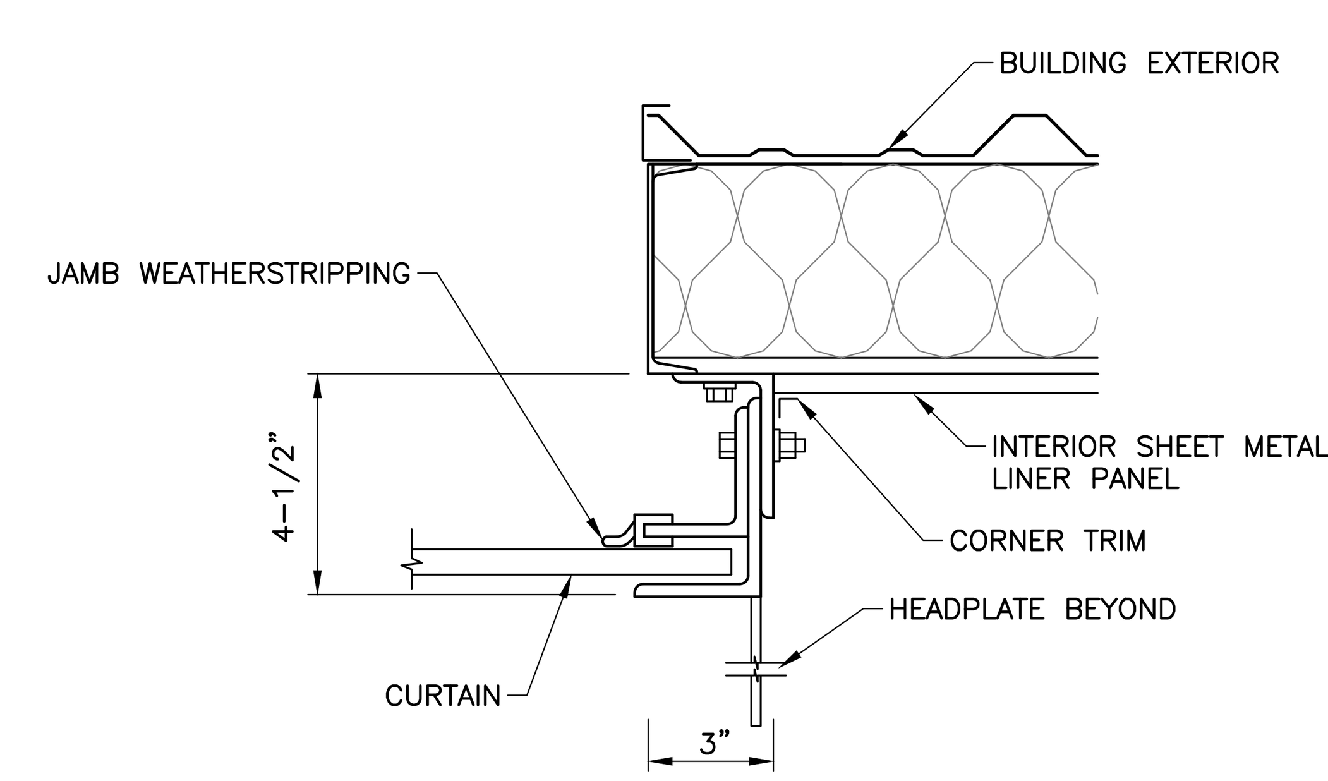
LOADING DOCK LEVELER

NOT TO SCALE

1 / 20-A-1 / 20-A-3



NOTE: G.C. TO COORDINATE FASTENING REQUIREMENTS FOR OVERHEAD DOOR HOOD WITH MFC.



OVERHEAD COILING DOOR

NOT TO SCALE

2 / 20-A-1 / 20-A-3 / 20-A-5

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: MVM | Designed By: MVM | Checked By: PBH/RPN | Approved By: JWG

ARCHITECTURAL

SCHEDULES AND DETAILS

Rev.	Date	Description

JON W. GREGORY CIVIL No. 32913 — 5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

99-A-3

GENERAL

1. Refer to the project specifications for general contract requirements for materials, workmanship, and shop drawings.
2. Refer to Architectural, Mechanical, Electrical drawings, and approved shop drawings for location and dimensions of chases, reglets, inserts, openings, sleeves, depressions, and requirements for attachment of finishes.
3. All dimensions shown on the structural drawings shall be field coordinated by the Contractor with the Architectural, Mechanical, and Electrical drawings and any inconsistencies reported to the Structural Engineer before proceeding with the affected work.
4. Contractor shall verify all dimensions and elevations in the field. Notify the Architect/Engineer immediately, in writing, of any field condition uncovered during construction that is not consistent with the plans, that is structurally inadequate, or that will impair Architectural layouts or attachment of finishes.
5. All construction work shall comply with the Massachusetts State Building Code (9th Edition) and IBC 2015 Building Code.
6. Work not indicated on a part of the drawings but reasonably implied to be similar to that shown at corresponding places, shall be included in the Contractor's work.
7. The Contractor shall be completely responsible for the safety of adjacent structures, property, his workmen, and the public, as affected by the construction of this project.
8. All Contractors are required to examine the drawings and specifications carefully, visit the site and fully inform themselves as to all existing conditions and limitations prior to agreeing to perform the work. Failure to visit the site and familiarize themselves with the existing conditions and limitations will in no way relieve the Contractor from furnishing any materials or performing any work in accordance with drawings and specifications without additional cost to the owner.

SHORING AND UNDERPINNING WORK

1. Protect adjacent foundations during excavation by sheet piling, bracing, shoring, etc., as required by field conditions. Do not undermine existing footings.

FOUNDATION BACKFILL AND DRAINAGE

1. All footings shall be carried down 6" into the undisturbed compacted structural fill or sand layer having a minimum bearing capacity of 3 kips per square foot.
2. Bearing material as well as footing elevations are based on available information described in Sanborn Head Geotechnical Report dated June 1, 2016. If upon excavation down to levels shown, acceptable bearing material is not encountered, the footing shall be lowered or increased in size at the direction of the Architect/Engineer. All loose sand pockets shall be removed and replaced with compacted structural fill.
3. Removal of existing fill materials: Remove all forest mat, subsoil and fill material down to the sand layer and install the compacted structural fill or crushed stone layer per the Geotechnical Report.
4. All engineered fills shall be compacted to 95% modified proctor density. The entire backfilling and compacting operations shall be witnessed by a field representative of the owner who is experienced and trained in supervising earthwork operations and conducting quality control field testing.
5. The Architect/Engineer assumes no responsibility for the validity of the subsurface conditions described on the drawings, borings, or test pits. These data are included only to assist the contractor during bidding and subsequent construction, and represent conditions only at those specific locations at the particular time they were made. Refer to the Geotechnical Report for all information regarding earthwork and the foundation bearing layer.
6. No footing shall be placed in water.
7. All exterior construction shall be carried down a minimum of 4'–6" below finished grade, unless otherwise shown on the plans.
8. All footing excavations shall be finished by hand.
9. All footing excavations shall be inspected by the Architect/Engineer before the footings are poured in order to confirm that the foundation material is adequate to sustain the design bearing pressure.
10. Material adjacent to and below footings shall be kept from freezing at all times. If material is found to be frozen it shall be removed and replaced with concrete. If any frozen material should be found below the slab on grade, it shall be removed and replaced with 95% compacted granular material.
11. Unless noted otherwise, all footings shall be centered in each direction under supported members.
12. All foundation walls, retaining walls, and grade beams shall be braced during the operations of backfilling and tamping. Bracing shall be left in position until the permanent restraints have been installed.
13. Install drainage system as shown on the mechanical drawings.
14. Contractor shall carry out continuous pumping of ground water until sufficient dead load has accumulated to prevent flotation of any part of the structure. Site dewatering method during construction shall be submitted to the Architect/Engineer for review.
15. Protect streets, sidewalks, and adjacent building foundations during excavation by sheet piling, bracing, shoring, etc., as required by field conditions. Excavations and shoring shall be inspected by a competent registered engineer employed by the contractor and protection against slides and cave–ins shall be increased if he deems necessary.
16. See architectural drawings and specifications for perimeter insulation.
17. Important Note: Soil bearing layer must be inspected by either the geotechnical or structural engineer prior to placement of the concrete mat.

CAST IN PLACE CONCRETE

1. All concrete work shall comply with the standard "Specifications for Structural Concrete Buildings" ACI 301 and the "Building Code Requirements for Reinforced Concrete" ACI 318 latest Editions.
2. All concrete shall have a 4,000 PSI minimum 28 day compressive strength. Maximum water cement ratio shall be 0.43. At mud mat use 3,000 PSI concrete.
3. Controlled concrete shall be used, proportioned, mixed, and placed under the supervision of an approved Concrete Control Engineer.
4. All slabs shall be placed to their full thickness without horizontal construction joints.
5. Construction joints at foundation walls, foundation mat, and slabs on grade shall be used as shown on the drawings. Coordinate construction joint locations with the structural engineer. Spacing of foundation wall construction joints shall not exceed 30'–0".
6. Slabs on grade shall be placed in rectangles not to exceed 2,500 square feet in area. Control joints shall be placed in the panels within 24 hours after casting. Foundation shall be placed in rectangles not exceeding 5,000 square feet.
7. Wherever sleeves are inserted in concrete slabs, beams, or walls they shall consist of galvanized steel or cast iron pipe.

REINFORCING

1. All reinforcing bar detailing shall be as specified in the American Concrete Institute "Manual of Standard Practice for Detailing Reinforced Concrete Structures" ACI 315, amended to date.
2. All reinforcing steel except as otherwise noted shall be ASTM A615 Billet Steel deformed bars, Grade 60.
3. All welded wire fabric shall conform to ASTM A185. Lap splices shall be 8" minimum, embed 4" minimum at end supports.
4. Where continuous bars are called for, indicated, or required they shall be run continuously around corners, doweled into intersecting walls, lapped at necessary splices, splices staggered wherever possible, and hooked at discontinuous ends. Laps shall be 60 diameters of the bar unless noted otherwise in the splice schedule on Drawing 20–S–2.
5. Unless noted otherwise, at all four sides of openings provide 2#5 at top and bottom in slabs, and 1#5 at each face in walls, all bars extending 2'–6" beyond opening or hooked if necessary. In wall and grade beams where opening is 4'–0" or over, opening faces shall be reinforced.
6. Provide and schedule with shop drawings all necessary accessories to hold the reinforcing securely and accurately in position. High chairs shall be spaced 4'–0" o.c. maximum and wired to bottom slab reinforcing. Support bars on high chairs shall be #5 minimum. Slab bolsters shall be spaced at 3'–0" O.C. maximum.
7. Clearance of main reinforcing bars from adjacent concrete surfaces shall be:
   A. Where unformed face of concrete is in contact with earth: 3".
   B. Where formed face of concrete is in contact with earth: 2", where exposed to water or weather: 2" for bar size larger than #5, $1\frac{1}{2}$" for #5 and smaller bars. At tank walls use 2" cover, minimum, for all rebars.
   C. The maximum allowable deviation from the figures above, when placing reinforcing in the forms shall be $\frac{1}{4}$" for concrete shapes 10" in depth or width.
   D. In slabs: 2" at surfaces exposed to liquid, $1\frac{1}{2}$" at other areas. At interior exposed faces of walls: $1\frac{1}{2}$".
8. All reinforcinging shall be approved by the Architect/Engineer. Do not cut or displace any reinforcing steel to accommodate the installation of mechanical or electrical embedded items without the expressed written approval of the Architect. Coordinate the installation of pipes and conduit in the slab with the placing of the reinforcing steel and mesh to ensure that the top bars and mesh are in their proper position at the top of the slab and are not cut or displaced by conduit or pipes.
9. Notify the Architect at least 24 hours in advance of any concreting so that he may inspect the arrangement of reinforcing steel. Cast no concrete until the inspection has been made or waived by the Architect.

STRUCTURAL STEEL

1. Structural steel design, materials, and workmanship shall conform to the requirements of AISC "Specification for the Design, Fabrication, and Erection of Structural Steel Buildings", latest edition.
2. Structural steel shall be new structural carbon steel conforming to the following ASTM designation:
   A. ASTM A572 Grade 50 or ASTM A992 for rolled shapes except ASTM A36 for channels, angles, and plates.
   B. ASTM A53 for steel pipes.
   C. ASTM A500 Grade B for cold formed steel tubing.
3. All shop and field connections shall be by welding or high strength bolts.
4. Structural steel sections and details not specifically shown shall be similar to those shown for similar situations as determined by the Architect/Engineer.
5. All bolted connections shall be high strength conforming to:
   A. ASTM A325N bolts for all steel to steel connections except A325 for slip critical connections. Use 3/4" or 7/8" diameter bolts, unless noted otherwise.
   B. A307 bolts for anchor bolts. Bolts and nuts shall be hot dipped galvanized per ASTM A153. Bolts and nuts must be treated as an assembly.
   C. The minimum number of bolts per connection shall be two.
6. A325 bolts shall be installed with the bolt tension specified in "Specifications for Structural Joints using ASTM A325 or ASTM A490 Bolts".
7. Hot dip galvanize all structural steel columns, beams, lintels, hardware, miscellaneous metal, and connections after fabrication in accordance with ASTM A123.
8. Provide spray on and/or gypsum wallboard to achieve the required fire rating.
9. The Engineer shall review for approval the size, location, and method of cutting penetrations in structural steel members for all trades.
10. All welding will be inspected by a qualified testing agency retained by the owner. Cooperate fully with the testing agency to repair all defective welds.
11. The Contractor shall check prior to the erection of structural steel the level and location of all bearing surface and anchor bolts, and any deficiencies shall be corrected by the General Contractor to the satisfaction of the Structural Steel Contractor.
12. Submit for Architect/Engineer approval complete shop drawings for all structural steel, steel joists, steel roof decking, and steel floor decking.
13. Field welding at galvanized steel: remove galvanized coating prior to welding. After welding is complete, apply two (2) coats of zinc compound.

CARPENTRY

1. All wood members to be used for new framing shall be new material as specified in the following notes or in the specifications.
2. All new lumber and plywood must have a grade stamp from the associations having jurisdiction which indicates specie, mill number. moisture content when surfaced, and grade or stress rating.
3. Lumber materials:
   A. Lumber grading rules: NFPA or WWPA
   B. Framing Members for supporting roof: SPF #2 15 percent maximum moisture content. Minimum beqring length of joists on wood ledgers shall be $1\frac{1}{2}$ inches.
   C. All lumber in contact with concrete or exterior masonry shall be pressure treated in accordance with current American Wood Preservers Association (AWPA) Standards. The retention shall be 0.40 lbs per cubic foot.
4. Plywood sheathing shall be APA rated $\frac{3}{4}$" tongue–in–groove interior type with exterior glue, underlayment grade glued–nailed to the roof framing system with 8d nails @ 4" o.c. at panel edges, 12" o.c. at intermediate framing at the roof framing system.
5. All new member to member connections shall be joist or beam hangers; lag bolted or thru–bolted connections shall be used where indicated on the drawings. All connector items shall be used in accordance with the Timber Construction Manual (AITC), latest edition recommendations.
6. Refer to the Massachusetts State Building Code nailing schedule for nailing and bolting not otherwise specified on the drawings.
7. All re–framing shall be inspected and approved by the architect/engineer or his designate prior to applying new finishes.

MASONRY

1. Masonry walls shall be 8"or 6" nominal thickness.
2. Concrete masonry units shall have a minimum compressive strength of 3,000 PSI on the net area, and grout strength shall be at least equal to the CMU strength. Masonry design strength: f'm = 2,100 PSI.
3. Mortar shall be Type S high strength mortar conforming to ASTM C270–886.
4. All exterior reinforced masonry walls shall have #6@2'–0"o.c. minimum vertical reinforcing. Provide 2#6 vertical each side of each wall opening, at each corner, and at ends of walls unless noted otherwise. Provide 2#5 horizontal continuous reinforcing rods at 4'–0" o.c. vertical spacing above foundation wall. Add 2#5 horizontal reinforcing at window sills and louver openings. Extend 2'–6" beyond opening.
5. All interior reinforced masonry walls shall have #5@2'–8"o.c. minimum vertical reinforcing. Provide 2#5 vertical each side of each wall opening, at each corner, and at ends of walls unless noted otherwise. Provide 2#5 horizontal continuous reinforcing rods at 4'–0" o.c. vertical spacing above foundation wall. Add 2#5 horizontal reinforcing at window sills and louver openings. Extend 2'–6" beyond opening.
6. All reinforced masonry walls shall have #9 gauge wire ladders (Ladur type) at 16" o.c. minimum horizontal reinforcement.
7. Grout all walls solid. "Solid" indicates that all slots and cells shall be filled. Filling cores with mortar shall not be acceptable and special care shall be taken to keep cores free of mortar droppings. The top two courses below each floor level and roof shall be filled continuously with grout.
8. Grout shall be placed using high or low lift grouting procedure per NCMA recommendations.
9. Provide hollow load bearing concrete masonry units conforming to ASTM C90, Type 1, and moisture controlled units.
   A. Size: Provide units with nominal 8" high x 16" long face dimensions (7 5/8" x 15 5/8" actual), unless indicated otherwise. Provide thickness indicated, or if not indicated, as necessary to create a properly supported, structurally safe wall built within the height to width limitations required by codes and recommended by the National Concrete Masonry Association.
   B. Shapes: Provide special shaped units for lintels, corners, jambs, and headers, control joints and other conditions. Never expose cores. Provide round corner edge at exposed corners.
   C. Weight: Provide normal weight units.

PRECAST PLANKS

1. All precast and/or prestressed concrete work shall conform to the building code requirements for reinforced concrete: ACI 318 and the PCI manual for quality control of precast prestressed concrete, Manual 116, latest editions.
2. All hollow core floor panels shall have a 5,000 PSI minimum 28 day compressive strength.
3. Dimensional tolerance shall be in accordance with the recommended values by the Precast Concrete Institute.
4. Drypack shall have a minimum compressive strength of 5,000 PSI and shall have a non–metallic aggregate.
5. Bearing strips or pads shall be plastic as shown on the drawings.
6. Grout shall be non–shrink high strength non–metallic type grout and shall have a minimum compressive strength of 5,000 PSI.
7. All structural steel shapes and plates used for precast connections shall conform to ASTM A36. All steel shapes and plates at precast concrete connections shall be galvanized. At welding area, grind as required before welding and provide two (2) coats of ZRC (cold galvanizing paint) after connection is completed.
8. All inserts, plates, straps, anchors, etc., shall be provided with the variuos precast elements as called for on the drawings.
9. Any deviation from the construction details shown on the drawings or inserts supplied by the precast manufacturer shall be submitted to the Engineer for approval prior to fabrication.
10. Shop drawings shall be submitted for approval for conformity of all layout and detailing as shown on the drawings prior to fabrication.
11. Precast manufacturer shall coordinate openings for ducts, piping, chases, blockouts, etc., with the Architectural and Mechanical drawings.
12. Shore all steel beams and/or angles carrying plank only on one side until plank is grouted in place.
13. Submit complete calculations and shop drawings of all precast units for approval prior to fabrications. Include all inserts, openings, and sleeves required by Mechanical trades.
14. All sleeves placed in concrete members used for structural members connections shall be made of corrugated metal and shall be galvanized.
15. The Contractor shall coordinate with the precast manufacturer all connections between structural steel, cast in place concrete, and precast concrete members.
16. Provide smooth uniform masonry bearing surfaces for all precast units.
17. Replace at no cost to the owner any chipped, cracked or defective units, including all units manufactured beyond the size and camber tolerance stipulated in MNL–116, latest edition.
18. Correct differential camber between adjacent units which remain after grouting by grinding or approved leveling compounds.

MASONRY LOOSE LINTELS

1. Unless otherwise indicated on the drawings, provide one angle for each 4" of masonry thickness for all masonry openings in accordance with the following schedule:

MAXIMUM MASONRY OPENING	INTERIOR	EXTERIOR
UP TO 4'–0"	L4x3 1/2x1/4	L4x3 1/2x5/16
4'–1" TO 6'–0"	L5x3 1/2x1/4	L5x3 1/2x5/16
6'–1" TO 8'–0"	L6x3 1/2x3/8	L6x3 1/2x3/8

2. All exterior lintels shall be galvanized.
3. Lintels shall be 12" longer than masonry openings.
4. Angle long leg shall be vertical.
5. All lintels in pairs shall be welded or bolted together at 2'–0" o.c.

ROOF TRUSSES NOTES

1. See General Notes for project requirements.
2. Truss spacing shall be 2'–0" o.c. maximum.
3. Truss manufacturer shall design and detail all trusses and submit calculations and shop drawings for approval. Truss design shall comply with the "Design Specification for Light Gage Metal Plate Connectors with Wood Trusses".
4. Design loads shall be as follows:
   Top Chord:
   A. Snow/Live Load = 60 PSF + Snowdrift
   B. Dead Load = 10 PSF + Truss Weight
   Bottom Chord:
   A. Live Load = 10 PSF or 150 lb. Concentrated Load.
   B. Dead Load = 10 PSF + MEP loads per project requirements
   Wind Loads:
   A. Net Uplift = 20 PSF
5. Provide web braces as required by design. Coordinate with mechanical requirements.
6. Double trusses shall be nailed together with (2) 12d nails at 12" o.c.
7. Provide 2x4 wood blocking at all bottom chords at 8'–0" o.c., maximum. Provide horizontal truss at bottom chord elevation at locations shown in plan.

DESIGN LOADS

Design Code . . . . Massachuestts State Building Code, (9th Edition), and IBC 2015
Wind Load
   Basic Wind Speed (3 sec gust). . . . . 110 MPH
   Wind Importance Factor (Iw). 1.100
   Wind Exposure. C
   Internal Pressure Coefficient (GCPi). . . . . . . +0.18/–0.18
Live Load
   Slab on Grade . . . . 250 PSF
   First Fl Slab/Process Area. . . . . 150 PSF (RTD Units 9,000 lbs each)
   Mezzanine . . . . 100 PSF
Ground Snow Load. . . . . 55 PSF
Mechanical Equipment . . . . See Mechanical Dwgs
Seismic Load
   Seismic Importance Factor (Ie) 1.150
   Site Class. . . . . D
   Mapped Sprectral Response Acceleration. . . . Ss = 0.25g S1 = 0.067g
   Sprectral Response Coefficients . . . . Sms = 0.40g Sds = 0.267g Sd1 = 0.107g
   Seismic Design Category. . . . . B
   Basic Force Resisting Systems Used. . . . . . Intermediate Reinforced Masonry Shear Walls R = 4
   Site Coefficient. . . . . Fa = 1.6 and Fv = 2.4

MISCELLANEOUS

1. Wherever sleeves are inserted in concrete slabs, beams, or walls, they shall consist of galvanized steel or cast iron pipe.
2. Contractor shall carry out continuous pumping of ground water until sufficient dead load has accumulated to prevent floatation of any part of the structure.
3. Contractor shall verify all dimensions on the job.
4. Furnish and place all supports, temporary and permanent, shoring, bracing, needling, or sheet piling necessary to brace existing walls to remain, and party walls, so that no horizontal or vertical settlement occurs to these walls.
5. All compacted fill under slab on grade shall be compacted to a minimum density of 95%.
6. All trenches dug in earth basement slabs for grade beams shall be lined completely with a 1" lean concrete mix to stabilize the bottom and sloping sides.

CONDUITS AND PVC PIPES EMBEDDED IN CONC SLABS

1. Minimum conduit spacing shall be (three) 3 diameters on center.
2. Minimum distance from the top of slab to top of pipe shall be 4 inches; and from bottom of slab to underside of pipe, 4 inches.
3. At pipes parallel to bearing walls or beams, the minimum clear distance from the face of wall or beam to face of pipe shall be 18 inches.

TOWN OF BARNSTABLE MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: RC | Designed By: RH | Checked By: RH | Approved By: RH

STRUCTURAL

GENERAL NOTES

Rev. | Date | Description

May 1, 2019

5-1-19

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TATA & HOWARD

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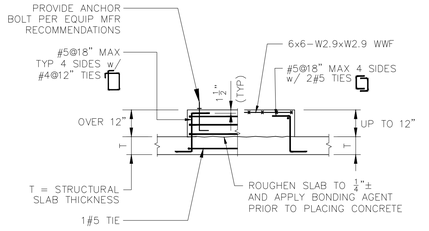
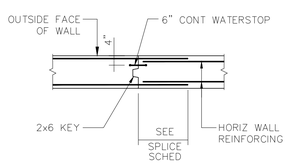
20-S-1

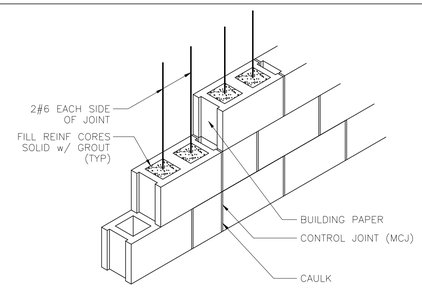


TYPICAL SECTION @ EQUIPMENT PAD – FOR SIZE & LOCATION SEE MECHANICAL DRAWINGS

TYPICAL DETAIL AT CONCRETE PADS

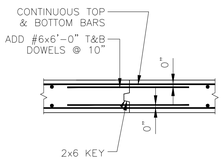


TYPICAL VERTICAL WALL CONSTRUCTION JOINT

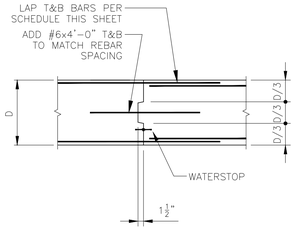


NOTE: INTERRUPT HORIZ REINF AT CONTROL JOINTS.

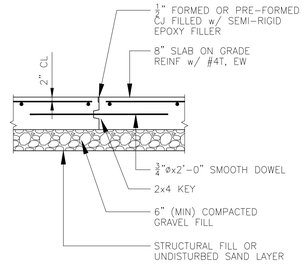
MICHIGAN TYPE MASONRY CONTROL JT DETAIL



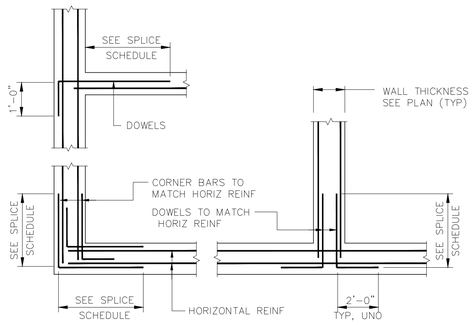
TYPICAL MAIN FLOOR SLAB CONSTRUCTION JOINT



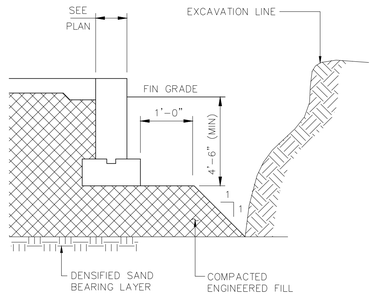
TYPICAL LOWER LEVEL MAT CONSTRUCTION JOINT



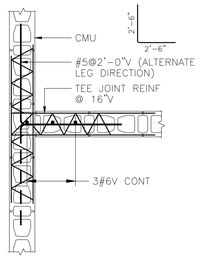
TYPICAL SLAB ON GRADE CONSTRUCTION JOINT



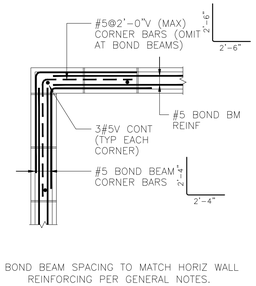
TYPICAL HORIZONTAL WALL REINF DETAILS



FOUNDATION BEARING DETAIL at ENGINEERED FILL

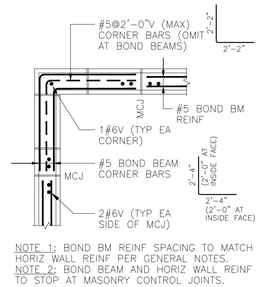


MASONRY WALL INTERSECTIONS



BOND BEAM SPACING TO MATCH HORIZ WALL REINFORCING PER GENERAL NOTES.

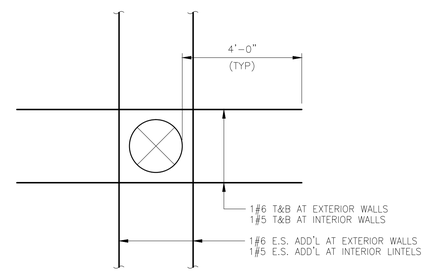
INTERIOR BOND BEAM CORNERS



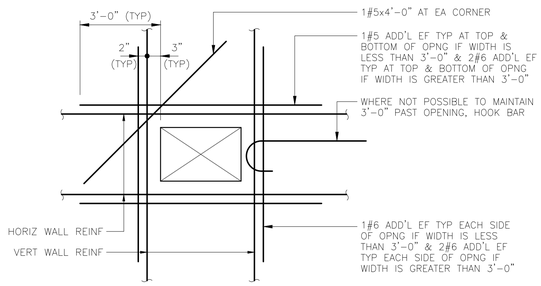
NOTE 1: BOND BM REINF SPACING TO MATCH HORIZ WALL REINF PER GENERAL NOTES.
NOTE 2: BOND BEAM AND HORIZ WALL REINF TO STOP AT MASONRY CONTROL JOINTS.

EXTERIOR BOND BEAM CORNERS

TYPICAL MASONRY WALL DETAILS

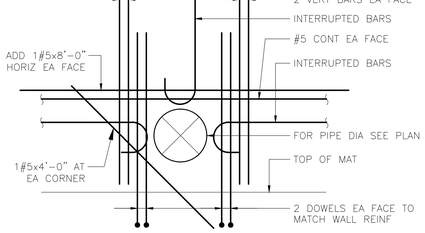


CMU WALL REINF DETAIL AT SLEEVE OPENINGS LARGER THAN 8" DIA



NOTE: EXTEND REINFORCING BARS 3'-0" MINIMUM BEYOND OPENING INTO WALL, PROVIDE STANDARD BEND & TURN BARS VERTICALLY AT WALL CORNERS AND/OR COLUMNS.

TYPICAL CONC WALL OPNG REINF DETAIL



CONC WALL REINF DETAIL AT SLEEVE OPENINGS LARGER THAN 8" DIA

UPTURNED KEY DETAIL

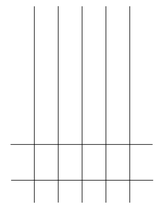
HATCH CURB DETAIL

CONCRETE REINFORCING SPLICE SCHEDULE

LAP SPLICE	TENSION LAP SPLICE			
CONCRETE	f'c = 3,000 PSI		f'c = 4,000 PSI	
BAR SIZE	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS
#3	28"	21"	24"	19"
#4	37"	29"	32"	25"
#5	46"	36"	40"	31"
#6	56"	43"	48"	38"
#7	81"	63"	70"	53"
#8	93"	72"	79"	61"

NOTES:

1. ALL SPLICES ARE LAP SPLICES UNLESS NOTED OTHERWISE IN SECTIONS.
2. A TOP BAR IS HORIZONTAL WITH AT LEAST 12" OF FRESH CONCRETE BELOW.



TOWN OF BARNSTABLE
MASSACHUSETTS

MAHER FILTRATION PLANT

STRUCTURAL

TYPICAL DETAILS

Approved By: RH
Checked By: RH
Designed By: RH
Drawn By: RC

Description | Date | Rev.

COMMONWEALTH OF MASSACHUSETTS
ROGER HOBEIKA
STRUCTURAL
No. 29509
REGISTERED
PROFESSIONAL ENGINEER

May 1, 2019

COMMONWEALTH OF MASSACHUSETTS
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5-1-19

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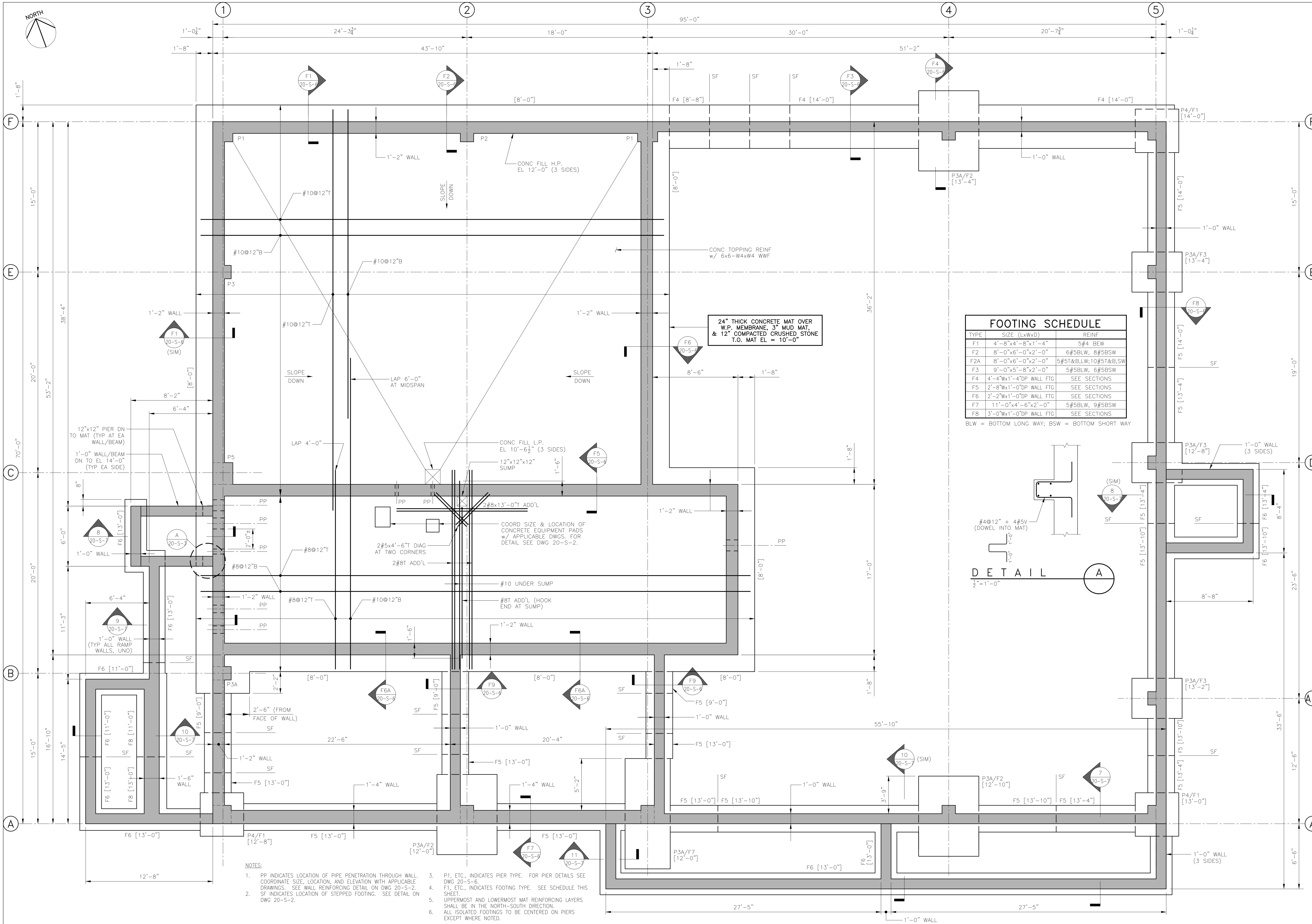
TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-S-2



FOOTING SCHEDULE

TYPE	SIZE (LxWxD)	REINF
F1	4'-8"x4'-8"x1'-4"	5#4 BEW
F2	8'-0"x6'-0"x2'-0"	6#5BLW, 8#5BSW
F2A	8'-0"x6'-0"x2'-0"	5#5T&B,LW;10#5T&B,SW
F3	9'-0"x5'-8"x2'-0"	5#5BLW, 6#5BSW
F4	4'-4"Wx1'-4"DP WALL FTG	SEE SECTIONS
F5	2'-8"Wx1'-0"DP WALL FTG	SEE SECTIONS
F6	2'-2"Wx1'-0"DP WALL FTG	SEE SECTIONS
F7	11'-0"x4'-6"x2'-0"	5#5BLW, 9#5BSW
F8	3'-0"Wx1'-0"DP WALL FTG	SEE SECTIONS

BLW = BOTTOM LONG WAY; BSW = BOTTOM SHORT WAY

NOTES:

1. PP INDICATES LOCATION OF PIPE PENETRATION THROUGH WALL. COORDINATE SIZE, LOCATION, AND ELEVATION WITH APPLICABLE DRAWINGS. SEE WALL REINFORCING DETAIL ON DWG 20-S-2.
2. SF INDICATES LOCATION OF STEPPED FOOTING. SEE DETAIL ON DWG 20-S-2.
3. P1, ETC., INDICATES PIER TYPE. FOR PIER DETAILS SEE DWG 20-S-6.
4. F1, ETC., INDICATES FOOTING TYPE. SEE SCHEDULE THIS SHEET.
5. UPPERMOST AND LOWERMOST MAT REINFORCING LAYERS SHALL BE IN THE NORTH-SOUTH DIRECTION.
6. ALL ISOLATED FOOTINGS TO BE CENTERED ON PIERS EXCEPT WHERE NOTED.

TOWN OF BARNSTABLE
MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: RC Designed By: RH Checked By: RH Approved By: RH

STRUCTURAL

FOUNDATION PLAN

Rev	Date	Description

May 1, 2019

5-1-19

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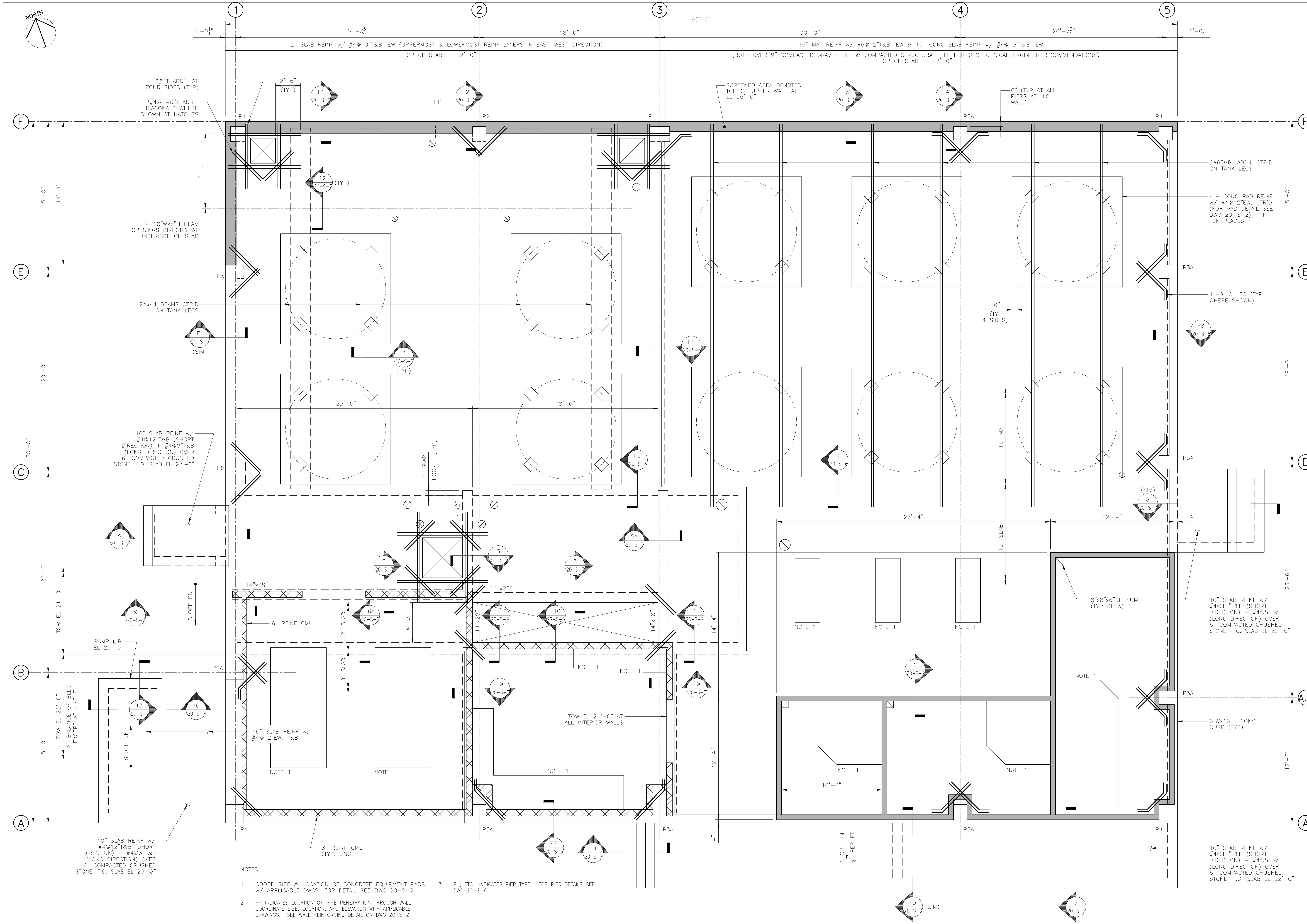
TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-S-3



NOTES:

1. COORD SIZE & LOCATION OF CONCRETE EQUIPMENT PADS w/ APPLICABLE DWGS. FOR DETAIL SEE DWG 20-S-2.
2. PP INDICATES LOCATION OF PIPE PENETRATION THROUGH WALL. COORDINATE SIZE, LOCATION, AND ELEVATION WITH APPLICABLE DRAWINGS. SEE WALL REINFORCING DETAIL ON DWG 20-S-2.
3. P1, ETC., INDICATES PIER TYPE. FOR PIER DETAILS SEE DWG 20-S-6.

TOWN OF BARNSTABLE
MASSACHUSETTS

MAHER FILTRATION PLANT

STRUCTURAL

FIRST FLOOR SLAB PLAN

Drawn By: RC | Designed By: RH | Checked By: RH | Approved By: RH

Rev | Date | Description

May 1, 2019

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TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
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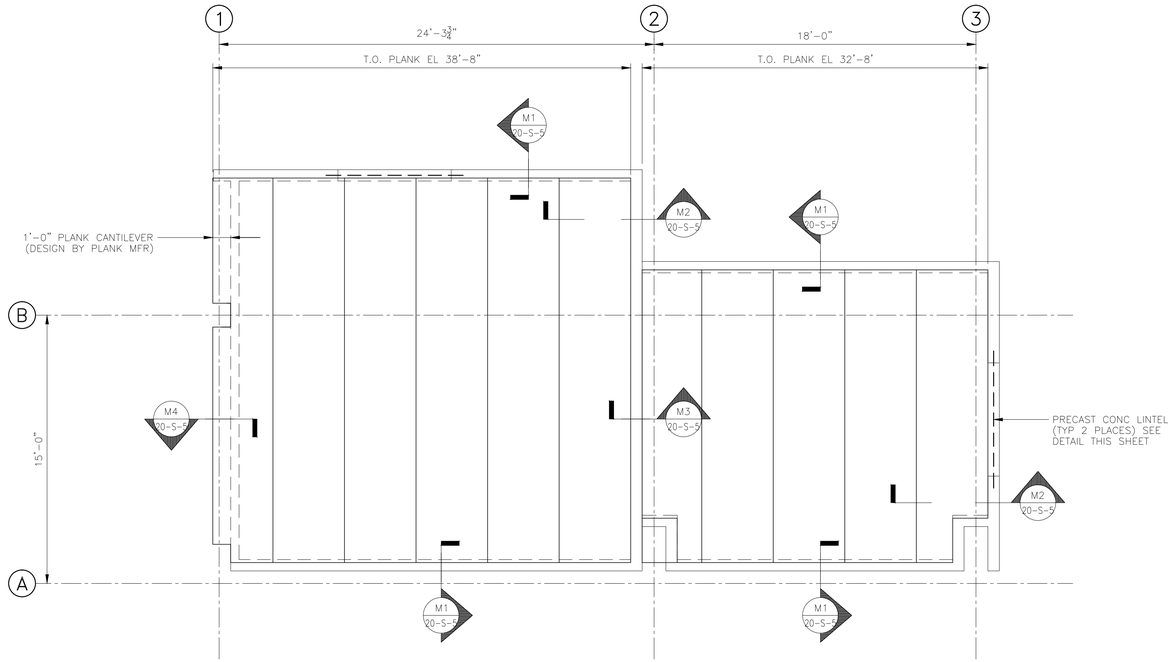
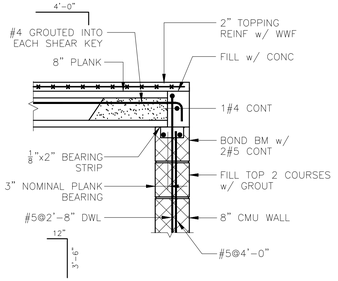
20-S-4



FLOOR cONSTRUCTION: 2" CONCRETE TOPPING REINF w/ 6x6-W4xW4 WWF OVER 8" PRECAST, PRESTRESSED HOLLOW CORE PLANKS.

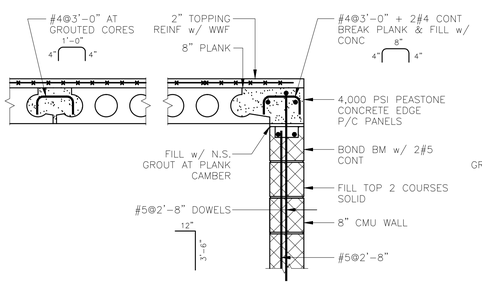
MEZZANINE FRAMING PLAN

¼"=1'-0"



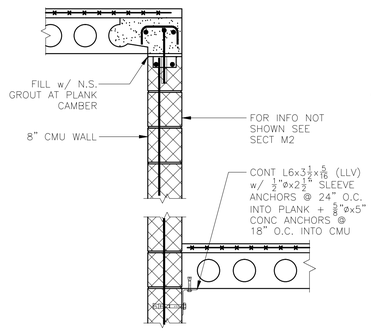
S E C T I O N M1

¾"=1'-0" S-5



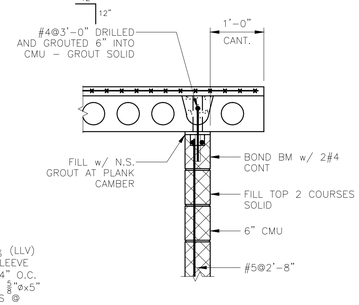
S E C T I O N M2

¾"=1'-0" S-5



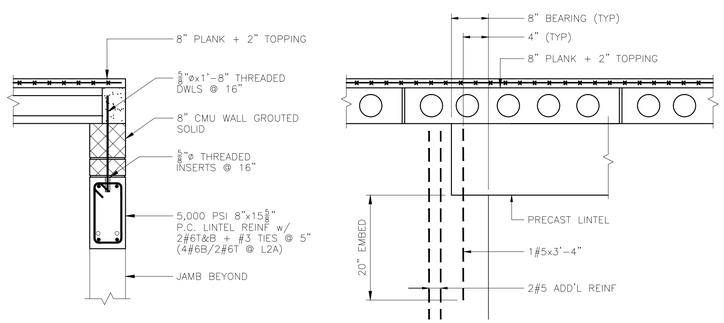
S E C T I O N M3

¾"=1'-0" S-5



S E C T I O N M4

¾"=1'-0" S-5



PRECAST LINTEL DETAIL

¾"=1'-0"

TOWN OF BARNSTABLE
MASSACHUSETTS

MAHER FILTRATION PLANT

STRUCTURAL

MEZZANINE FRAMING PLAN AND SECTIONS

Drawn By: RC
Designed By: RH
Checked By: RH
Approved By: RH

Rev.	Date	Description

COMMONWEALTH OF MASSACHUSETTS
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TATA & HOWARD

T&H NO.: 5241
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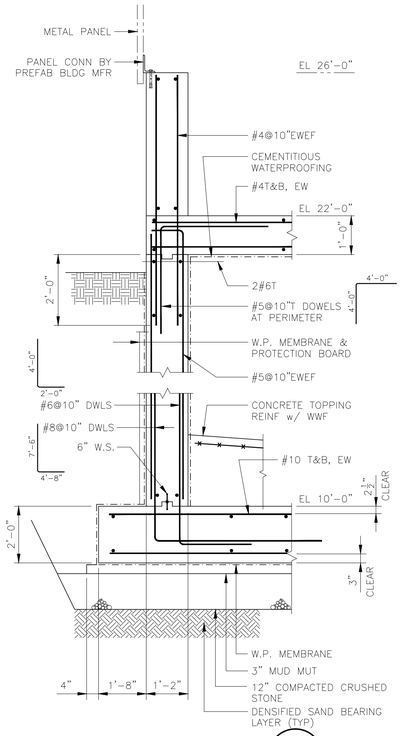
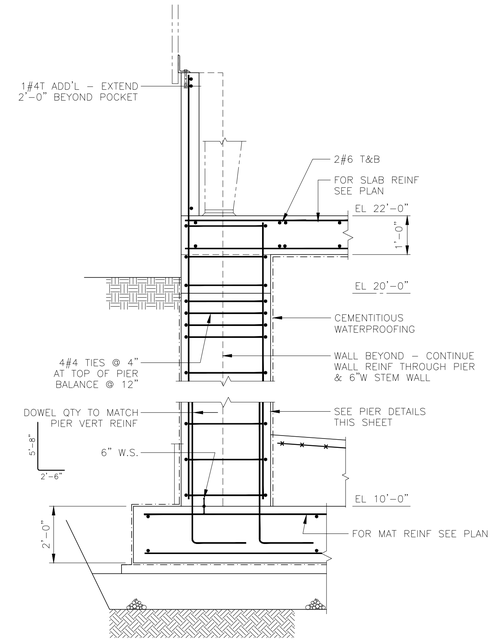
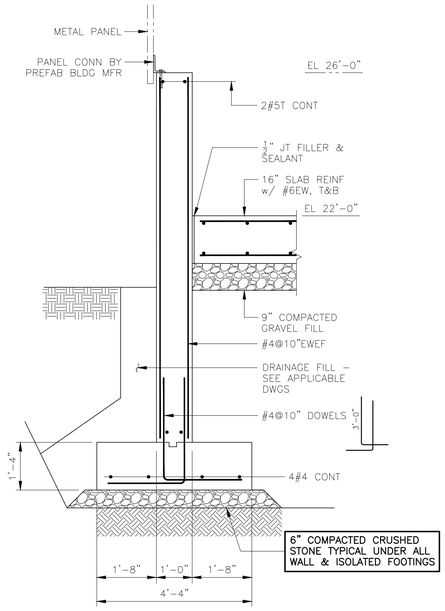
20-S-5



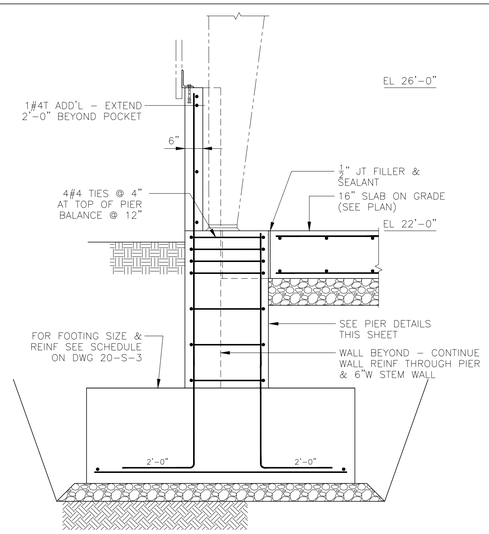
SECTION F1 (S-3) S-4
1"=1'-0"



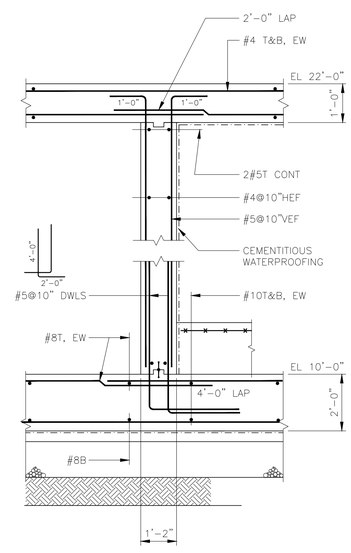
SECTION F2 (S-3) S-4
½"=1'-0"



SECTION F3 (S-3) S-4
½"=1'-0"

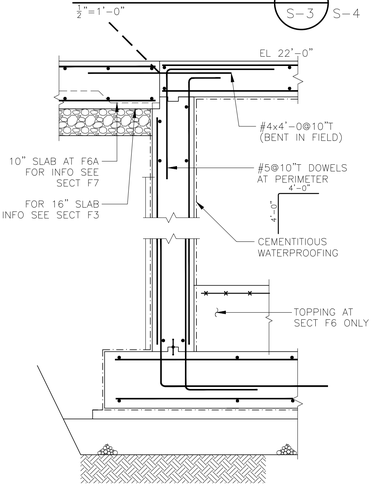


SECTION F4 (S-3) S-4
½"=1'-0"



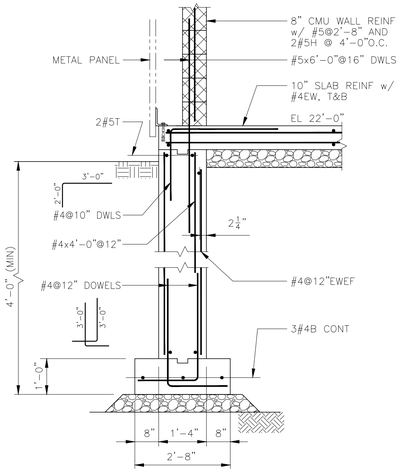
NOTE: FOR INFO NOT SHOWN SEE SECTION F1.

SECTION F5 (S-3) S-4
½"=1'-0"

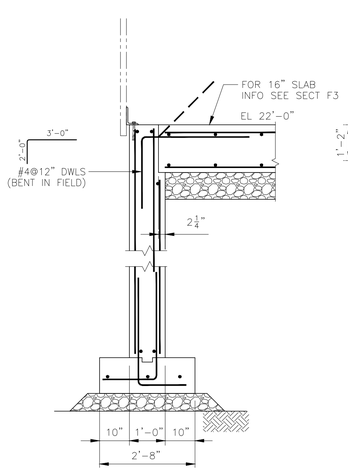


SECTION F6 (S-3) S-4
½"=1'-0"

SECTION F6A (S-3) S-4
½"=1'-0"

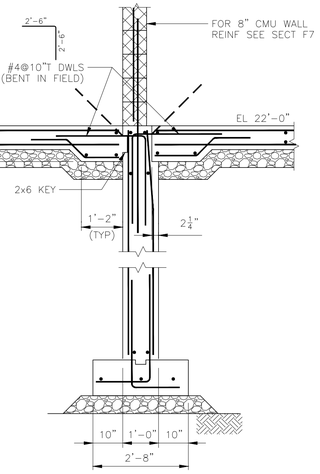


SECTION F7
½"=1'-0"



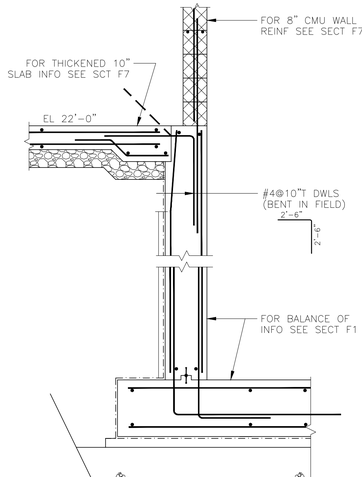
NOTE: FOR INFO NOT SHOWN SEE SECTION F7.

SECTION F8 (S-3) S-4
½"=1'-0"

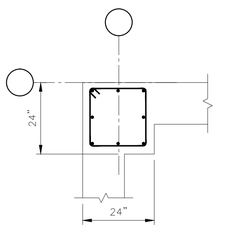


NOTE: FOR INFO NOT SHOWN SEE SECTION F7.

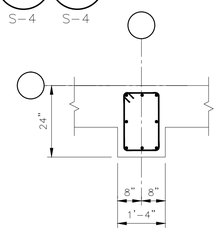
SECTION F9 (S-3) S-4
½"=1'-0"



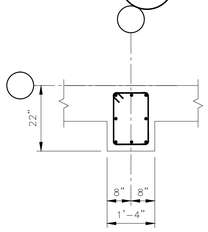
SECTION F10 (S-3) S-4
½"=1'-0"



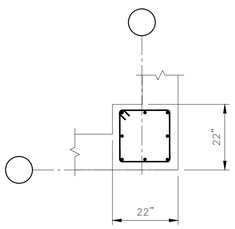
PIER P1 – 24"x24"
REINF w/ 8#6 VERTICAL DOWELED INTO FOOTING & #4 TIES @ 12"
TOP OF PIER EL = 20'-0"



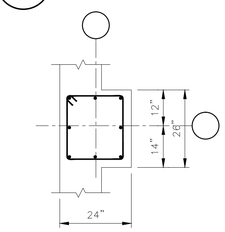
PIER P2 – 16"x24"
REINF w/ 8#9 VERTICAL DOWELED INTO FOOTING & #4 TIES @ 12"
TOP OF PIER EL = 20'-0"



PIER P3/P3A – 16"x22"
REINF w/ 8#6 VERTICAL DOWELED INTO FOOTING & #4 TIES @ 12"
TOP OF PIER P3 EL = 20'-0"
TOP OF PIER P3A EL = 22'-0"



PIER P4 – 22"x22"
REINF w/ 8#6 VERTICAL DOWELED INTO FOOTING & #4 TIES @ 12"
TOP OF PIER EL = 22'-0"



PIER P5 – 24"x26"
REINF w/ 8#6 VERTICAL DOWELED INTO FOOTING & #4 TIES @ 12"
TOP OF PIER EL = 20'-0"

TOWN OF BARNSTABLE
MASSACHUSETTS

MAHER FILTRATION PLANT

STRUCTURAL

SECTIONS AND DETAILS

Drawn By: RC | Designed By: RH | Checked By: RH | Approved By: RH

Rev.	Description	Date

COMMONWEALTH OF MASSACHUSETTS
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No. 28620
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May 1, 2019

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TATA & HOWARD

T&H NO.: 5241
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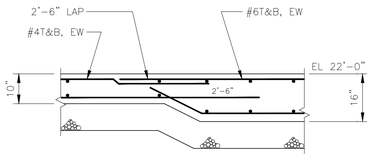
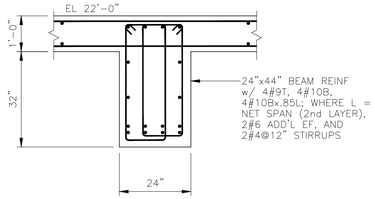
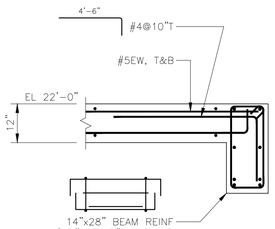
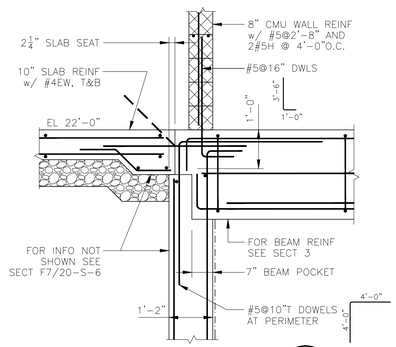
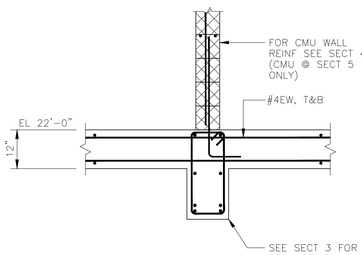
20-S-6

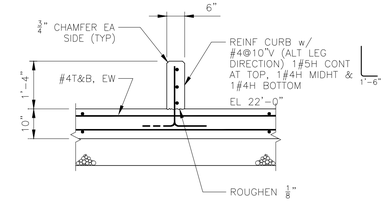












SECTION 1
½"=1'-0" S-4

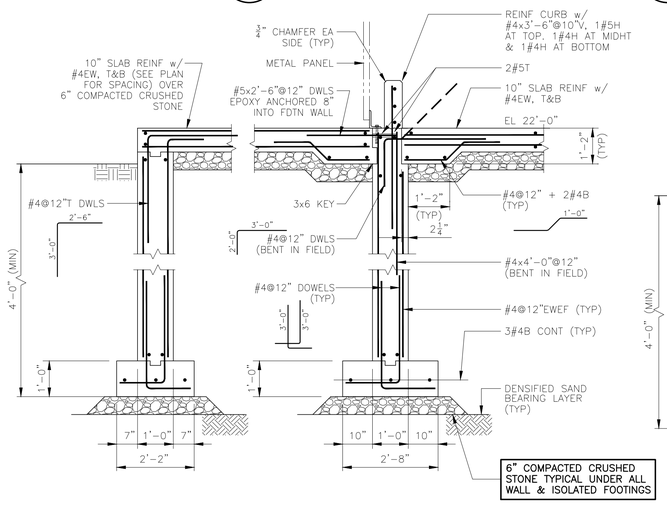
SECTION 2
½"=1'-0" S-4

SECTION 3
½"=1'-0" 20-S-4

SECTION 4
½"=1'-0" 20-S-4

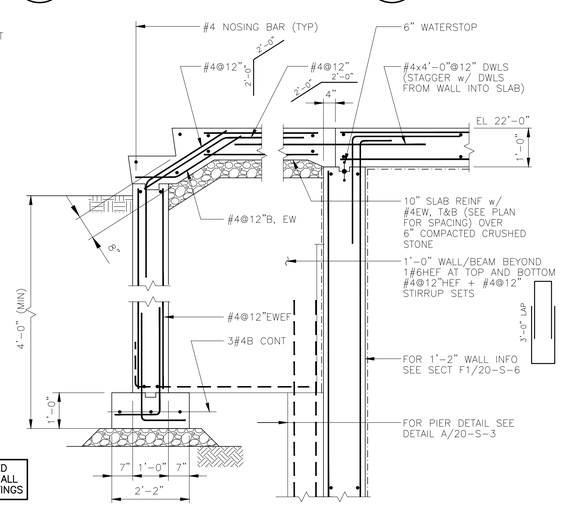
SECTION 5 5A
½"=1'-0" 20-S-4 20-S-4

SECTION 6
½"=1'-0" 20-S-4

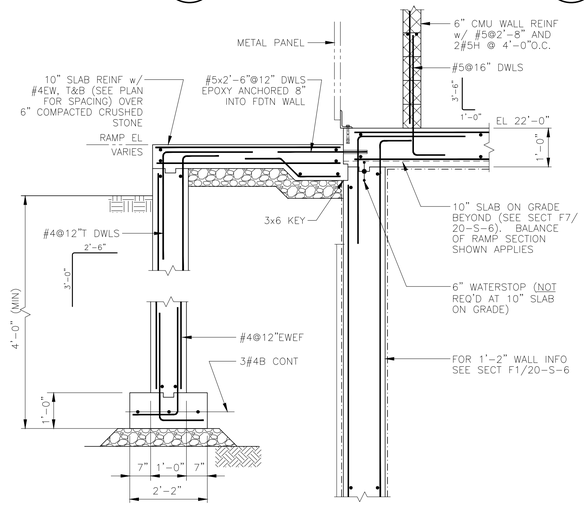


NOTE: FOR RAILING DETAIL SEE ARCH'L DWGS.

SECTION 7
½"=1'-0" S-3 S-4

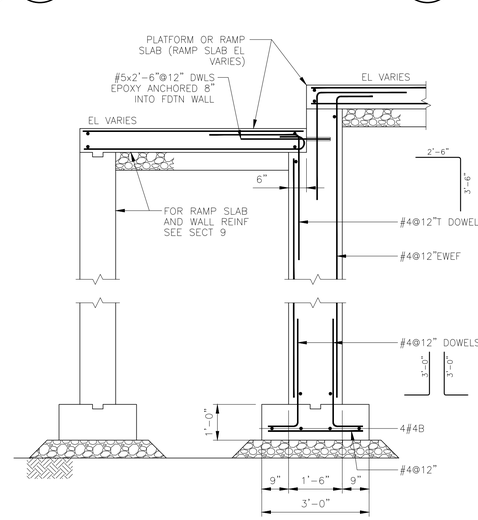


SECTION 8
½"=1'-0" S-3 S-4

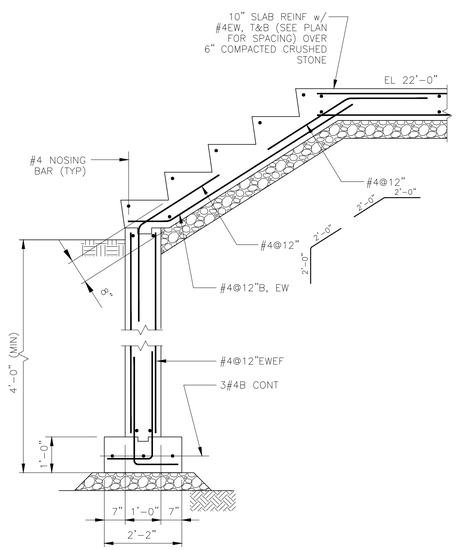


NOTE: FOR RAILING DETAIL SEE ARCH'L DWGS.

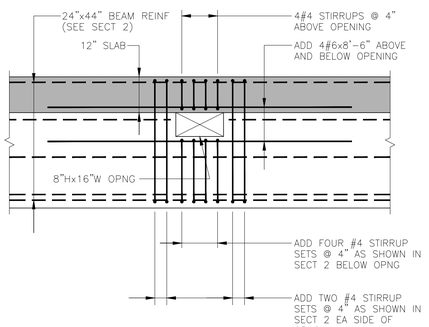
SECTION 9
½"=1'-0" S-3 S-4



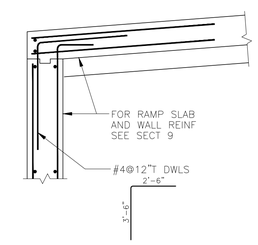
SECTION 10
½"=1'-0" S-3 S-4



SECTION 11
½"=1'-0" S-3 S-4



SECTION 12
½"=1'-0" S-3



NOTE: FOR BALANCE OF SECTION SEE SECT 9.

SECTION 13
½"=1'-0" S-4

TOWN OF BARNSTABLE
MASSACHUSETTS

MAHER FILTRATION PLANT

STRUCTURAL

SECTIONS AND DETAILS

Drawn By: RC | Designed By: RH | Checked By: RH | Approved By: RH

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ROGER HOBEIKA
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May 1, 2019

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TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
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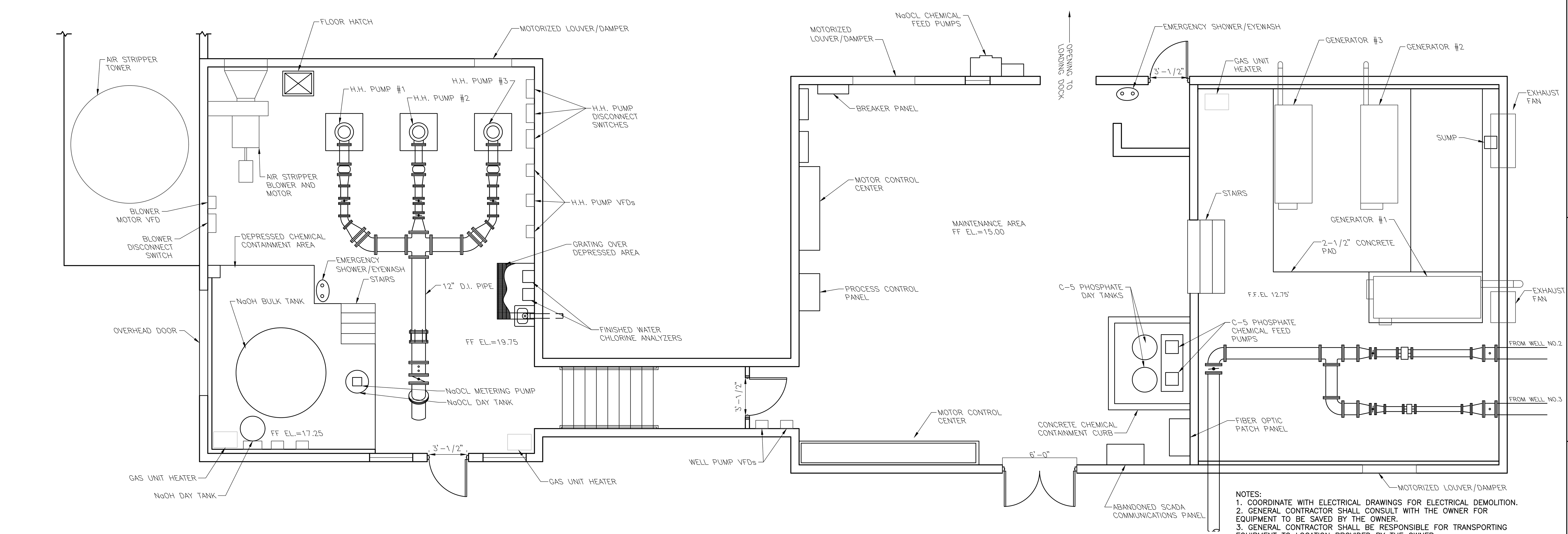
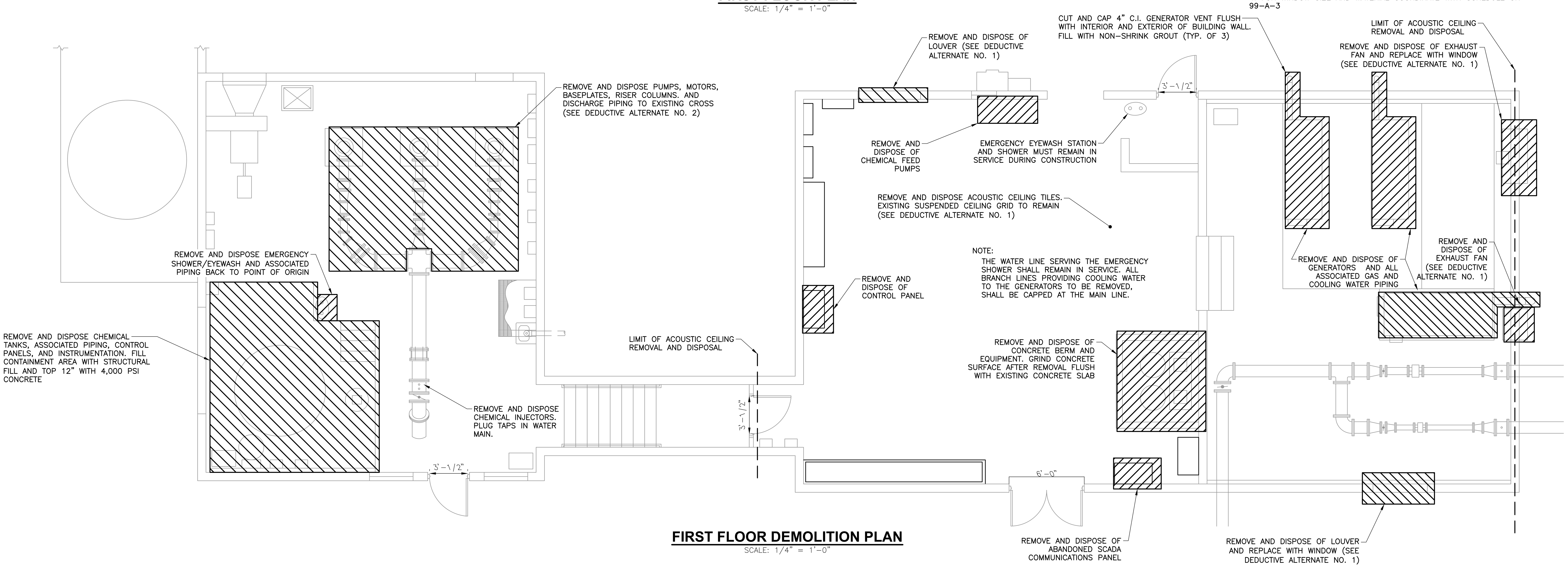
20-S-7



NOTES:
1. COORDINATE WITH ELECTRICAL DRAWINGS FOR ELECTRICAL DEMOLITION.
2. GENERAL CONTRACTOR SHALL CONSULT WITH THE OWNER FOR EQUIPMENT TO BE SAVED BY THE OWNER.
3. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR TRANSPORTING EQUIPMENT TO LOCATION PROVIDED BY THE OWNER
4. FOR WINDOW SIZE AND MATERIAL COORDINATE WITH SCHEDULE ON 99-A-3

FIRST FLOOR PLAN

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



FIRST FLOOR DEMOLITION PLAN

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: MVM | Designed By: RSP | Checked By: PBH/RPN | Approved By: JWG

PROCESS

EXISTING TREATMENT PLANT FIRST FLOOR PLANS

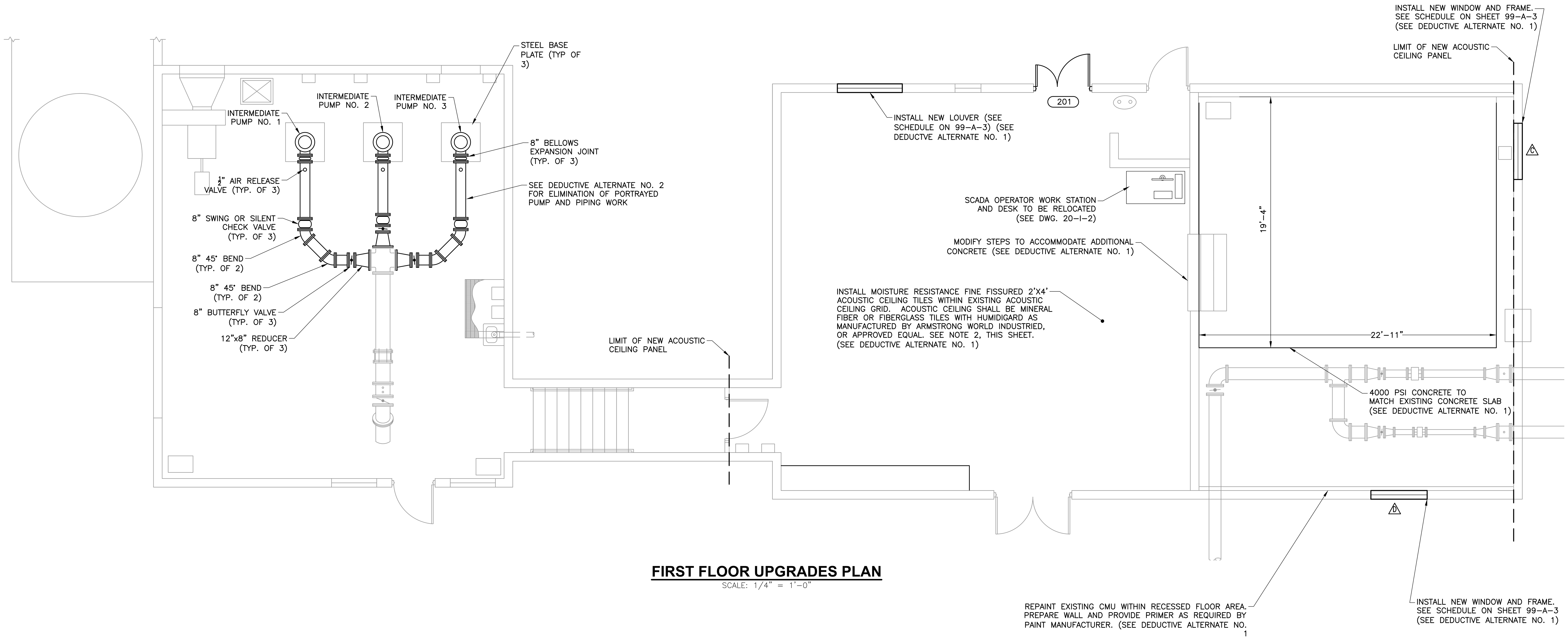
Rev.	Date	Description

COMMONWEALTH OF MASSACHUSETTS
JON W. GREGORY
CIVIL
No.
5-1-19

TATA & HOWARD

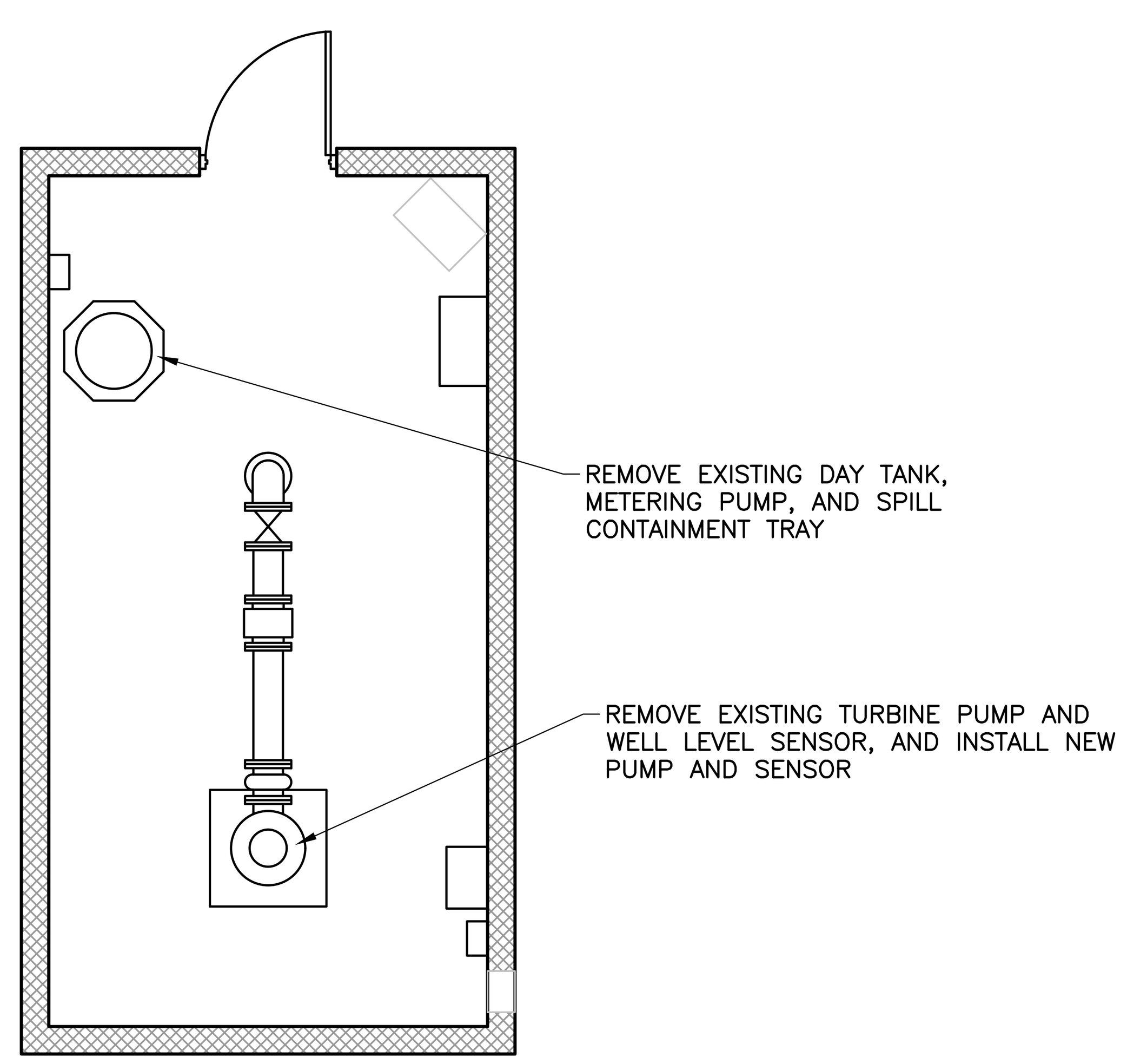
T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

10-D-1



FIRST FLOOR UPGRADES PLAN

SCALE: 1/4" = 1'–0"



MAHER PUMP STATION NO. 1 UPGRADES PLAN

SCALE: 1/4" = 1'–0"

NOTES:

1. CONTRACTOR SHALL VERIFY ROUGH OPENING SIZE PRIOR TO ORDERING LOUVERS, WINDOWS AND DOORS.
2. ACOUSTIC CEILING TILES SHALL MEET THE FOLLOWING SPECIFICATIONS:
   a. SHALL BE 3/4 INCHES THICK AND SHALL FIT EXISTING CEILING GRID.
   b. LIGHT REFLECTANCE SHALL NOT BE LESS THAN 0.80 (PER ASTM E1477).
   c. CLASS A FLAME SPREAD.
   d. TILE SHALL CARRY THE U.L. LABEL AND SHALL HAVE A CLASS 25 FLAME SPREAD RATING ACCORDING TO ASTM E1264.

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: MVM | Designed By: RSP | Checked By: PBH/RPN | Approved By: JWG

PROCESS
EXISTING TREATMENT PLANT
FIRST FLOOR & MAHER PUMP
STATION NO. 1 UPGRADES PLAN

Rev.	Date	Description

COMMONWEALTH OF MASSACHUSETTS
JON W. GREGORY
CIVIL
No. 36793
REGISTERED PROFESSIONAL ENGINEER
5-1-19

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T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

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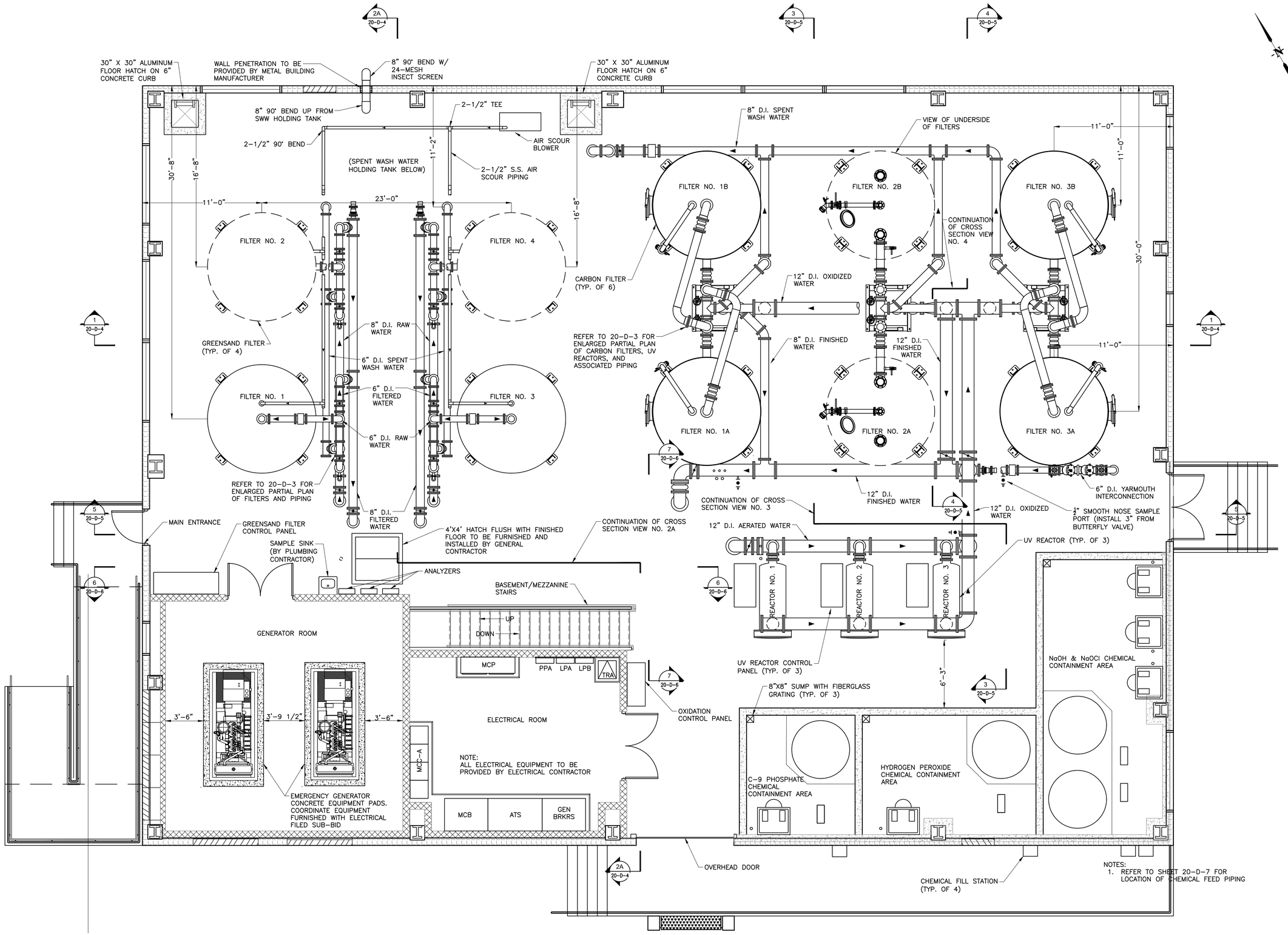


FIRST FLOOR PLAN

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

PROCESS

FIRST FLOOR PLAN

Rev.	Date	Description

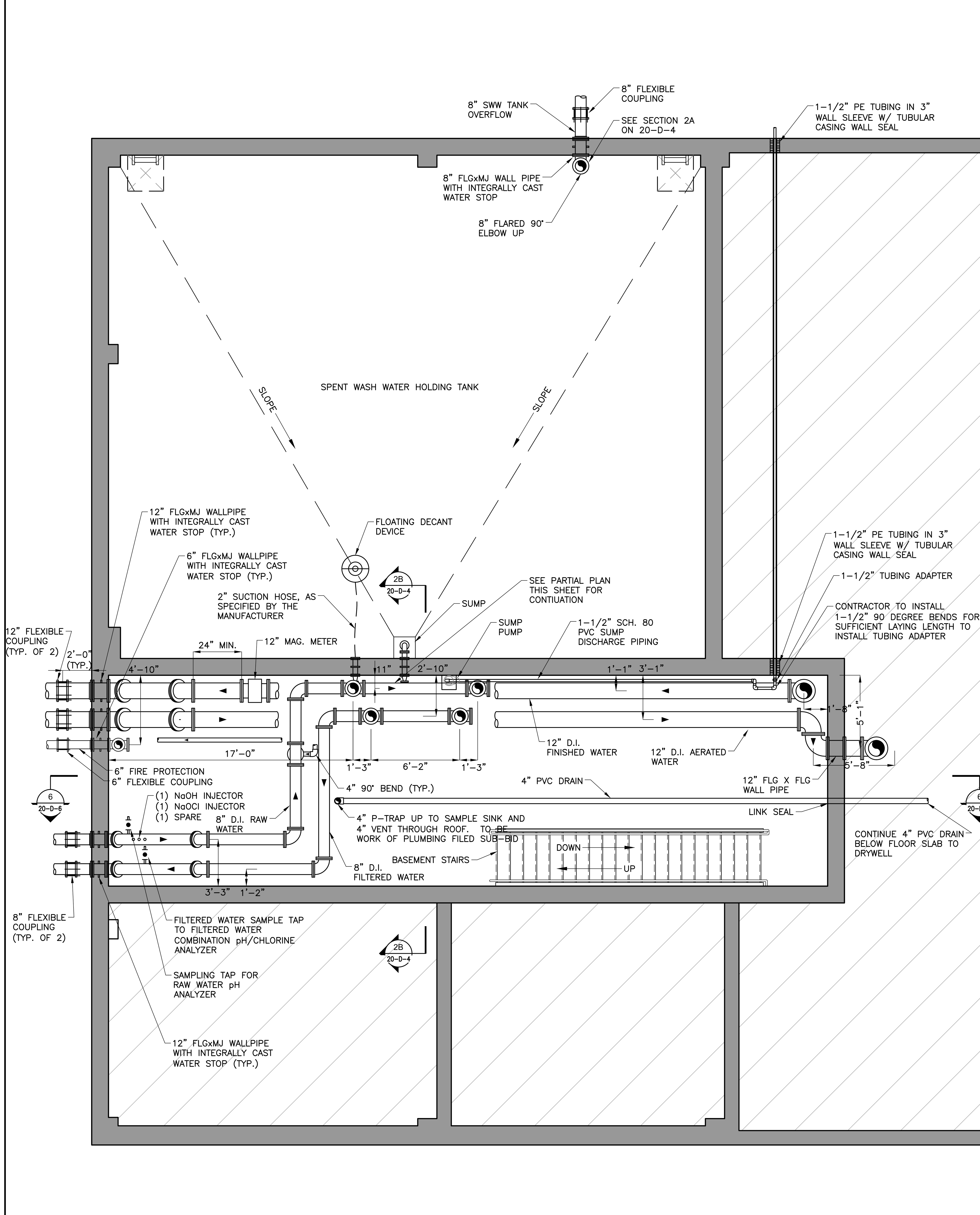
Drawn By: MJK
Designed By: RSP
Checked By: PBH/RPN
Approved By: JWG

COMMONWEALTH OF MASSACHUSETTS JOHN W. GREGORY CIVIL No. 40970 REGISTERED PROFESSIONAL ENGINEER 5-1-19

TATA & HOWARD

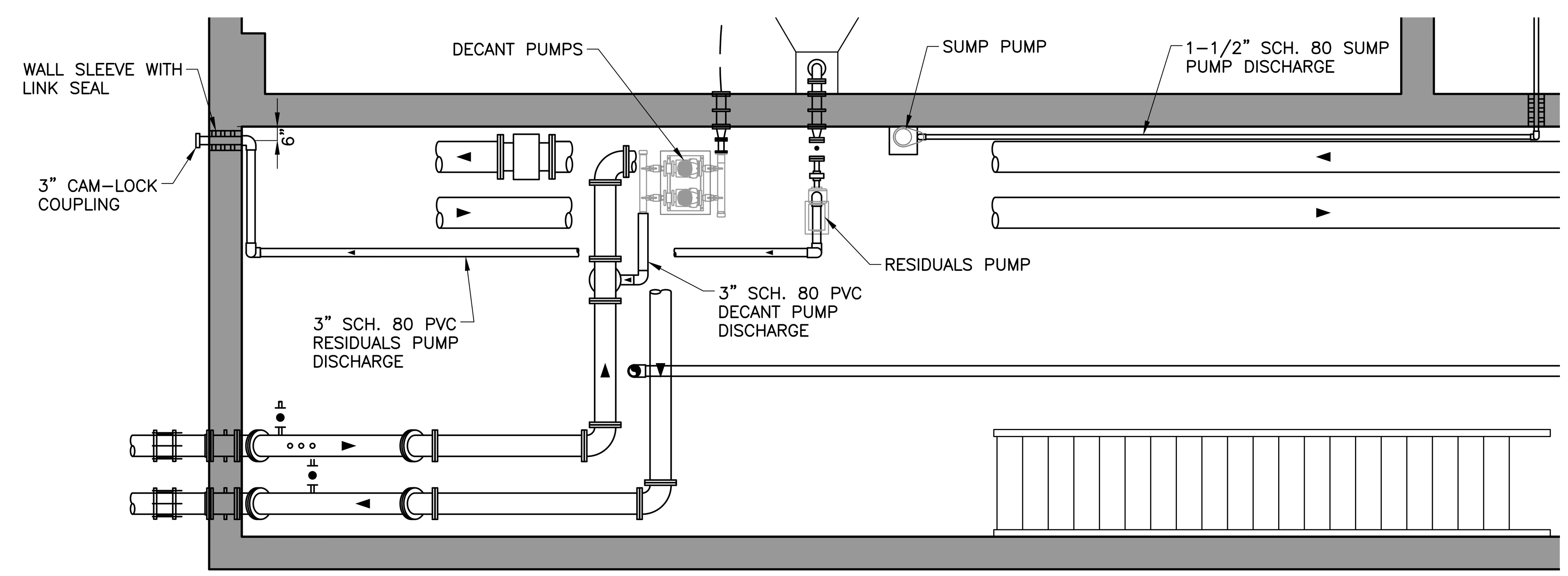
T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-D-1



BASEMENT FLOOR PLAN

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



BASEMENT FLOOR PARTIAL PLAN

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: MJK | Designed By: RSP | Checked By: PBH/RPN | Approved By: JWG

PROCESS

BASEMENT PLANS

Rev.	Date	Description

5-1-19

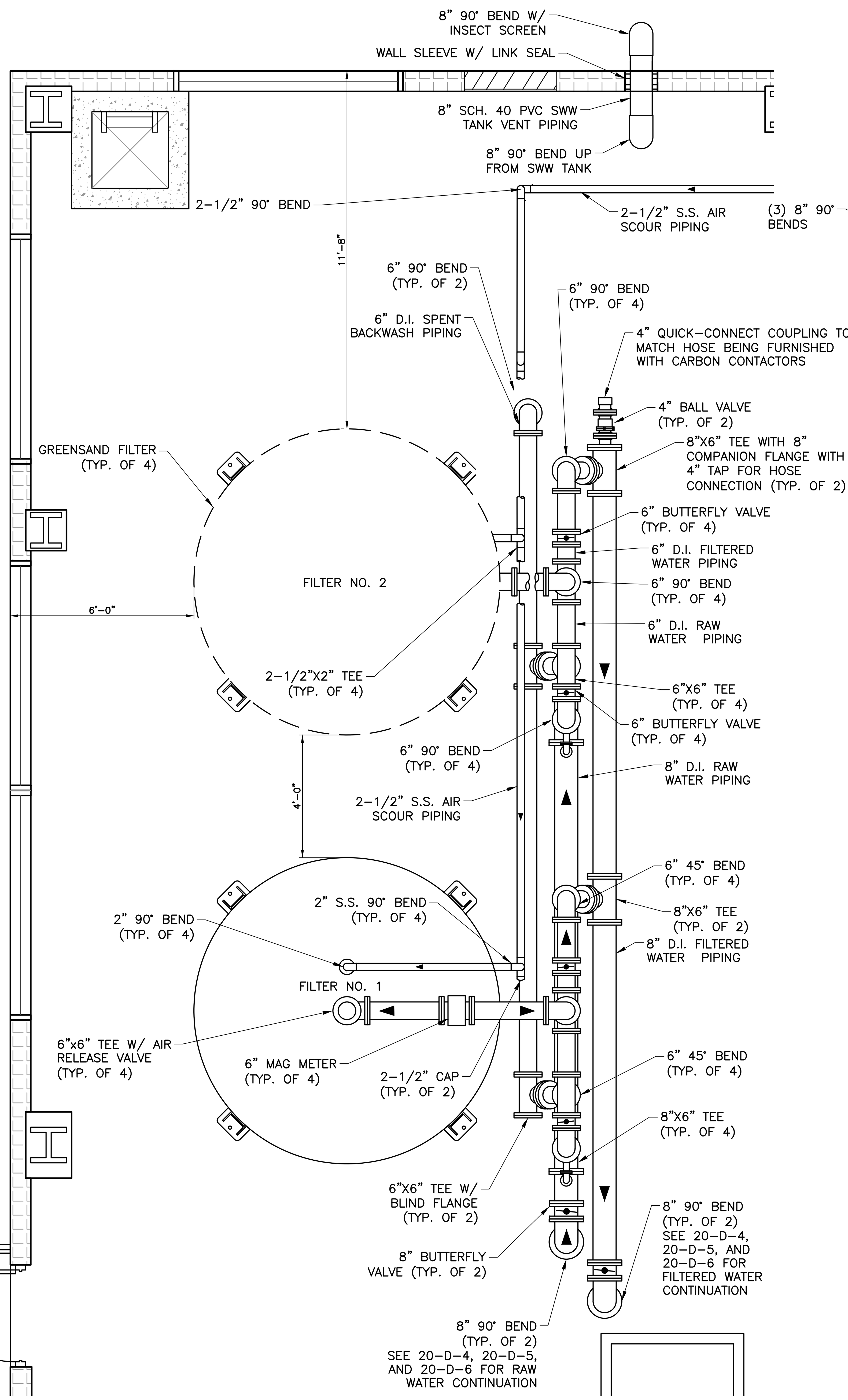
TATA & HOWARD

T&H NO.: 5241

DATE: MAY 2019

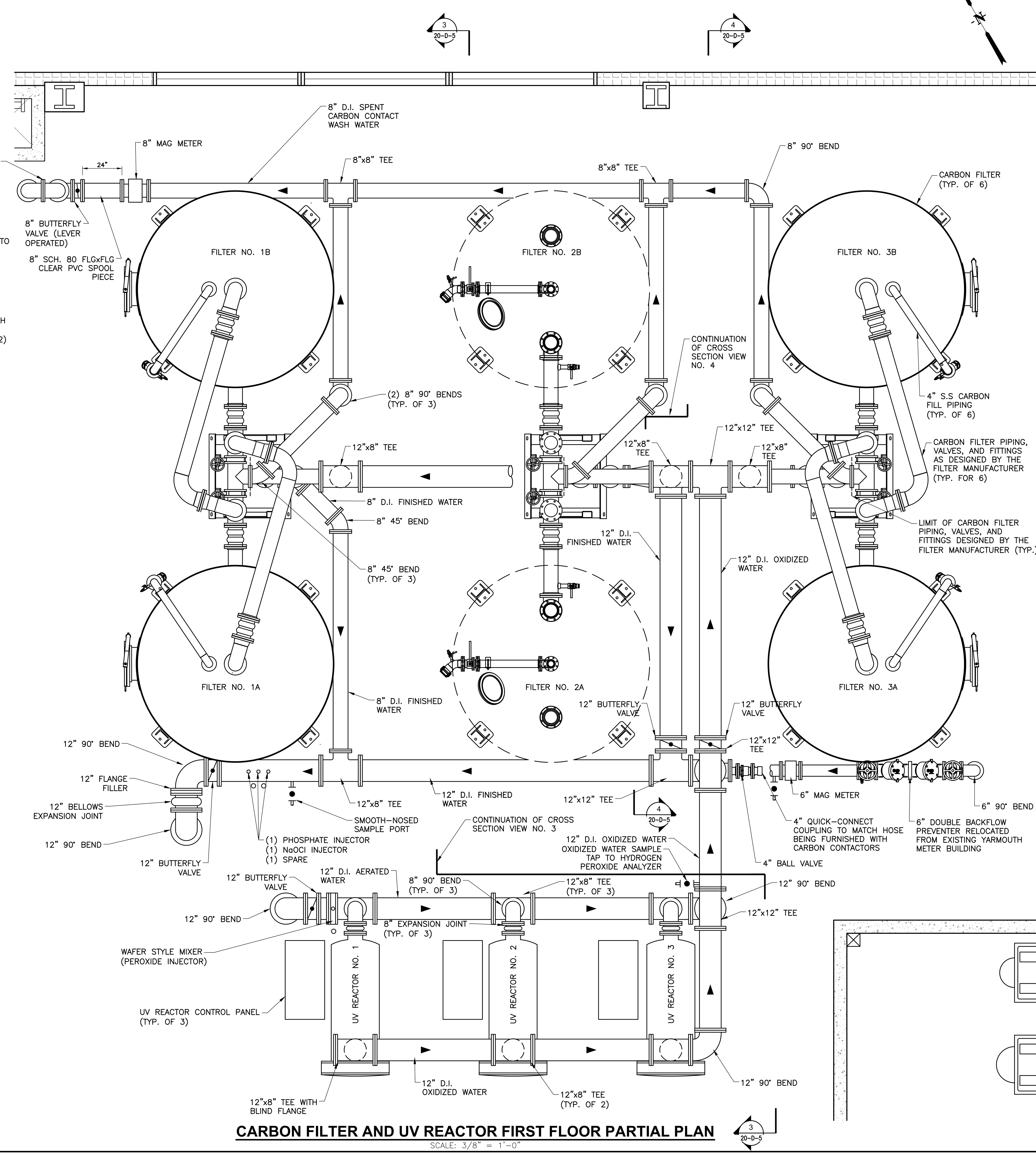
SCALE: AS NOTED

20-D-2



GREENSAND FILTER FIRST FLOOR PARTIAL PLAN

SCALE: 3/8" = 1'-0"



CARBON FILTER AND UV REACTOR FIRST FLOOR PARTIAL PLAN

SCALE: 3/8" = 1'-0"

3 20-D-5

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: MJK | Designed By: RSP | Checked By: PBH/RPN | Approved By: JWG

PROCESS
FIRST FLOOR
PARTIAL PLANS

Rev.	Date	Description

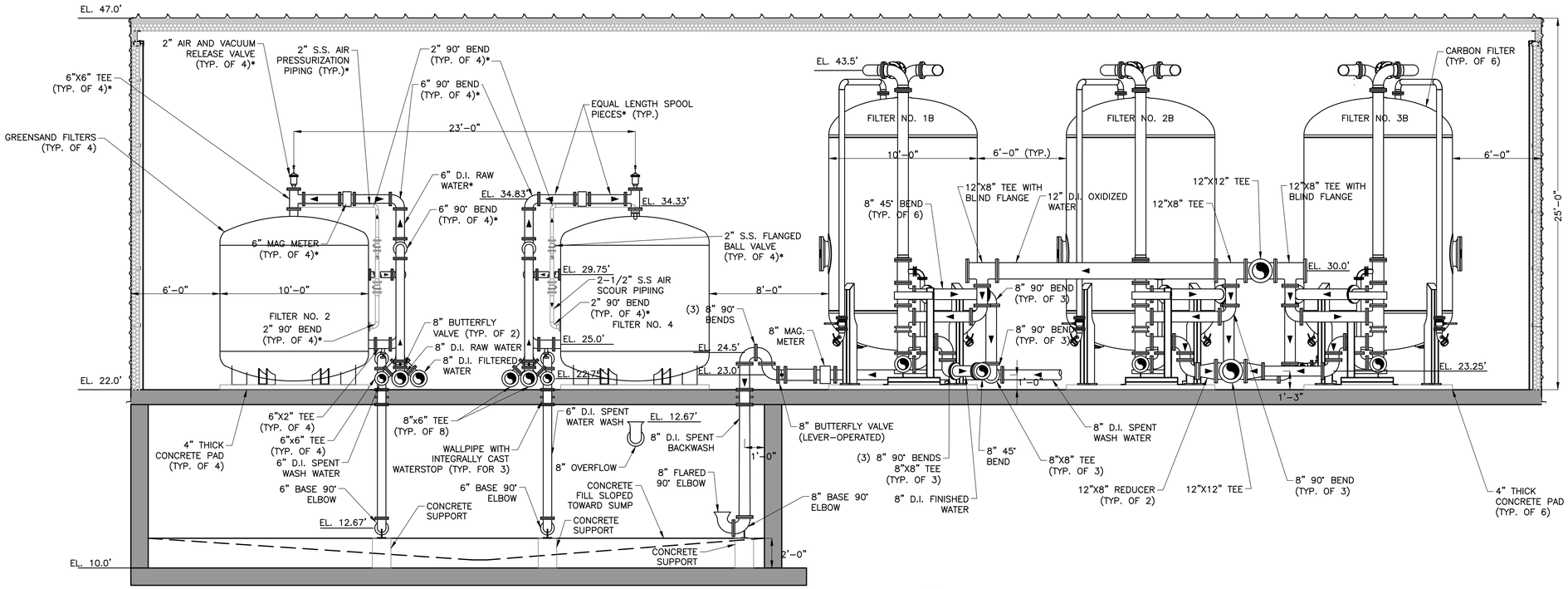
COMMONWEALTH OF MASSACHUSETTS — JON W. GREGORY — CIVIL — No. 38218 — REGISTERED PROFESSIONAL ENGINEER

5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

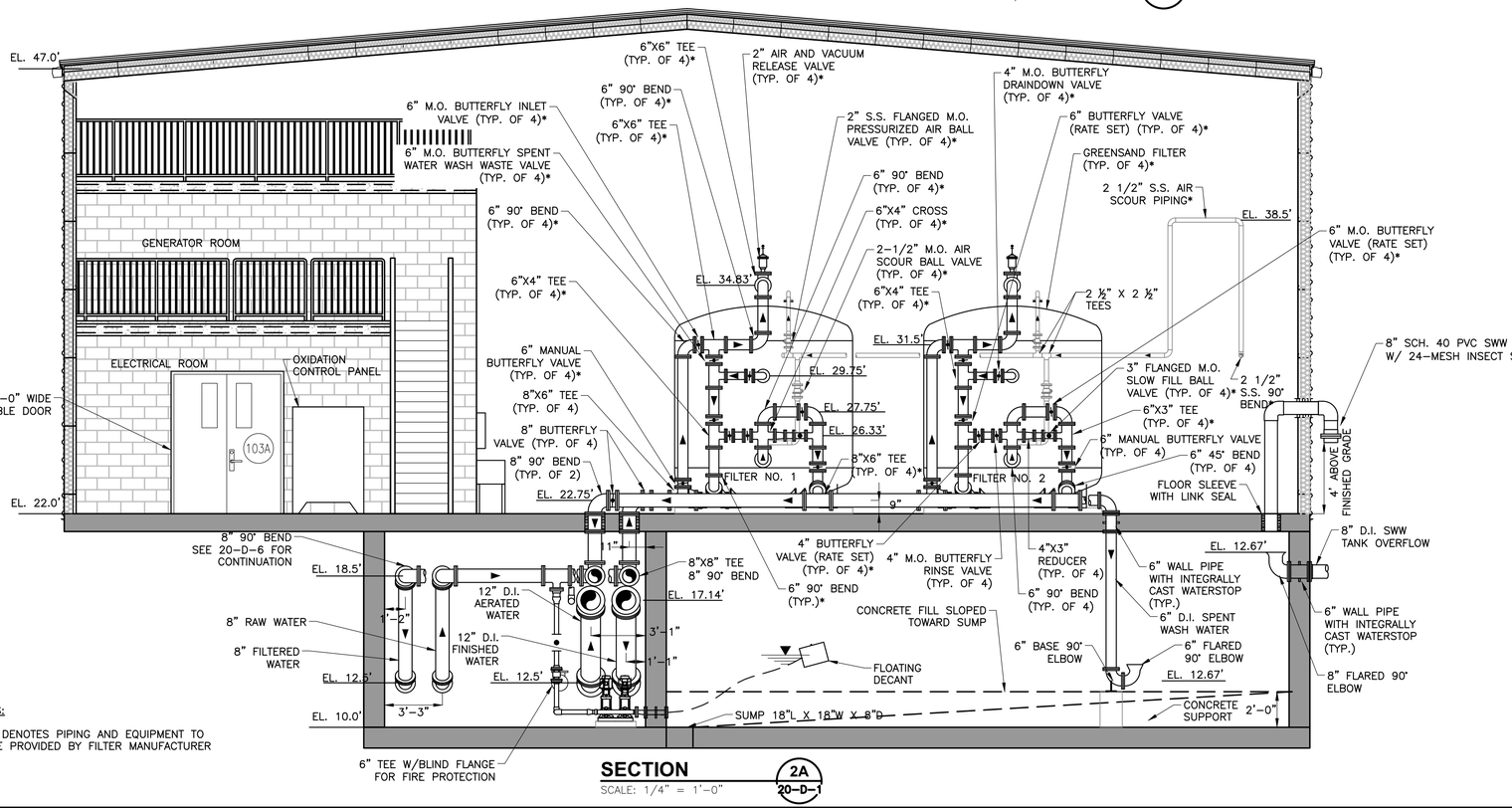
20-D-3



SECTION

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

1 / 20-D-1



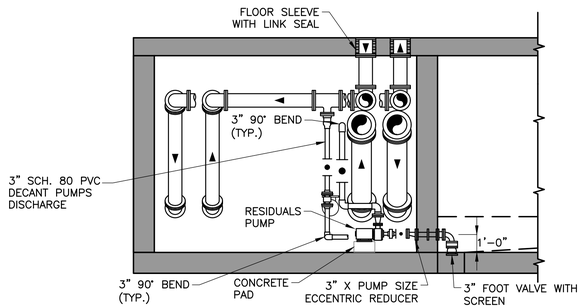
SECTION

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

2A / 20-D-1

NOTES:

1. * DENOTES PIPING AND EQUIPMENT TO BE PROVIDED BY FILTER MANUFACTURER



SECTION

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

2B / 20-D-2

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

PROCESS

CROSS SECTIONS I

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Approved By: JWG
Checked By: PBH/RPN
Designed By: RSP
Drawn By: MJK

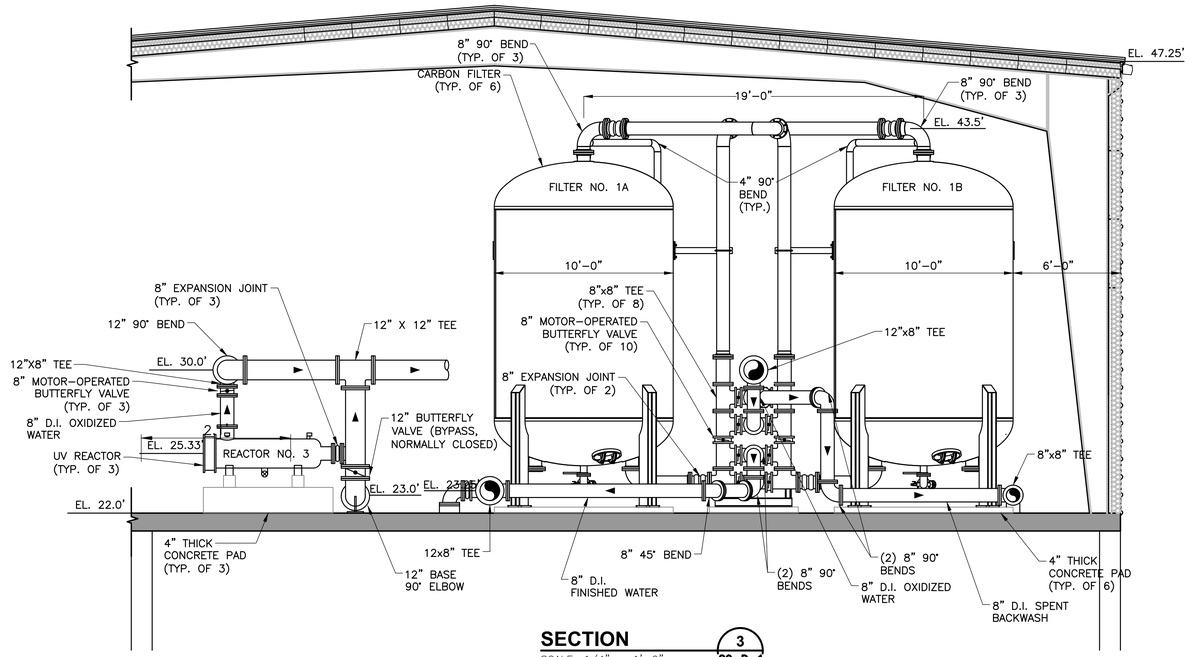
Description | Date | Rev.

COMMONWEALTH OF MASSACHUSETTS JON W. GREGORY CIVIL No. 42078 REGISTERED PROFESSIONAL ENGINEER 5-1-19

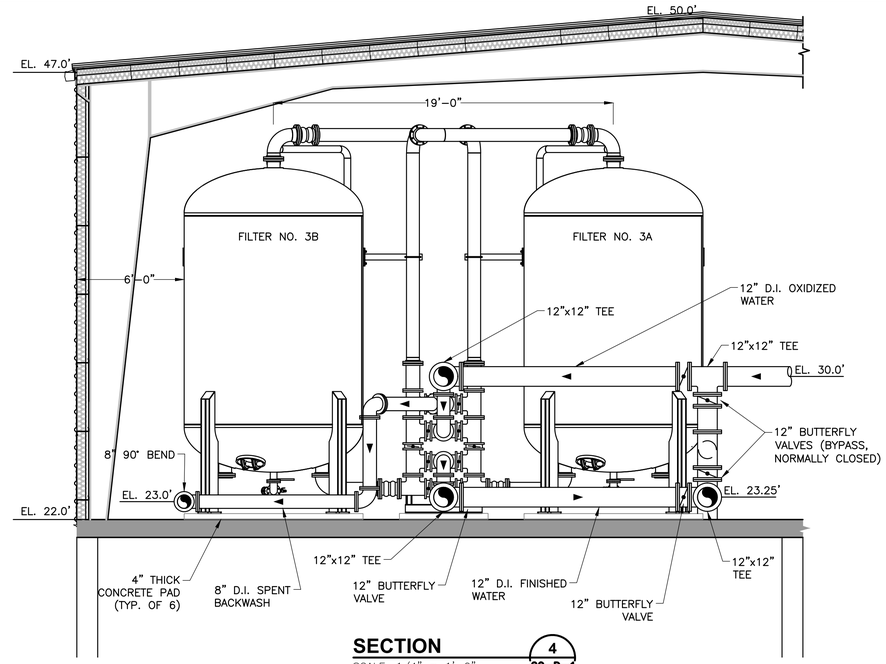
TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

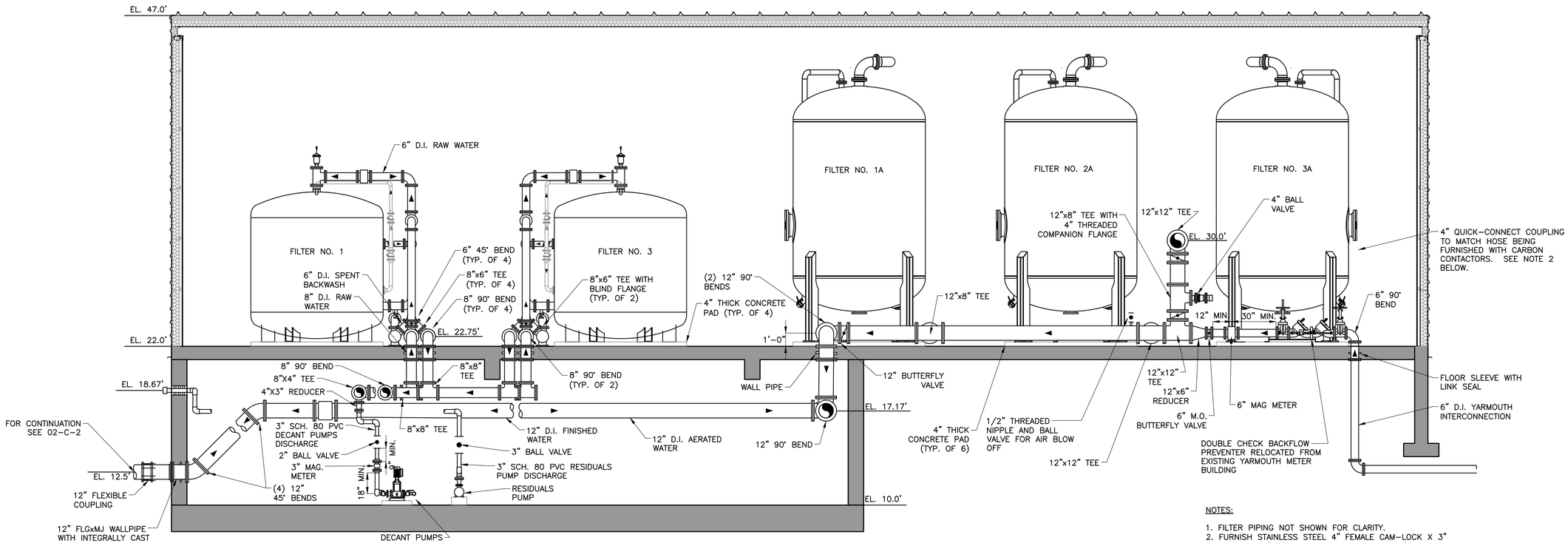
20-D-4



SECTION 3 / 20-D-1
SCALE: 1/4" = 1'-0"



SECTION 4 / 20-D-1
SCALE: 1/4" = 1'-0"



SECTION 5 / 20-D-1
SCALE: 1/4" = 1'-0"

NOTES:

1. FILTER PIPING NOT SHOWN FOR CLARITY.
2. FURNISH STAINLESS STEEL 4" FEMALE CAM-LOCK X 3" FEMALE NPT, 3"X2" THREADED ADAPTOR, AND 2" MALE CAM-LOCK WITH CAP FOR METER TESTING.

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

PROCESS

CROSS SECTIONS II

Approved By: JWG
Checked By: PBH/RPN
Designed By: RSP
Drawn By: MJK

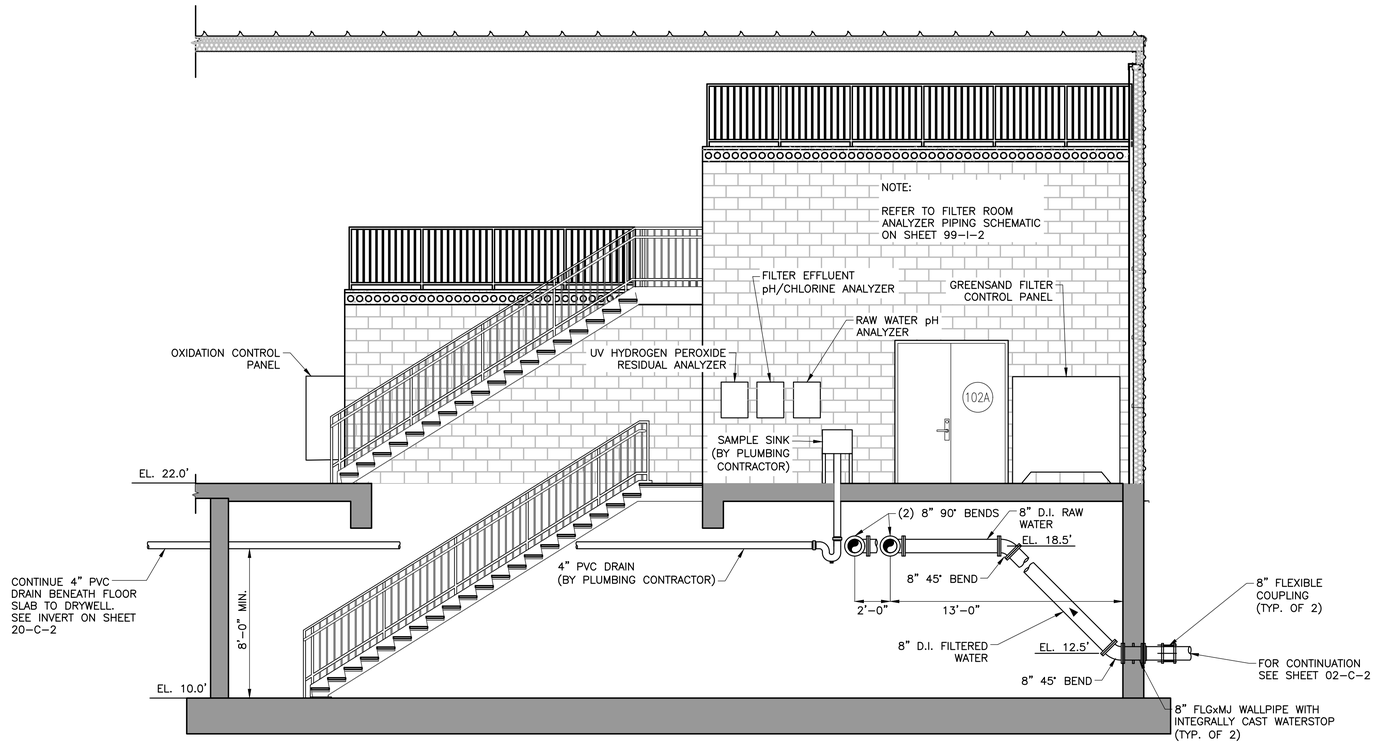
Description
Date
Rev.

COMMONWEALTH OF MASSACHUSETTS JOHN W. GREGORY CIVIL No. 42078 REGISTERED PROFESSIONAL ENGINEER
5-1-19

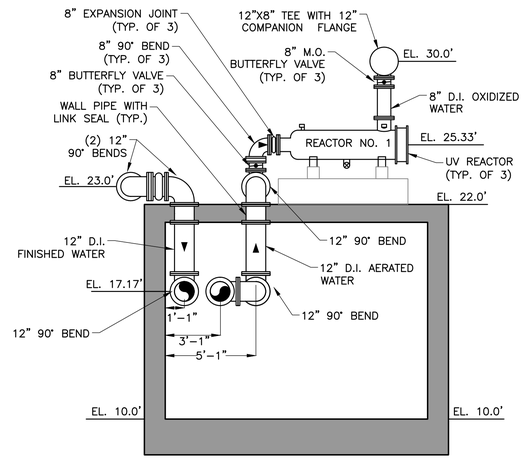
TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-D-5



SECTION 6 / 20-D-1&2
SCALE: 1/4" = 1'-0"



SECTION 7 / 20-D-1
SCALE: 1/4" = 1'-0"

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

PROCESS

CROSS SECTIONS III

Drawn By: MJK | Designed By: RSP | Checked By: PBH/RPN | Approved By: JWG

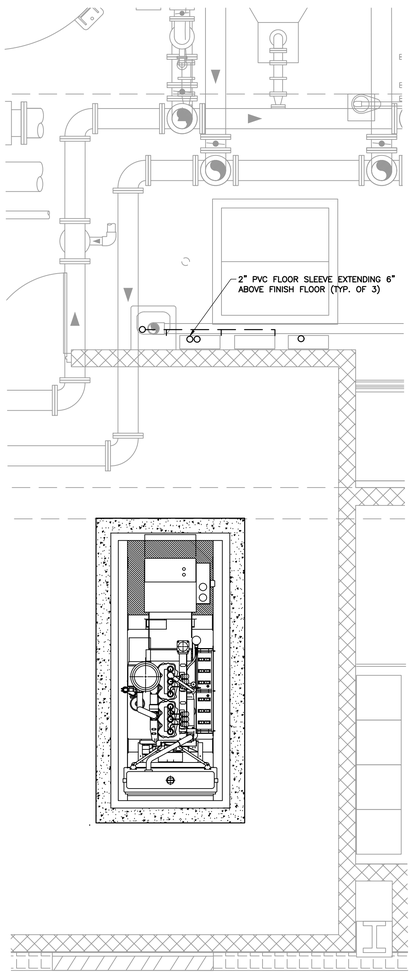
Rev.	Date	Description

COMMONWEALTH OF MASSACHUSETTS JON W. GREGORY CIVIL No. 34703 REGISTERED PROFESSIONAL ENGINEER 5-1-19

TATA & HOWARD

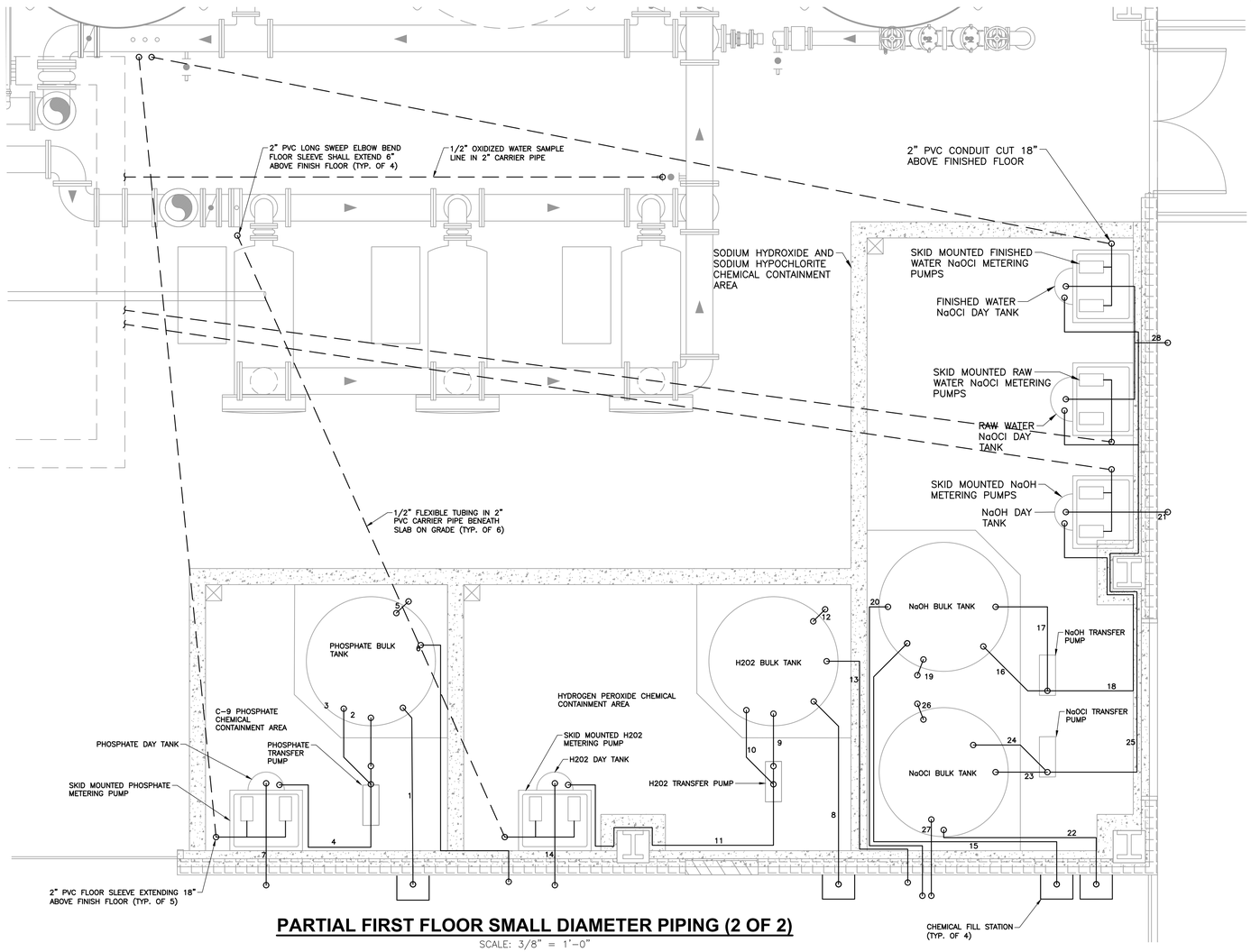
T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-D-6



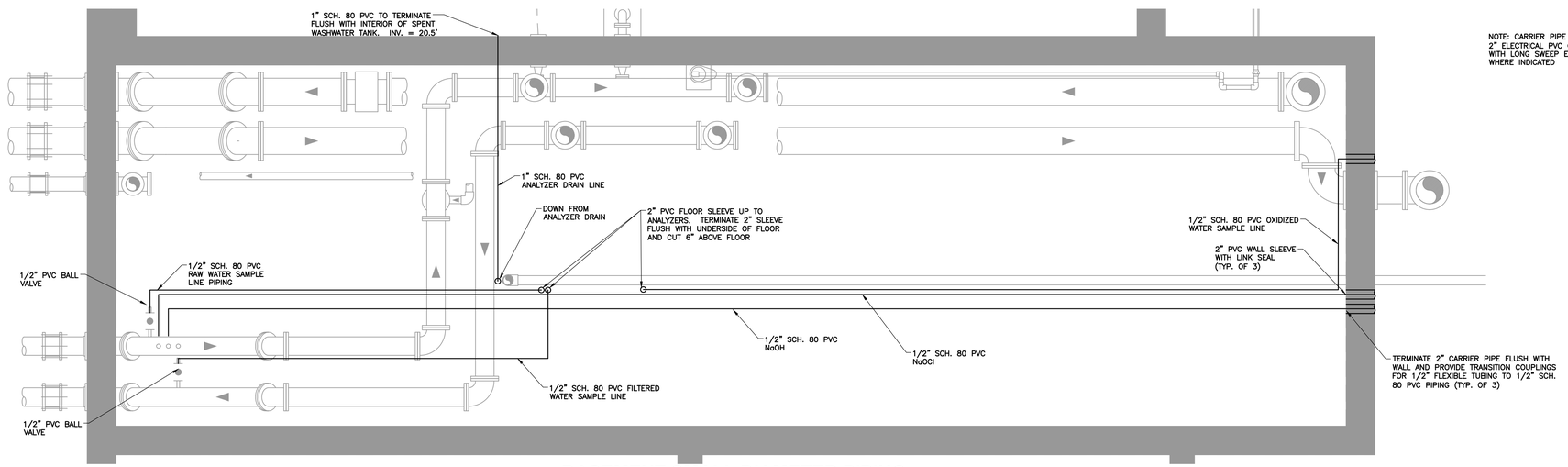
PARTIAL FIRST FLOOR SMALL DIAMETER PIPING (1 OF 2)

SCALE: 3/8" = 1'-0"



PARTIAL FIRST FLOOR SMALL DIAMETER PIPING (2 OF 2)

SCALE: 3/8" = 1'-0"



BASEMENT SMALL DIAMETER PIPING

SCALE: 3/8" = 1'-0"

NOTE: CARRIER PIPE SHALL BE 2" ELECTRICAL PVC CONDUIT WITH LONG SWEEP ELBOWS WHERE INDICATED

Pipe Table

No.	Dia.	Material	Description
1	2"	CPVC	Phosphate Bulk Tank Fill
2	1-1/2"	CPVC	Phosphate Bulk Tank Discharge
3	1/2"	CPVC	Phosphate Transfer Pump Return
4	1"	CPVC	Phosphate Day Tank Fill
5	3"	PVC	Phosphate Bulk Tank Overflow
6	4"	PVC	Phosphate Bulk Tank Vent
7	2"	PVC	Phosphate Day Tank Vent
8	2"	CPVC	H2O2 Bulk Tank Fill
9	1-1/2"	CPVC	H2O2 Bulk Tank Discharge
10	1/2"	CPVC	H2O2 Transfer Pump Return
11	1"	CPVC	H2O2 Day Tank Fill
12	3"	PVC	H2O2 Bulk Tank Overflow
13	4"	PVC	H2O2 Bulk Tank Vent
14	2"	PVC	H2O2 Day Tank Vent
15	2"	CPVC	NaOH Bulk Tank Fill
16	1-1/2"	CPVC	NaOH Bulk Tank Discharge
17	1/2"	CPVC	NaOH Transfer Pump Return
18	1"	CPVC	NaOH Day Tank Fill
19	3"	PVC	NaOH Bulk Tank Overflow
20	4"	PVC	NaOH Bulk Tank Vent
21	2"	PVC	NaOH Day Tank Vent
22	2"	CPVC	NaOCl Bulk Tank Fill
23	1-1/2"	CPVC	NaOCl Bulk Tank Discharge
24	1/2"	CPVC	NaOCl Transfer Pump Return
25	1"	CPVC	NaOCl Day Tank Fill
26	3"	PVC	NaOCl Bulk Tank Overflow
27	4"	PVC	NaOCl Bulk Tank Vent
28	2"	PVC	NaOCl Day Tank Vent

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

PROCESS
SMALL DIAMETER PIPING PLAN

Approved By: JWG
Checked By: PBH/RPN
Designed By: RSP
Drawn By: MVM

Rev.	Date	Description

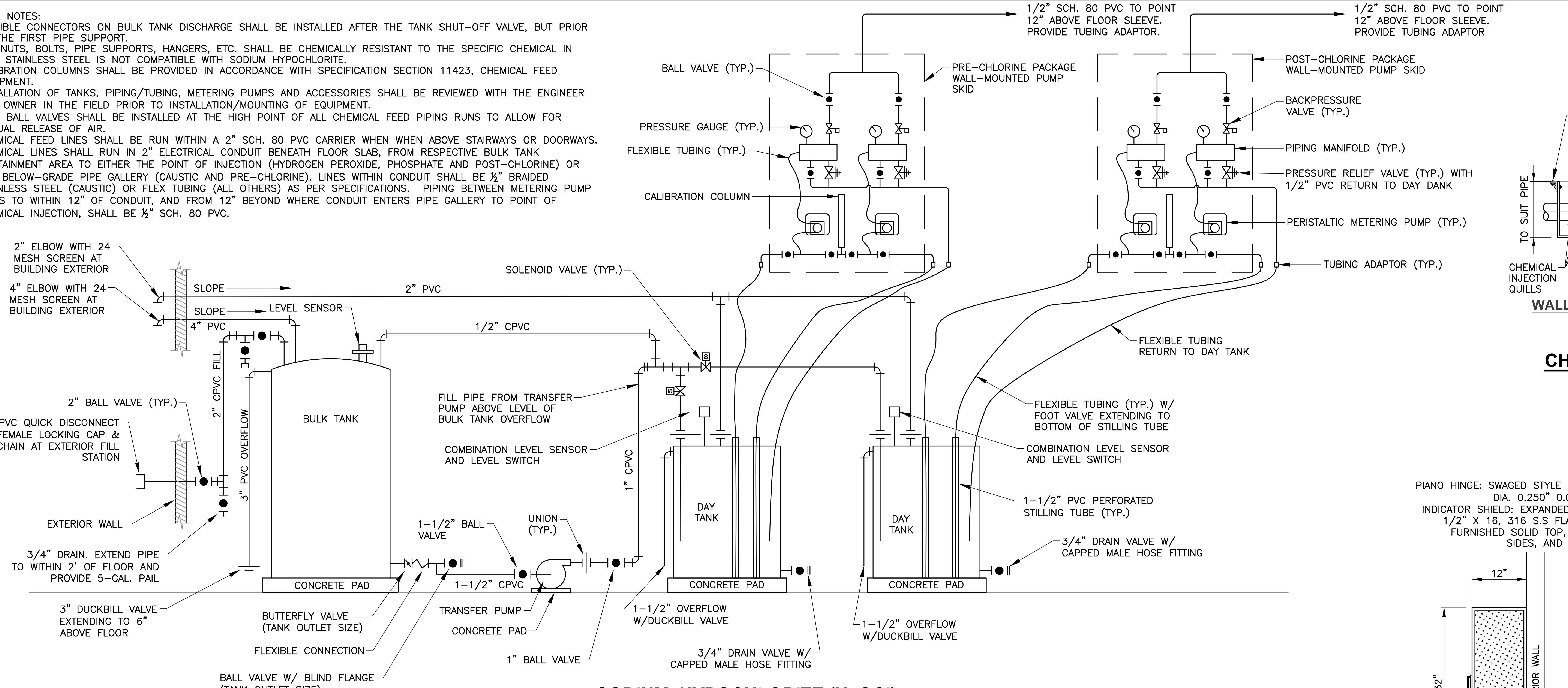
COMMONWEALTH OF MASSACHUSETTS
JON W. GREGORY
CIVIL
No. 36703
REGISTERED PROFESSIONAL ENGINEER
5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

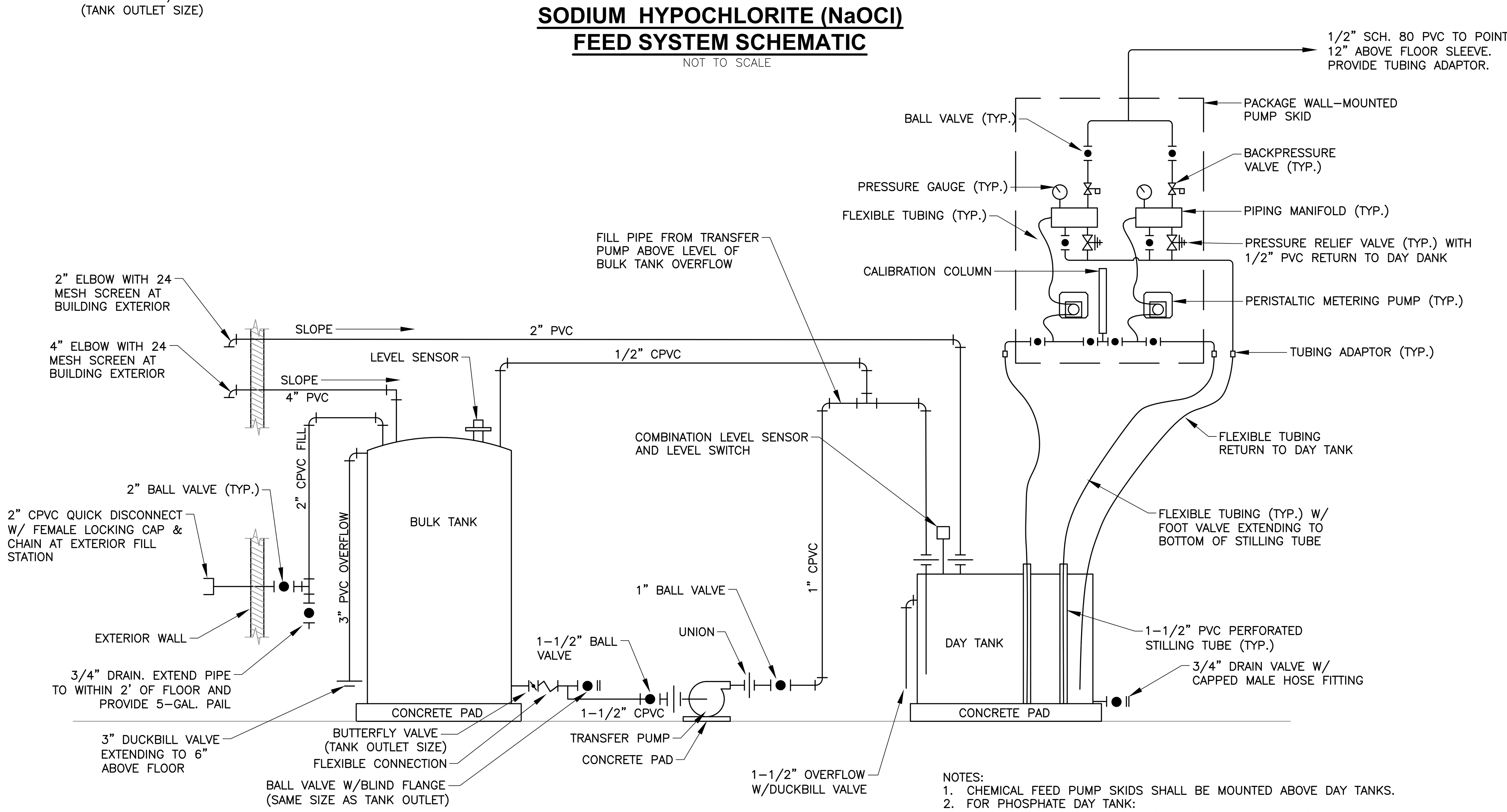
20-D-7

GENERAL NOTES:
1. FLEXIBLE CONNECTORS ON BULK TANK DISCHARGE SHALL BE INSTALLED AFTER THE TANK SHUT-OFF VALVE, BUT PRIOR TO THE FIRST PIPE SUPPORT.
2. ALL NUTS, BOLTS, PIPE SUPPORTS, HANGERS, ETC. SHALL BE CHEMICALLY RESISTANT TO THE SPECIFIC CHEMICAL IN USE. STAINLESS STEEL IS NOT COMPATIBLE WITH SODIUM HYPOCHLORITE.
3. CALIBRATION COLUMNS SHALL BE PROVIDED IN ACCORDANCE WITH SPECIFICATION SECTION 11423, CHEMICAL FEED EQUIPMENT.
4. INSTALLATION OF TANKS, PIPING/TUBING, METERING PUMPS AND ACCESSORIES SHALL BE REVIEWED WITH THE ENGINEER AND OWNER IN THE FIELD PRIOR TO INSTALLATION/MOUNTING OF EQUIPMENT.
5. 1/2" BALL VALVES SHALL BE INSTALLED AT THE HIGH POINT OF ALL CHEMICAL FEED PIPING RUNS TO ALLOW FOR MANUAL RELEASE OF AIR.
6. CHEMICAL FEED LINES SHALL BE RUN WITHIN A 2" SCH. 80 PVC CARRIER WHEN WHEN ABOVE STAIRWAYS OR DOORWAYS.
7. CHEMICAL LINES SHALL RUN IN 2" ELECTRICAL CONDUIT BENEATH FLOOR SLAB, FROM RESPECTIVE BULK TANK CONTAINMENT AREA TO EITHER THE POINT OF INJECTION (HYDROGEN PEROXIDE, PHOSPHATE AND POST-CHLORINE) OR THE BELOW-GRADE PIPE GALLERY (CAUSTIC AND PRE-CHLORINE). LINES WITHIN CONDUIT SHALL BE ½" BRAIDED STAINLESS STEEL (CAUSTIC) OR FLEX TUBING (ALL OTHERS) AS PER SPECIFICATIONS. PIPING BETWEEN METERING PUMP SKIDS TO WITHIN 12" OF CONDUIT, AND FROM 12" BEYOND WHERE CONDUIT ENTERS PIPE GALLERY TO POINT OF CHEMICAL INJECTION, SHALL BE ½" SCH. 80 PVC.



SODIUM HYPOCHLORITE (NaOCl) FEED SYSTEM SCHEMATIC

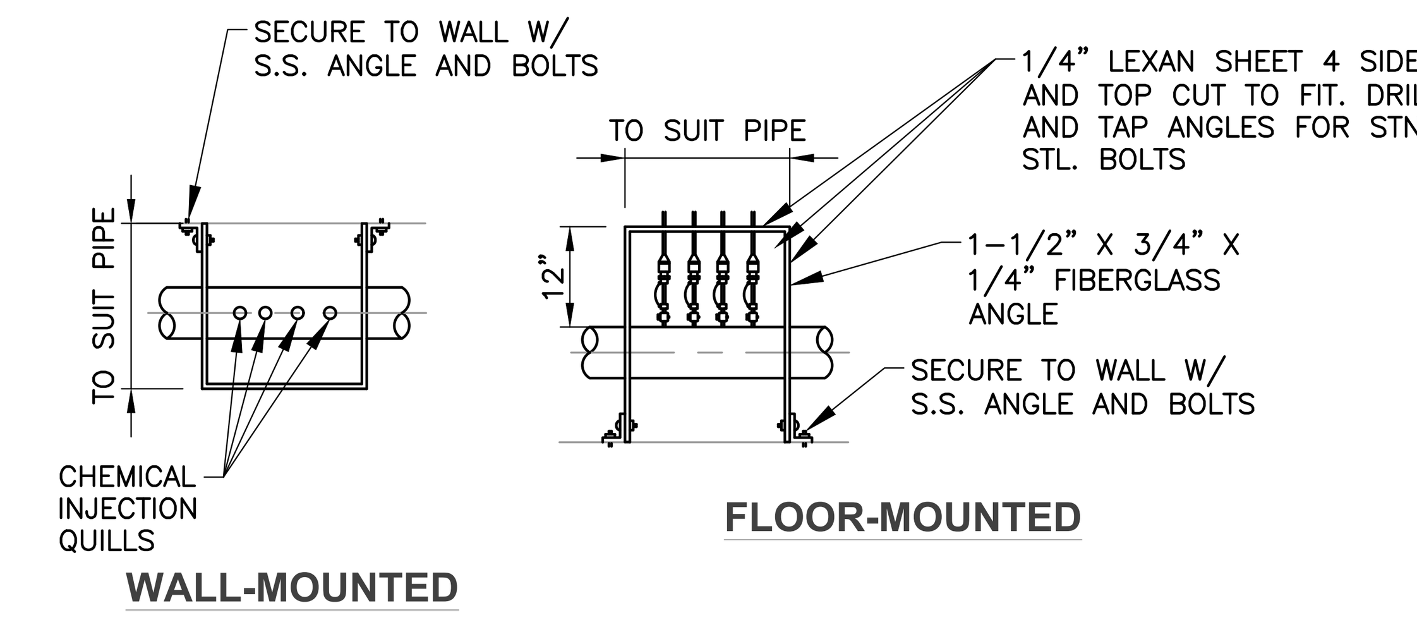
NOT TO SCALE



NOTES:
1. CHEMICAL FEED PUMP SKIDS SHALL BE MOUNTED ABOVE DAY TANKS.
2. FOR PHOSPHATE DAY TANK:
   a. DAY TANK WILL BE MOUNTED ATOP A WEIGHT SCALE.
   b. NO COMBINATION LEVEL SWITCH WILL BE INSTALLED.
   c. PROVIDE LOOPED SECTION OF FLEXIBLE HOSE ON PHOSPHATE TANK VENT LINE TO ALLOW VERTICAL MOVEMENT OF TANK/SCALE.

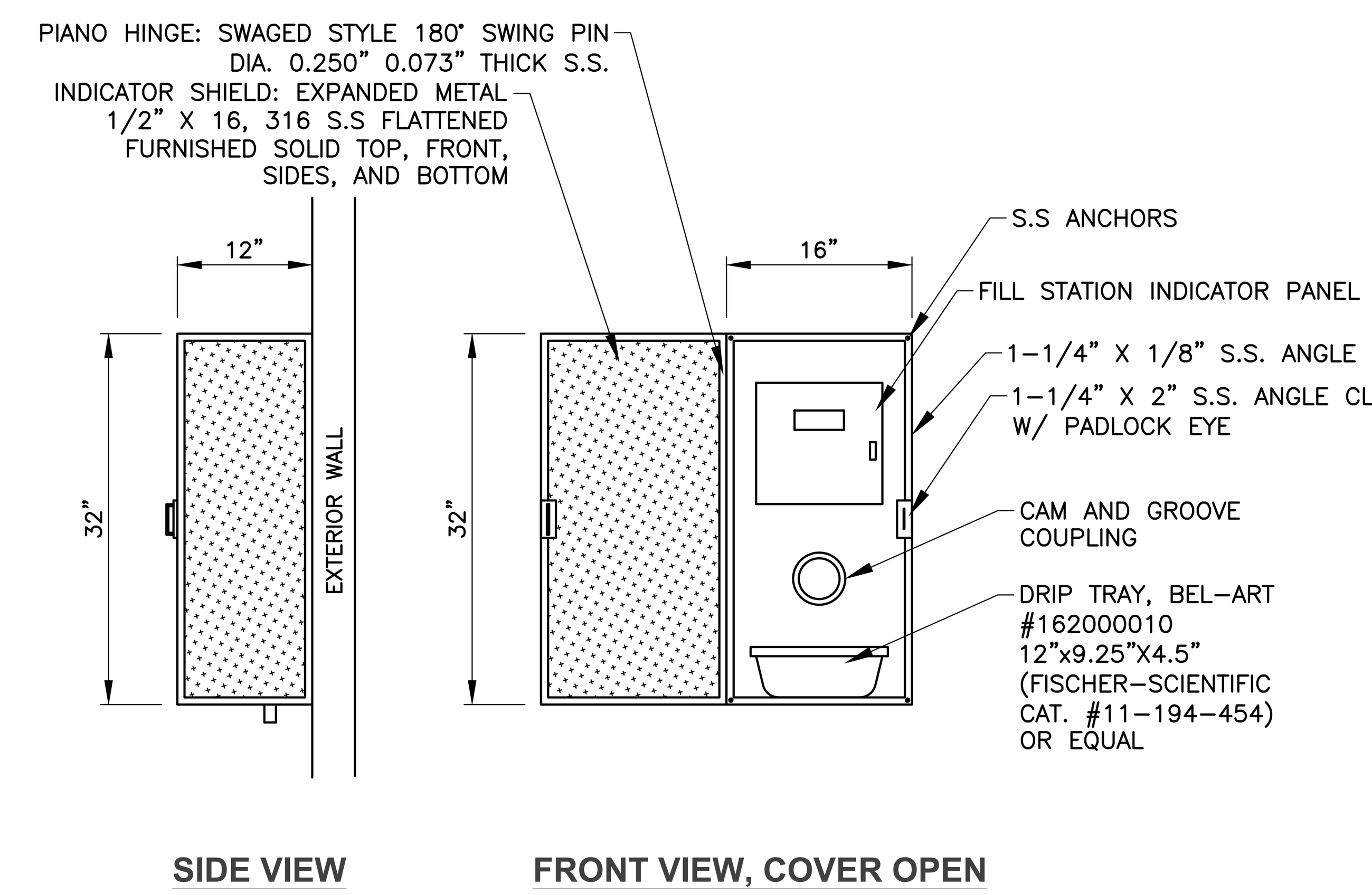
HYDROGEN PEROXIDE (H_2O_2), SODIUM HYDROXIDE (NaOH), & PHOSPHATE FEED SYSTEM SCHEMATIC

NOT TO SCALE



CHEMICAL FEED CORPORATION GUARD FLOOR/WALL-MOUNTED

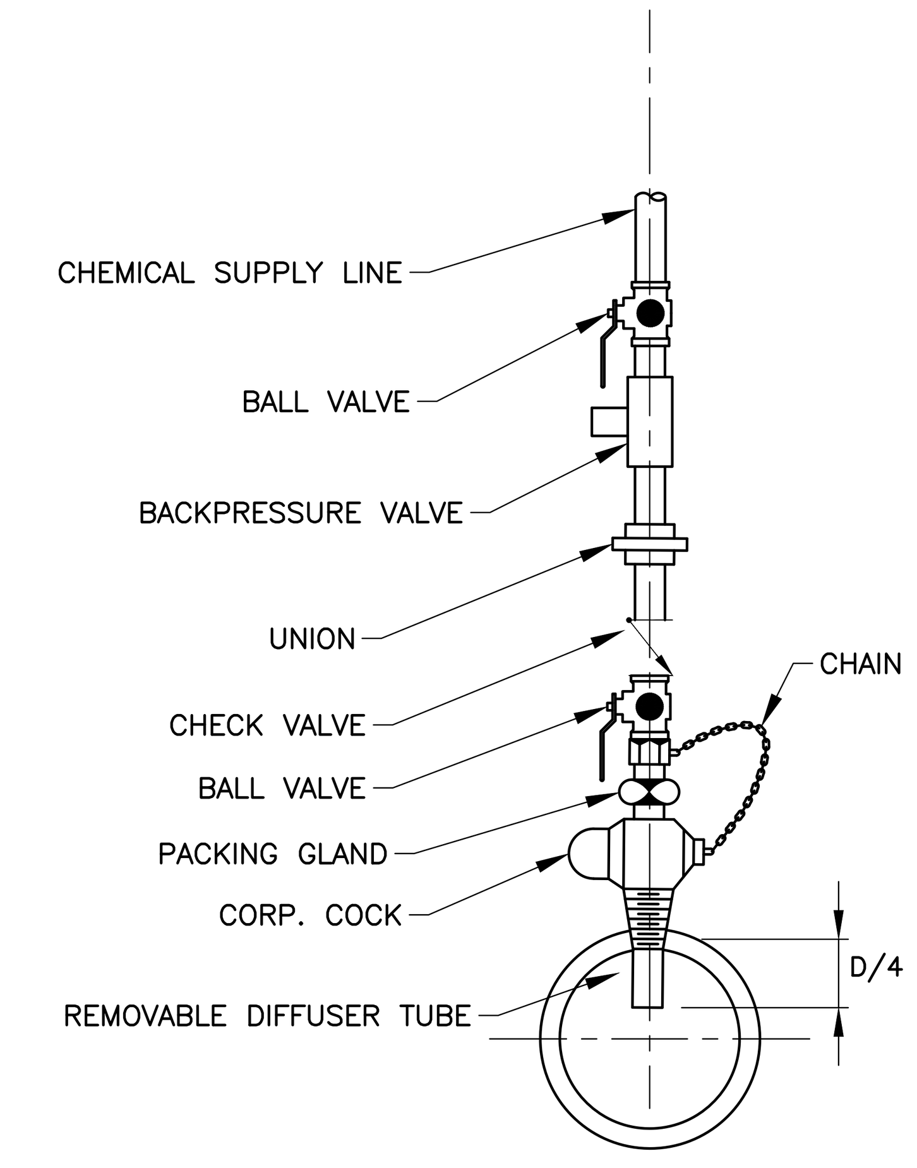
NOT TO SCALE



NOTES:
1. ALL MATERIALS OF FABRICATION, INCLUDING HARDWARE, SHALL BE TYPE 316 STAINLESS STEEL.
2. FILL LINE COVER SHALL BE LABELED WITH APPROPRIATE CHEMICAL.
3. A NAME PLATE (316 S.S.) SHALL BE PROVIDED FOR EACH FILL LINE INCLUDING CHEMICAL NAME, FORMULA, 4-DIGIT UN NUMBER AND BULK TANK ID WHICH THE LINE IS TO FILL.
4. FINAL DIMENSIONS SHALL BE COORDINATED WITH EQUIPMENT BEING HOUSED.

CHEMICAL FILL AND INDICATOR SHIELDS

NOT TO SCALE



CHEMICAL DIFFUSER

NOT TO SCALE

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: MJK | Designed By: RSP | Checked By: PBH/RPH | Approved By: JWG

PROCESS
CHEMICAL FEED
SYSTEM SCHEMATICS

Rev.	Date	Description

COMMONWEALTH OF MASSACHUSETTS JON W. GREGORY CIVIL No. 52618 REGISTERED PROFESSIONAL ENGINEER
5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

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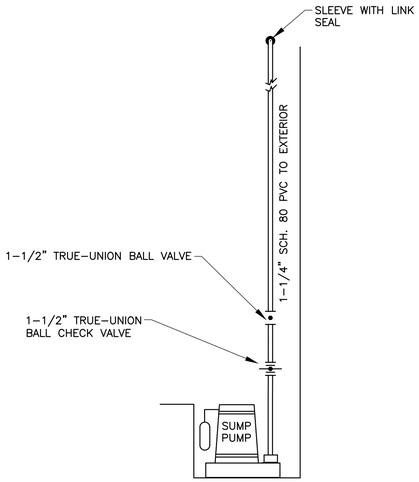
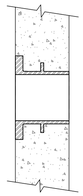
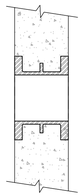


SUMP PUMP PIPING

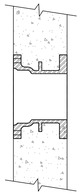
NOT TO SCALE



FL x PE WALL PIPE



FL x FL WALL PIPE

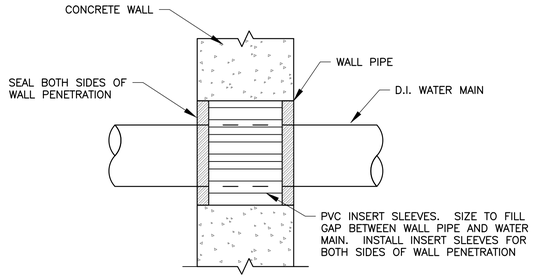


TAPPED MJ x FL WALL PIPE

WALL PIPE DETAILS

NOT TO SCALE

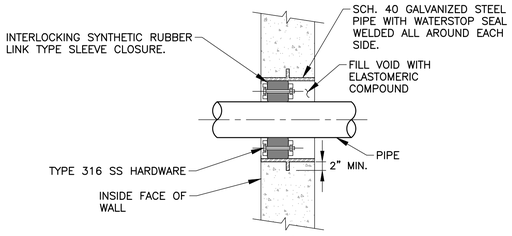
NOTES:
1. ALL WALL PIPES SHALL HAVE INTEGRALLY CAST WATERSTOP.
2. BOLT HOLES SHALL BE TAPPED HOLES FOR STUDS.



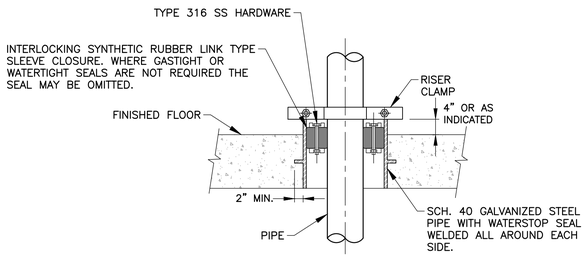
NOTES
1. REFER TO SPECIFICATION SECTION 15120 PIPING SPECIALTIES FOR PIPE PENETRATION SEAL REQUIREMENTS.

TUBULAR CASING PIPE PENETRATION SEAL

SCALE: NONE



WALL SLEEVE



FLOOR SLEEVE

WALL AND FLOOR SLAB PIPE PENETRATION DETAIL

NOT TO SCALE

NOTES:
1. WALL SLEEVES SHALL BE SIZED TO ALLOW FOR THE CORRECT LINK SEAL REQUIRED FOR THE CARRIER PIPE.
2. SOME LOCATIONS WILL REQUIRE DOUBLE LINKS SEALS REFER TO DRAWINGS FOR LOCATIONS.

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

PROCESS

DETAILS

Drawn By: MJK
Designed By: RSP
Checked By: PBH/RPN
Approved By: JWG

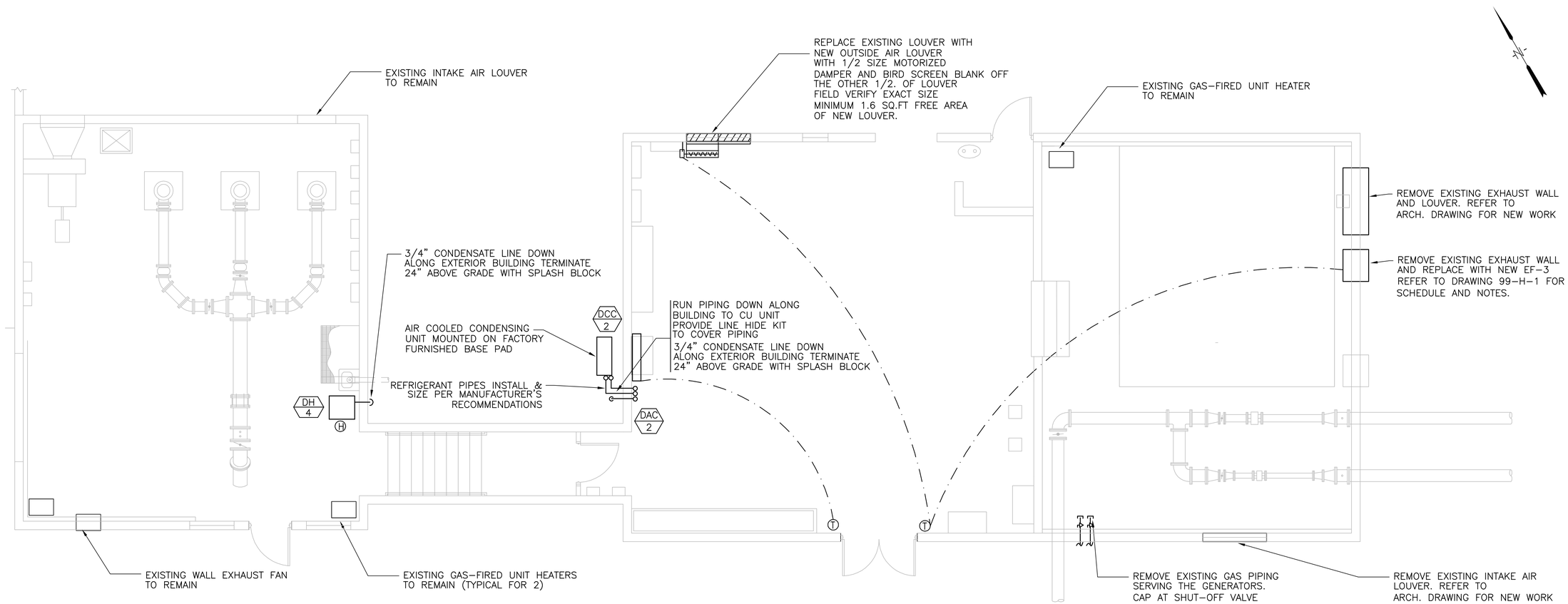
Rev.	Date	Description

COMMONWEALTH OF MASSACHUSETTS
JON W. GREGORY
No. 42073
REGISTERED PROFESSIONAL ENGINEER
5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

99-D-2



EXISTING FACILITY PLAN

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

HVAC

EXISTING FACILITY UPGRADES

Drawn By: TMM
Designed By: TMM
Checked By: PBH/RPN
Approved By: JWG

Rev.	Date	Description

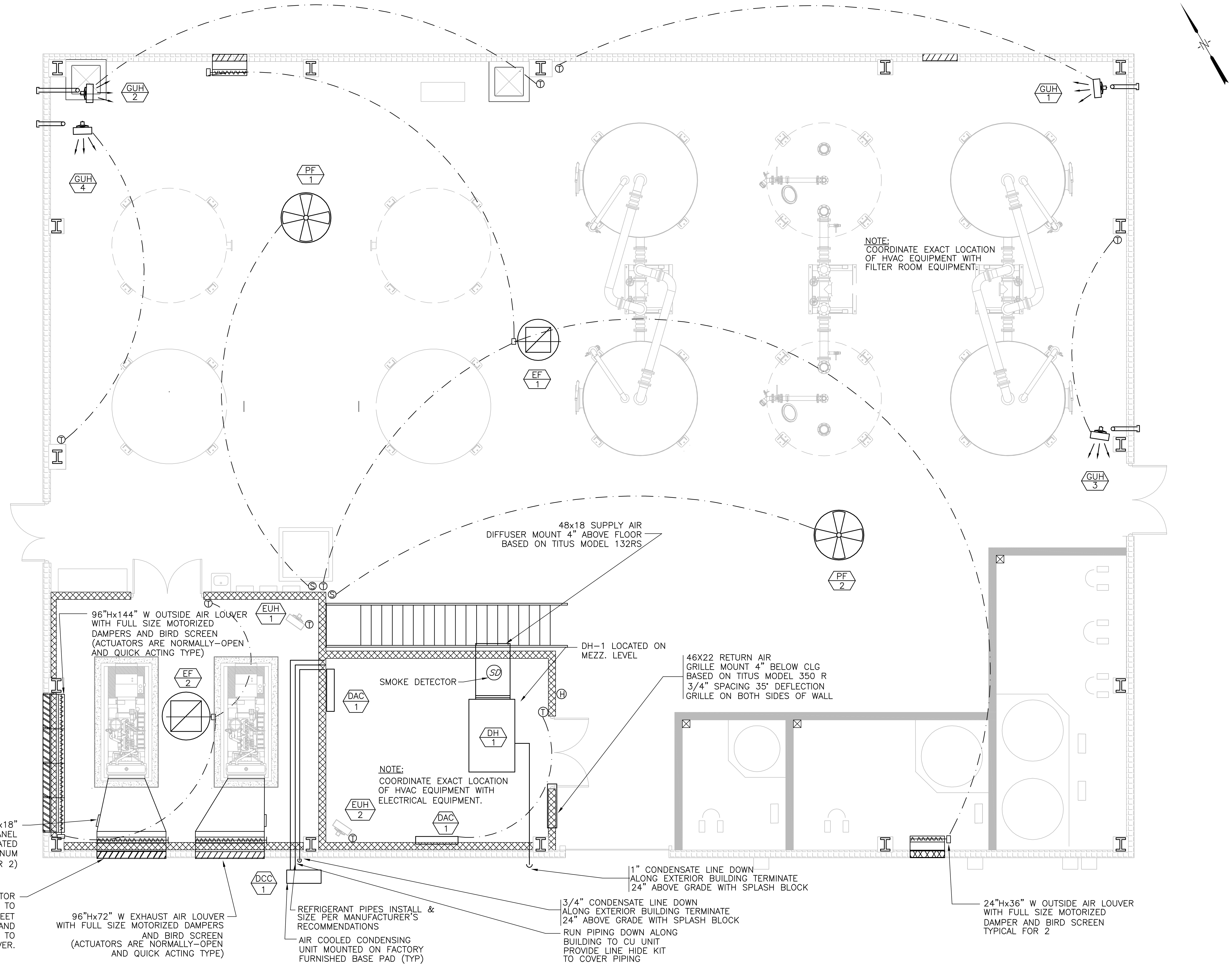
COMMONWEALTH OF MASSACHUSETTS JON W. GREGORY 5-1-19

COMMONWEALTH OF MASSACHUSETTS TODD H. MILLER 5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

10-H-1



FIRST FLOOR PLAN

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By TMM | Designed By TMM | Checked By PBH/RPN | Approved By JWG

HVAC
FIRST FLOOR PLAN

Rev.	Date	Description

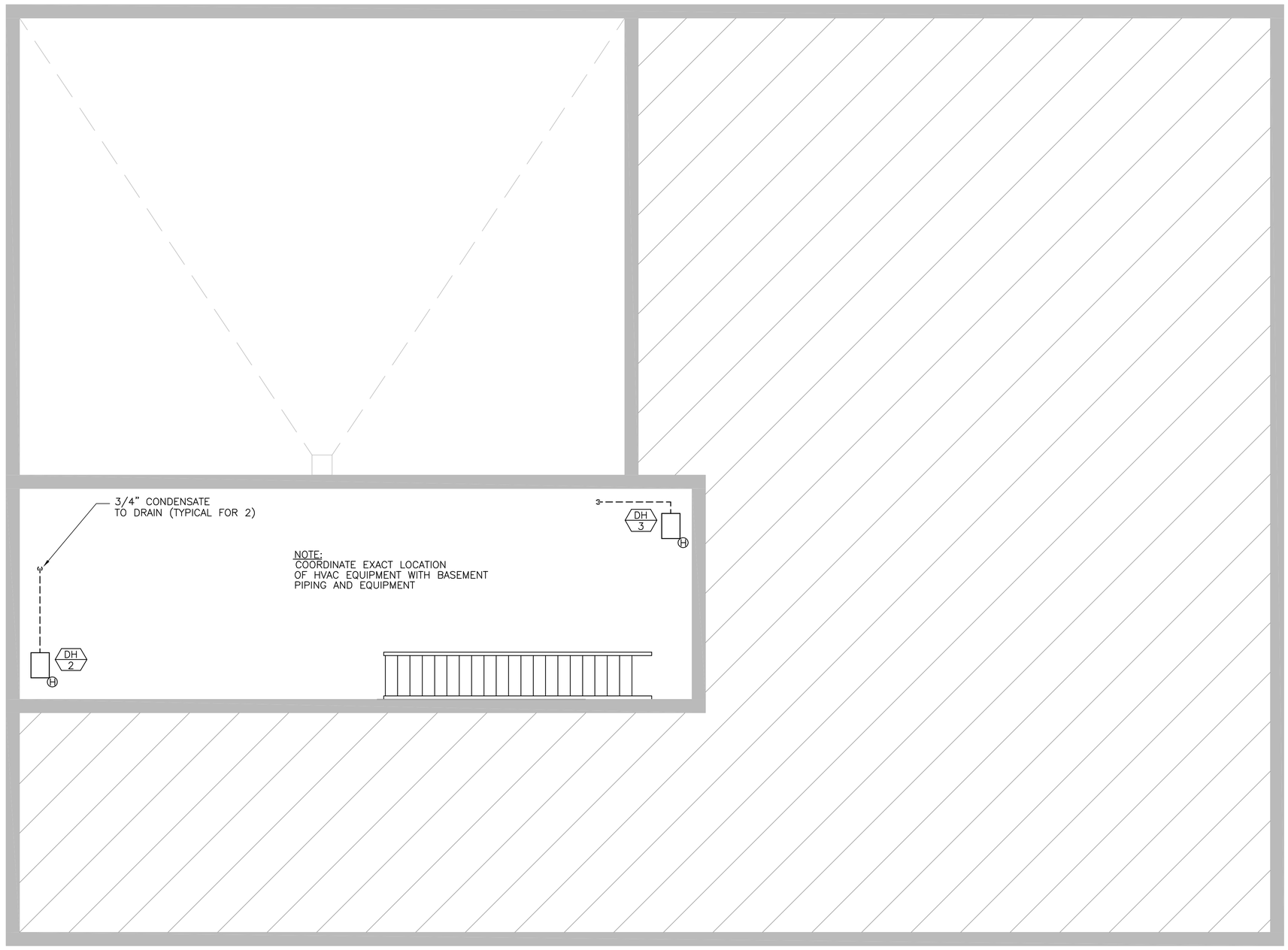
5-1-19

5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-H-1



BASEMENT FLOOR PLAN

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

HVAC
BASEMENT FLOOR PLAN

Drawn By: TMM | Designed By: TMM | Checked By: PBH/JRPN | Approved By: JWG

Rev.	Date	Description

JON W. GREGORY — COMMONWEALTH OF MASSACHUSETTS — No. 49728 — REGISTERED PROFESSIONAL ENGINEER — 5-1-19

TODD H. MASON — COMMONWEALTH OF MASSACHUSETTS — REGISTERED PROFESSIONAL ENGINEER — 5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-H-2

ELECTRIC UNIT HEATER SCHEDULE (EUH)

UNIT NO.	TYPE	MBH	CFM	ELEC COIL KW	ELEC COIL AMPS	MOTOR DATA @ 60 HZ HP	MOTOR DATA @ 60 HZ RPM	MOTOR DATA @ 60 HZ V	MOTOR DATA @ 60 HZ PH	SELECTION BASED ON	REMARKS
EUH-1,2	ELECT. UNIT HEATER	17.0	500	5	6.0	1/100	1600	480	3	QMARK MUH	PROVIDE WALL BRACKET, 1

NOTE: 1. PROVIDE BUILT IN THERMOSTAT.

FAN SCHEDULE (EF)

MARK	CFM	S.P.	RPM	ELECTRICAL VOLT	ELECTRICAL Ø	ELECTRICAL HZ	HP	TYPE	SERVICE	MFG	ACCESSORIES
EF-1	5,500	0.50	730	460	3	60	1-1/2	ROOF BELT DRIVE	FILTER ROOM	GREENHECK GB-240-15	MOTORIZED DAMPER ROOF CURB 1,2
EF-2	12,000	0.5	815	460	3	60	5	ROOF BELT DRIVE	GENERATOR ROOM	GREENHECK GB-300-50	MOTORIZED DAMPER ROOF CURB 2
PF-1&2	27,500	–	275	115	1	60	1/20	CEILING	FILTER RM	LEADING EDGE 56001A	WALL MOUNTED, FAN GUARD SPEED CONTROLLER,
EF-3	800	0.25	1160	120	1	60	1/4	SIDE WALL DIRECT DRIVE	EXISTING BLDG	GREENHECK GB-300-50	MOTORIZED DAMPER MOTOR GUARD 1,2,3

1. PROVIDE PERMATECTOR COATING ON ENTIRE EF-1.
2. PROVIDE A 24 VOLT WALL MOUNTED THERMOSTAT WITH ON/OFF/AUTO SUB BASE.
3. WALL OPENING 25"x25", PROVIDE WALL COLLAR

GAS UNIT HEATER SCHEDULE (GUH)

MARK	SERVES	MBH IN	MBH OUT	CFM	RPM	H.P.	ELECTRICAL VOLT	ELECTRICAL PH.	ELECTRICAL HZ.	INTAKE/ EXHAUST SIZE 2@	DESIGN EQUIPMENT	NOTES
GUH-1,2	AERATOR ROOM	30.0	24.6	465	1550	1/35	120	1	60	4"	REZNOR UDAS-30	1,2,3,4,5
GUH-3,4	FILTER ROOM	45.0	37.350	629	1550	1/35	120	1	60	4"	REZNOR UDAS-45	1,2,3,4,5

NOTES:
1. PROVIDE OPTIONAL STAINLESS STEEL HEAT EXCHANGER AND BURNER.
2. GAS CONTROL VALVE
3. PROVIDE HANGER KIT.
4. PROVIDE WALL THERMOSTAT.
5. PROVIDE INTAKE/EXHAUST AIR COMPACT TERMINATION KIT OPTION CC14

DEHUMIDIFIER SCHEDULE (DH)

UNIT	SERVICE	CAPACITY	CFM	ELECTRICAL VOLT	ELECTRICAL Ø	ELECTRICAL HZ	ELECTRICAL	MFG	NOTES
DH-1	FILTER RM	57.0 LBS/HR	5400	480	3	60	15.3 KW	BASED ON DCA 5400A	1
DH-2&3	BASEMENT	6.8 LBS/HR	400	120	1	60	16.5 AMPS	BASED ON DESERT AIRE HPR120	2
DH-4	EXIST. BLDG	97 PPD	700	120	1	60	16.0 AMPS	BASED ON EPAC K100-E	3

NOTE: 1 PROVIDE WALL MOUNTED HUMIDISTAT WITH ON/OFF/AUTO SUB-BASE. PROVIDE RUBBER PADS UNDER UNIT
NOTE: 2 PROVIDE WALL MOUNTED HUMIDITY CONTROLLER AND BUILT-IN CONDENSATE PUMP.
NOTE: 3 BUILT-IN HUMIDITY CONTROLLER AND BUILT-IN CONDENSATE PUMP.

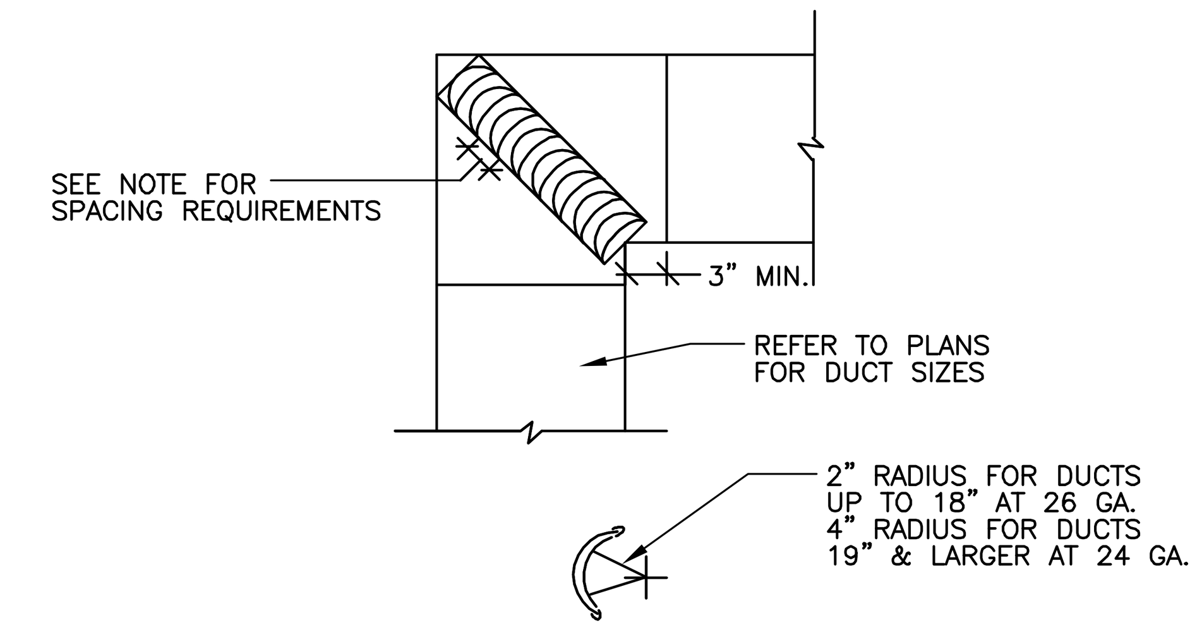
DUCTLESS SPLIT SYSTEM AIR CONDITIONER/ HEAT PUMP (DAC) (DCC)

MARK	LOCATION / SERVES	COOLING AMBIENT TEMP	COOLING EAT WB	COOLING TOTAL MBH	HEATING TOTAL MBH	CFM	EVAPORATOR UNIT (INDOOR) ELECTRICAL	VOLTS	PH	HZ	AMPS	MODEL NUMBER	MARK	CONDENSING UNIT (OUTDOOR) COMPRESSOR DATA BKR.SIZE	MIN. AMPACITY	VOLTS	PHASE	HZ	COOLING MBH	MODEL NUMBER	NOTES
DAC-1	ELECTRICAL ROOM	95	75	34.6	–	850		208	1	60	1.0	MSY-D36NA	DCC-1	25 AMPS		208	1	60	34.6	MUY-D36NA	1,2,3
DAC-2	EXISTING BLDG	95	75	34.6	–	850		208	1	60	1.0	MSY-D36NA	DCC-2	25 AMPS		208	1	60	34.6	MUY-D36NA	1,2,3

NOTES:
1. PROVIDE WIRED WALL MOUNTED PROGRAMMABLE, WEEKLY SCHEDULE, NIGHT SETBACK, KEYPAD AND THERMOSTATS TO CONTROL UNIT
2. SELECTION BASED ON MITSUBISHI.
3. PROVIDE LOW AMBX TEMPERATURE CONTROLS

HVAC CONSTRUCTION NOTES

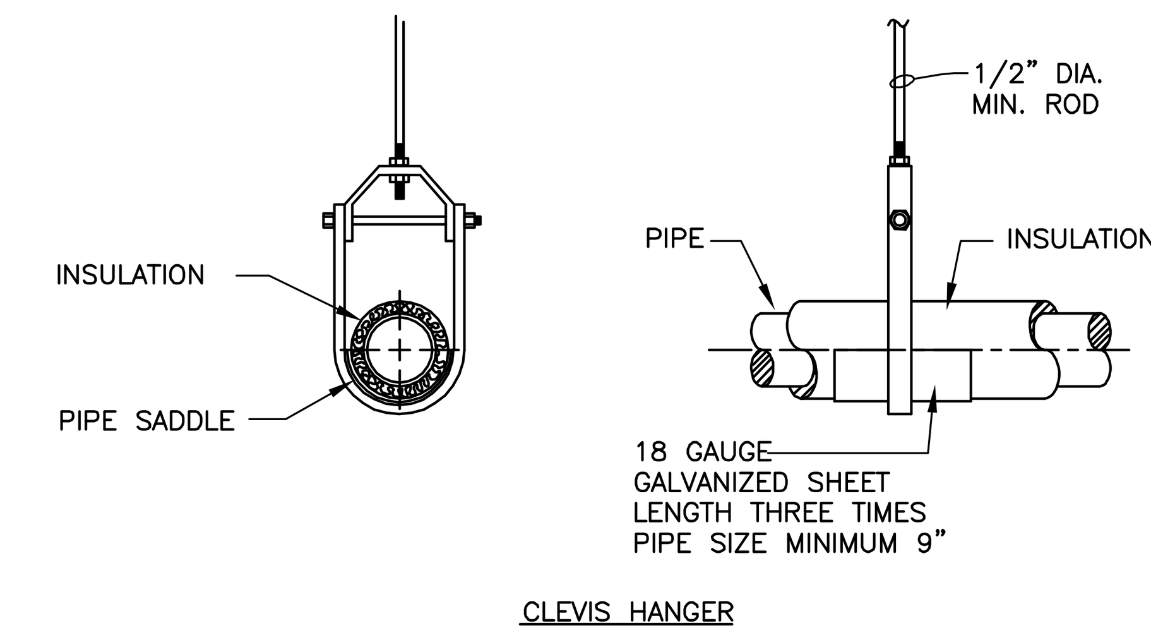
1. DUCTWORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH 1995 2ND EDITION SMACNA STANDARDS.
2. COORDINATE DUCTWORK AND PIPING WITH PLUMBING, FIRE PROTECTION AND ELECTRICAL. MAKE OFFSETS AND TRANSITIONS TO COORDINATE WITH OTHER TRADES WITHOUT ADDITIONAL EXPENSE TO THE OWNER.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING AND BEARING COSTS OF NECESSARY PERMITS, BONDS, AND FEES FOR WORK. SECURE AND PAY ALL FEES FOR PERMITS, UTILITY CONNECTIONS, AND INSPECTION OF WORK.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING AND PATCHING AS REQUIRED FOR PROPER INSTALLATION OF THE MATERIAL AND EQUIPMENT.
5. ALL WORK SHALL BE DONE IN ACCORDANCE WITH ALL APPLICABLE LAWS, ORDINANCES, STATE AND LOCAL CODES AND SHALL BE SUBJECT TO CONTROL OF PUBLIC AUTHORITIES HAVING JURISDICTION.
6. THIS CONTRACTOR SHALL START UP AND BALANCE ALL OUTLETS TO INDICATED CFM'S PER NEBB GUIDELINES. FURNISH BALANCING REPORT.



NOTE:
2-1/8" SPACING FOR DUCTS UP TO 18". 3-1/4 " SPACING FOR DUCTS 19" AND OVER.

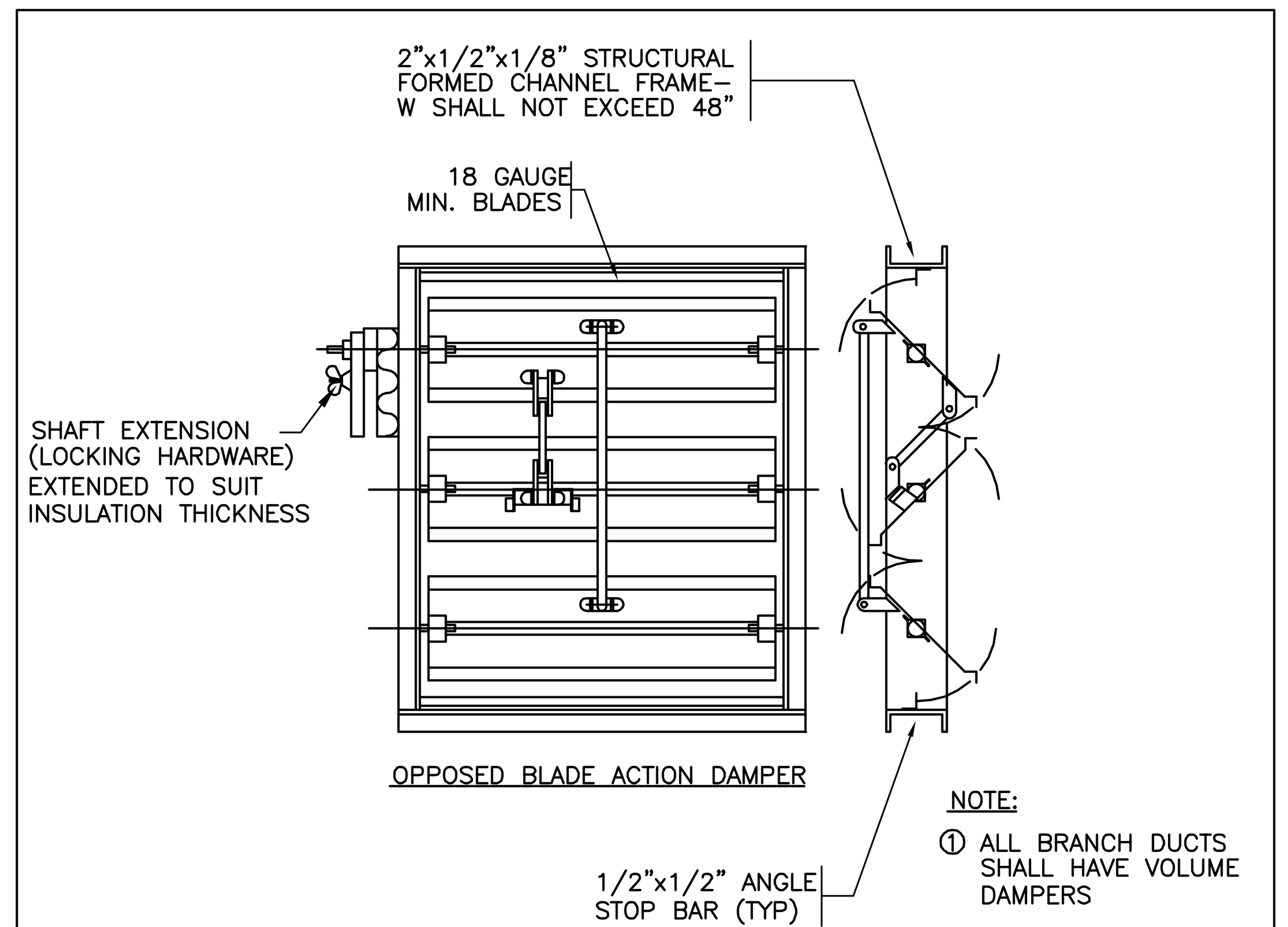
NOTES:
1. TYPICAL FOR ALL RECTANGULAR DUCT ELBOWS

TYPICAL TURNING VANE DETAIL — NTS



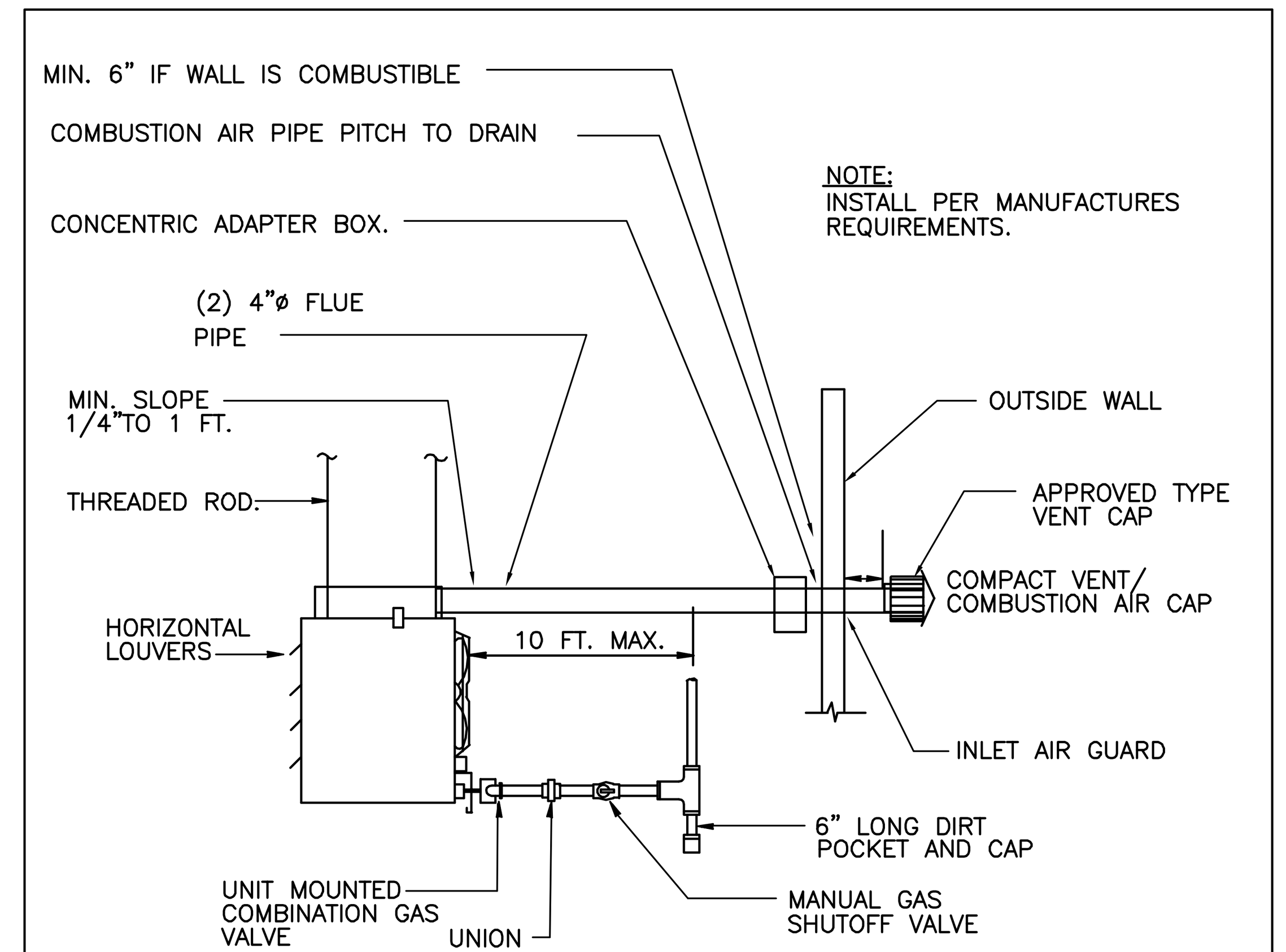
NOTES:
1. INSULATION ABOVE SADDLES SHALL BE FOAM GLASS OF SAME THICKNESS AS PIPE INSULATION AND A COMPRESSIVE STRENGTH OF NOT LESS THAN 3,300 PSI.
2. HANGER RODS SHALL BE THE SAME AND OF THE SIZE REQUIRED BUT NOT SMALLER THAN 1/2" DIAMETER.
3. HANGERS ARE ALSO TYPICAL FOR UNINSULATED PIPING (WITHOUT INSULATION AND SADDLES.)
4. CONNECT TO TOP OR BOTTOM CHORD OF JOISTS

TYPICAL PIPE HANGER DETAIL — NTS



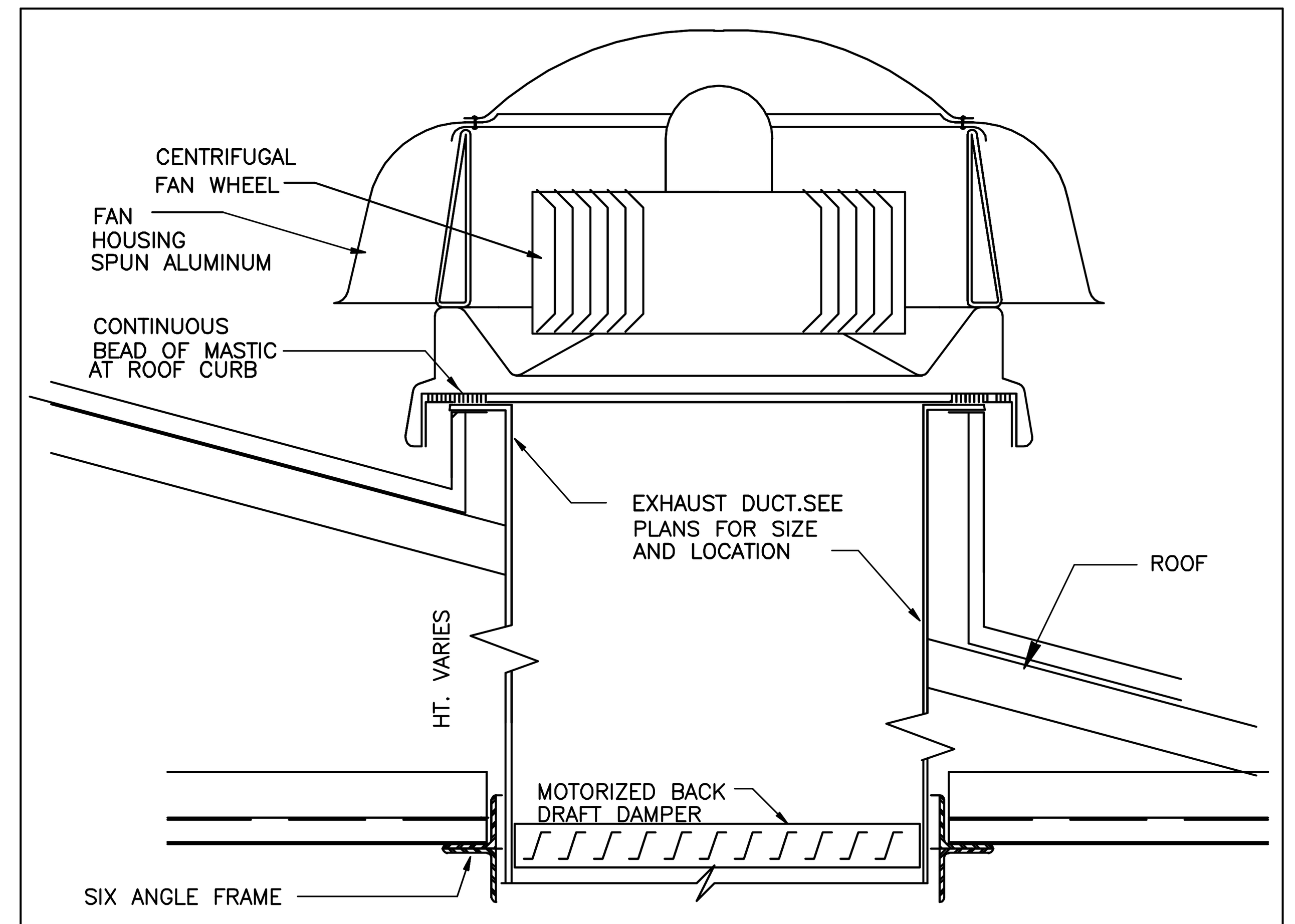
NOTE:
① ALL BRANCH DUCTS SHALL HAVE VOLUME DAMPERS

OPPOSED BLADE VOLUME DAMPER (OBD) — NTS



NOTE:
INSTALL PER MANUFACTURES REQUIREMENTS.

TYPICAL GAS FIRED UNIT HEATER DETAIL — NTS



ROOF FAN DETAIL — NTS

TOWN OF BARNSTABLE, MASSACHUSETTS
MAHER FILTRATION PLANT
HVAC
SCHEDULES, DETAILS & NOTES

Drawn By: TMM | Designed By: TMM | Checked By: PBH/RPN | Approved By: JWG

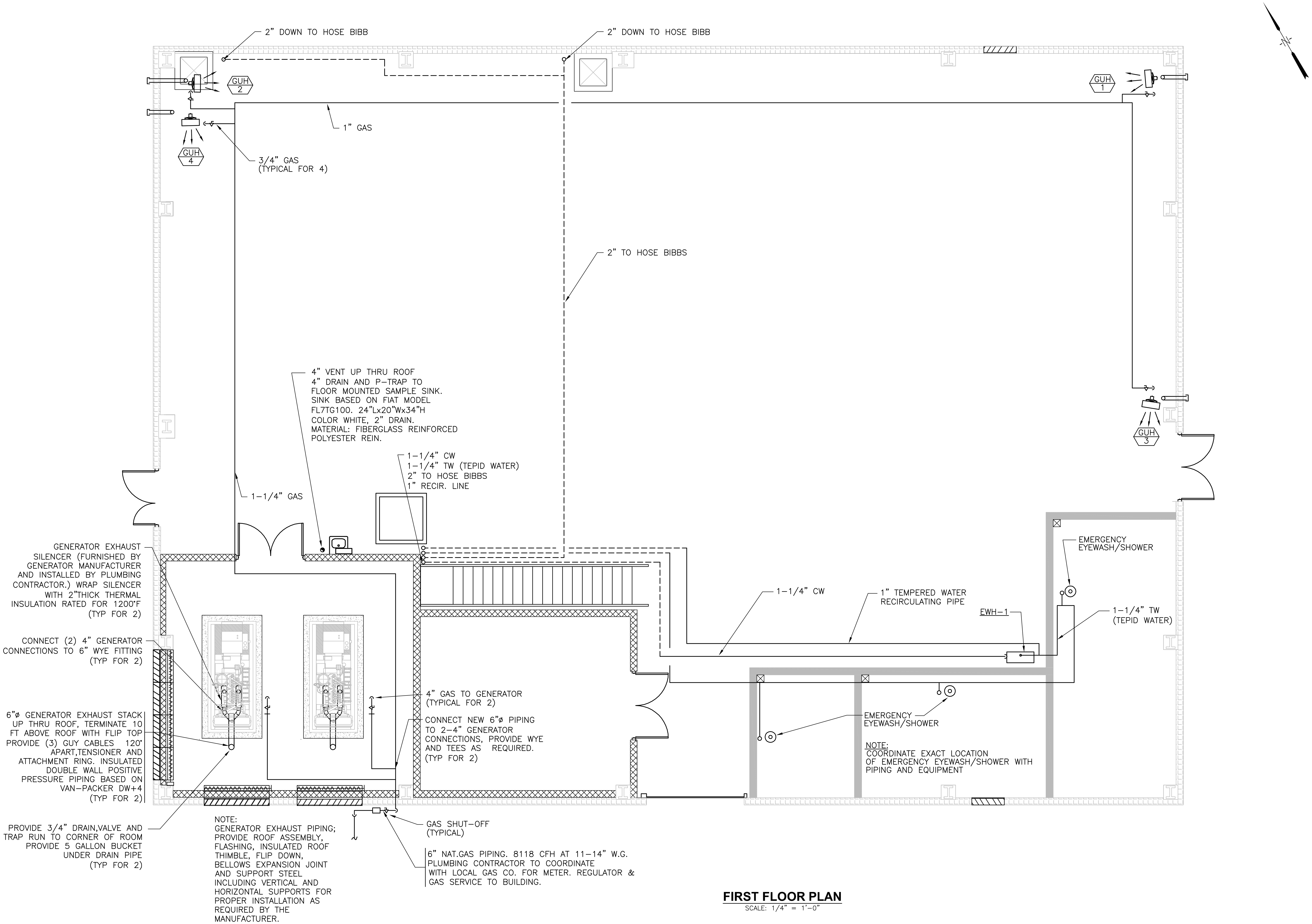
Rev.	Date	Description

5-1-19
5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

99-H-1



FIRST FLOOR PLAN

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: TMM | Designed By: TMM | Checked By: PBH/RPN | Approved By: JWG

PLUMBING
FIRST FLOOR PLAN

Rev.	Date	Description

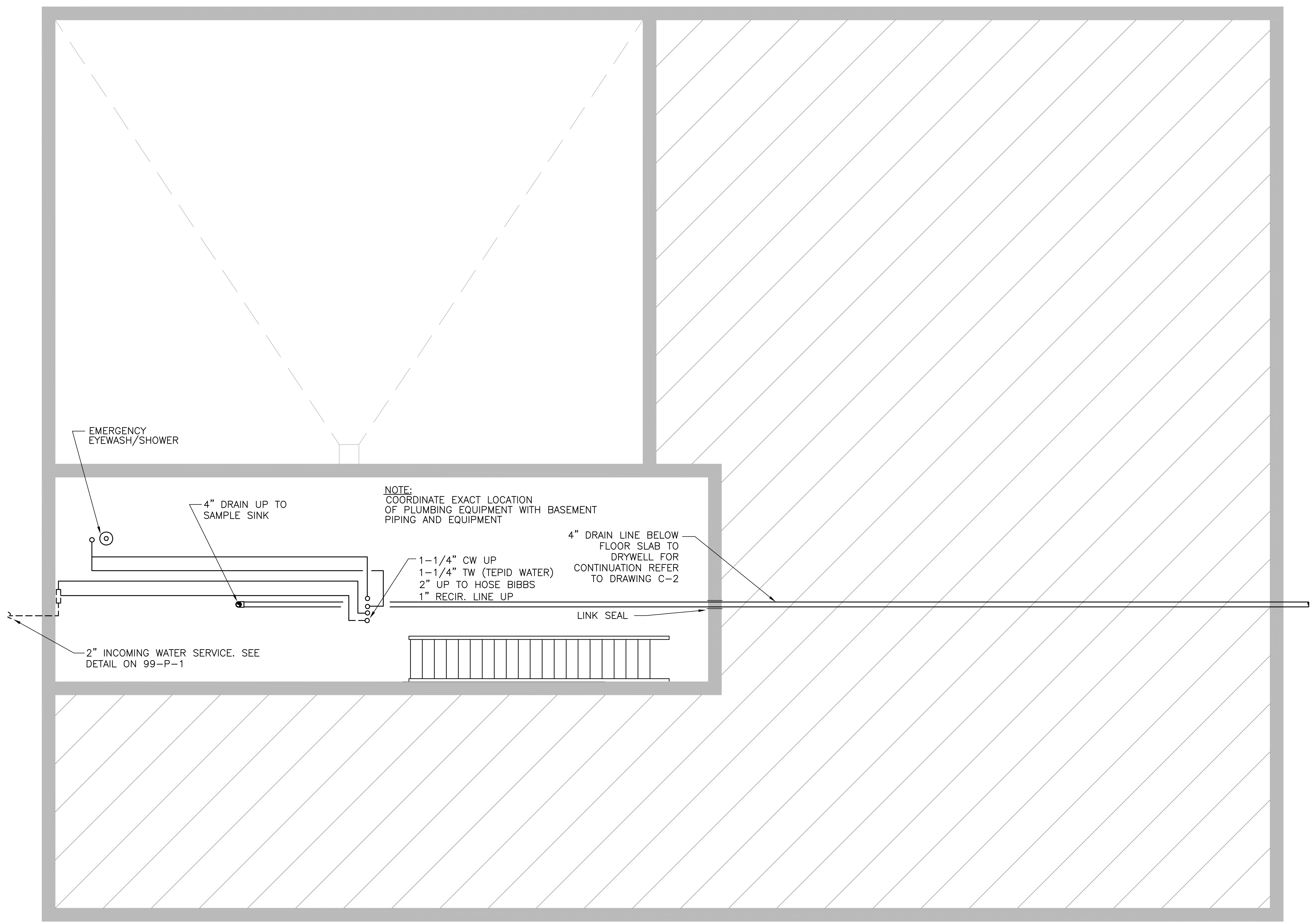
5-1-19

5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-P-1



BASEMENT FLOOR PLAN

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: TMM | Designed By: TMM | Checked By: PBH/RPN | Approved By: JWG

PLUMBING
BASEMENT FLOOR PLAN

Rev.	Date	Description

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TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-P-2

GENERAL LEGEND

Symbol	Abbr.	Description
	CO	CLEANOUT
	FCO	FLOOR CLEANOUT
		ELBOW UP OR RISE
		ELBOW DOWN OR DROP
		UNION
		PIPE CONTINUATION
		BALL VALVE
	WH	WALL HYDRANT
		BACKFLOW PREVENTER
		WATER METER

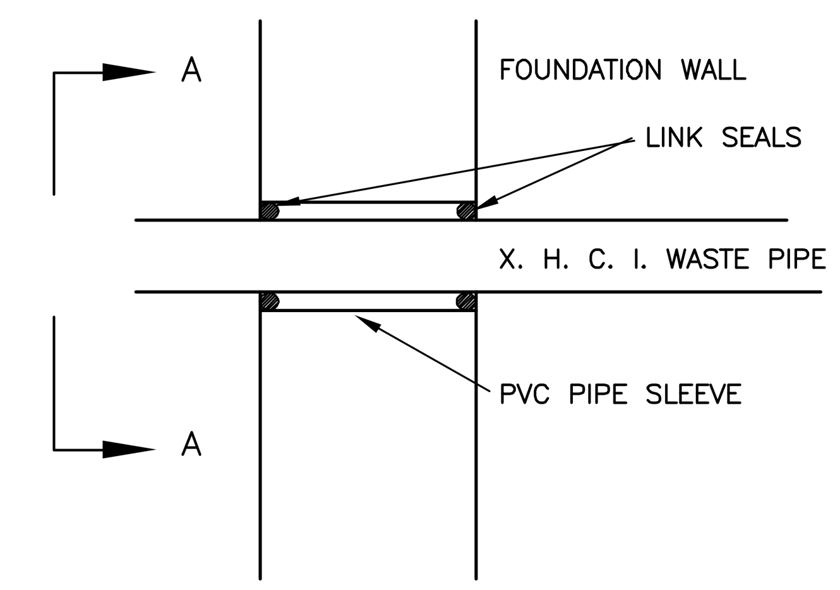
ABBREVIATIONS

CW	COLD WATER
CO	CLEAN OUT
G	GAS
DN	DOWN
FCO	FLOOR CLEANOUT
HW	HOT WATER
P-#	FIXTURE NUMBER
SD	STORM DRAIN
TYP	TYPICAL
V	VENT
VTR	VENT THRU ROOF
W	WASTE

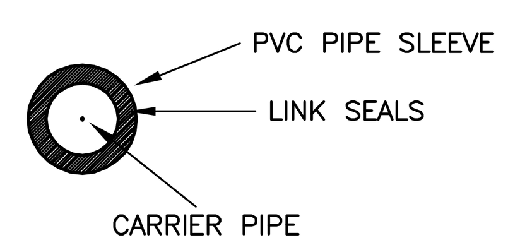
PLUMBING-ELECTRICAL SCHEDULE

TAG	FIXTURE	SERVICE	MANUFACTURER	MODEL NO.	VOLTS	PHASE	HERTZ	KW	AMPS	CW	TW	REMARKS
EWH-1	ELECTRIC TANKLESS HEATER	EMERGENCY SHOWER	EEMAX	APO72480EFGN4XGFCI	480	3	60	72.0	87	1-1/4	1-1/4	1,2

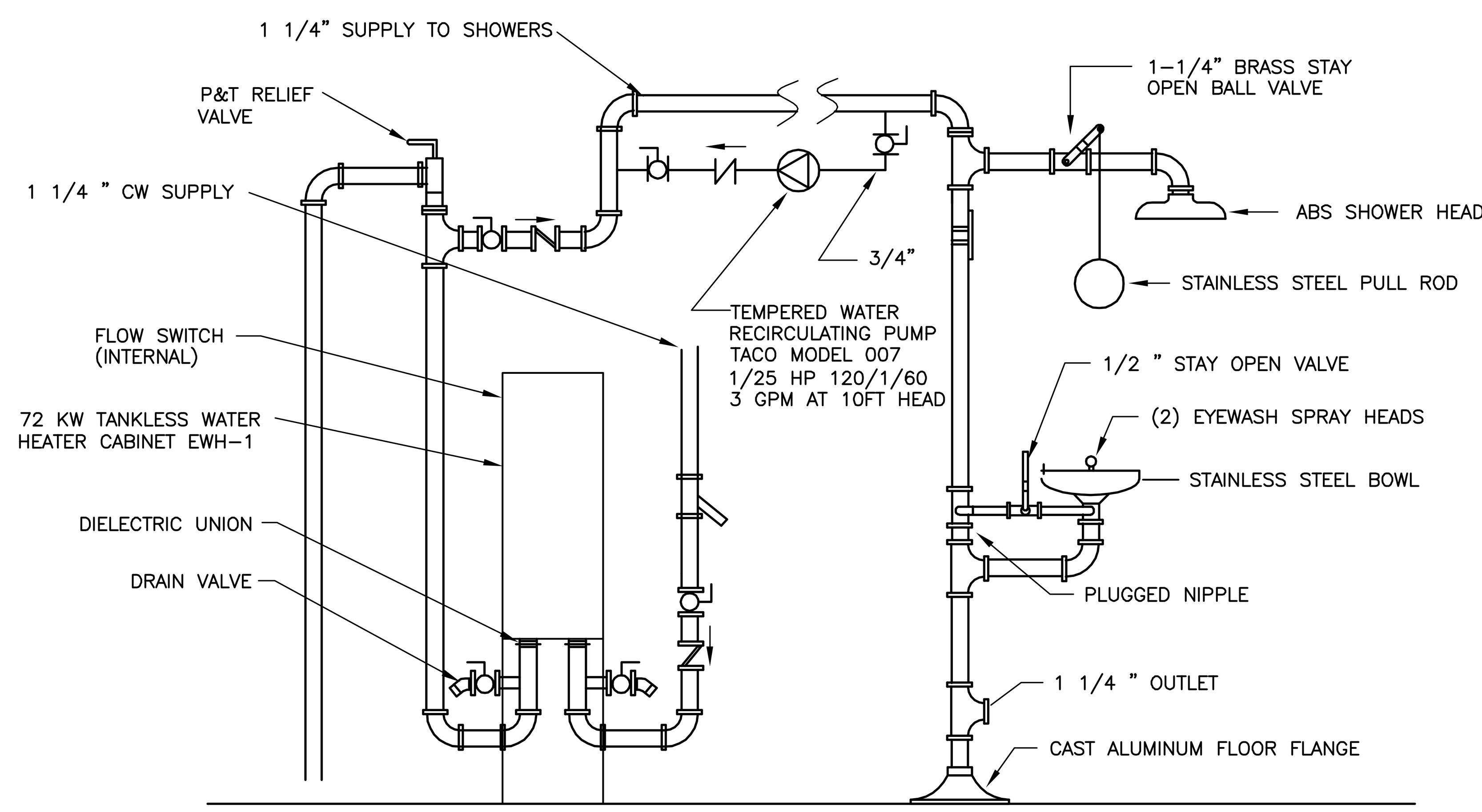
NOTE 1. 20° RISE AT 20 GPM, OUTLET TEMPERATURE 90°F MAX.
NOTE 2. PROVIDE 24" LEGS, SIREN AND BEACON



TYPICAL PIPE PENETRATION THROUGH CONCRETE WALLS
SCALE: NONE



SECTION A – A



EMERGENCY SHOWER AND EYEWASH SYSTEM
NOT TO SCALE

PLUMBING GENERAL NOTES

1.) REFER TO ARCHITECTURAL DRAWINGS FOR FINISHED FLOOR ELEVATIONS.

2.) ALL WORK PERFORMED SHALL CONFORM TO ALL APPLICABLE LAWS, STATE AND LOCAL CODES AND SHALL BE SUBJECT TO CONTROL OF PUBLIC AUTHORITIES HAVING JURISDICTION.

3.) CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING AND BEARING COSTS OF NECESSARY PERMITS, BONDS AND FEES FOR WORK. SECURE AND PAY ALL FEES FOR PERMITS, UTILITY CONNECTIONS AND INSPECTION OF WORK.

4.) THE FINAL ARRANGEMENT OF THE WORK SHALL SUIT FIELD CONDITIONS

5.) VERIFY ALL DIMENSIONS IN THE FIELD.

6.) EQUIPMENT & PIPING INSTALLATION SHALL BE COORDINATED WITH ALL OTHER BUILDING SYSTEMS AND BUILDING COMPONENTS. ALL WORK WHICH CAUSES INTERFERENCE DUE TO FAILURE OF COORDINATION SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE.

7.) AFTER INSTALLATION ALL EQUIPMENT AND PIPING SYSTEMS SHALL BE TESTED TO DEMONSTRATE CAPABILITY TO PERFORM SATISFACTORILY. ANY DEFICIENCIES SHALL BE CORRECTED AND RETESTED. ALL EQUIPMENT, MATERIAL, AND LABOR REQUIRED FOR TESTING SHALL BE FURNISHED BY THE CONTRACTOR.

8.) PRIOR TO TESTING ALL PIPING SYSTEMS SHALL BE THOROUGHLY CLEANED AND BE IN PROPER CONDITION.

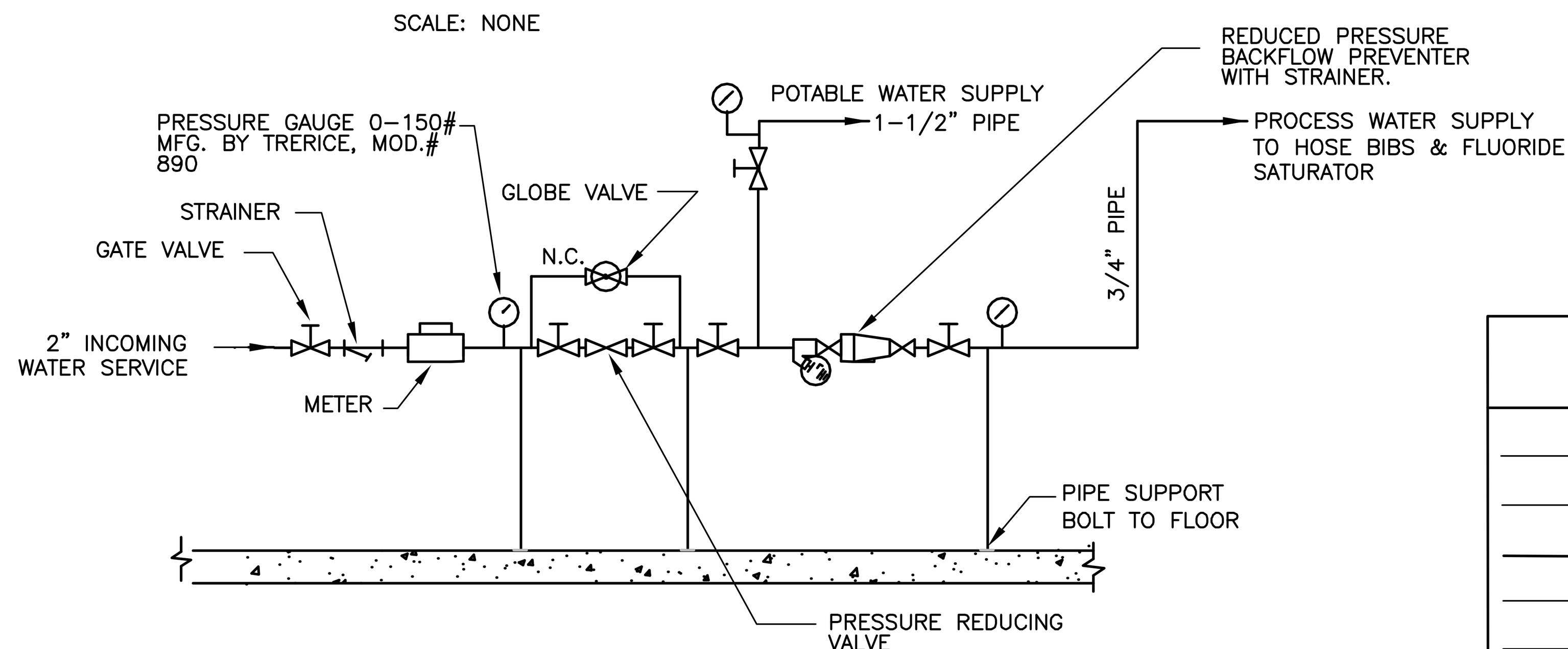
9.) ARCHITECTURAL BACKGROUND INFORMATION IS SHOWN FOR COORDINATION PURPOSES ONLY. REFER TO THE PROPER DRAWINGS FOR EXACT LOCATIONS, SIZES & QUANTITIES OF OTHER TRADES WORK.

10.) ABOVE SLAB PLUMBING PIPING SHALL BE HELD AS HIGH AS POSSIBLE.

11.) NO PLUMBING PIPING SHALL BE RUN IN OR THROUGH THE ELECTRIC ROOMS.

12.) PLUMBING CONTRACTOR IS RESPONSIBLE FOR ALL FINAL CONNECTIONS TO SITE UTILITIES. COORDINATE EXACT LOCATION, INV., AND UTILITY MATERIALS IN FIELD.

13.) GAS PIPING SHALL BE SCHEDULE 40 BLACK IRON WITH SCREWED FITTING. PLUMBING CONTRACTOR TO FURNISH AND INSTALL AND CONNECT GAS PIPING TO GAS-FIRED EQUIPMENT, COORDINATE WITH HVAC CONTRACTOR FOR EXACT LOCATION OF EQUIPMENT.



WATER SERVICE ENTRANCE
NOT TO SCALE

PIPING LEGEND

Symbol	Abbr.	Description
	CW	COLD WATER ABOVE SLAB
	HW	HOT WATER
—G—	G	GAS
	S or W	SOIL OR WASTE ABOVE GROUND
	S or W	SOIL OR WASTE BELOW SLAB
—SD—	SD	STORM DRAIN
	V	VENT ABOVE GROUND

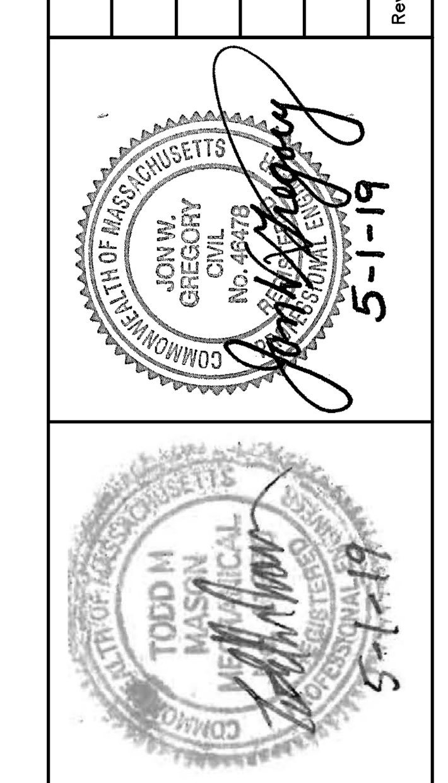
TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: TMM | Designed By: TMM | Checked By: PBH/RPN | Approved By: JWG

PLUMBING
SCHEDULES, DETAILS & NOTES

Rev.	Date	Description



TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

99-P-1

LEGEND

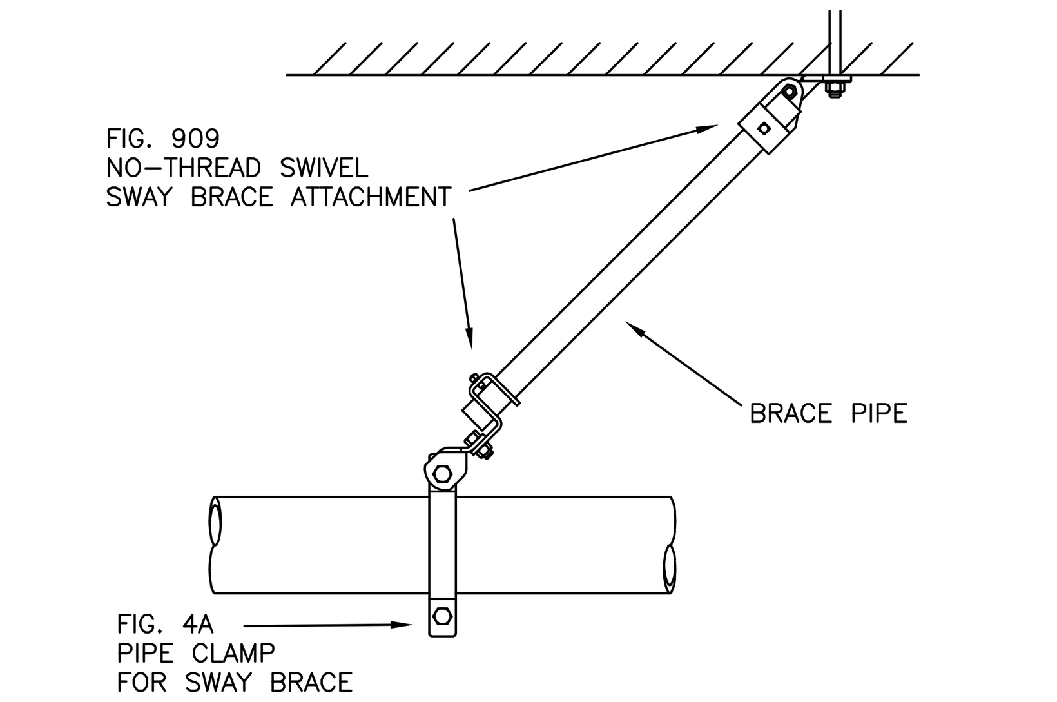
- GATE VALVE
- OUTSIDE SCREW & YOKE (OS&Y) VALVE
- VALVE IN VERTICAL
- RISE (SINGLE LINE – PLAN VIEW)
- DROP (SINGLE LINE – PLAN VIEW)
- BOTTOM TAKEOFF
- TOP TAKEOFF
- PIPE BREAK (SINGLE LINE)
- BUTTERFLY VALVE
- PIV POST INDICATOR VALVE
- INSPECTOR'S TEST VALVE & SIGHT GLASS
- RPZ — REDUCED PRESSURE BACKFLOW PREVENTER
- DCBP — DOUBLE CHECK VALVE BACKFLOW PREVENTER
- DIRECTION OF FLOW IN PIPE
- UP — PITCH PIPE UP IN DIRECTION OF FLOW
- DN — PITCH PIPE DOWN IN DIRECTION OF FLOW
- EXISTING LINES TO REMAIN
- EXISTING TO BE REMOVED
- NEW LINE TO BE INSTALLED
- PENDANT SPRINKLER HEAD (SSP K=8.0) INTERMEDIATE TEMP UNLESS OTHERWISE INDICATED
- UPRIGHT SPRINKLER HEAD (SSU K=8.0) INTERMEDIATE TEMP UNLESS OTHERWISE INDICATED
- SIDEWALL SPRINKLER HEAD (SSS K=5.6)
- CONCEALED SPRINKLER HEAD (K=5.6)
- AP SPECIFIC APPLICATION ATTIC HEAD (SSU K=5.6)
- BACK TO BACK (BB) SPECIFIC APPLICATION ATTIC HEAD (K=8.0)
- DIRECTIONAL (SD) SPECIFIC APPLICATION ATTIC HEAD (K=5.6)
- FDC — FIRE DEPARTMENT CONNECTION
- EB — ELECTRIC BELL
- STANDPIPE & HOSE CONNECTION
- DRY PIPE RISER
- WET PIPE RISER

CALL OUT SYMBOLS

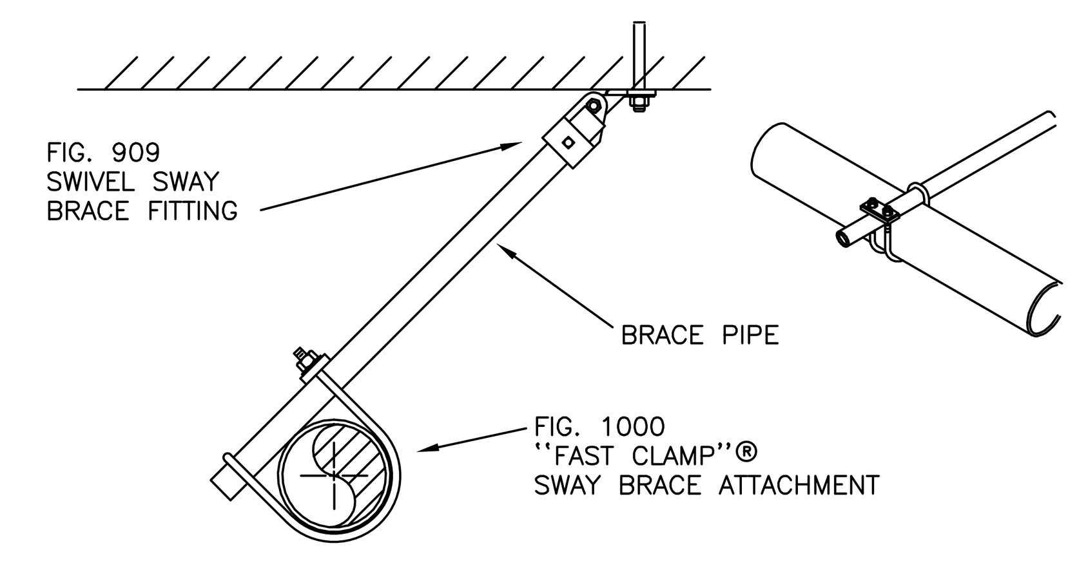
- DETAIL DESIGNATION / SHEET NUMBER
- REVISION NUMBER
- CONNECT NEW TO EXISTING
- SECTION DESIGNATION / SHEET NUMBER
- HYDRAULIC REFERENCE NODE
- HYDRAULICALY REMOTE AREA

FIRE PROTECTION GENERAL NOTES:

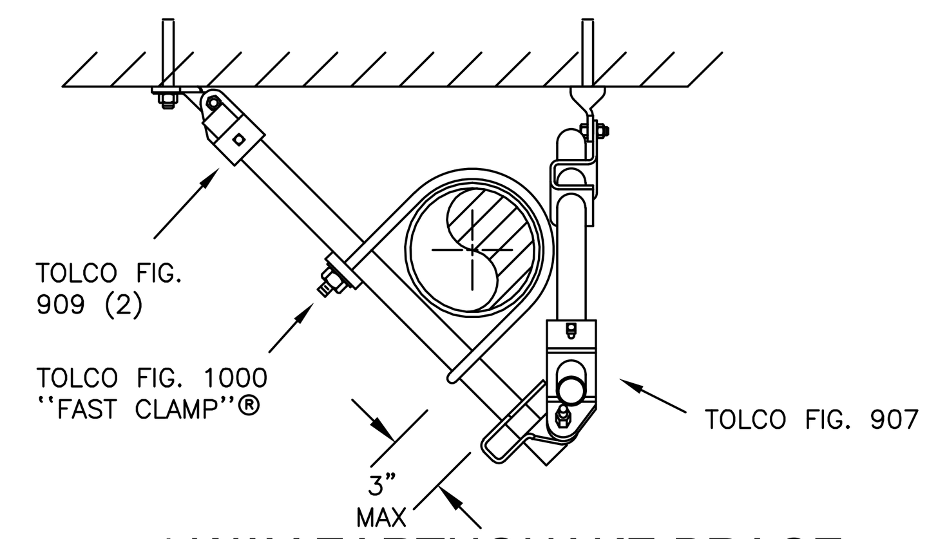
1. ALL PIPING SHOWN IS DIAGRAMMATIC ONLY, EXACT LOCATION TO BE DETERMINED IN THE FIELD.
2. CONTRACTOR SHALL REVIEW ALL CIVIL, STRUCTURAL, ARCHITECTURAL, HVAC AND PLUMBING DRAWINGS TO BE FAMILIAR WITH THE DETAILS OF CONSTRUCTION IN ADDITION TO COORDINATING WITH THE OTHER TRADES TO ELIMINATE CONFLICTS PRIOR TO INSTALLATION.
3. CONTRACTOR SHALL BASE ALL CALCULATIONS ON A FLOW TEST NO MORE THAN 12 MONTHS OLD.
4. FURNISH AND INSTALL ALL NECESSARY PIPING, EQUIPMENT, VALVES AND SUPPORTS REQUIRED TO PROVIDE A COMPLETE AND FUNCTIONING SYSTEM.
5. REQUIRED FIRE RESISTANCE OF ALL FLOORS AND WALLS SHALL BE MAINTAINED WHERE PENETRATIONS OCCUR. FIRESTOPPING SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
6. ALL CONTROL VALVES SHALL BE PROVIDED WITH TAMPER SWITCHES. WIRING TO FIRE ALARM CONTROL PANEL SHALL BE UNDER SECTION 16001.
7. ALL FIRE PROTECTION WORK SHALL BE IN ACCORDANCE WITH MASSACHUSETTS STATE BUILDING CODE, NINTH EDITION, CHAPTER 9, INCLUDING ALL PERTINENT NFPA REFERENCED STANDARDS AS ADOPTED.
8. SEISMIC RESTRAINT SHALL BE PROVIDED IN ACCORDANCE WITH NFPA-13 AND MASS. BUILDING CODE.
9. SPRINKLER HEADS SHALL BE CENTERED IN CEILING TILES.
10. FIREPROOF ALL WALL PENETRATIONS WITH A 3-HR RATING



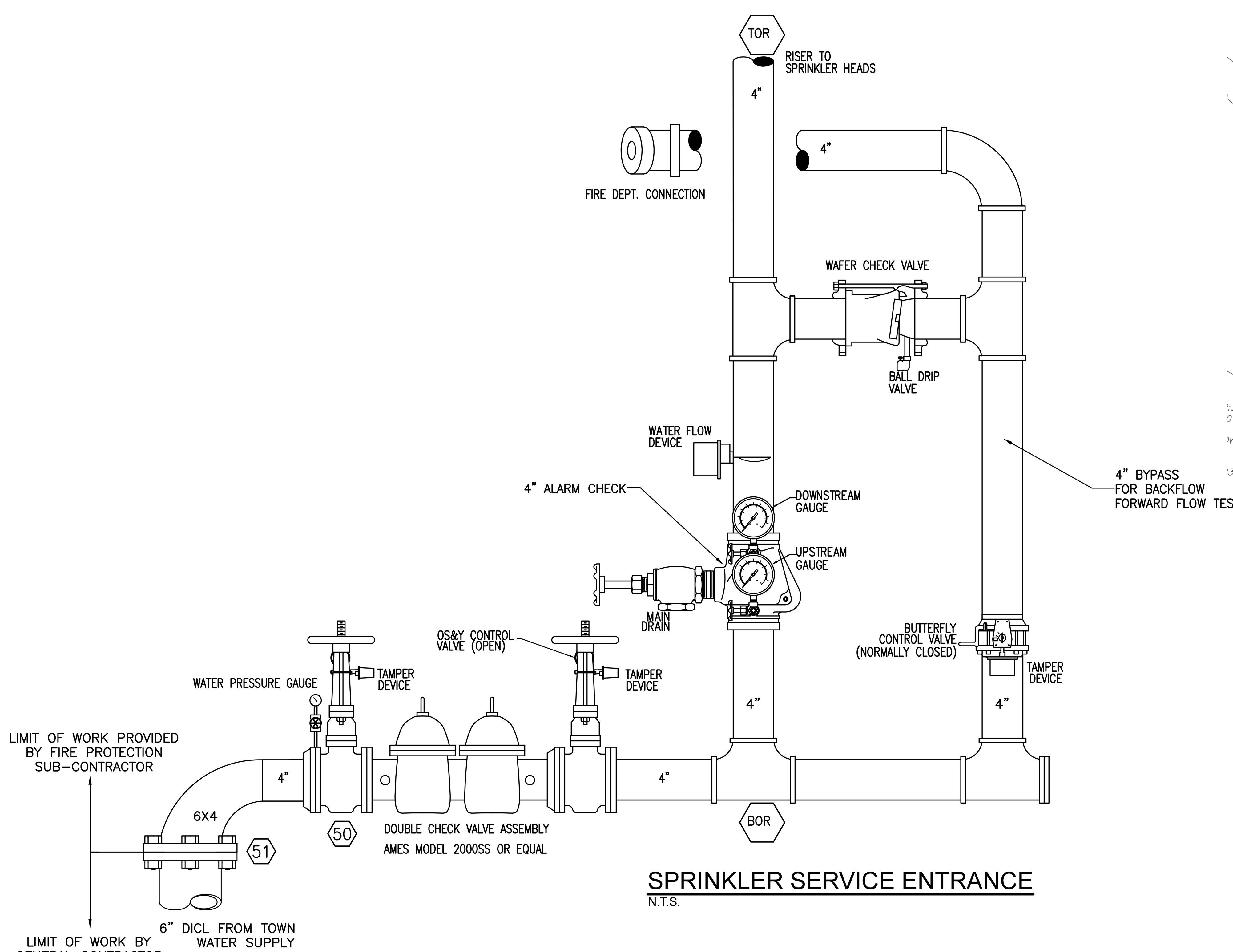
LONGITUDINAL EARTHQUAKE BRACE
NON-THREADED BRACE PIPE N.T.S.



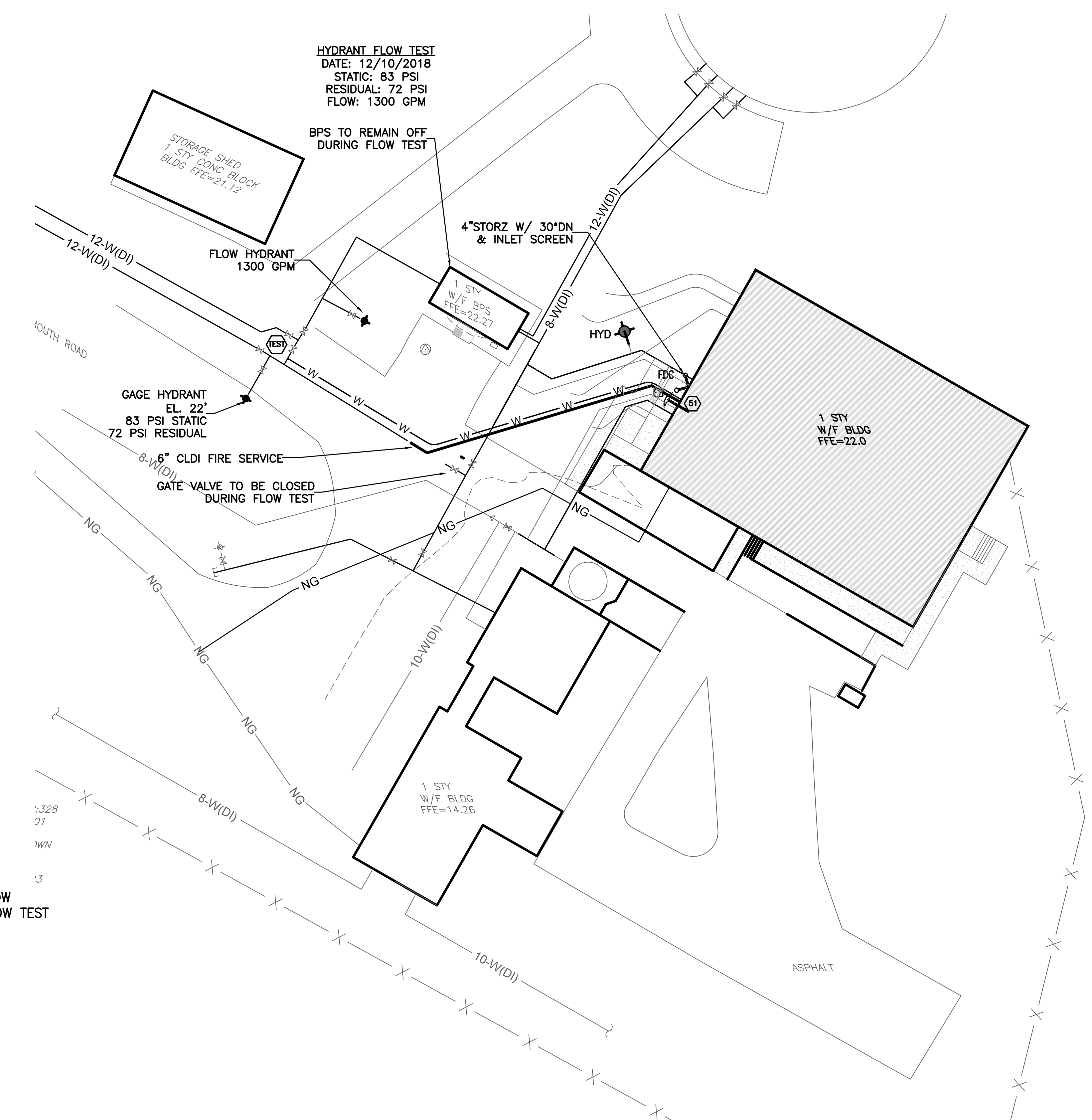
LATERAL EARTHQUAKE BRACE
NON-THREADED BRACE PIPE N.T.S.



4 WAY EARTHQUAKE BRACE
LATERAL/LONGITUDINAL EARTHQUAKE BRACE N.T.S.



SPRINKLER SERVICE ENTRANCE
N.T.S.



SITE PLAN
SCALE: 1"=30'

0 15' 30' 60'
Scale: 1"=30'-0"

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: JRW Designed By: JRW Checked By: PBH/RPN Approved By: JWG

FIRE PROTECTION LEGEND, DETAILS & NOTES

Rev.	Date	Description

5-1-19

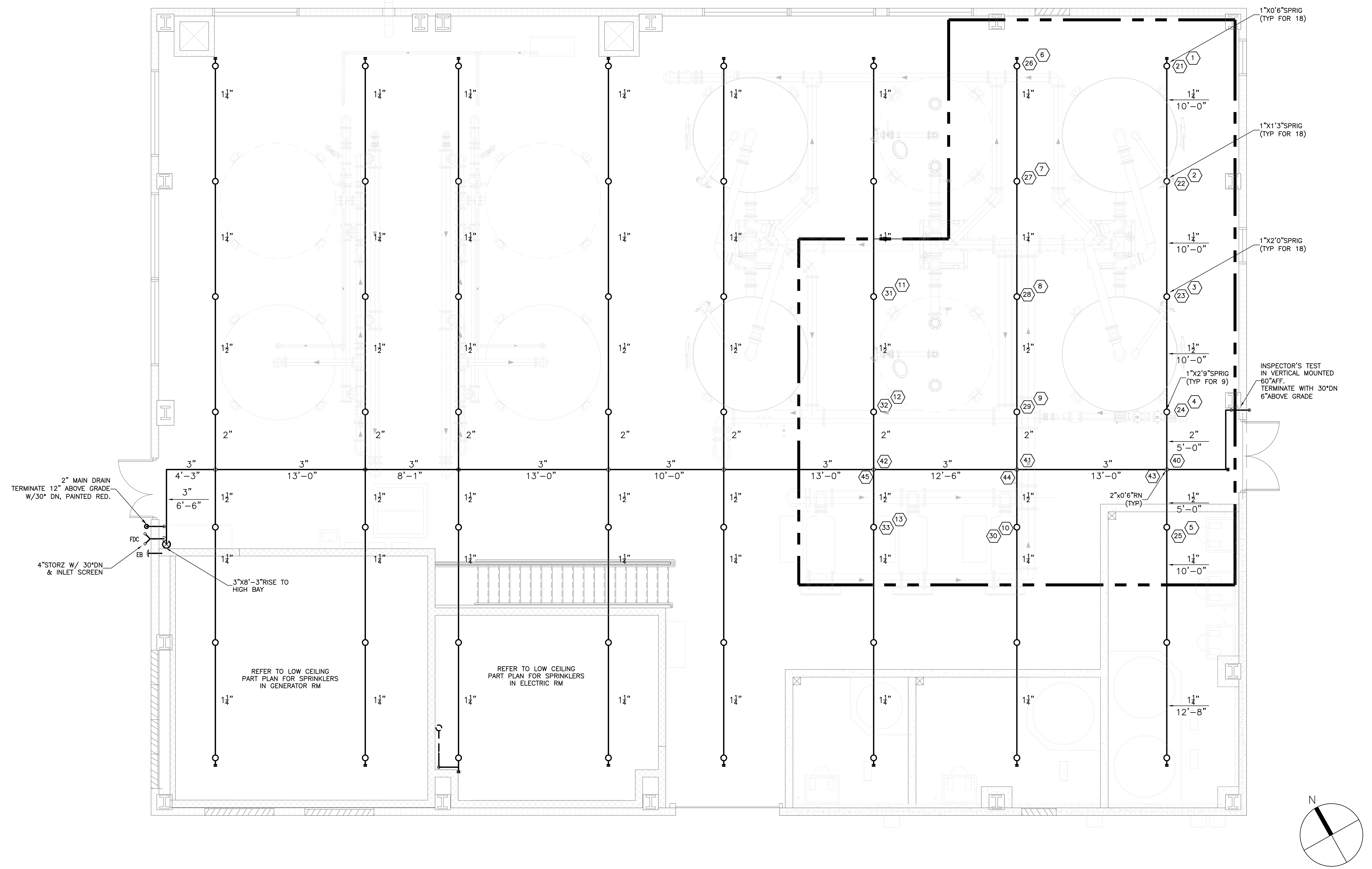
JRW ENGINEERING

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

01-FP-1

REMOTE AREA #1
ORDINARY HAZARD – GROUP 2
0.2 GPM/SF OVER 1606 SF
130 SF MAX COVERAGE
646.88 GPM @ 57.32 PSI
22.6 PSI REMAINING
250 GPM HOSE ALLOWANCE



FIRST FLOOR (HIGH BAY CEILING)

1/4"=1'-0"

0 2' 4' 8'
Scale: 1/4"=1'-0"

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: JRW | Designed By: JRW | Checked By: PBH/RPN | Approved By: JNG

FIRE PROTECTION FIRST FLOOR SPRINKLER PLAN

Rev.	Date	Description

JOHN W. GREGORY CIVIL No. 46028
5-1-19

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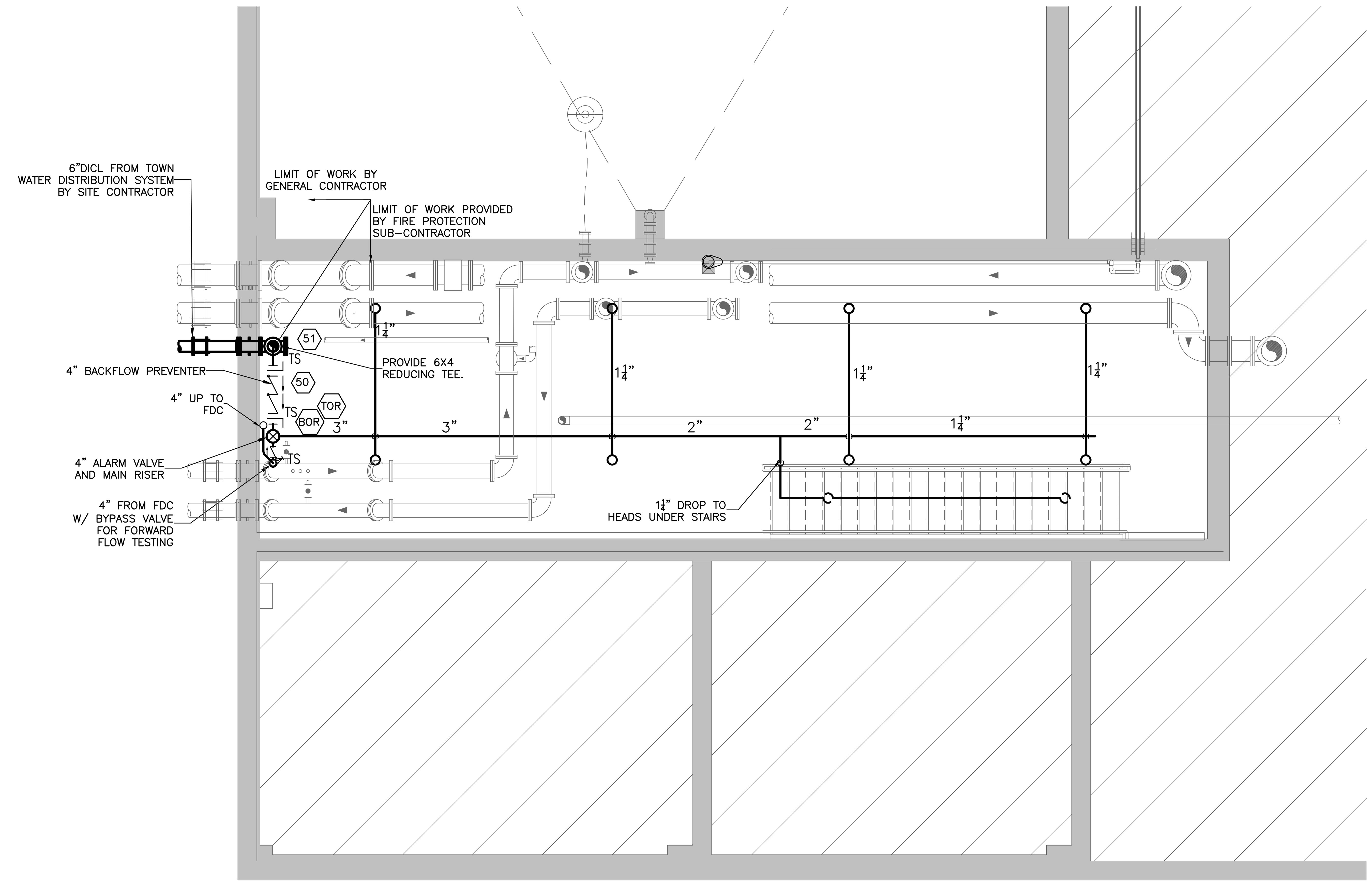
TATA & HOWARD

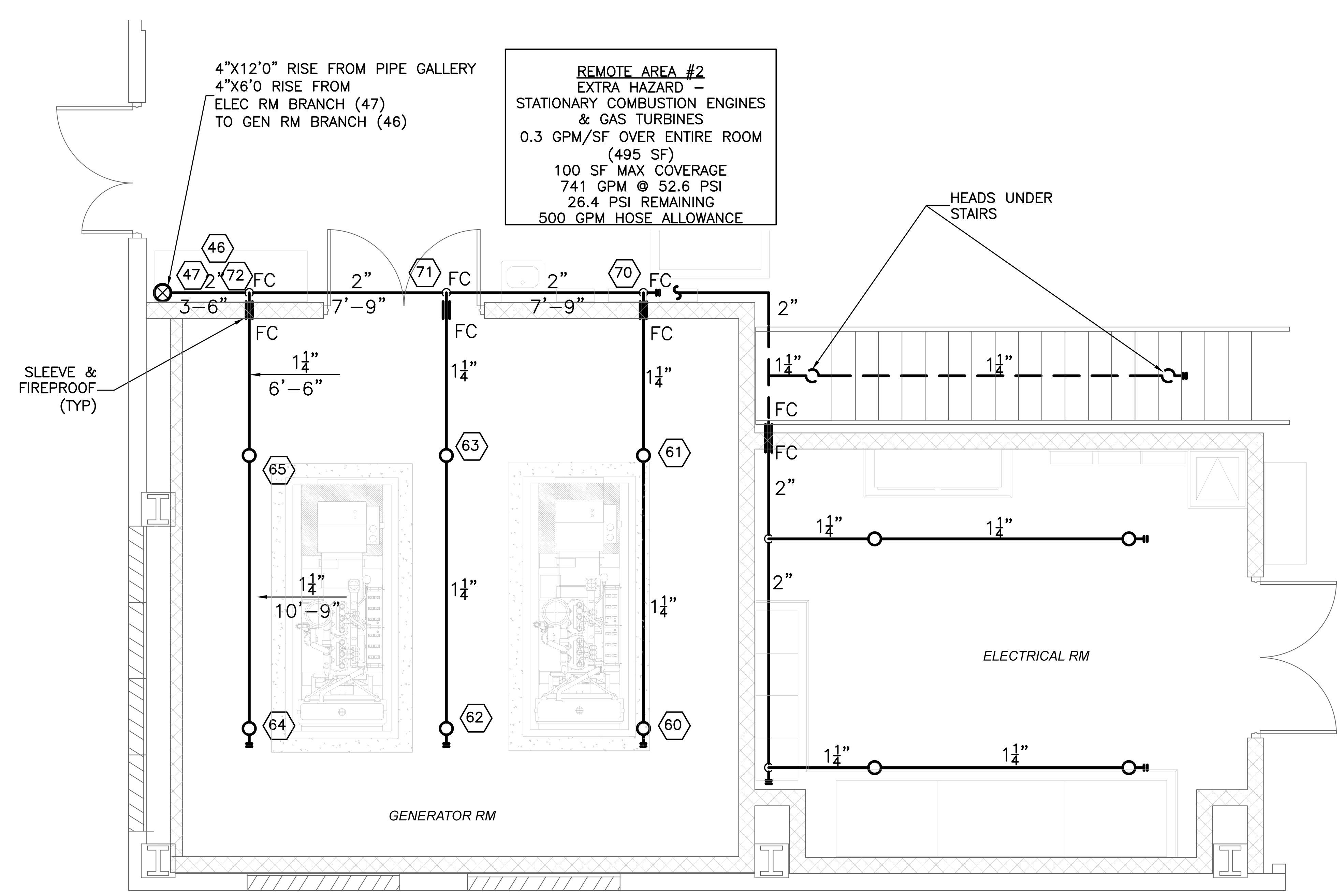
T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-FP-1



BASEMENT PART PLAN

1/4"=1'-0"



FIRST FLOOR PART PLAN (LOW CEILING)

1/4"=1'-0"

N

0 2' 4' 8'

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

FIRE PROTECTION BASEMENT & MEZZANINE SPRINKLER PLANS

Drawn By: JRW | Designed By: JRW | Checked By: PBH/RPN | Approved By: JWG

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POWER LEGEND

RECEPTACLE OUTLETS – NUMERAL BY THE SIDE OF THE SYMBOL INDICATES CIRCUIT NUMBER

- DUPLEX CONVENIENCE OUTLET MOUNTED AT +18" OR AS NOTED.
- DOUBLE DUPLEX OUTLET (FOURPLEX) RECEPTACLE MOUNTED AT +18" OR AS NOTED.
- DUPLEX CONVENIENCE OUTLET MOUNTED ABOVE COUNTER. VERIFY EXACT MOUNTING HEIGHT WITH ARCHITECTURAL ELEVATIONS.
- TELEPHONE OUTLET AT +18" OR AS NOTED. FURNISH (1) 3/4" CONDUIT WITH PULL WIRE TO TELEPHONE MOUNTING BOARD OR AS NOTED.
- CABLE TV OUTLET AT +18" OR AS NOTED. FURNISH (1) 3/4" CONDUIT WITH PULL WIRE TO TELEPHONE MOUNTING BOARD OR AS NOTED.
- DEDICATED OUTLET AT +18" OR AS NOTED. 'HUBBELL' #IG5262 (ORANGE) RECEPTACLE WITH ISOLATED GROUND.
- DEDICATED TWISTLOCK OUTLET AT +18" OR AS NOTED.
- MULTI-OUTLET ASSEMBLY
- FLUSH MOUNTED PANELBOARD AND CABINET. MOUNT 6'-6" TO TOP
- SURFACE MOUNTED PANELBOARD AND CABINET. MOUNT 6'-6" TO TOP
- PB — PULL BOX
- 4X — COMBINATION MOTOR CONTROLLER – FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR. SIZE AS NOTED. NUMBER INDICATES NEMA TYPE CONSTRUCTION.
- 1 — MOTOR – SIZE AS INDICATED ON DRAWINGS.
- DISCONNECT SWITCH – SIZE AND FUSES AS PER MANUFACTURER'S RECOMMENDATIONS (WEATHERPROOF WHERE OUTSIDE).
- J — JUNCTION BOX IN ACCESSIBLE LOCATION.
- J — JUNCTION BOX IN ACCESSIBLE LOCATION WITH FLEXIBLE CONDUIT CONNECTION TO EQUIPMENT AS NOTED.
- PE — PHOTOCELL ON ROOF (AIM NORTH).
- SEALING FITTING
- VS 12 — MOTOR CONTROLLER OR VFD – INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR. NUMBER INDICATES NEMA TYPE CONSTRUCTION, VS INDICATES VENDOR SUPPLIED.
- EQUIPMENT SHOWN LIGHT & DASHED INDICATES EXISTING EQUIPMENT EXCEPT, FOR UNDERGROUND CONDUITS AND/OR AS OTHERWISE NOTED.
- EQUIPMENT SHOWN LIGHT, DASHED, & HATCHED INDICATES EXISTING EQUIPMENT TO BE REMOVED.
- UTILITY POLE

RACEWAYS AND CONDUCTORS

- INDICATES HOMERUN FROM EQUIPMENT TO PANELBOARD OR AS NOTED.
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- —OHP— PROPOSED OVERHEAD PRIMARY CABLE
- — —EX— — EXISTING UNDERGROUND ELECTRICAL CONDUIT
- — —E— — PROPOSED UNDERGROUND ELECTRICAL CONDUIT
- — —EP— — PROPOSED UNDERGROUND PRIMARY ELEC CONDUIT
- — —S— — PROPOSED UNDERGROUND SIGNAL CONDUIT
- — —T— — PROPOSED UNDERGROUND TELEPHONE CONDUIT

LIGHTING

LIGHTING FIXTURES – CAPITAL LETTER INDICATES THE FIXTURE TYPE AS SHOWN ON FIXTURE SCHEDULE. NUMERAL INDICATES CIRCUIT NO. AND SMALL LETTER DESIGNATES THE CONTROL SWITCH. EXACT MOUNTING PER SCHEDULE.

CEILING	WALL	DESCRIPTION
		SURFACE OR PENDANT INCANDESCENT, HID OR SIMILAR LAMP FIXTURE.
		SURFACE OR PENDANT INDIVIDUAL FLUORESCENT FIXTURE.
		SURFACE OR PENDANT CONTINUOUS
		BARE LAMP FLUORESCENT STRIP.
		SURFACE OR PENDANT EXIT LIGHT. ARROWS INDICATE ROUTE OF EGRESS.
		EMERGENCY LIGHTING FIXTURE BATTERY OPERATED. ARROWS INDICATE AIMING DIRECTION.
		POLE MOUNTED LIGHT FIXTURE, SINGLE POLE W/SINGLE AND/OR DOUBLE FIXTURE.

SWITCHED OUTLET

SMALL LETTER BY THE SIDE OF SYMBOLS INDICATES THE PARTICULAR SWITCH.
SAMPLE: S^a = SWITCH "a"

- S — SINGLE POLE SWITCH MOUNTED AT +48" OR AS NOTED.
- S_2 — TWO POLE SWITCH MOUNTED AT +48" OR AS NOTED.
- S_3 — THREE WAY SWITCH MOUNTED AT +48" OR AS NOTED.
- S_4 — FOUR WAY SWITCH MOUNTED AT +48" OR AS NOTED.
- S_P — SINGLE POLE SWITCH WITH PILOT LIGHT MOUNTED AT +48" OR AS NOTED.
- S_K — SINGLE POLE KEY OPERATED SWITCH MOUNTED AT +48" OR AS NOTED.
- S_M — H.P. RATED MANUAL MOTOR STARTER (WEATHERPROOF WHERE OUTSIDE).
- S_D — INCANDESCENT SLIDE CONTROL DIMMER AT +48" OR AS NOTED (1500 WATT UNLESS OTHERWISE NOTED).
- S_T — 0-60 MINUTE TIMER SWITCH MOUNTED AT +48" OR AS NOTED.

ABBREVIATED LIST OF NEMA ENCLOSURE TYPES

- TYPE 1: GENERAL PURPOSE. INDOOR.
- TYPE 2: DRIP-PROOF. NONCORROSIVE. INDOOR.
- TYPE 3: DUST-TIGHT. RAINTIGHT. OUTDOOR.
- TYPE 3R: RAINPROOF. OUTDOOR.
- TYPE 4: WATERTIGHT AND DUST-TIGHT. NONCORROSIVE. INDOOR AND OUTDOOR.
- TYPE 4X: WATERTIGHT AND DUST-TIGHT. CORROSION RESISTANT. INDOOR AND OUTDOOR.
- TYPE 6: WATERTIGHT. DUST-TIGHT. SHORT-TIME SUBMERSIBLE. INDOOR AND OUTDOOR.
- TYPE 6P: WATERTIGHT. DUST-TIGHT. LONG-TIME SUBMERSIBLE. INDOOR AND OUTDOOR.
- TYPE 7: CLASS 1, GROUPS A, B, C, OR D. INDOOR.
- TYPE 8: CLASS 1, GROUPS A, B, C, OR D. INDOOR OR OUTDOOR.
- TYPE 9: CLASS II, GROUPS E OR G. INDOOR.
- TYPE 12: DUST-TIGHT. WATERTIGHT. NONCORROSIVE LIQUID. INDOOR.
- TYPE 13: WATERTIGHT. DUST-TIGHT. OILTIGHT. NONCORROSIVE LIQUID INDOOR.

PROJECT GENERAL NOTES:

1. ALL WORK SHALL CONFORM TO THE MASSACHUSETTS ELECTRICAL CODE (M.E.C.) LATEST EDITION.
2. COORDINATE ALL ELECTRICAL EQUIPMENT LOCATIONS AND MECHANICAL APPURTENANCES WITHIN THE EXISTING CONDITIONS TO PROVIDE ADEQUATE WORKING AND ACCESS PER N.E.C. REQUIREMENTS.
3. WHERE EXISTING ELECTRICAL DEVICES AND PROCESS DEVICES ARE INDICATED THOSE LOCATIONS ARE APPROXIMATE AND NOT ALL ELECTRICAL DEVICES MAY BE INDICATED. (FIELD VERIFY ALL ELECTRICAL ITEMS WHERE POSSIBLE.)
4. CONDUITS, RACEWAYS AND CABLES SHALL BE PROPERLY AND SECURELY ATTACHED TO BUILDING STRUCTURAL COMPONENTS AS REQUIRED BY N.E.C. ALL FASTENERS AND HARDWARE SHALL BE APPROVED FOR THE INSTALLATION AND THE CONDITIONS ENCOUNTERED.
5. EACH JUNCTION IN ANY OF THE WIRING SYSTEMS SHALL BE MADE IN AN APPROVED JUNCTION BOX. SUCH BOX SHALL BE SUITABLE FOR THE SIZE AND NUMBER OF CONDUCTORS AND DEVICES TO BE INSTALLED, AS WELL AS THE CONDITION ENCOUNTERED. ALL SPLICES SHALL BE MADE WITH APPROVED, MECHANICAL CONNECTORS.
6. CONTRACTOR SHALL VERIFY ALL STRUCTURAL, PROCESS AND MECHANICAL CONDITIONS PRIOR TO ROUGH-IN FOR ELECTRICAL WIRING AND EQUIPMENT.
7. ALL ELECTRICAL WORK SHALL BE CAREFULLY COORDINATED WITH THE ON-SITE CONDITIONS. WHERE CUTTING, DRILLING OR ALTERATION TO THE WORK OF OTHERS IS NECESSARY FOR THE PROPER INSTALLATION OF ELECTRICAL EQUIPMENT, SUCH WORK SHALL BE PLANNED IN ADVANCE AND SHALL BE CAREFULLY DONE. ANY DAMAGE TO THE BUILDINGS OR EQUIPMENT SHALL BE REPAIRED BY PROPERLY TRAINED PERSONNEL TO THE SATISFACTION OF THE OWNER AT NO ADDITIONAL COST TO THE OWNER.
8. DURING ROUGH-IN AND FINISHED STAGES OF CONSTRUCTION, THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE TO PROTECT AND KEEP CLEAN ALL ELECTRICAL EQUIPMENT, PANELS, FIXTURES AND DEVICES AS WELL AS ALL EXISTING EQUIPMENT AND RELATED WORK AREAS.
9. THE CONTRACTOR SHALL PROVIDE ALL INFORMATION ABOUT EQUIPMENT WHICH HE/SHE IS FURNISHING TO THE ENGINEER/OWNER FOR REVIEW PURPOSES. THE CONTRACTOR SHALL PROVIDE ALL INSTALLATION DETAILS AND SUPPORT COMPONENTS SO THAT THESE MAY BE BUILT INTO THE CONSTRUCTION IN A TIMELY MANNER.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF THE FINAL LOCATIONS OF INSTRUMENTATION, CONTROL AND POWER CONNECTION DETAILS SO THAT THE ASSOCIATED ELECTRICAL WORK WILL BE PROPERLY COORDINATED AND INSTALLED.
11. EQUIPMENT LAYOUT AND EXACT LAYOUT OF NEW ELECTRICAL EQUIPMENT AND INSTRUMENTATION SHALL BE COORDINATED WITH PROCESS AND MECHANICAL EQUIPMENT.
12. DRAWINGS SHOW A LAYOUT OF ELECTRICAL/INSTRUMENTATION SYSTEMS AND EQUIPMENT DIAGRAMMATICALLY. EXACT LOCATION OF EQUIPMENT AND ROUTING OF RACEWAYS SHALL BE DETERMINED BY FIELD CONDITIONS AND DIRECTION BY ENGINEER AND OWNER. BY SUBMITTING A BID, CONTRACTOR WARRANTS THAT HE HAS VISITED THE SITE WHERE WORK IS TO BE PERFORMED, AND HAS EXAMINED THE EXISTING CONDITIONS AND EXTENT OF LABOR AND MATERIALS TO BE PROVIDED. COORDINATION WITH ALL TRADES, UTILITIES, ETC. SHALL BE PROVIDED. THE ENGINEER SHOULD BE NOTIFIED OF ANY DISCREPANCIES, OMISSIONS, CONFLICTS OR INTERFERENCES WHICH OCCUR BETWEEN VARIOUS DRAWINGS AND SPECIFICATIONS. IF SUCH NOTIFICATION IS NOT RECEIVED, THE INSTALLING CONTRACTOR(S) SHALL BE RESPONSIBLE FOR THEIR INTERPRETATIONS.

DEMOLITION GENERAL NOTES:

1. ANY DEMOLITION INDICATED ON THESE DRAWINGS IS SHOWN IN GENERAL TO INDICATE THE EXTENT OF DEMOLITION AND IS NOT TO BE CONSIDERED AS A RECORD DRAWING OF EXISTING CONDITIONS. ACCORDINGLY, THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLETE DEMOLITION OF ELECTRICAL WORK INDICATED INCLUDING ANY BURIED ITEMS OR EXISTING ITEMS NOT SHOWN ON THESE DRAWINGS. BEFORE DEMOLITION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR APPROPRIATE FIELD TESTING TO DETERMINE THE NATURE OF THE EXISTING WORK TO BE DEMOLISHED TO PROTECT EXISTING WORK REMAINING IN PLACE AND TO PROTECT THE PUBLIC.
2. REPAIR AND RESTORE TO ORIGINAL CONDITION ALL ITEMS OR PORTIONS OF ELECTRICAL WORK WHICH ARE NOT NOTED TO BE DEMOLISHED, BUT ARE DAMAGED BY WORK UNDER THIS CONTRACT. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO PROTECT AND RETAIN POWER TO ALL EXISTING ACTIVE EQUIPMENT WHICH SHALL REMAIN. ELECTRICAL CONTRACTOR SHALL RECONNECT ANY EQUIPMENT BEING DISTURBED BY THIS RENOVATION.
3. WHERE WORK BY THE GENERAL CONTRACTOR (WALL REMOVAL, NEW OR RELOCATED WALL OPENINGS), REQUIRES THE REMOVAL, RELOCATION, OR REFEEDING OF ELECTRICAL DEVICES OR LIGHTING FIXTURES, THE ELECTRICAL CONTRACTOR SHALL DISCONNECT AND MAKE SAFE OR RECONNECT AS REQUIRED ALL ACTIVE DEVICES REMAINING ON THAT CIRCUIT.
4. CONTRACTOR SHALL VERIFY ALL CIRCUIT IN EXISTING PANEL AFFECTED BY THIS ALTERATION. WHERE ADDITIONAL CIRCUITS ARE NEEDED, USE AVAILABLE SPARE BREAKERS IN THE PANEL. TIGHTEN ALL CONNECTIONS AS REQUIRED.
5. DO NOT PROCEED WITH DEMOLITION WITHOUT WRITTEN AUTHORITY TO PROCEED. PROCEED WITH DEMOLITION IN A SYSTEMATIC MANNER AND COORDINATE WITH ALL TRADES INVOLVED. COORDINATE AND SEQUENCE DEMOLITION SO AS NOT TO CAUSE A SHUTDOWN OF OPERATION OF SURROUNDING AREAS.
6. DISCONNECT OR SHUT OFF SERVICE TO AREAS WHERE ELECTRICAL WORK IS TO BE REMOVED. REMOVE ALL ELECTRICAL PANELS, EQUIPMENT, AND RELATED CONDUIT, AND WIRING WHICH ARE NOT A PART OF THE FINAL PROJECT IN ALL AREAS WHERE WORK OF THIS CONTRACT ARE TO BE PERFORMED. ALL REMOVED EQUIPMENT SHALL BE DISPOSED OF BY THIS CONTRACTOR UNLESS DIRECTED TO DO OTHERWISE BY THE OWNER. REMOVE ALL CONDUIT, WIRE, BOXES, AND FASTENING DEVICES AS REQUIRED TO AVOID ANY INTERFACE WITH NEW INSTALLATIONS. ABANDONED CIRCUITS TO BE CAPPED AT BOTH ENDS. REMOVE THE EXISTING WIRE NO LONGER IN USE FROM DEVICE LOCATION BACK TO PANEL.
7. ARRANGE TIMING SHUTDOWN PERIODS OF ALL-IN SERVICE PANELS WITH OWNER OR HIS/HER REPRESENTATIVE. DO NOT SHUT DOWN ANY UTILITY WITHOUT PRIOR WRITTEN APPROVAL.
8. WHERE EXISTING CIRCUITS ARE INDICATED TO BE REUSED, CONTRACTOR TO USE SENSING MEASURING DEVICES TO VERIFY THAT CIRCUITS FEEDING PROJECTS ARE OR ARE NOT IN USE.
9. EXISTING ELECTRICAL EQUIPMENT NECESSARY FOR EXISTING INSTALLATION TO REMAIN OPERATIONAL WILL HAVE TO BE PROTECTED DURING CONSTRUCTION.
10. THE ELECTRICAL CONTRACTOR SHALL TAKE INTO ACCOUNT IN FILING HIS/HER BID HIS/HER OBLIGATION TO PROVIDE FOR THE DISMANTLING AND REMOVAL OR MODIFICATION OF EXISTING ELECTRICAL EQUIPMENT, CONDUIT, WIRING AND RELATED ITEMS FOR THEIR REPLACEMENT OR MODIFICATION AS SPECIFIED.
11. CONTRACTOR SHALL COORDINATE WITH OWNER FOR POSSIBLE SALVAGE OF ANY OF THE ABOVE LISTED EQUIPMENT INCLUDING BUT NOT LIMITED TO MCC, STARTERS, GENERATORS, INSTRUMENTATION, PANELS, WIRING & CONDUIT.
12. THE CONTRACTOR SHALL UTILIZE EXISTING BRANCH CIRCUITS WHEREVER POSSIBLE. DISCONNECT CIRCUITS BACK TO LAST DEVICE (FIXTURE OR OUTLET) UNAFFECTED BY THE DEMOLITION. EXTEND CIRCUITS FROM LAST DEVICE TO NEW DEVICE LOCATIONS AND CIRCUIT AS SHOWN ON FLOOR PLAN.
13. THE ELECTRICAL DEVICES AND PROCESS EQUIPMENT INDICATED ON THIS DRAWING REPRESENT EQUIPMENT TAKEN FROM EXISTING PLANS FURNISHED BY THE OWNER AND SITE VISITS BY THE ENGINEER AND DO NOT REPRESENT ALL EQUIPMENT AND WIRING WITHIN THE DEMOLITION AREA. THESE DOCUMENTS HAVE BEEN PREPARED TO ASSIST THE CONTRACTOR IN PRICING DEMOLITION WORK. CONTRACTOR IS TO VISIT THE SITE AND EXAMINE ALL EXISTING CONDITIONS. NO EXTRA COMPENSATION OR TIME EXTENSION WILL BE PERMITTED BECAUSE OF LACK OF COMPLIANCE WITH THIS REQUIREMENT.

ABBREVIATIONS

ACB	AIR CIRCUIT BREAKER
ALT	ALTERNATE
AC	ALTERNATING CURRENT
AL	ALUMINUM
AWG	AMERICAN WIRE GAUGE
A	AMPERE(S)
ATS	AUTOMATIC TRANSFER SWITCH
BW	BUSWAY
CLG	CEILING
CKT	CIRCUIT
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
COND	CONDUCTOR
C	CONDUIT (SEE RACEWAYS AND CONDUCTORS)
CONN	CONNECT
CC	CONTROL CABINET
CP	CONTROL PANEL
CU	COPPER
CT	CURRENT TRANSFORMER
DIM	DIMMER CONTROL
D.C.	DIRECT CURRENT
DISC	DISCONNECT
DPP	DISTRIBUTION POWER PANEL
DP	DOUBLE POLE
DT	DOUBLE THROW
DN	DOWN
E	ELECTRIC
E.C.	ELECTRICAL CONTRACTOR
EUH	ELECTRIC UNIT HEATER
EWC	ELECTRIC WATER COOLER
EMT	ELECTRICAL METALLIC TUBING
EM	EMERGENCY
ELR	END LINE RESISTOR
EXIST	EXISTING
XP	EXPLOSION PROOF
FDR	FEEDER
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
F.P.C.	FIRE PROTECTION CONTRACTOR
FLUOR	FLUORESCENT
FL	FLOOR
F.S.C.	FOOD SERVICE CONTRACTOR
HZ	FREQUENCY IN CYCLES PER SECOND
F	FUSE
FS	FUSIBLE SWITCH
GEN	GENERATOR
G.C.	GENERAL CONTRACTOR
GRD	GROUND
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
H.I.D.	HIGH INTENSITY DISCHARGE
HP	HORSEPOWER
HOA	HAND-OFF-AUTO
H.P.S.	HIGH PRESSURE SODIUM
IMC	INTERMEDIATE METALLIC CONDUIT
INC	INCANDESCENT
IC	INTERCOM
ISO	ISOLATED NEUTRAL
JB	JUNCTION BOX
K	KEY OPERATED
KVAR	KILOVAR(S)
KVA	KILOVOLT AMPERE(S)
KW	KILOWATT(S)
LP	LIGHTING PANEL
L.P.S.	LOW PRESSURE SODIUM
LV	LOW VOLTAGE
MGST	MAGNETIC STARTER
MCB	MAIN CIRCUIT BREAKER
MLO	MAIN LUGS ONLY
MH	MANHOLE
MTS	MANUAL TRANSFER SWITCH
MC	MECHANICAL CONTRACTOR
MIKE	MICROPHONE
MTR	MOTOR
MCC	MOTOR CONTROL CENTER
KCMIL	THOUSAND CIRCULAR MIL(S)
NF	NONFUSED
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NTS	NOT TO SCALE
N.I.C.	NOT IN CONTRACT
OL	OVERLOAD ELEMENT
OC	OVER COUNTER
PNL	PANEL
P	PILOT INDICATOR
PVC	POLYVINYL CHLORIDE
PLG.C	PLUMBING CONTRACTOR
PT	POTENTIAL TRANSFORMER
PF	POWER FACTOR
PP	POWER PANEL
PRI	PRIMARY
PS	PULL SWITCH
RECP	RECEPTACLE
R	RELAY
RC	REMOTE CONTROL
RGS	RIGID GALVANIZED STEEL CONDUIT
RWT	REFLECTED WAVE TRAP
S	SIGNAL
SEC	SECONDARY
SP	SINGLE POLE
ST	SINGLE THROW
SPK	SPEAKER
SMR	SURFACE METAL RACEWAY
S.S.	SOLID STATE
SW	SWITCH
SWBD	SWITCHBOARD
T.C.C.	TEMPERATURE CONTROL CONTRACTOR
TEMP	TEMPORARY
T	TELEPHONE
TV	TELEVISION
TB	TERMINAL BOX
XFMR	TRANSFORMER
TYP	TYPICAL
UE	UNDERGROUND ELECTRIC
UG	UNDERGROUND
UH	UNIT HEATER
UNG	UNGROUNDED
UNP	UNGROUNDED PRIMARY
UPS	UNINTERRUPTED POWER SYSTEM
US	UNDERGROUND SIGNAL
VP	VAPORPROOF
VAR	REACTIVE VOLT AMPERES
V	VOLT(S)
VA	VOLTAMP(S)
VFD	VARIABLE FREQUENCY DRIVE
W	WATT(S)
WP	WEATHERPROOF

DETAIL & SECTION MARK LEGEND

- 2 — DETAIL NUMBER
- E-3 — SHEET NUMBER – WHERE DETAIL IS LOCATED
- DIRECTION SECTION IS BEING CUT
- A — SECTION LETTER
- E-1 — SHEET NUMBER – WHERE SECTION IS LOCATED

DIRECTION OF NORTH

DIAGRAM SYMBOLS

- FUSED SWITCH
- CIRCUIT BREAKER
- LINE REACTOR
- DISCONNECT SWITCH
- TRANSFER SWITCH
- SOLID-STATE SOFT STARTER
- POTENTIAL TRANSFORMER
- CURRENT TRANSFORMER
- VFD

METER: X INDICATES TYPE
- V = VOLTMETER
- A = AMMETER
- W = WATT METER
- H = KILOWATT HOUR METER
- D = KILOWATT HOUR DEMAND METER

- DMM — DIGITAL MULTI METER
- AS — AMMETER SWITCH
- VS — VOLTMETER SWITCH
- GF — GROUND FAULT INTERRUPTER
- K — KIRK KEY INTERLOCK

XX — MOTOR CONTROLLER: XX INDICATES TYPE
- SS = SOLID STATE STARTER
- AF = ADJUSTABLE FREQUENCY STARTER
- AT = AUTO TRANSFORMER STARTER
- PW = PART WINDING STARTER
- Y-Δ = WYE-DELTA STARTER
- WR = WOUND ROTOR STARTER
- 22 = TWO SPEED TWO WINDING
- 21 = TWO SPEED ONE WINDING
- NR = FULL VOLTAGE NON REVERSING STARTER
- R = FULL VOLTAGE REVERSING STARTER
- LC = LIGHTING CONTACTOR

- CAPACITOR
- LIGHTNING ARRESTER
- EARTH GROUND
- TRANSFORMER
- PLUG AND RECEPTACLE OR DRAWOUT DEVICE
- X — MOTOR
- G — GENERATOR
- X — GENERAL LOADS

X INDICATES HORSEPOWER OR KILOWATTS

CONTROL DIAGRAM SYMBOLS

NOTE:
ALL CONTROL SYMBOLS ARE DRAWN ASSUMING DEENERGIZED CIRCUITS, EMPTY TANKS, UNPRESSURIZED LINES, ETC.

OPEN ON INCREASE / CLOSE ON INCREASE
- PRESSURE SWITCH
- LEVEL SWITCH
- FLOW SWITCH
- TEMPERATURE SWITCH
- SOLENOID VALVE

NORMALLY CLOSED / NORMALLY OPEN
- PUSH BUTTON
- INSTANTANEOUS CONTACT
- TIMED CLOSE CONTACT
- TIMED OPEN CONTACT
- LIMIT SWITCH

XO / OX — SELECTOR SWITCH: QUANTITY OF ARROWS INDICATES NUMBER OF POSITIONS. XO INDICATES UPPER CONTACT CLOSED IN LEFT POSITION AND OPEN IN RIGHT POSITION

INSTRUMENTATION SYMBOLS

- AIT — ANALYTICAL INDICATOR TRANSMITTER
- FS — FLOAT SWITCH
- FT — FLOW TRANSMITTER
- LKS — LEAK SENSOR
- LSL — LEVEL SWITCH LOW
- LSH — LEVEL SWITCH HIGH
- LS — LEVEL SWITCH
- LT — LEVEL TRANSMITTER
- MOV — MOTORIZED OPERATED VALVE
- MTD — METHANE DETECTOR
- PB — PUSH BUTTON SWITCH
- SC — SPEED CONTROLLER (POTENTIOMETER)
- PS — PRESSURE SWITCH
- SV — SOLENOID VALVE
- TS — TEMPERATURE SWITCH

INSTRUMENTATION NOTES:

1. ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY POWER AND SIGNAL WIRING WITH CONDUITS AS SHOWN ON ELECTRICAL AND INSTRUMENTATION DRAWINGS BETWEEN POWER PANELS, PLC'S, CONTROL PANELS, AND FIELD INSTRUMENTS AS REQUIRED.
2. MINIMUM SIZE CONDUIT TO BE 3/4".
3. MINIMUM SIZE CONTROL WIRING TO BE #14 AWG. SHIELDED CABLE TO BE 2/C#16 FOR LOOP POWERED DEVICES. 4/C#16 FOR 4-WIRE DEVICES.
4. WIRING MAY BE COMBINED IN SINGLE RACEWAYS FOR EACH OF THE FOLLOWING CATEGORIES. DO NOT MIX CATEGORIES IN A SINGLE CONDUIT:
   A. 120V POWER WIRING
   B. CONTROL AND DISCRETE OUTPUT SIGNALS (24VAC)
   C. DISCRETE INPUT SIGNALS (24VDC)
   D. ANALOG SIGNAL WIRING
5. LOCATION OF PROCESS EQUIPMENT, MOTORS, VALVES, INSTRUMENTS, ETC. SHOWN ON THE DRAWINGS ARE APPROXIMATE. REFER TO PROCESS AND MECHANICAL DRAWINGS FOR EXACT LOCATIONS. FINAL LOCATIONS TO BE DETERMINED IN FIELD TO MATCH EQUIPMENT SUPPLIED BY CONTRACTOR.
6. REFER TO POWER PLANS FOR INSTRUMENTATION POWER REQUIREMENTS.
7. IT IS THE INTENT OF DRAWINGS AND SPECIFICATIONS TO OBTAIN A COMPLETE AND SATISFACTORY INSTALLATION. AN ATTEMPT HAS BEEN MADE TO SEPARATE AND COMPLETELY DEFINE THE WORK OF THE CONTRACTOR. DRAWINGS ARE DIAGRAMMATIC, BUT SHALL BE FOLLOWED AS CLOSELY AS ACTUAL CONSTRUCTION OF THE FACILITY AND THE WORK OF OTHER TRADES WILL PERMIT. THE DRAWINGS OF NECESSITY UTILIZE SYMBOLS AND SCHEMATIC DIAGRAMS TO INDICATE VARIOUS ITEMS OF WORK. THEREFORE, NO INTERPRETATION WILL BE MADE FROM THE LIMITATION OF SYMBOLS AND DIAGRAMS THAT ANY ELEMENTS NECESSARY FOR A COMPLETE INSTALLATION ARE EXCLUDED. THE ENGINEER SHOULD BE NOTIFIED OF ANY DISCREPANCIES, OMISSIONS, CONFLICTS OR INTERFERENCES WHICH OCCUR BETWEEN VARIOUS DRAWINGS AND SPECIFICATIONS. IF SUCH NOTIFICATION IS NOT RECEIVED, THE INSTALLING CONTRACTOR(S) SHALL BE RESPONSIBLE FOR THEIR INTERPRETATIONS.
8. DURING ROUGH IN AND FINISHED STAGES OF CONSTRUCTION, THE INSTRUMENTATION SUBCONTRACTOR SHALL BE RESPONSIBLE TO PROTECT AND KEEP CLEAN ALL INSTRUMENTATION EQUIPMENT, PANELS, FIXTURES AND DEVICES AS WELL AS ALL EXISTING EQUIPMENT AND RELATED WORK AREAS.
9. THE CONTRACTOR SHALL PROVIDE ALL INFORMATION ABOUT EQUIPMENT WHICH HE/SHE IS FURNISHING TO THE ENGINEER/OWNER FOR REVIEW PURPOSES. THE CONTRACTOR SHALL PROVIDE ALL INSTALLATION DETAILS AND SUPPORT COMPONENTS SO THAT THESE MAY BE BUILT INTO THE CONSTRUCTION IN A TIMELY MANNER.
10. ELECTRICAL CONTRACTOR AND/OR SUBCONTRACTOR TO OBTAIN ALL PERMITS AND INSPECTIONS.
11. CONTROL CIRCUITS SHALL BE ARRANGED TO USE SUPERVISED CONTACTS WHEREVER POSSIBLE. THIS MEANS THAT NORMALLY CLOSED CONTACTS WILL BE USED AND THE CONTACTS WILL OPEN WHEN A PROCESS TRANSITION OCCURS (E.G. HIGH LEVEL, LOW LEVEL, HIGH PRESSURE, ETC.)
12. REFER TO ELECTRICAL SERIES DRAWINGS FOR ADDITIONAL DETAILS FOR CONDUIT, DEVICE LOCATIONS, AND POWER CIRCUITS.
13. DRAWINGS SHOW A LAYOUT OF SCADA/INSTRUMENTATION SYSTEMS AND EQUIPMENT DIAGRAMMATICALLY. EXACT LOCATION OF EQUIPMENT AND ROUTING OF RACEWAYS SHALL BE DETERMINED BY FIELD CONDITIONS AND DIRECTION BY ENGINEER AND OWNER. BY SUBMITTING A BID, CONTRACTOR WARRANTS THAT HE HAS VISITED THE SITE WHERE WORK IS TO BE PERFORMED, AND HAS EXAMINED THE EXISTING CONDITIONS AND EXTENT OF LABOR AND MATERIALS TO BE PROVIDED. COORDINATION WITH ALL TRADES, UTILITIES, ETC. SHALL BE PROVIDED.

INSTRUMENTATION GROUNDING

1. SHIELDED CONDUCTORS SHALL HAVE THEIR SHIELD WIRE CONNECTED TO GROUND AT ONE END ONLY.
2. CONTROL CABINETS SHALL BE PROVIDED WITH AN ISOLATED INSTRUMENT GROUND BUS FOR INSTRUMENTATION GROUND WIRE. THIS BUS SHALL BE TIED TO FACILITY GROUND AT A SINGLE POINT (BONDED).
3. EQUIPMENT & INSTRUMENT GROUNDS SHALL NOT BE INTERMIXED.
4. WHERE ANALOG SIGNALS ARE LACED FROM ONE DEVICE TO ANOTHER, THE SHIELD/DRAIN WIRE SHALL BE CONTINUOUS AND ONLY TIED TO GROUND AT ONE POINT.

PROCESS SIGNAL SCALING & CALIBRATION

1. ALL INSTRUMENTS SHALL BE PROPERLY CALIBRATED BY THE INSTALLING CONTRACTOR. A CALIBRATION STICKER SHALL BE ATTACHED INDICATING CALIBRATION DATE AND THE INITIALS OF THE INDIVIDUAL WHO PERFORMED THE CALIBRATION.
2. ALL PROCESS ANALOG LOOPS SHALL BE PROPERLY CALIBRATED AND SCALED TO THE EXTENT POSSIBLE AND PRACTICAL. ANALOG INSTRUMENTS SHALL BE CALIBRATED TO READ THE ENTIRE OPERATING RANGE FOR THE PARAMETER BEING MONITORED.

INSTRUMENTATION PIPING & MOUNTING

1. DIRECT READING INSTRUMENTS SHALL BE MOUNTED AT EYE HEIGHT, ~5 FT ABOVE FINISHED FLOOR, UNLESS PROCESS RESTRAINTS NECESSITATE OTHER MOUNTING ARRANGEMENTS, OR UNLESS OTHERWISE NOTED.
2. INSTRUMENTS SHALL BE SECURELY ANCHORED TO THE STRUCTURES OR MONITORED EQUIPMENT. PROPER MOUNTING HARDWARE SHALL BE UTILIZED. (BOLTS, NUTS, UNISTRUT, ETC.)
3. ALL INSTRUMENT TUBING SHALL BE STAINLESS STEEL UNLESS OTHERWISE NOTED. TUBING INSTALLATION SHALL PROVIDE ADEQUATE PROTECTION AND SUPPORT WHERE APPROPRIATE. TUBING AND PIPING ARRANGEMENTS SHALL BE PROPERLY SLOPED AND INSTALLED FOR THE FLUID BEING MONITORED.
4. ALL INSTRUMENT TAPS INTO PROCESS PIPING SHALL BE PROVIDED WITH AN ISOLATION VALVE. (NOMINAL 1/2" OR 3/4" BALL VALVE). ISOLATION VALVES SHALL BE CONSTRUCTED OF MATERIAL COMPATIBLE WITH THE MONITORED PROCESS FLUID.
6. ALL INSTRUMENTS WHICH REQUIRE PERIODIC CALIBRATION SHALL BE PROVIDED WITH MEANS TO CALIBRATE IN PLACE (E.G. CALIBRATION BLOCK AND/OR CALIBRATION VALVING.)
7. VENTS AND DRAINS SHALL BE PROVIDED ON PROCESS EQUIPMENT AND INSTRUMENTATION AS REQUIRED TO SUPPORT ROUTINE AND MAINTENANCE OPERATIONS.

INSTRUMENTATION SYMBOLS CONT.

- TT — TEMPERATURE TRANSMITTER
- ZS — PROXIMITY SWITCH
- FS — FIELD MOUNTED INSTRUMENT: NEW DENOTES FURNISHED & INSTALLED UNDER BASE BID
- FS — FIELD MOUNTED INSTRUMENT: EXISTING
- FS — VENDER SUPPLIED INSTRUMENT INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR
- FS 101 — INSTRUMENT IDENTIFICATION LETTER & IDENTIFICATION #; DESTINATION & LOOP IDENTIFICATION # (TO PLC# DO-XXX)

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

ELECTRICAL NOTES AND LEGEND

Approved By: | Checked By: | Designed By: JWC | Drawn By:

Rev.	Date	Description

COMMONWEALTH OF MASSACHUSETTS — JON W. GREGORY — CIVIL — No. 46478 — REGISTERED PROFESSIONAL ENGINEER — 5-1-19

COMMONWEALTH OF MASSACHUSETTS — SADEGH M. RADVAR — ELECTRICAL — No. 37935 — REGISTERED PROFESSIONAL ENGINEER — 5-2-19

SMR ENGINEERING, PC
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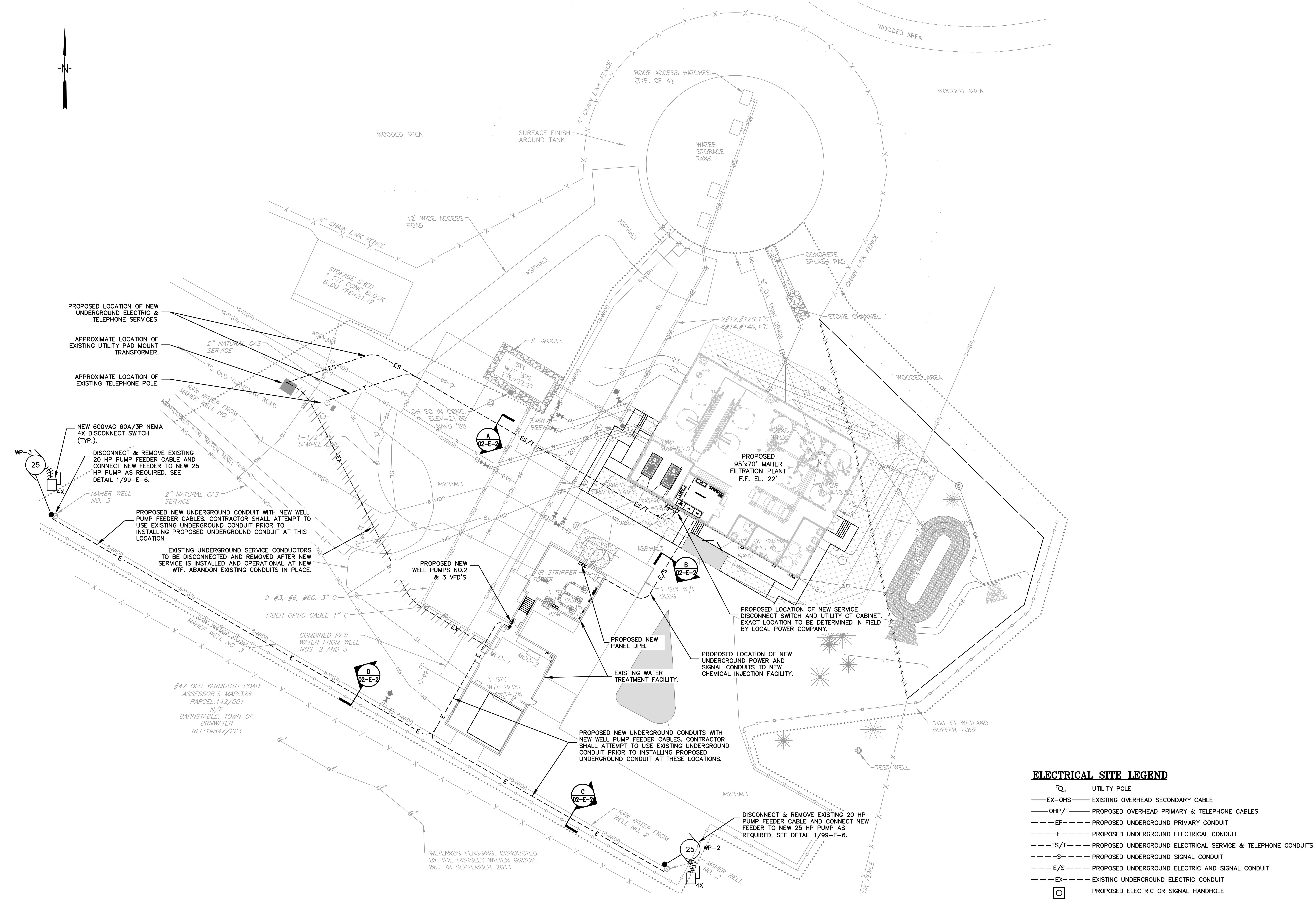
TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

01-E-1



PROPOSED LOCATION OF NEW UNDERGROUND ELECTRIC & TELEPHONE SERVICES.
APPROXIMATE LOCATION OF EXISTING UTILITY PAD MOUNT TRANSFORMER.
APPROXIMATE LOCATION OF EXISTING TELEPHONE POLE.
NEW 600VAC 60A/3P NEMA 4X DISCONNECT SWITCH (TYP.).
WP-3
25
DISCONNECT & REMOVE EXISTING 20 HP PUMP FEEDER CABLE AND CONNECT NEW FEEDER TO NEW 25 HP PUMP AS REQUIRED. SEE DETAIL 1/99-E-6.
MAHER WELL NO. 3
PROPOSED NEW UNDERGROUND CONDUIT WITH NEW WELL PUMP FEEDER CABLES. CONTRACTOR SHALL ATTEMPT TO USE EXISTING UNDERGROUND CONDUIT PRIOR TO INSTALLING PROPOSED UNDERGROUND CONDUIT AT THIS LOCATION
EXISTING UNDERGROUND SERVICE CONDUCTORS TO BE DISCONNECTED AND REMOVED AFTER NEW SERVICE IS INSTALLED AND OPERATIONAL AT NEW WTF. ABANDON EXISTING CONDUITS IN PLACE.
PROPOSED NEW WELL PUMPS NO.2 & 3 VFD'S.
PROPOSED NEW PANEL DPB.
EXISTING WATER TREATMENT FACILITY.
PROPOSED LOCATION OF NEW UNDERGROUND POWER AND SIGNAL CONDUITS TO NEW CHEMICAL INJECTION FACILITY.
PROPOSED LOCATION OF NEW SERVICE DISCONNECT SWITCH AND UTILITY CT CABINET. EXACT LOCATION TO BE DETERMINED IN FIELD BY LOCAL POWER COMPANY.
PROPOSED NEW UNDERGROUND CONDUITS WITH NEW WELL PUMP FEEDER CABLES. CONTRACTOR SHALL ATTEMPT TO USE EXISTING UNDERGROUND CONDUIT PRIOR TO INSTALLING PROPOSED UNDERGROUND CONDUIT AT THESE LOCATIONS.
DISCONNECT & REMOVE EXISTING 20 HP PUMP FEEDER CABLE AND CONNECT NEW FEEDER TO NEW 25 HP PUMP AS REQUIRED. SEE DETAIL 1/99-E-6.
WP-2
MAHER WELL NO. 2
PROPOSED 95'x70' MAHER FILTRATION PLANT F.F. EL. 22'
WATER STORAGE TANK
ROOF ACCESS HATCHES (TYP. OF 4)
SURFACE FINISH AROUND TANK
6' CHAIN LINK FENCE
12' WIDE ACCESS ROAD
STORAGE SHED 1 STY CONC BLOCK BLDG FFE=21.12
CONCRETE SPLASH PAD
STONE CHANNEL
WOODED AREA
1 STY W/F BPS FFE=22.27
3' GRAVEL
2" NATURAL GAS SERVICE
TO OLD YARMOUTH ROAD
RAW WATER FROM MAHER WELL NO. 1
ABANDONED RAW WATER MAIN
9-#3, #6, #6G, 3" C
FIBER OPTIC CABLE 1" C
COMBINED RAW WATER FROM WELL NOS. 2 AND 3
AIR STRIPPER TOWER
1 STY W/F BLDG
MCC-1
MCC-2
#47 OLD YARMOUTH ROAD ASSESSOR'S MAP:328 PARCEL:142/001 N/F BARNSTABLE, TOWN OF BRNWATER REF:19847/223
WETLANDS FLAGGING, CONDUCTED BY THE HORSLEY WITTEN GROUP, INC. IN SEPTEMBER 2011
RAW WATER FROM WELL NO. 2
100-FT WETLAND BUFFER ZONE
TEST WELL
ASPHALT
A 02-E-2
B 02-E-2
C 02-E-2
D 02-E-2
N

ELECTRICAL SITE LEGEND

Symbol	Description
(pole symbol)	UTILITY POLE
——EX–OHS——	EXISTING OVERHEAD SECONDARY CABLE
——OHP/T——	PROPOSED OVERHEAD PRIMARY & TELEPHONE CABLES
– – –EP– – –	PROPOSED UNDERGROUND PRIMARY CONDUIT
– – –E– – –	PROPOSED UNDERGROUND ELECTRICAL CONDUIT
– – –ES/T– – –	PROPOSED UNDERGROUND ELECTRICAL SERVICE & TELEPHONE CONDUITS
– – –S– – –	PROPOSED UNDERGROUND SIGNAL CONDUIT
– – –E/S– – –	PROPOSED UNDERGROUND ELECTRIC AND SIGNAL CONDUIT
– – –EX– – –	EXISTING UNDERGROUND ELECTRIC CONDUIT
(square symbol)	PROPOSED ELECTRIC OR SIGNAL HANDHOLE

FILTRATION PLANT MODIFIED ELECTRICAL SITE PLAN 1 / 02-E-1

SCALE: 1"=20'-0" (FULL SIZE DRAWING)

0 20' 40'
SCALE: 1" = 20'

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

MODIFIED ELECTRICAL SITE PLAN

Drawn By: JWC | Designed By: JWC | Checked By: SMR | Approved By: JWC

Rev.	Date	Description

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TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
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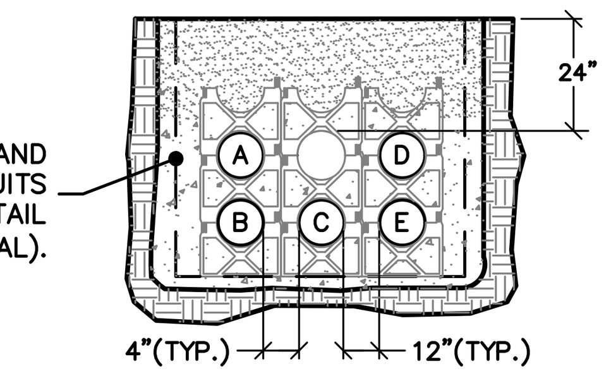
02-E-1

ELECTRICAL DUCT BANK SCHEDULE

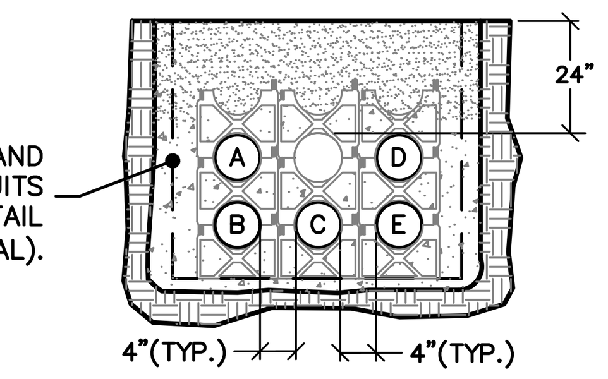
DUCT BANK SECTION NO.	CONDUIT	EQUIPMENT	WIRE	CONNECTION
A 02-E-2	(A) 4" PVC	MAIN CIRCUIT BREAKER (MCB)	4#500 KCMIL	SERVICE CONDUIT FROM EXISTING UTILITY PAD MOUNTED TRANSFORMER TO MAIN CIRCUIT BREAKER (MCB) IN NEW SWITCHGEAR AT NEW FILTRATION BUILDING.
	(B) 4" PVC	MAIN CIRCUIT BREAKER (MCB)	4#500 KCMIL	SERVICE CONDUIT FROM EXISTING UTILITY PAD MOUNTED TRANSFORMER TO MAIN CIRCUIT BREAKER (MCB) IN NEW SWITCHGEAR AT NEW FILTRATION BUILDING.
	(C) 4" PVC	SPARE	PULL ROPE	SPARE CONDUIT FROM EXISTING UTILITY PAD MOUNTED TRANSFORMER TO MAIN CIRCUIT BREAKER (MCB) SECTION IN NEW SWITCHGEAR AT NEW FILTRATION BLD.
	(D) 3" PVC	TELEPHONE SYSTEM	TELEPHONE CABLE	TELEPHONE CONDUIT FROM EXISTING UTILITY POLE TO NEW TELEPHONE TERMINAL BOARD AT NEW FILTRATION BUILDING.
	(E) 3" PVC	SPARE	PULL ROPE	SPARE CONDUIT FROM EXISTING UTILITY POLE TO NEW TELEPHONE TERMINAL BOARD AT NEW FILTRATION BUILDING.
B 02-E-2	(A) 4" PVC	PANEL DPB	4#350 KCMIL, 1#1/0G	FEEDER CONDUIT FROM NEW MCC-A IN NEW FILTRATION BUILDING TO NEW DISTRIBUTION PANEL DPB IN EXISTING WTF.
	(B) 4" PVC	PANEL DPB	4#350 KCMIL, 1#1/0G	FEEDER CONDUIT FROM NEW MCC-A IN NEW FILTRATION BUILDING TO NEW DISTRIBUTION PANEL DPB IN EXISTING WTF.
	(C) 4" PVC	SPARE	PULL ROPE	SPARE CONDUIT FROM MCC-A IN NEW FILTRATION BUILDING TO 24" AFG @ EXISTING WTF.
	(D) 2" PVC	NEW MCP PANEL	FIBER OPTIC CABLE	SIGNAL CONDUIT FROM NEW MCP PANEL IN NEW FILTRATION BUILDING TO FIBER OPTIC PATCH PANEL IN EXISTING WTF.
	(E) 2" PVC	SPARE	PULL ROPE	SPARE CONDUIT FROM NEW MTU PANEL IN NEW FILTRATION BUILDING TO 24" AFG @ EXISTING WTF.
C 02-E-2	(A) NEW 3" PVC	WELL NO.2	3#4, WITH #6 GRD VFD RATED CABLE & 4#14	FEEDER CONDUIT FROM NEW VFD INSIDE EXISTING WTF TO NEW WELL NO.2 PUMP MOTOR VIA NEW UNDERGROUND CONDUIT.
	(B) NEW 2" PVC	WELL NO.2 LEVEL TRANSMITTER	(1) 2/C#16 SH., PR. CABLE	SIGNAL CONDUIT FROM NEW WELL LEVEL TRANSMITTER AT NEW WELL NO.2 TO NEW PCP PANEL INSIDE EXISTING WTF VIA NEW UNDERGROUND CONDUIT.
	(C) NEW 2" PVC	SPARE	PULL ROPE	SPARE CONDUIT FROM NEW WELL NO.2 TO 18" AFG AT EXTERIOR OF EXISTING WTF.
D 02-E-2	(A) NEW 3" PVC	WELL NO.3	3#4, WITH #6 GRD VFD RATED CABLE & 4#14	FEEDER CONDUIT FROM NEW VFD INSIDE EXISTING WTF TO NEW WELL NO.3 PUMP MOTOR VIA NEW UNDERGROUND CONDUIT.
	(B) NEW 2" PVC	WELL NO.3 LEVEL TRANSMITTER	(1) 2/C#16 SH., PR. CABLE	SIGNAL CONDUIT FROM NEW WELL LEVEL TRANSMITTER AT NEW WELL NO.3 TO NEW PCP PANEL INSIDE EXISTING WTF VIA NEW UNDERGROUND CONDUIT.
	(C) NEW 2" PVC	SPARE	PULL ROPE	SPARE CONDUIT FROM NEW WELL NO.3 TO 18" AFG AT EXTERIOR OF EXISTING WTF.

UNDERGROUND CONDUIT NOTES:

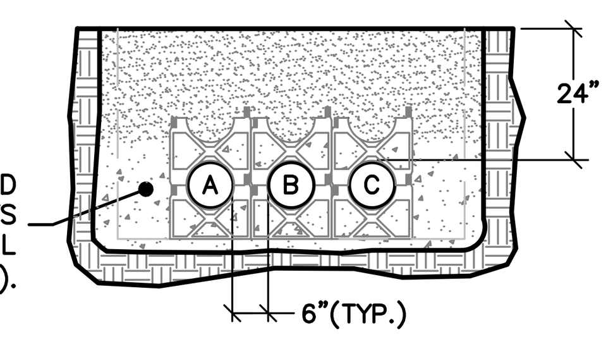
1. PROVIDE RIGID GALVANIZED SWEEPS ON ALL 90° TURNS.
2. COORDINATE NEW UNDERGROUND CONDUIT LOCATION WITH EXISTING UNDERGROUND ELECTRIC CONDUIT, PROCESS PIPING AND STRUCTURES PRIOR TO EXCAVATION.
3. REPAIR EXISTING PAVED AND GRASSED AREAS TO CONDITION EXISTING PRIOR TO EXCAVATION.
4. ALL UTILITY COMPANIES, PUBLIC AND PRIVATE, MUST BE NOTIFIED, INCLUDING THOSE IN CONTROL OF UTILITIES NOT SHOWN ON THIS PLAN, (SEE CHAPTER 370, ACTS OF 1963, MASSACHUSETTS GENERAL LAWS) PRIOR TO DESIGNING, EXCAVATING, BLASTING, INSTALLING, BACKFILLING, GRADING, PAVEMENT RESTORING OR REPAVING.
5. REFER TO DETAIL 2/02-E-2 FOR TYPICAL TRENCHING DETAIL FOR ELECTRICAL/TELEPHONE/FIRE ALARM/CABLE CONDUITS.
6. CONTRACTOR SHALL FURNISH AND INSTALL POLYESTER PULLING TAPE IN ALL SPARE CONDUITS RATED @ 2500 LBS, WITH FOOTAGE MARKINGS AS MANUFACTURED BY NEPT CO., MODEL# WP2500 OR APPROVED EQUAL.



DUCT BANK SECTION A 02-E-2
SCALE: NONE

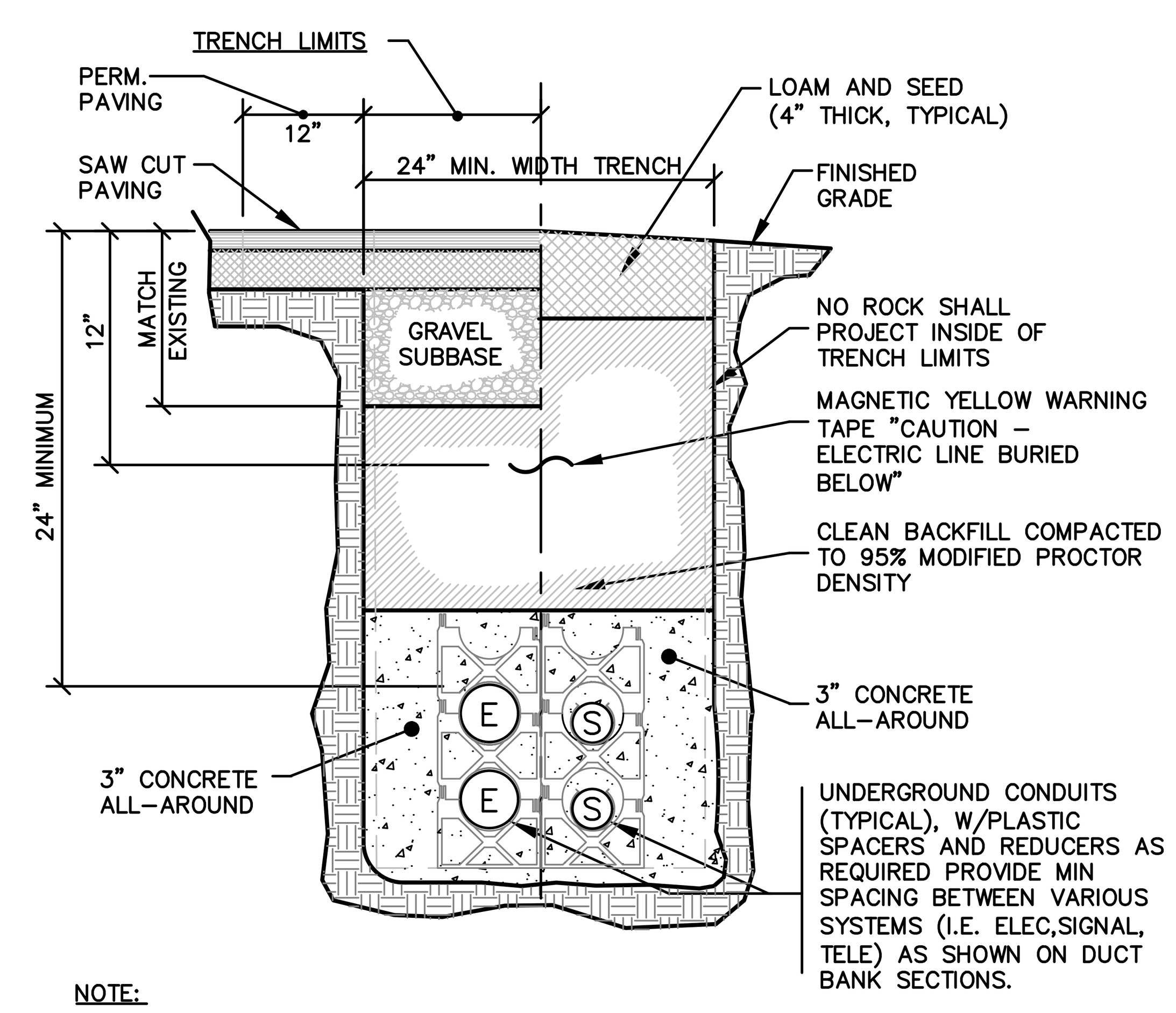


DUCT BANK SECTION B 02-E-2
SCALE: NONE



DUCT BANK SECTION C 02-E-2 D 02-E-2
SCALE: NONE

ELECTRICAL DUCT BANK SCHEDULE WITH DUCT BANK SECTIONS 1 02-E-2
SCALE: NONE



NOTE:

REFER TO ELECTRICAL SITE PLAN & DUCT BANK SCHEDULE FOR SPECIFIC REQUIREMENTS.

TYPICAL ELECTRICAL TRENCHING DETAIL 2 02-E-2
SCALE: NONE

SUBSURFACE WORK NOTE:

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR IT'S REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONTACT "DIG SAFE" AT 1(888)344-7233 (1(888)DIG-SAFE)AND COORDINATE ACTIVITIES PRIOR TO ANY EXCAVATIONS.

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

ELECTRICAL DUCT BANK SCHEDULE WITH DUCT BANK SECTIONSAND DETAILS

Drawn By:JWC Designed By:JWC Checked By:SMR Approved By:JWC

Rev.	Date	Description

5-1-19

5-2-19

SMR ENGINEERING, PC

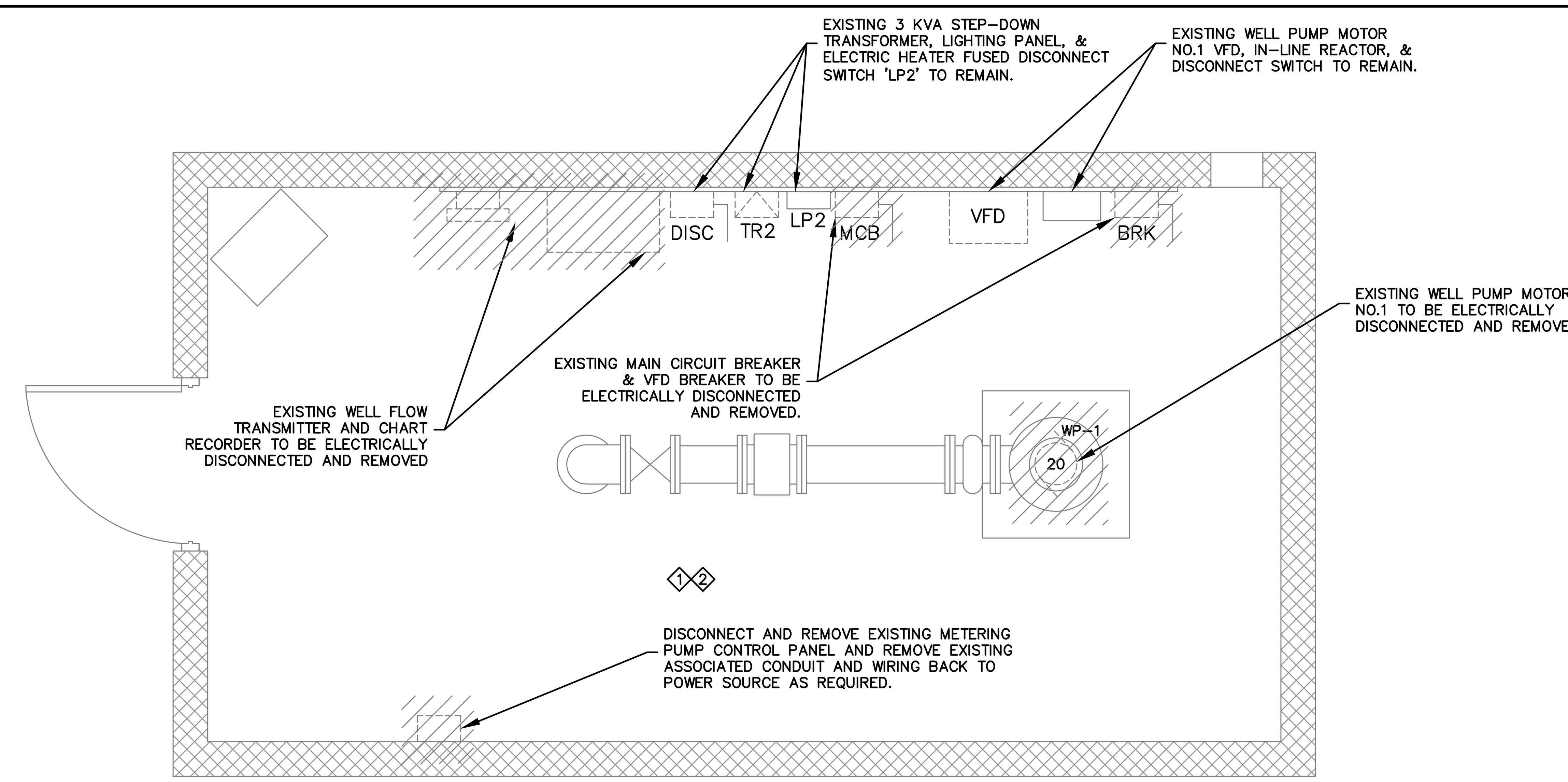
TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

02-E-2

KEY NOTES:

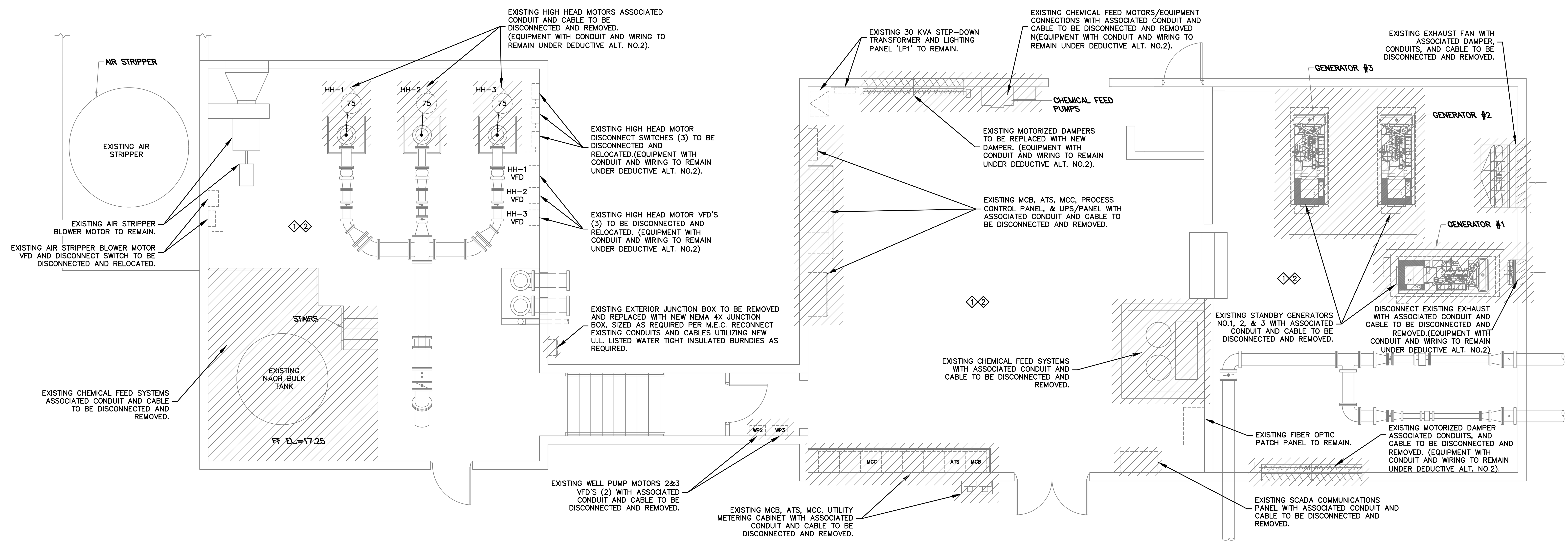
1. REFER TO DEMOLITION NOTES ON SHEET 01-E-1.
2. THE EXISTING FACILITY TO REMAIN FULLY OPERATIONAL WHILE THE NEW ELECTRICAL SYSTEMS BEING INSTALLED AND WIRED. ALL ELECTRICAL SHUT DOWNS MUST BE KEPT AT A MINIMUM AND APPROVED BY OWNER.



EXISTING PUMPING STATION NO.1 DEMOLITION PLAN (1 / 10-E-1)

SCALE: 1/2"=1'-0" (FULL SIZE DRAWING)

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



EXISTING TREATMENT FACILITY ELECTRICAL DEMOLITION PLAN (2 / 10-E-1)

SCALE: 1/4"=1'-0" (FULL SIZE DRAWING)

0 2' 4' 8' SCALE: 1/4" = 1'-0"

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: JWC | Designed By: JWC | Checked By: SMR | Approved By: JWG

EXISTING TREATMENT PLANT ELECTRICAL DEMOLITION PLAN

Rev.	Date	Description

COMMONWEALTH OF MASSACHUSETTS JON W. GREGORY CIVIL No. 46478 REGISTERED PROFESSIONAL ENGINEER 5-1-19

COMMONWEALTH OF MASSACHUSETTS SADEGH M. RADVAR ELECTRICAL No. 37935 REGISTERED PROFESSIONAL ENGINEER 5-2-19

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TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

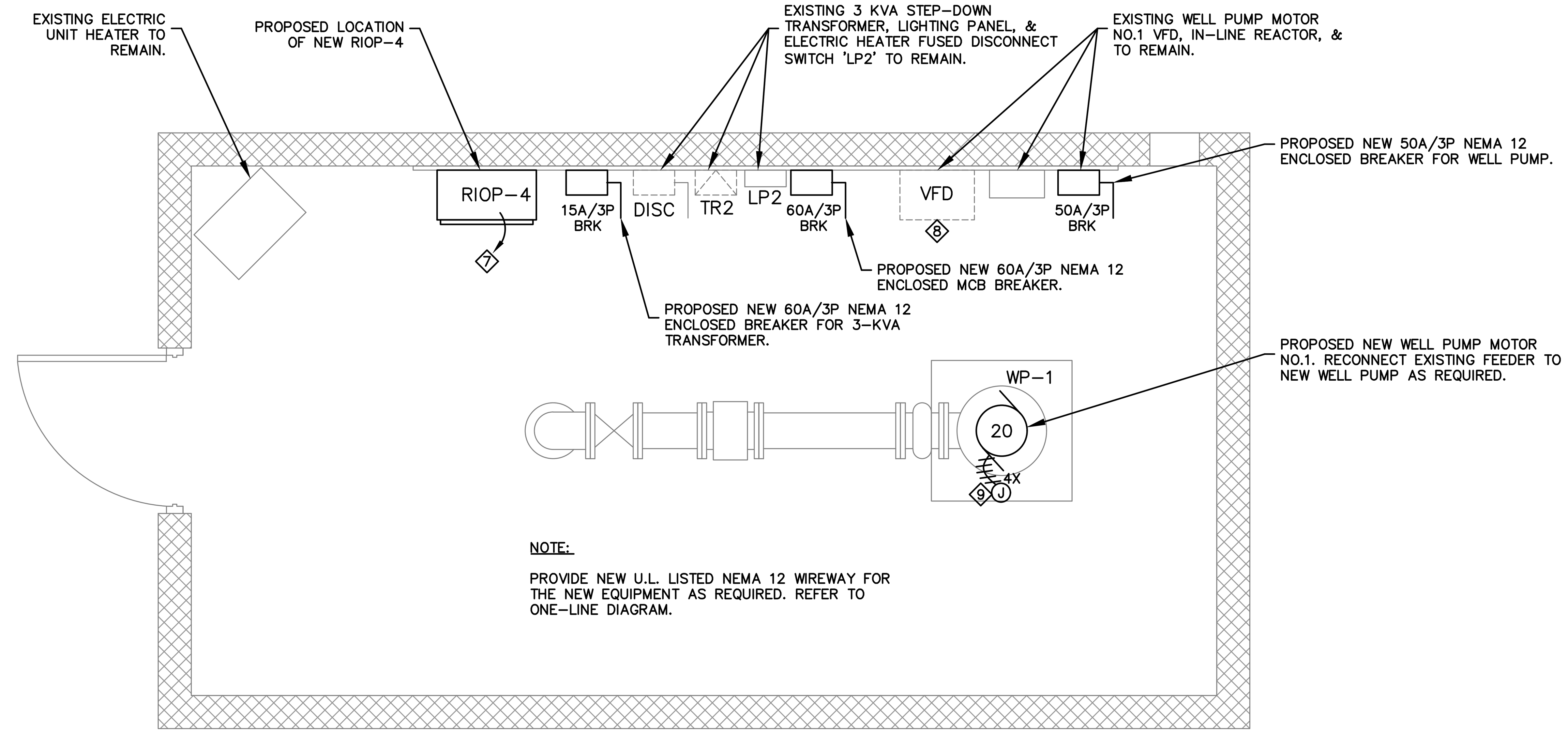
10-E-1

KEY NOTES:

1. PROVIDE 3/4" THICK PLYWOOD W/2-COATS GRAY ENAMEL PAINT FOR ALL PANELS, CABINETS ETC. AS REQUIRED.
2. ALL WIRING SHALL BE WITHIN RIGID GALVANIZED STEEL CONDUITS IN ALL AREAS EXCEPT AS NOTED. ALL ELECTRICAL PANELS, DISCONNECT SWITCHES, PULL BOXES, J-BOXES, ETC. EXCEPT FOR, CHEMICAL FEED AND PROCESS AREA SHALL BE PROVIDED WITH NEMA 12 METAL CONSTRUCTION UNLESS OTHERWISE NOTED. ALL WIRING IN THE PUMP ROOMS, AND NON-PROCESS AREAS SHALL BE WITHIN RIGID GALVANIZED STEEL CONDUIT. ALL ELECTRICAL PANELS, DISCONNECT SWITCHES, PULL BOXES, J-BOXES, ETC. SHALL BE PROVIDED WITH NEMA 4X STAINLESS STEEL METAL CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR CONDUIT TYPE AND APPLICATION.
3. (1) NEW 3/4" CONDUIT WITH 3#10, 1#10G & 4#14 ALARM CABLES TO RELOCATED BLOWER VFD.
4. (1) NEW 2" CONDUIT W/3#4 & 1#6G, & 4#14 ALARMS TO RESPECTIVE RELOCATED PUMP VFD.
5. (1) NEW 3/4" CONDUIT WITH 2#12, 1#12G TO EXISTING LIGHTING PANEL LP1. PROVIDE NEW 20A/1P FEEDER U.L. LISTED BRANCH BREAKER. MATCH EXISTING TYPE, STYLE AND AIC RATING AS REQUIRED.
6. PROPOSED LOCATION OF NEW JUNCTION BOX FOR EXISTING BOOSTER PUMP AND WELL NO.1 FEEDERS. PROVIDE NEW NEMA 12 JUNCTION BOX SIZE AS REQUIRED. CONNECT EXISTING FEEDERS TO NEW FEEDERS WITH NEW U.L. LISTED INSULATED BURNDIES AS REQUIRED. REFER TO ELECTRICAL ONE-LINE DIAGRAM.
7. (1) NEW 3/4" CONDUIT WITH 2#12, 1#12G TO EXISTING LIGHTING PANEL LP2. PROVIDE NEW 20A/1P FEEDER U.L. LISTED BRANCH BREAKER. MATCH EXISTING TYPE, STYLE AND AIC RATING AS REQUIRED.
8. READJUST THE EXISTING VFD'S OVERCURRENT PROTECTION PARAMETERS/DEVICES TO MATCH THE NEW PUMP MOTOR'S FLA PER M.E.C.
9. (1) NEW 1½" CONDUIT WITH 3#6, 1#6G & 4#14 TO EXISTING VFD.
10. (1) 3/4" CONDUIT WITH 2#12, 1#12G TO EXHAUST FAN NO.3 (EF-3) AS INDICATED.
11. (1) NEW 3/4" CONDUIT WITH 2#12, 1#12G TO EXISTING LIGHTING PANEL LP1. PROVIDE NEW 20A/1P FEEDER U.L. LISTED BRANCH BREAKER. MATCH EXISTING TYPE, STYLE AND AIC RATING AS REQUIRED.
12. (1) NEW 3/4" CONDUIT WITH 2#12, 1#12G TO EXISTING LIGHTING PANEL LP1. PROVIDE NEW 20A/1P FEEDER U.L. LISTED BRANCH BREAKER. MATCH EXISTING TYPE, STYLE AND AIC RATING AS REQUIRED.
13. (1) 3/4" CONDUIT WITH (1) NEW 2/C#16 SH., PR. CABLE TO NEW PCP PANEL (WELL LEVEL SIGNAL).

GENERAL NOTE:

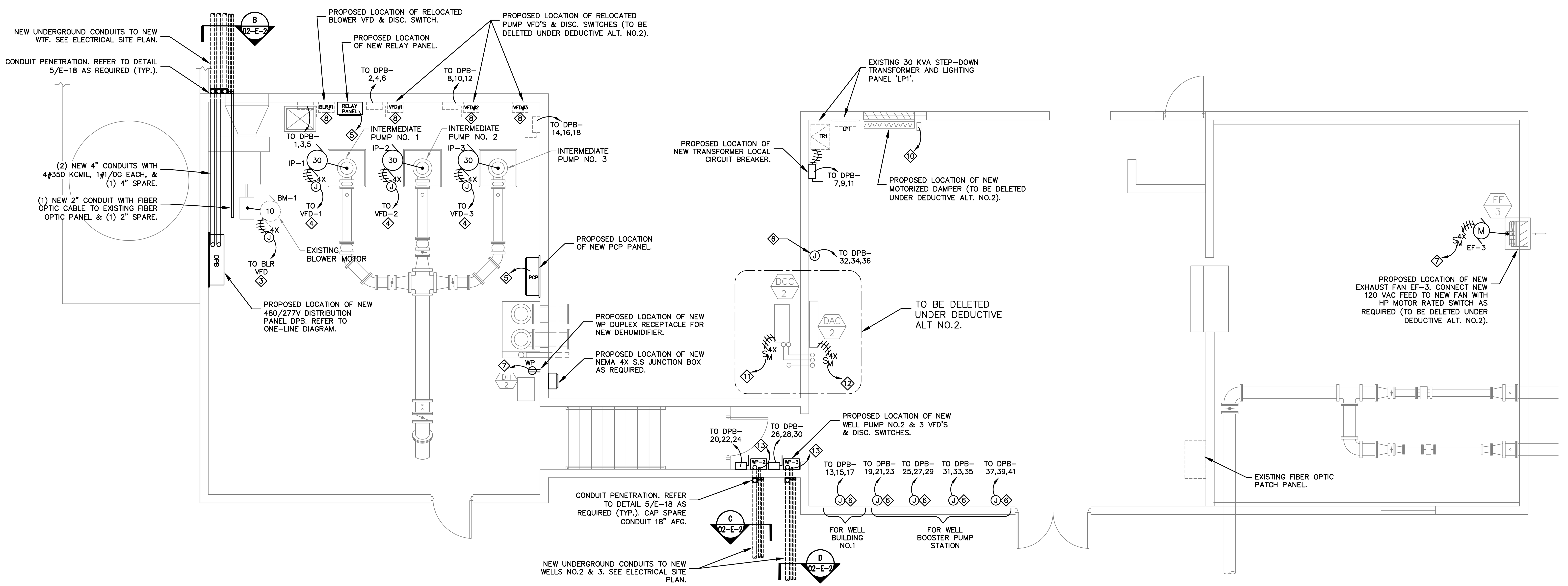
1. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL INSTRUMENTATION AND CONTROL WIRING & CONDUITS AS SHOWN ON INSTRUMENTATION DRAWINGS FOR THE WATER TREATMENT FACILITY AND ALL REMOTE PUMP STATIONS AS REQUIRED.
2. ELECTRICAL CONTRACTOR SHALL COORDINATE EXACT LOCATION OF ALL PROCESS EQUIPMENT, INSTRUMENTATION DEVICES, CONTROL PANELS, HVAC EQUIPMENT, ELECTRIC MOTORS. ETC. WITH GENERAL CONTRACTOR AND VARIOUS TRADES AS REQUIRED.



EXISTING PUMPING STATION NO.1 MODIFIED POWER PLAN 1 / 10-E-2

SCALE: 1/2"=1'-0" (FULL SIZE DRAWING)

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



EXISTING TREATMENT FACILITY ELECTRICAL MODIFICATION PLAN 1 / 10-E-2

SCALE: 1/4"=1'-0" (FULL SIZE DRAWING)

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

EXISTING TREATMENT PLANT ELECTRICAL MODIFICATION PLAN

Drawn By: JWC | Designed By: JWC | Checked By: SMR | Approved By: JWC

Rev.	Date	Description

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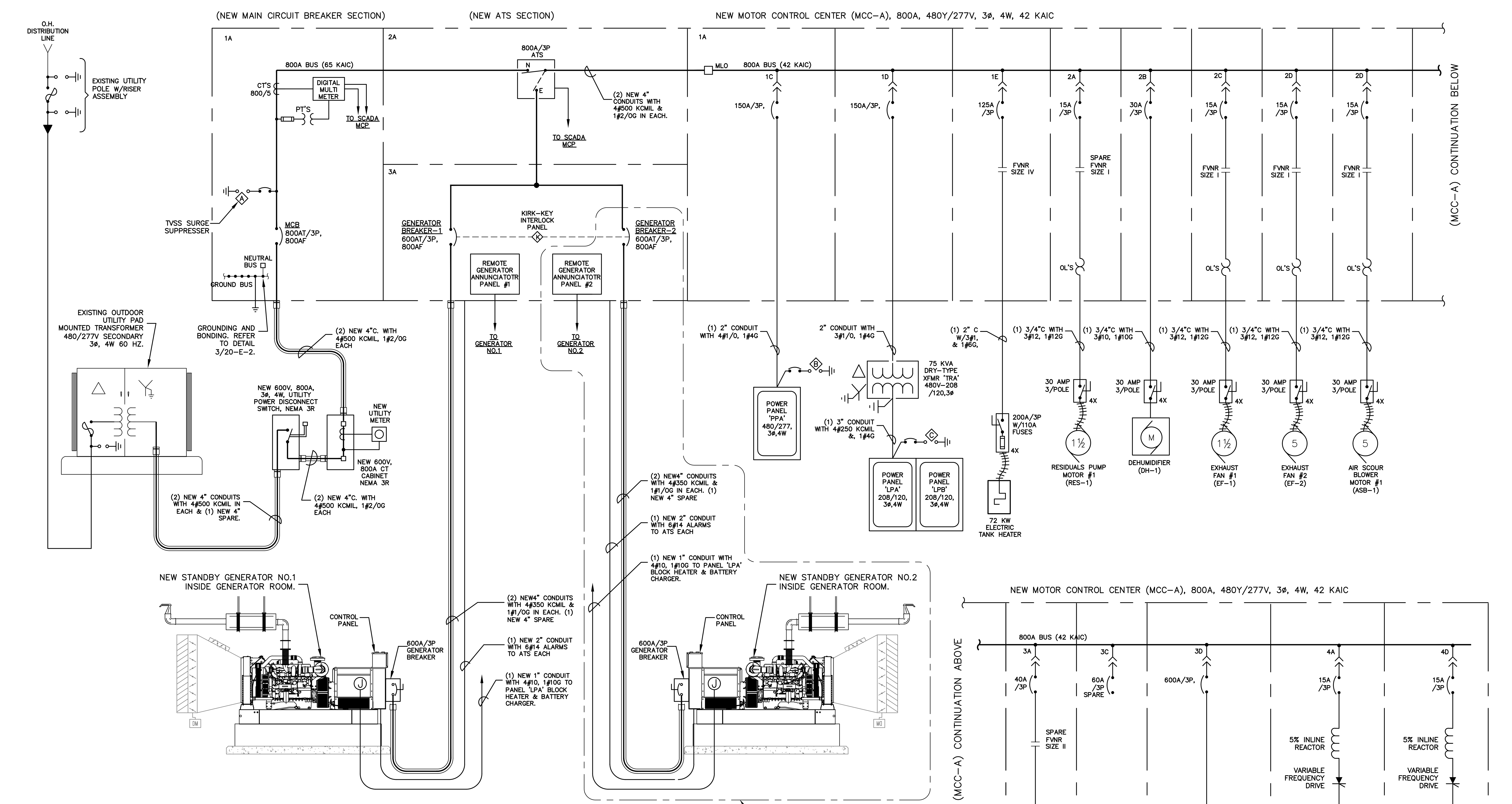
5-2-19

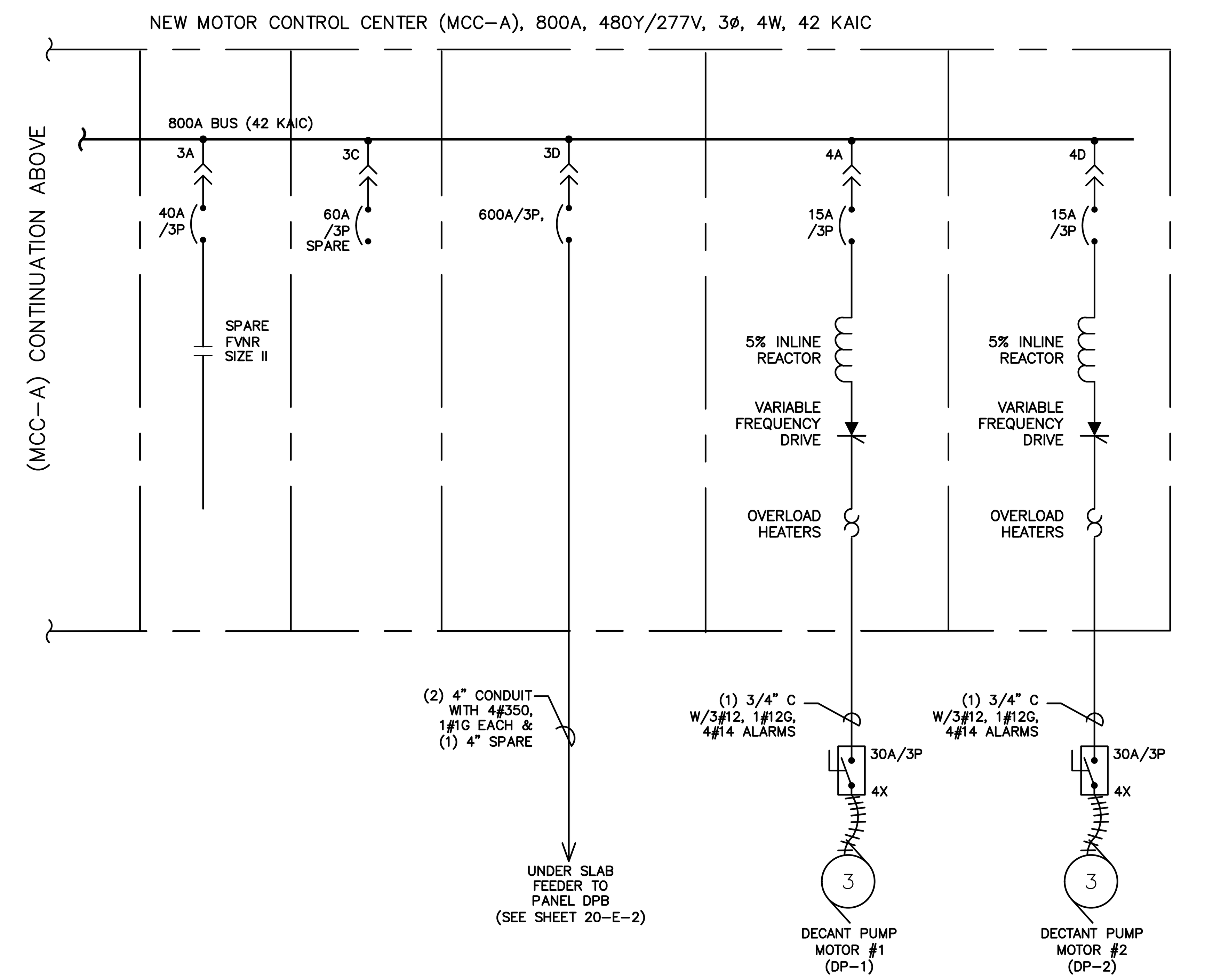
SMR ENGINEERING, PC — Electrical, Instrumentation & Control Systems Engineering

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

10-E-2





TRANSIENT VOLTAGE SURGE SUPPRESSER (TVSS) SCHEDULE:

LOCATION		MODEL NO.	SYSTEM VOLTAGE	PEAK SURGE CURRENT
A	MAIN BRKR (MCB)	PTE300-3Y201-D	480Y/277V, 3ø,4W	300,000 AMPS PER ø
B	480/277 VAC, 3ø,4W PANELS	PTE160-3Y201-L	480Y/277V, 3ø,4W	160,000 AMPS PER ø
C	208/120 VAC, 3ø,4W PANELS	PTE080-3Y101-L	480Y/277V, 3ø,4W	80,000 AMPS PER ø

NOTE:

1. SURGE PROTECTORS SHALL BE MANUFACTURED BY INNOVATIVE TECHNOLOGY OR APPROVED EQUAL.
2. UNIT SHALL HAVE: 10 MODE MOV DESIGN, SINE-WAVE TRACKING, 20 YEAR WARRANTY, & SURGE COUNTER.

PARTIAL SYMBOLS LEGEND:

- DMM : DIGITAL MULTI-METER
- ES : EMERGENCY SHUTDOWN
- ST : SHUNT TRIP
- GFP : GROUND FAULT PROTECTION
- CT'S : CURRENT TRANSFORMER
- CT'S : CURRENT TRANSFORMER
- PT'S : POTENTIAL TRANSFORMER
- SP : SURGE PROTECTOR (TVSS)
- SST : SOLID STATE TRIP
- RWT : REFLECTOR WAVE TRAP

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

ELECTRICAL ONE-LINE DIAGRAM

Drawn By: JWC | Designed By: JWC | Checked By: SMR | Approved By: RPN

Rev.	Date	Description

5-1-19

5-2-19

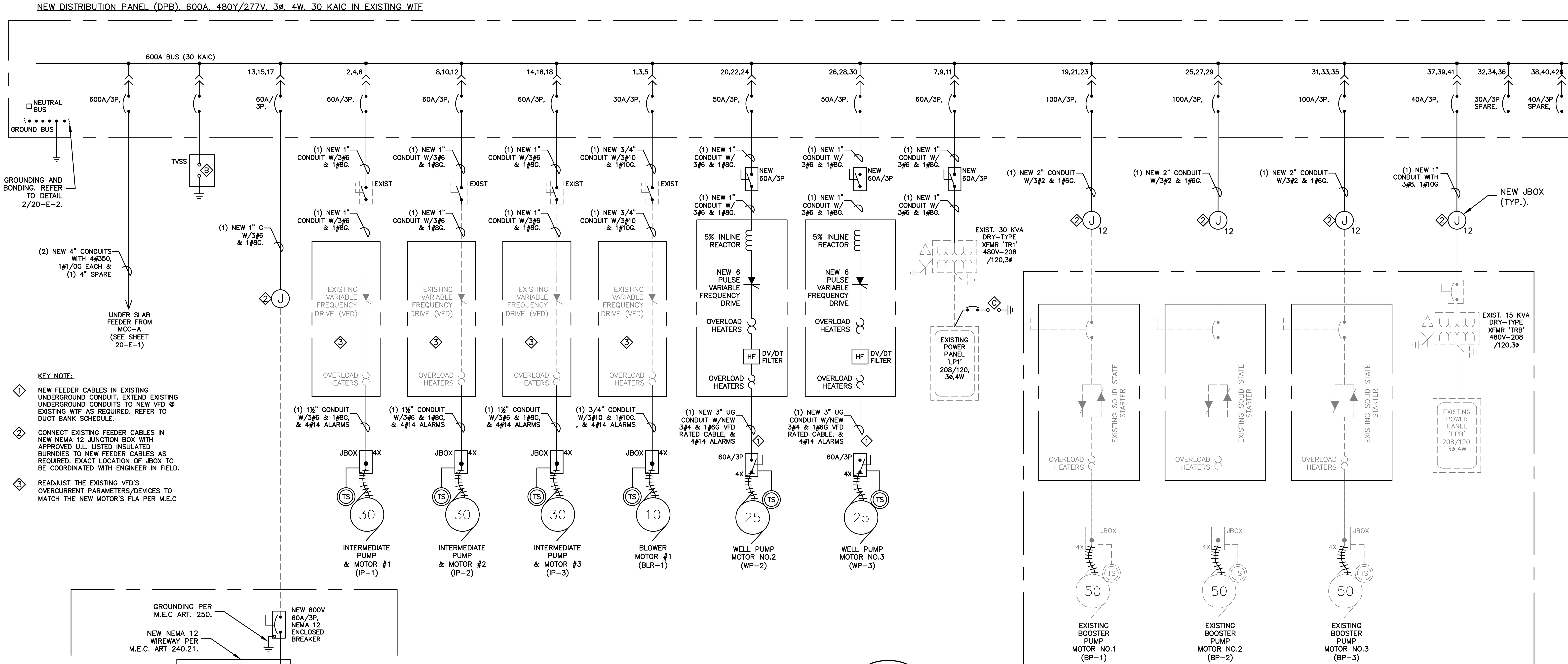
SMR ENGINEERING, PC

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

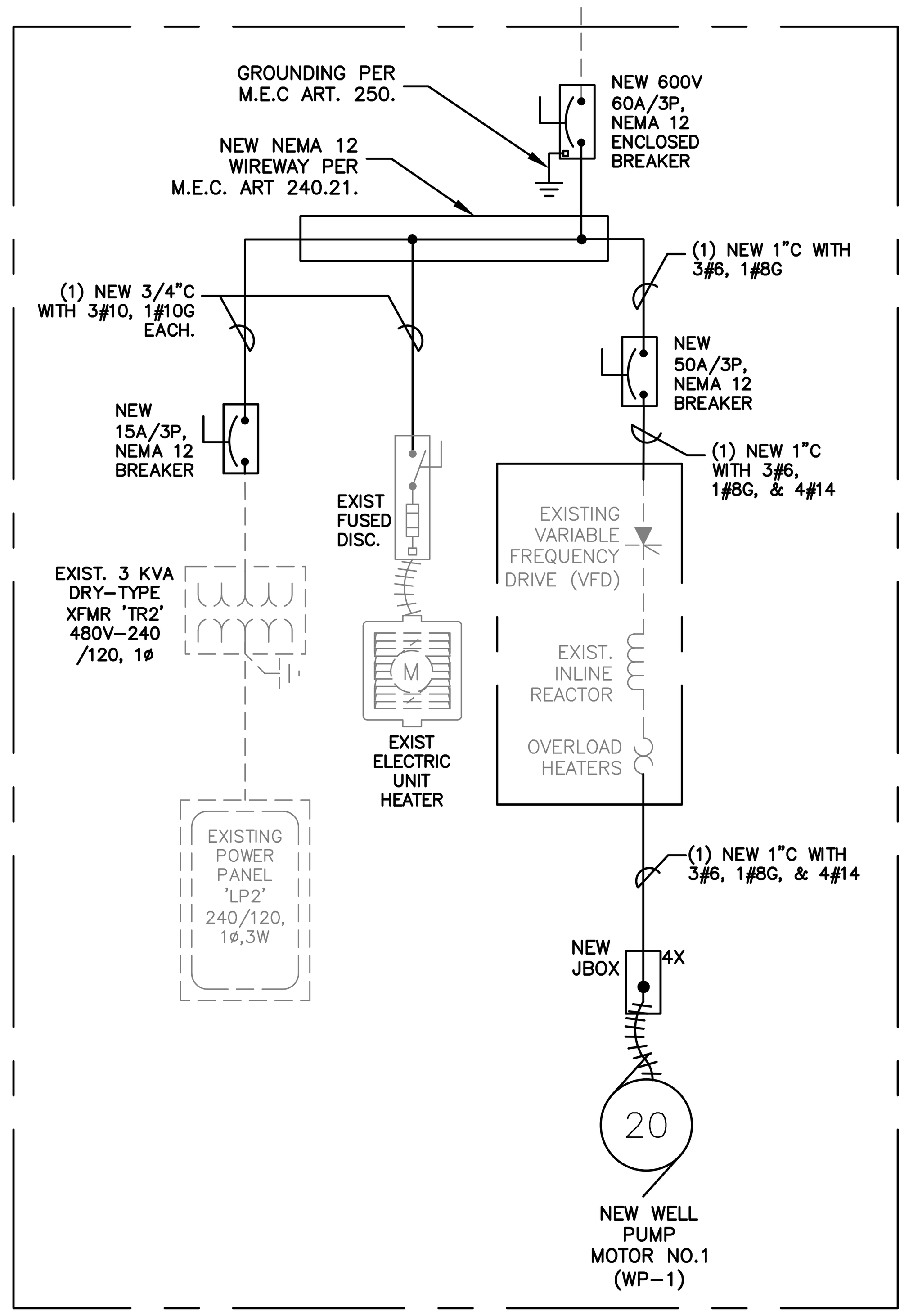
20-E-1

NEW DISTRIBUTION PANEL (DPB), 600A, 480Y/277V, 3Ø, 4W, 30 KAIC IN EXISTING WTF



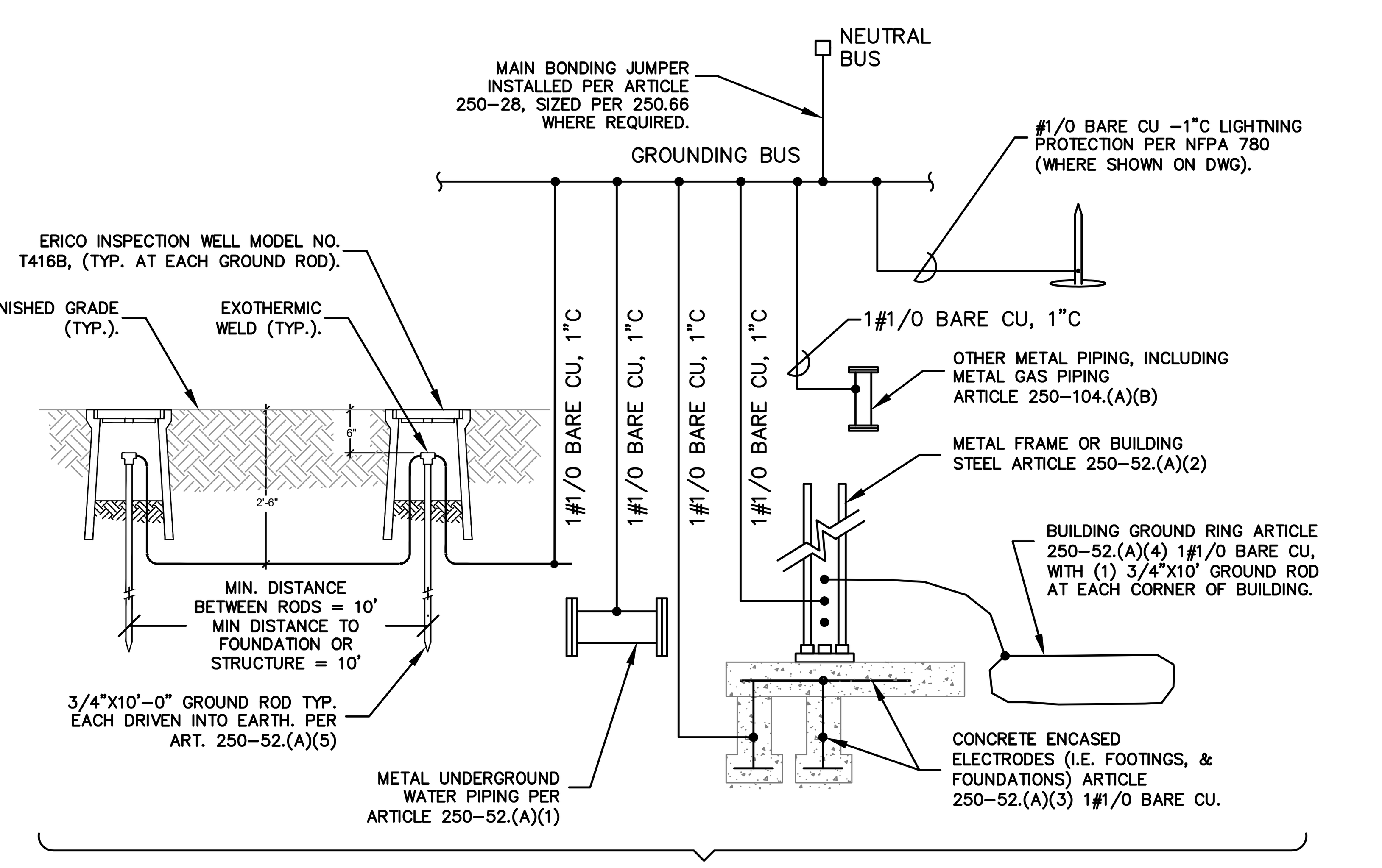
KEY NOTE:

1. NEW FEEDER CABLES IN EXISTING UNDERGROUND CONDUIT. EXTEND EXISTING UNDERGROUND CONDUITS TO NEW VFD @ EXISTING WTF AS REQUIRED. REFER TO DUCT BANK SCHEDULE.
2. CONNECT EXISTING FEEDER CABLES IN NEW NEMA 12 JUNCTION BOX WITH APPROVED U.L. LISTED INSULATED BURNDIES TO NEW FEEDER CABLES AS REQUIRED. EXACT LOCATION OF JBOX TO BE COORDINATED WITH ENGINEER IN FIELD.
3. READJUST THE EXISTING VFD'S OVERCURRENT PARAMETERS/DEVICES TO MATCH THE NEW MOTOR'S FLA PER M.E.C

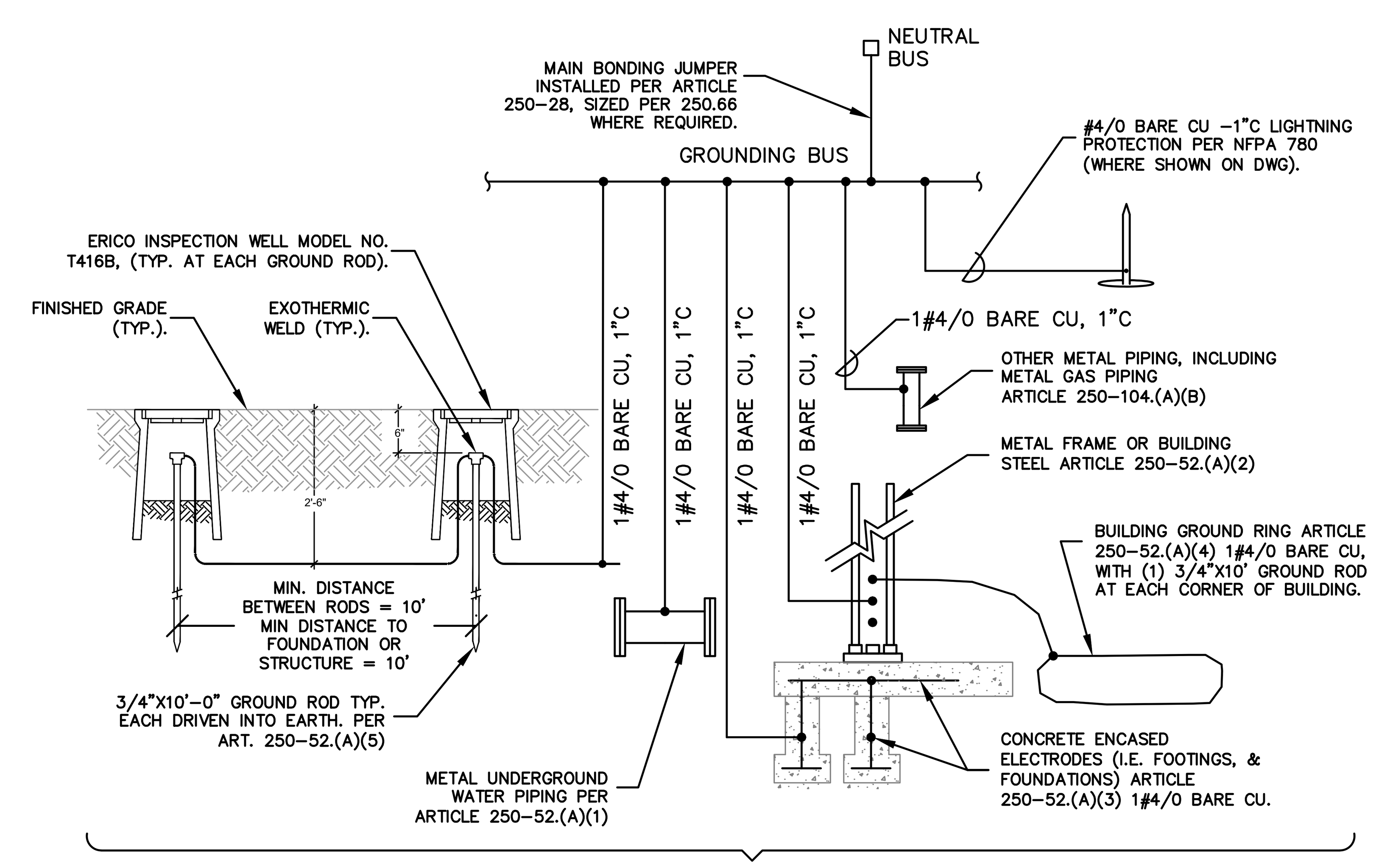


EXISTING PUMP STATION NO.1

EXISTING WTF NEW ONE-LINE DIAGRAM (1 / 20-E-2)
SCALE: NONE



NEW GROUNDING AND BONDING @ EXISTING WATER PLANT (2 / 20-E-2)
SCALE: NONE



NEW GROUNDING AND BONDING @ NEW FILTRATION PLANT (3 / 20-E-2)
SCALE: NONE

TOWN OF BARNSTABLE, MASSACHUSETTS
MAHER FILTRATION PLANT
ELECTRICAL ONE-LINE DIAGRAM

Drawn By: JWC | Designed By: JWC | Checked By: SMR | Approved By: RPN

Rev.	Date	Description

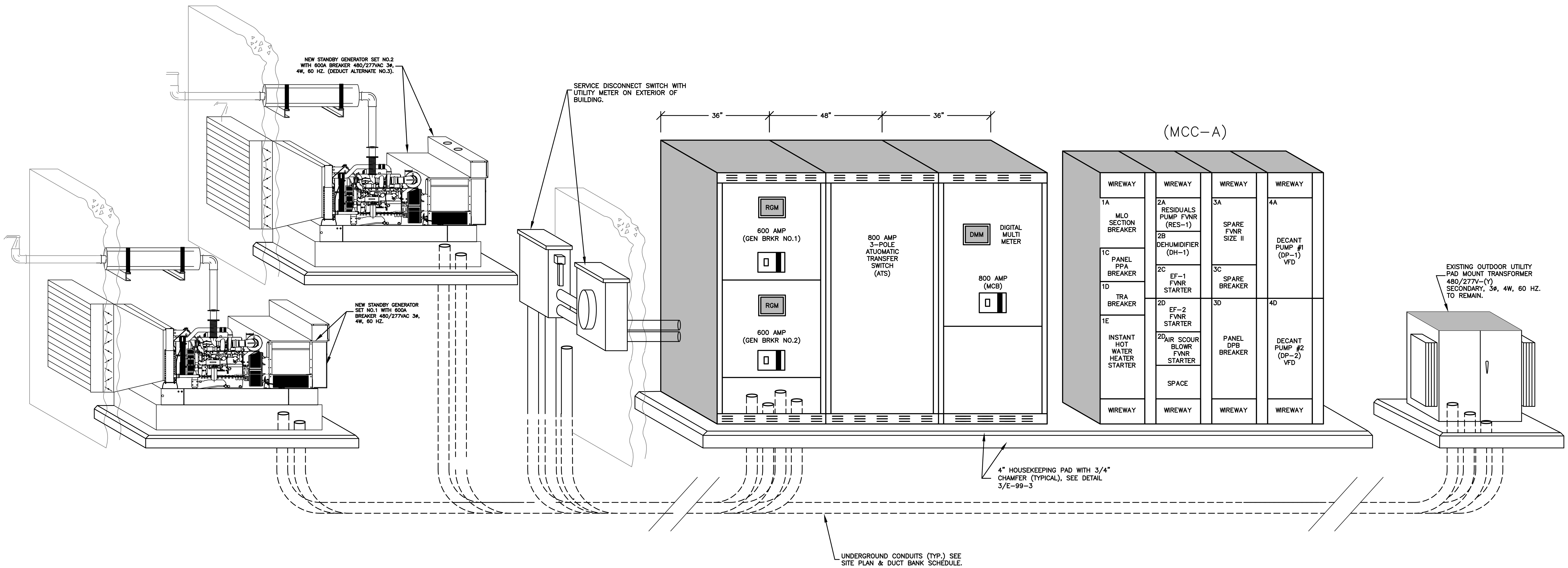
5-1-19
5-2-19

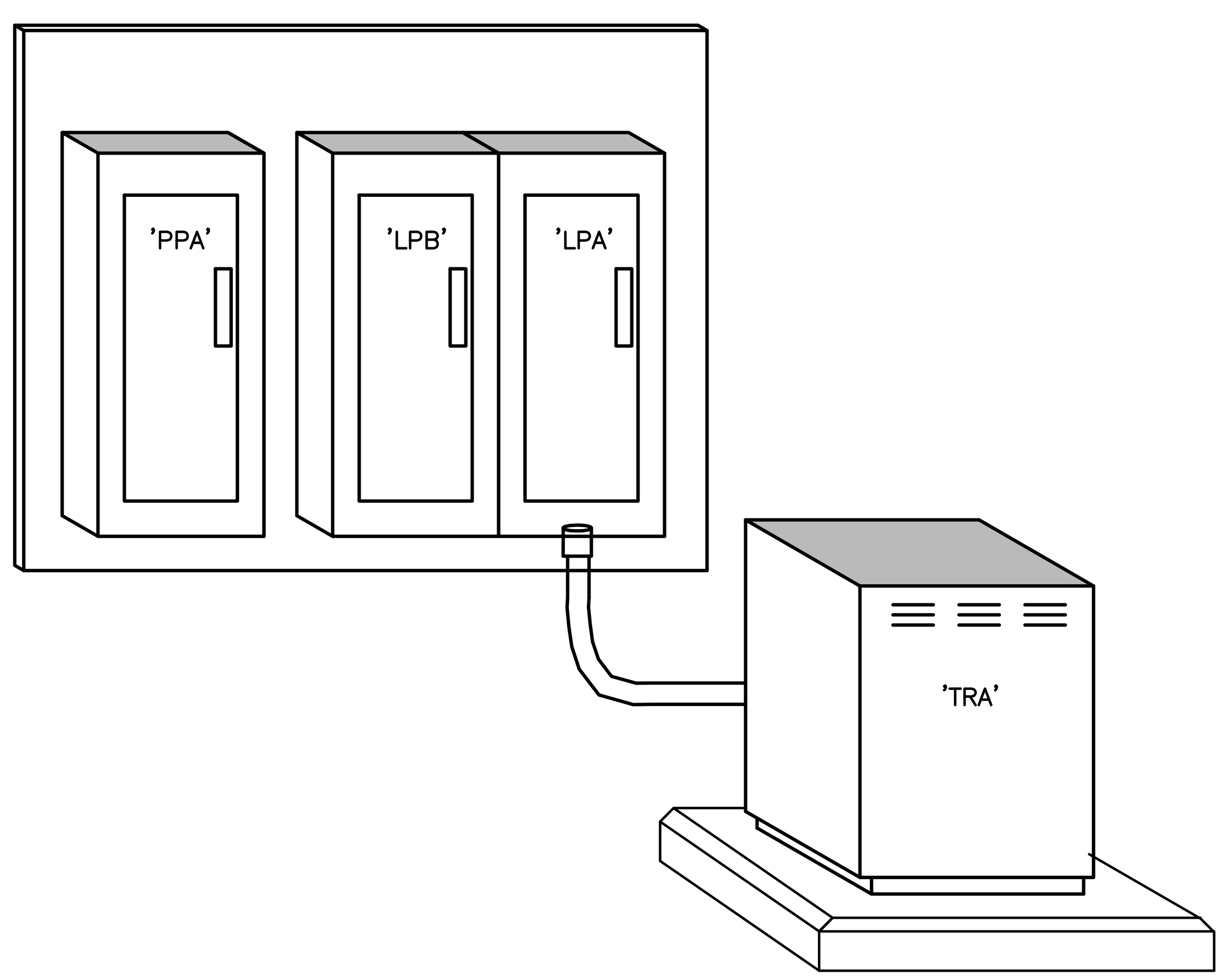
SMR ENGINEERING, PC

TATA & HOWARD

T&H NO.:	5241
DATE:	MAY 2019
SCALE:	AS NOTED

20-E-2





TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: JWC	Designed By: JWC	Checked By: SMR	Approved By: RPN

ELECTRICAL EQUIPMENT ELEVATIONS

Rev.	Date	Description

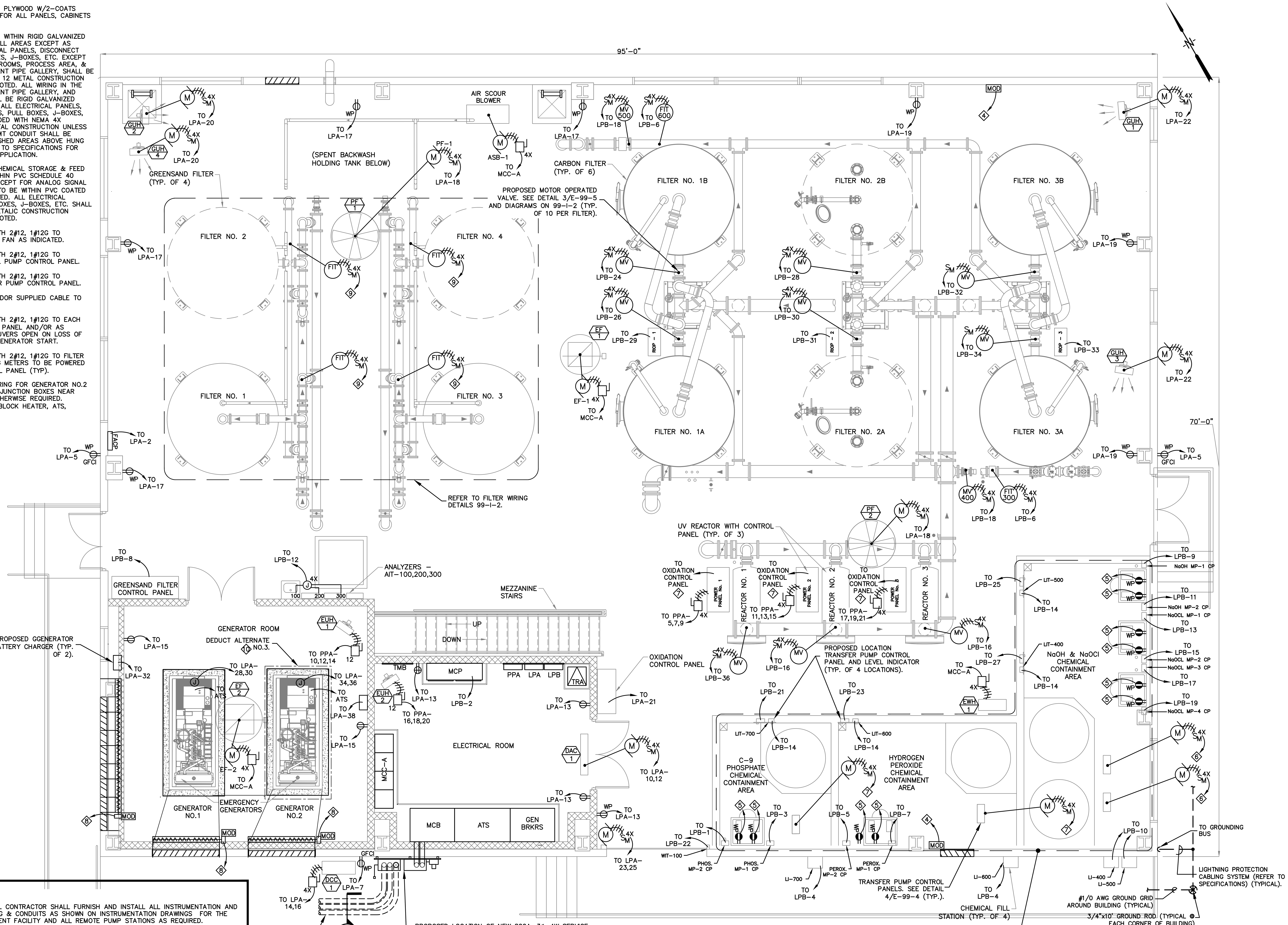
TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-E-3

KEY NOTES:

1. PROVIDE 3/4" THICK PLYWOOD W/2-COATS GRAY ENAMEL PAINT FOR ALL PANELS, CABINETS ETC. AS REQUIRED.
2. ALL WIRING SHALL BE WITHIN RIGID GALVANIZED STEEL CONDUITS IN ALL AREAS EXCEPT AS NOTED. ALL ELECTRICAL PANELS, DISCONNECT SWITCHES, PULL BOXES, J-BOXES, ETC. EXCEPT FOR CHEMICAL FEED ROOMS, PROCESS AREA, & LOWER LEVEL BASEMENT PIPE GALLERY, SHALL BE PROVIDED WITH NEMA 12 METAL CONSTRUCTION UNLESS OTHERWISE NOTED. ALL WIRING IN THE LOWER LEVEL BASEMENT PIPE GALLERY, AND PROCESS AREA SHALL BE RIGID GALVANIZED STEEL CONDUIT, AND ALL ELECTRICAL PANELS, DISCONNECT SWITCHES, PULL BOXES, J-BOXES, ETC SHALL BE PROVIDED WITH NEMA 4X STAINLESS STEEL METAL CONSTRUCTION UNLESS OTHERWISE NOTED. EMT CONDUIT SHALL BE ALLOWED IN THE FINISHED AREAS ABOVE HUNG CEILING ONLY. REFER TO SPECIFICATIONS FOR CONDUIT TYPE AND APPLICATION.
3. ALL WIRING IN THE CHEMICAL STORAGE & FEED ROOMS SHALL BE WITHIN PVC SCHEDULE 40 RACEWAY SYSTEM, EXCEPT FOR ANALOG SIGNAL WIRING (4-20MADC) TO BE WITHIN PVC COATED RGS CONDUIT AS NOTED. ALL ELECTRICAL ENCLOSURES, PULL BOXES, J-BOXES, ETC. SHALL BE NEMA 4X NON-METALIC CONSTRUCTION UNLESS OTHERWISE NOTED.
4. (1) 3/4" CONDUIT WITH 2#12, 1#12G TO RESPECTIVE EXHAUST FAN AS INDICATED.
5. (1) 3/4" CONDUIT WITH 2#12, 1#12G TO RESPECTIVE CHEMICAL PUMP CONTROL PANEL.
6. (1) 3/4" CONDUIT WITH 2#12, 1#12G TO RESPECTIVE TRANSFER PUMP CONTROL PANEL.
7. 1" CONDUIT WITH VENDOR SUPPLIED CABLE TO OXIDATION PANEL.
8. (1) 3/4" CONDUIT WITH 2#12, 1#12G TO EACH GENERATOR CONTROL PANEL AND/OR AS INDICATED. NOTE: LOUVERS OPEN ON LOSS OF POWER AND EITHER GENERATOR START.
9. (1) 3/4" CONDUIT WITH 2#12, 1#12G TO FILTER CONTROL PANEL. MAG METERS TO BE POWERED FROM FILTER CONTROL PANEL (TYP).
10. ALL CONDUIT AND WIRING FOR GENERATOR NO.2 SHALL TERMINATE IN JUNCTION BOXES NEAR LOCATIONS WHERE OTHERWISE REQUIRED. (BATTERY CHARGER, BLOCK HEATER, ATS, ALARMS ETC.).



GENERAL NOTE:

1. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL INSTRUMENTATION AND CONTROL WIRING & CONDUITS AS SHOWN ON INSTRUMENTATION DRAWINGS FOR THE WATER TREATMENT FACILITY AND ALL REMOTE PUMP STATIONS AS REQUIRED.
2. ELECTRICAL CONTRACTOR SHALL COORDINATE EXACT LOCATION OF ALL PROCESS EQUIPMENT, INSTRUMENTATION DEVICES, CONTROL PANELS, HVAC EQUIPMENT, ELECTRIC MOTORS. ETC. WITH GENERAL CONTRACTOR AND VARIOUS TRADES AS REQUIRED.

FILTRATION PLANT FIRST FLOOR POWER PLAN 1 / 20-E-4

SCALE: 1/4"=1'-0" (FULL SIZE DRAWING)

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

ALL WIRING SHALL BE WITHIN PVC CONDUITS IN ALL CHEMICAL FEED AND STORAGE AREAS EXCEPT FOR ANALOG SIGNAL WIRING (4-20mADC) TO BE WITHIN PVC COATED RGS CONDUIT AS NOTED. ALL ELECTRICAL PANELS, DISCONNECT SWITCHES, PULL BOXES, JUNCTION BOXES, ETC. SHALL BE NONMETALLIC 4X CONSTRUCTION. REFER TO SPECIFICATIONS FOR CONDUIT TYPE AND APPLICATION.

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

FIRST FLOOR POWER PLAN

Drawn By: CMS | Designed By: JWC | Checked By: SMR | Approved By: JWG

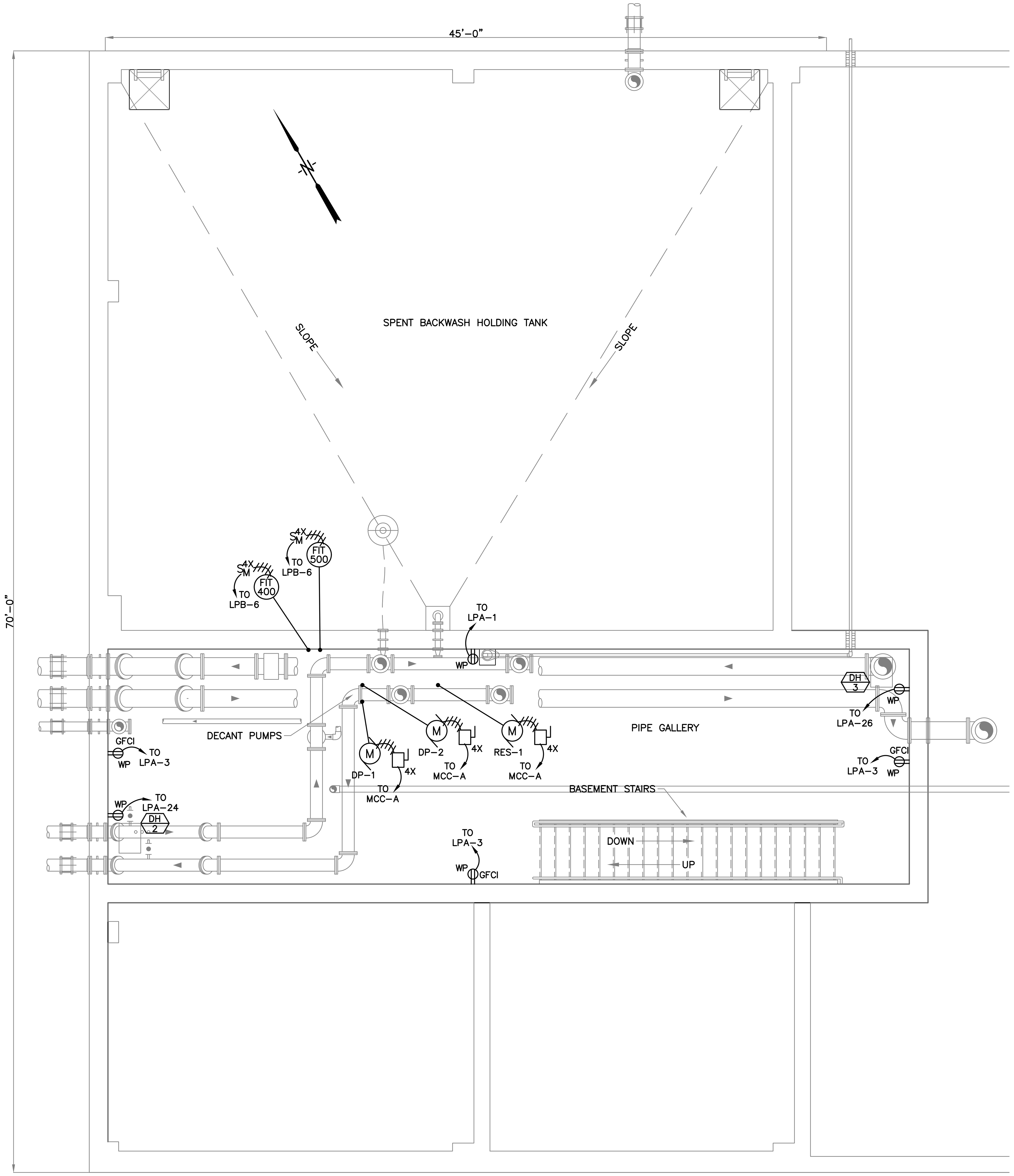
Rev.	Date	Description

SMR ENGINEERING, PC

TATA & HOWARD

T&H NO.:	5241
DATE:	MAY 2019
SCALE:	AS NOTED

20-E-4



FILTRATION PLANT BASEMENT POWER PLAN (1 / 20-E-5)
SCALE: 1/4"=1'-0" (FULL SIZE DRAWING)

0 2' 4' 8'
SCALE: 1/4" = 1'-0"

KEY NOTES:

1. PROVIDE 3/4" THICK PLYWOOD W/2-COATS GRAY ENAMEL PAINT FOR ALL PANELS, CABINETS ETC. AS REQUIRED.
2. ALL WIRING SHALL BE WITHIN RIGID GALVANIZED STEEL CONDUITS IN ALL AREAS EXCEPT AS NOTED. ALL ELECTRICAL PANELS, DISCONNECT SWITCHES, PULL BOXES, J-BOXES, ETC. EXCEPT FOR CHEMICAL FEED ROOMS, PUMP ROOMS, PROCESS AREA, & LOWER LEVEL BASEMENT PIPE GALLERY SHALL BE PROVIDED WITH NEMA 12 METAL CONSTRUCTION UNLESS OTHERWISE NOTED. ALL WIRING IN THE LOWER LEVEL BASEMENT PIPE GALLERY PUMP ROOMS, PROCESS AREA SHALL BE RIGID GALVANIZED STEEL CONDUIT, ALL ELECTRICAL PANELS, DISCONNECT SWITCHES, PULL BOXES, J-BOXES, ETC SHALL BE PROVIDED WITH NEMA 4X STAINLESS STEEL METAL CONSTRUCTION UNLESS OTHERWISE NOTED. EMT CONDUIT SHALL BE ALLOWED IN THE FINISHED AREAS ABOVE HUNG CEILING ONLY. REFER TO SPECIFICATIONS FOR CONDUIT TYPE AND APPLICATION.
3. ALL WIRING IN THE CHEMICAL STORAGE & FEED ROOMS SHALL BE WITHIN PVC SCHEDULE 40 RACEWAY SYSTEM. ALL ELECTRICAL ENCLOSURES, PULL BOXES, J-BOXES, ETC. SHALL BE NEMA 4X NON-METALIC CONSTRUCTION UNLESS OTHERWISE NOTED.

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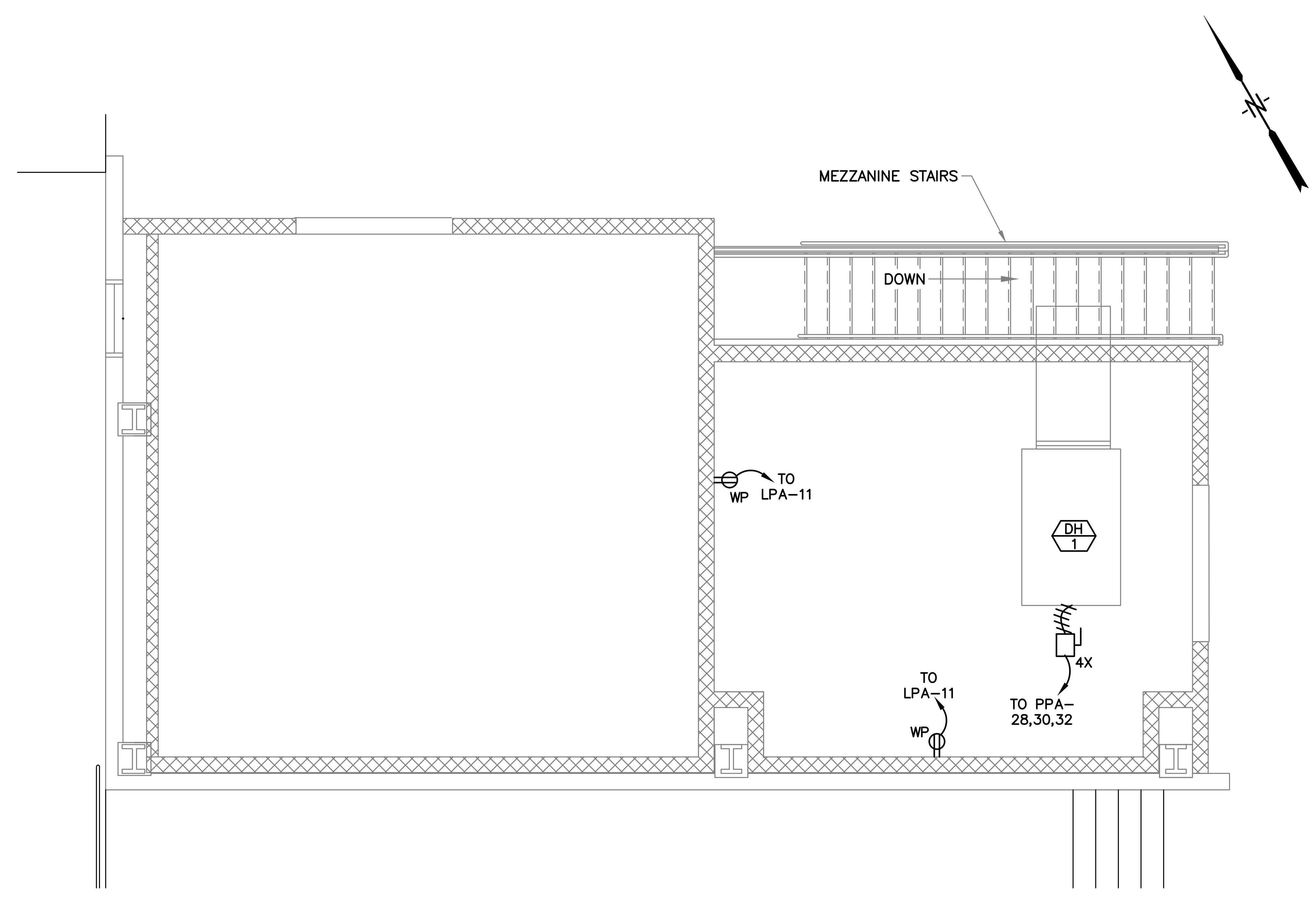

FILTRATION PLANT MEZZANINE POWER PLAN (1 / 20-E-5)
SCALE: 1/4"=1'-0" (FULL SIZE DRAWING)

0 2' 4' 8'
SCALE: 1/4" = 1'-0"

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

BASEMENT & MEZZANINE POWER PLAN

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-E-5

KEY NOTES:

1. PROVIDE 3/4" THICK PLYWOOD W/2-COATS GRAY ENAMEL PAINT FOR ALL PANELS, CABINETS ETC. AS REQUIRED.
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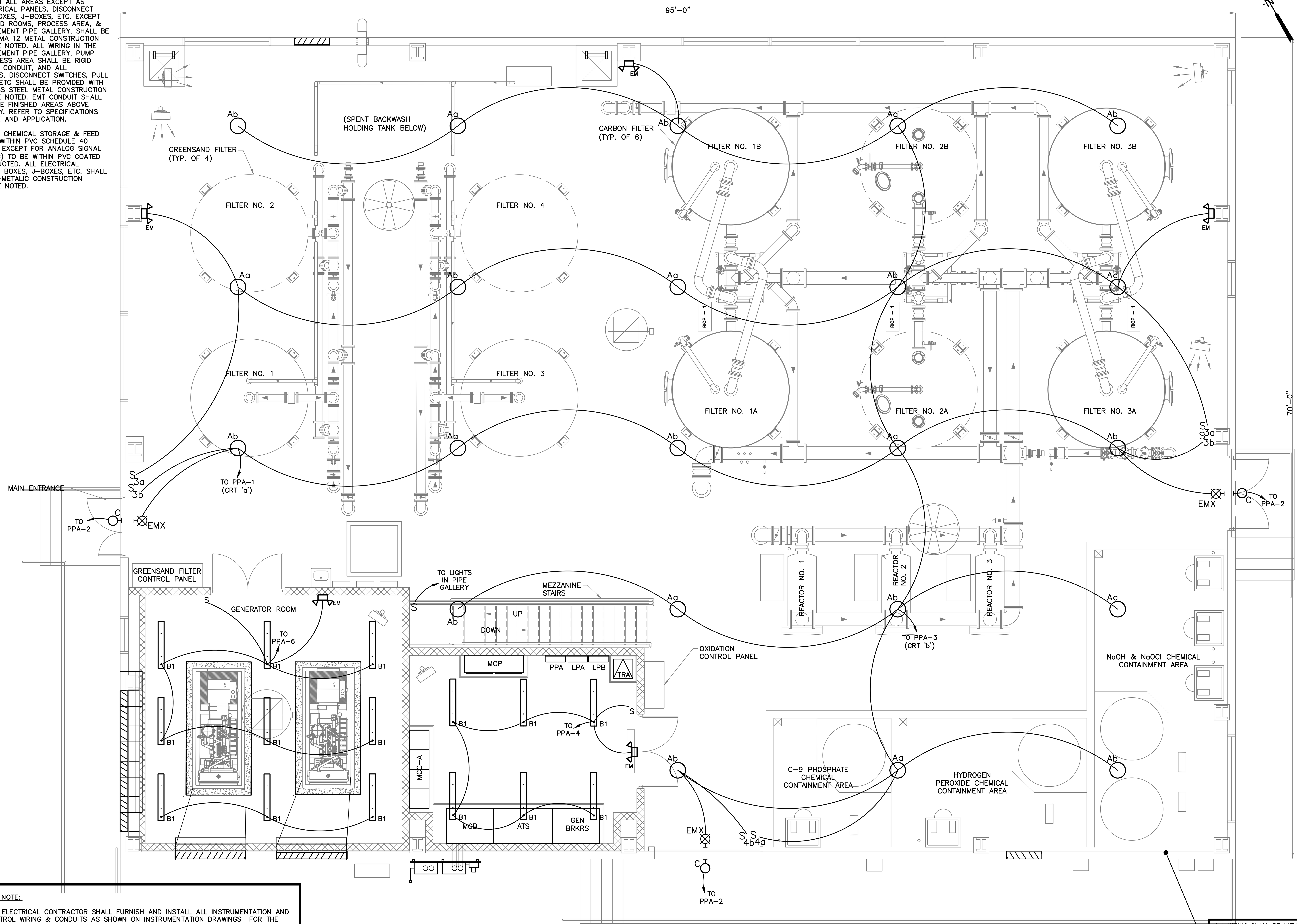

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FILTRATION PLANT FIRST FLOOR LIGHTING PLAN 1 / 20-E-6

SCALE: 1/4"=1'-0" (FULL SIZE DRAWING)

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

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

FIRST FLOOR LIGHTING PLAN

Drawn By: GMS | Designed By: JWG | Checked By: SMR | Approved By: JWG

Rev.	Date	Description

5-1-19

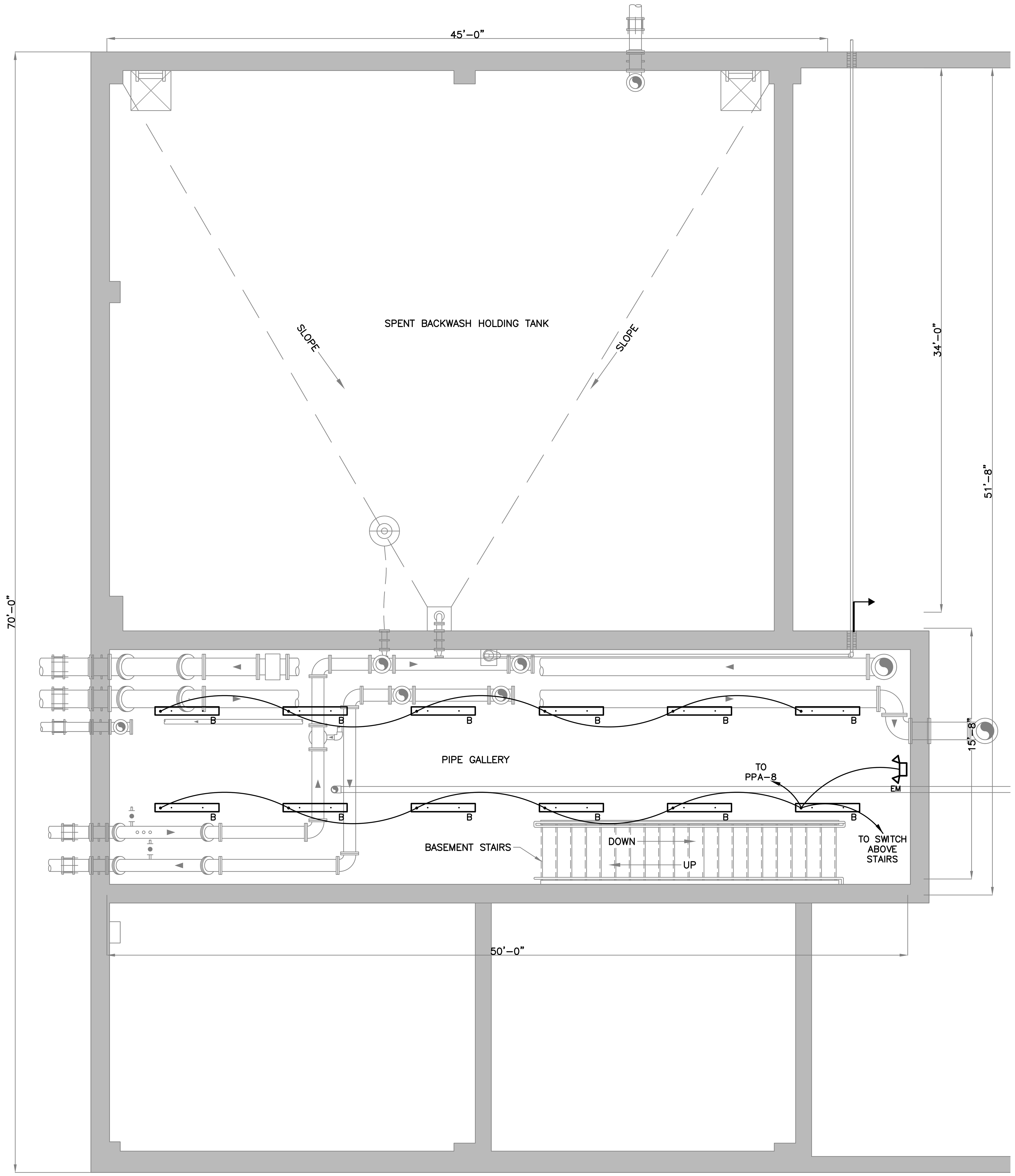
5-2-19

SMR ENGINEERING, PC — Electrical, Instrumentation & Control Systems Engineering

TATA & HOWARD

T&H NO.:	5241
DATE:	MAY 2019
SCALE:	AS NOTED

20-E-6



FILTRATION PLANT BASEMENT LIGHTING PLAN 1 / 20-E-7

SCALE: 1/4"=1'-0" (FULL SIZE DRAWING)

0 2' 4' 8' SCALE: 1/4" = 1'-0"

KEY NOTES:

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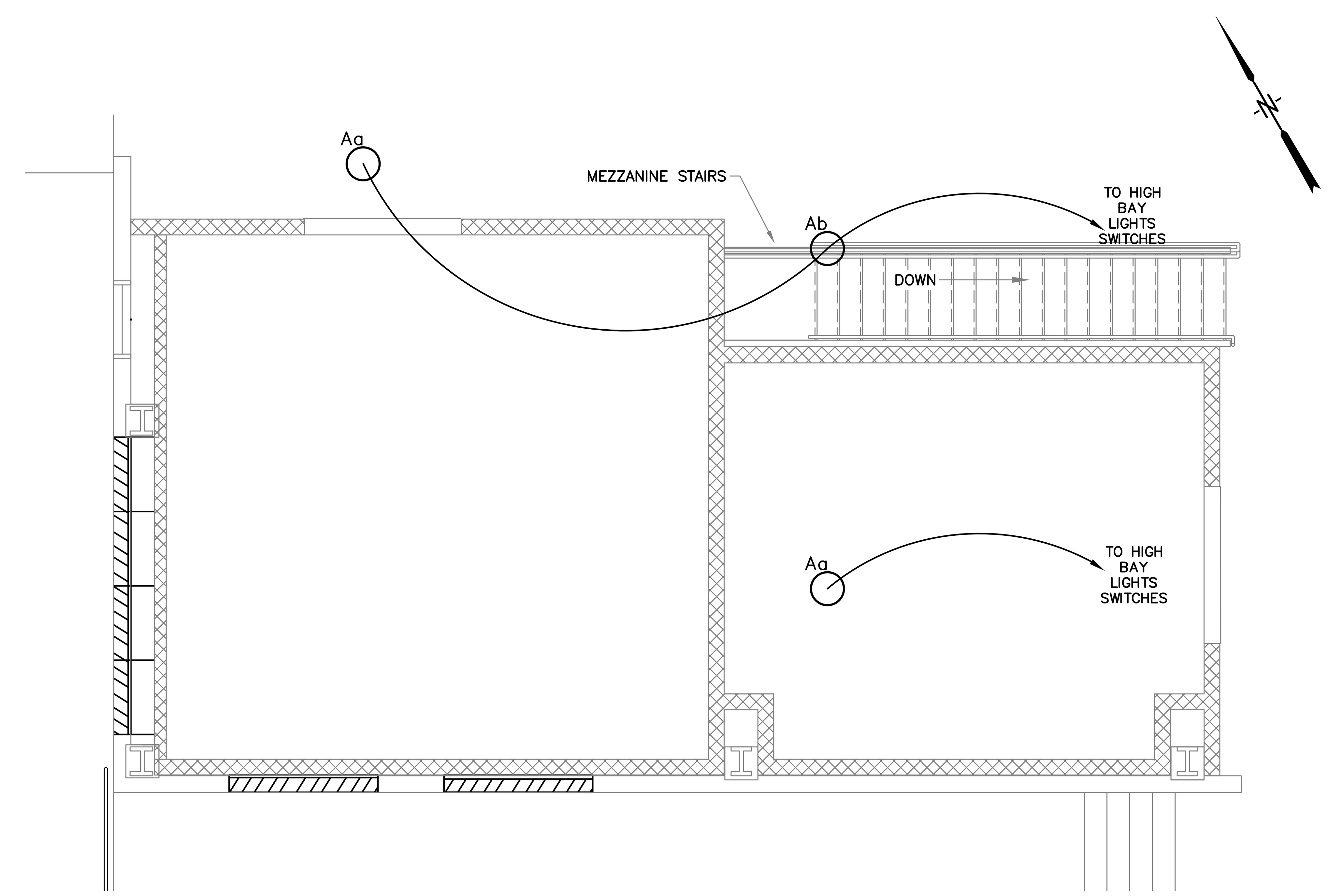

FILTRATION PLANT MEZZANINE LIGHTING PLAN 2 / 20-E-7

SCALE: 1/4"=1'-0" (FULL SIZE DRAWING)

0 2' 4' 8' SCALE: 1/4" = 1'-0"

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: JWC | Designed By: GMS | Checked By: SMR | Approved By: JWG

BASEMENT & MEZZANINE LIGHTING PLAN

Rev.	Date	Description

5-1-19

5-2-19

SMR ENGINEERING, PC
Electrical, Instrumentation & Control Systems Engineering

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-E-7

KEY NOTES:

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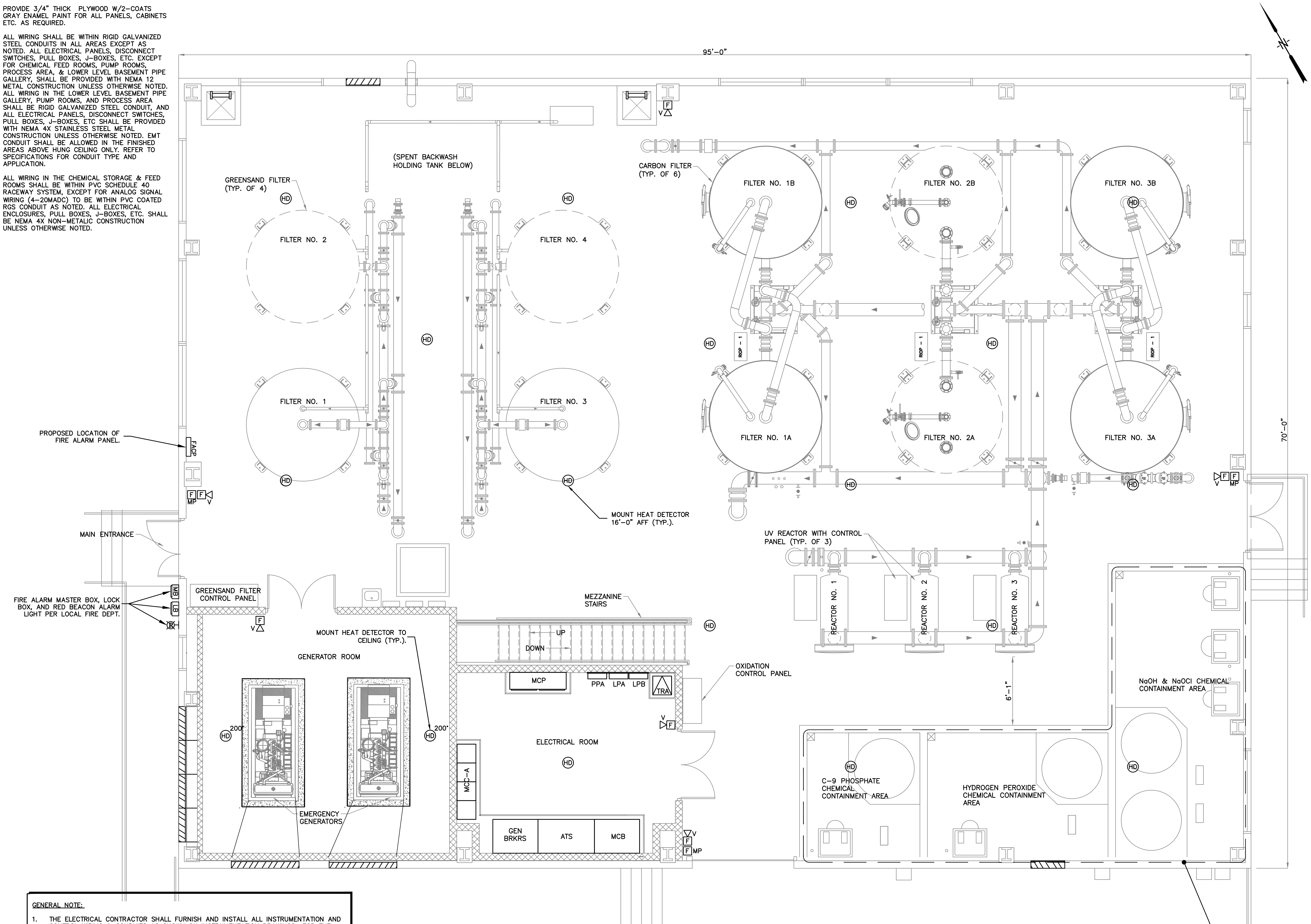

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FILTRATION PLANT FIRST FLOOR FIRE & SECURITY ALARM PLAN 1 / 20-E-8

SCALE: 1/4"=1'-0" (FULL SIZE DRAWING)

0 2' 4' 8'
SCALE: 1/4" = 1'-0"

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TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

FIRST FLOOR FIRE & SECURITY ALARM PLAN

Rev.	Date	Description

Drawn By: GMS | Designed By: JWC | Checked By: SMR | Approved By: JWG

COMMONWEALTH OF MASSACHUSETTS JOHN W. GREGORY CIVIL No. 46478 REGISTERED PROFESSIONAL ENGINEER 5-1-19

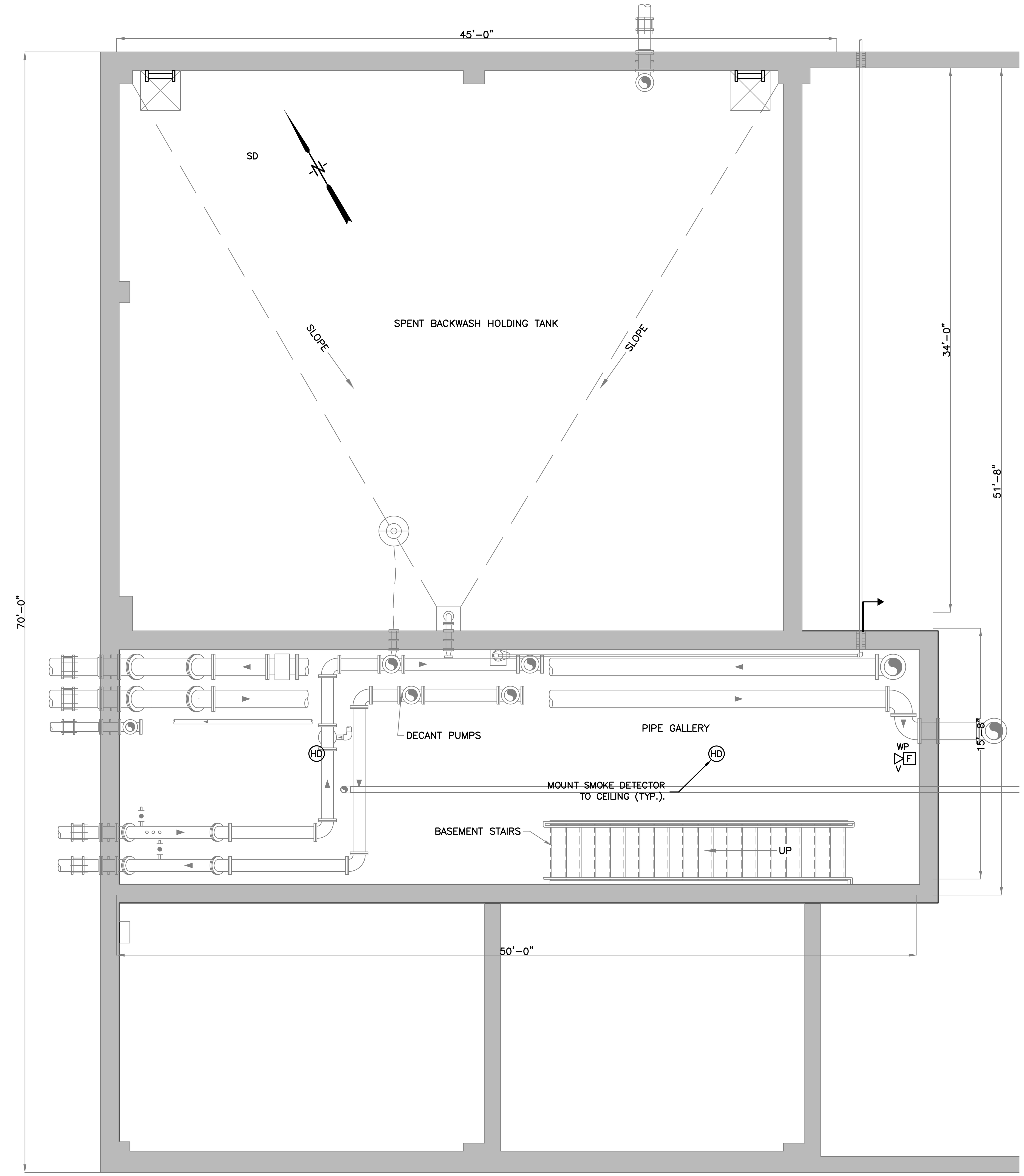
COMMONWEALTH OF MASSACHUSETTS SADEGH M. RADVAR ELECTRICAL No. 37935 REGISTERED PROFESSIONAL ENGINEER 5-2-19

SMR ENGINEERING, PC
Electrical, Instrumentation & Control Systems Engineering
22 Greeley Street, Suite 2
Merrimack, NH 03054
Phone 603/429-3313 Fax 603/429-3466

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-E-8



KEY NOTES:

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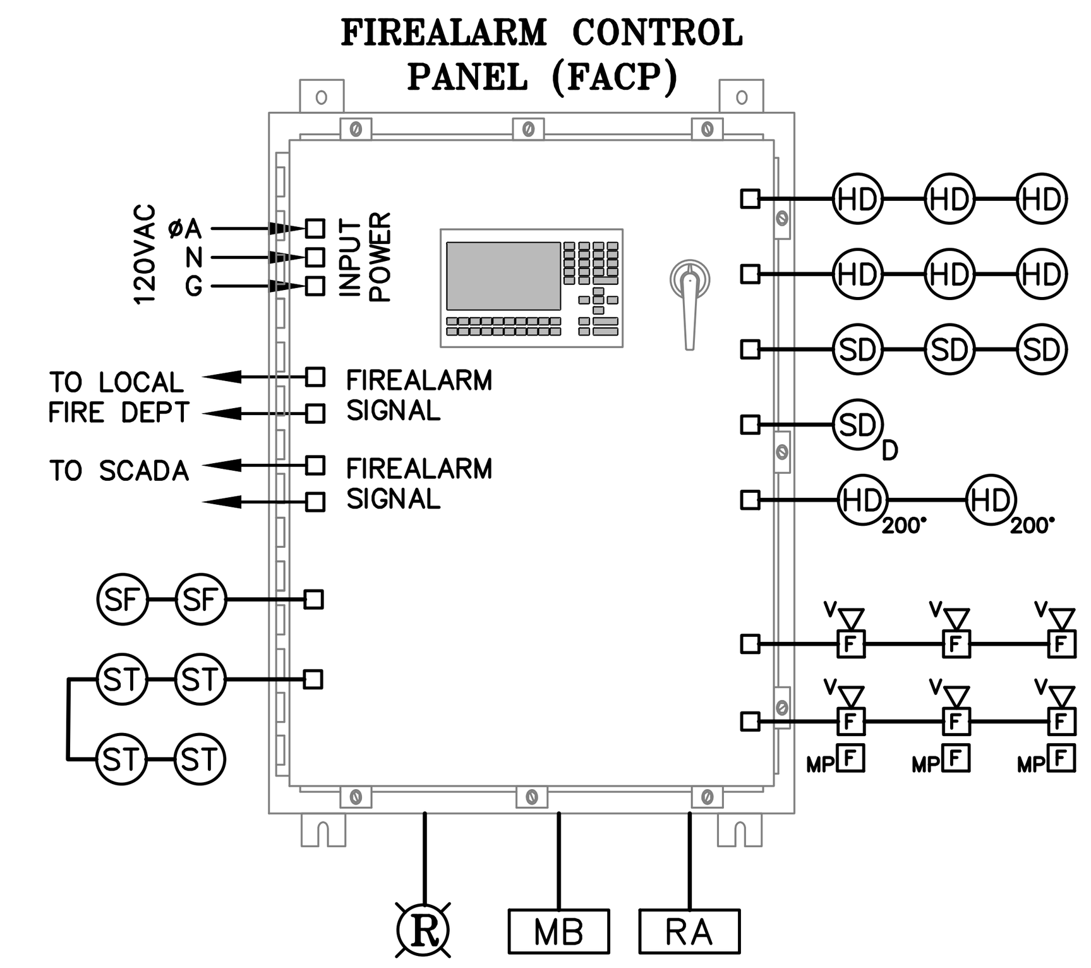
FILTRATION PLANT BASEMENT FIRE & SECURITY ALARM PLAN 1 / 20-E-9
SCALE: 1/4"=1'-0" (FULL SIZE DRAWING)

0 2' 4' 8' SCALE: 1/4" = 1'-0"



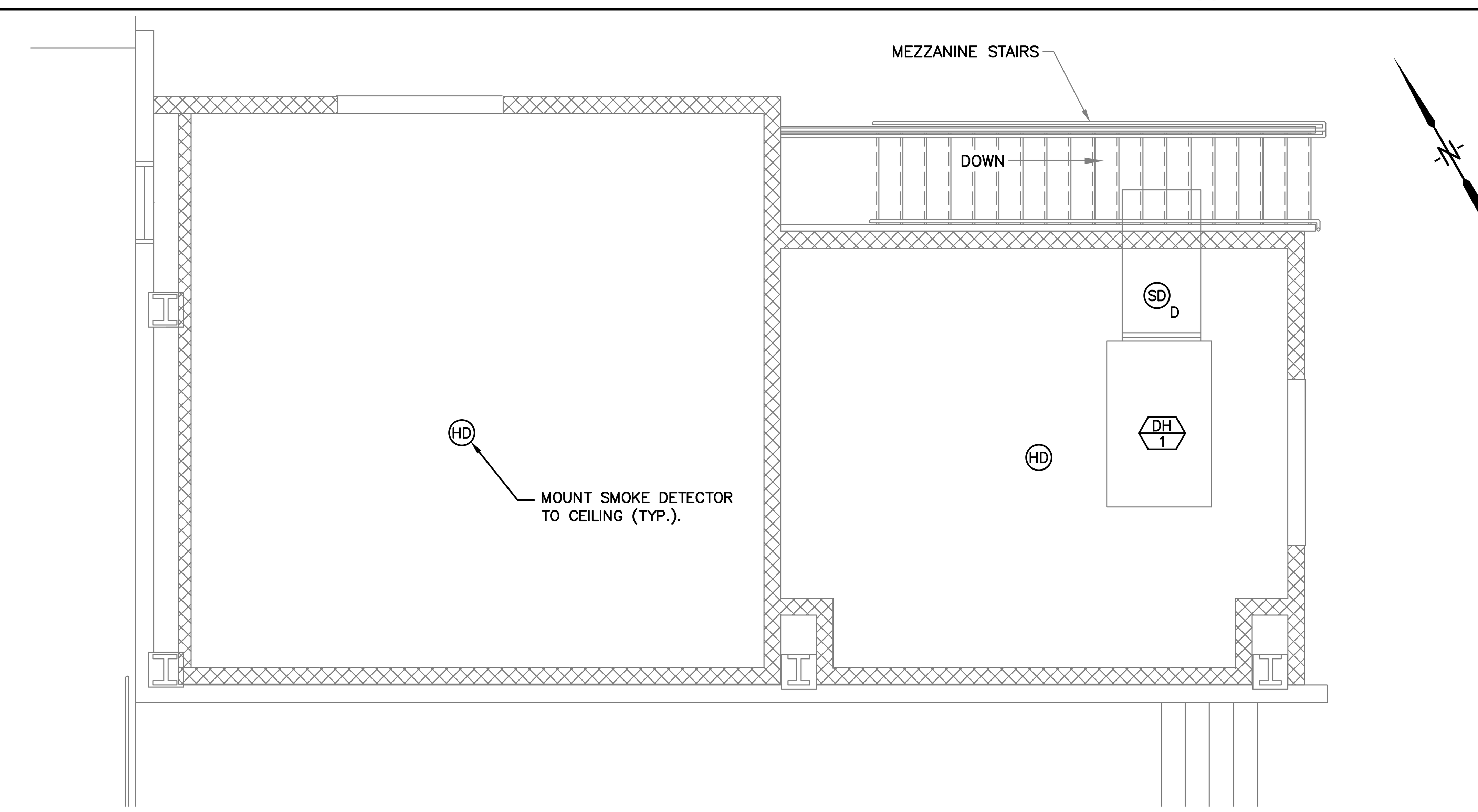
SYSTEM NOTES:

1. EACH RISER DIAGRAM IS GENERIC AND DOES NOT SHOW ALL DEVICES. REFER TO FLOOR PLANS FOR ALL EXACT LOCATIONS AND NUMBER OF FIRE ALARM & SECURITY DEVICES REQUIRED FOR COMPLETE SYSTEM.
2. FINAL LOCATION AND EXACT NUMBER OF DETECTION AND INDICATING DEVICES SHALL BE DETERMINED BY THE LOCAL AUTHORITY HAVING JURISDICTION. CONTRACTOR SHALL COORDINATE WITH LOCAL FIRE DEPARTMENT PRIOR TO SUBMITTAL. PROVIDE ALL NECESSARY HARDWARE AND WIRING AS REQUIRED.
3. EACH ROOM AND SPACE WITHIN FACILITY SHALL BE PROVIDED WITH SEPARATE ZONE.
4. PROVIDE MASTER BOX WITH HARDWIRED OR WIRELESS COMMUNICATIONS INCLUDING BUT NOT LIMITED TO RADIO ANTENNA ASSEMBLY ETC. AS PER LOCAL FIRE DEPARTMENT REQUIREMENTS. EXACT LOCATION OF MASTER BOX SHALL BE DETERMINED BY LOCAL FIRE DEPARTMENT.

FIRE ALARM SYSTEM LEGEND:

FACP	FIRE ALARM CONTROL PANEL
SD	SMOKE DETECTOR
SD D	DUCT TYPE SMOKE DETECTOR
HD 135°	HEAT DETECTOR FIXED TEMPERATURE DETECTOR
HD 200°	HEAT DETECTOR W/TEMPERATURE RISE OF 200°F
F MP	FIRE ALARM – MANUAL PULL STATION WITH LUMINOUS STYLE 3 DIMENSIONAL FIRE ALARM MARKER
V F	FIRE ALARM – AUDIBLE/VISUAL SIGNAL
EOLD	END OF LINE DEVICE
SF	SPRINKLER FLOW SWITCH
ST	SPRINKLER TAMPER SWITCH
MB	MASTER BOX
RA	REMOTE ANNUCIATOR PANEL
LB	REMOTE LOCK BOX
R	RED BEACON ALARM LIGHT, LOCATION PER LOCAL FIRE DEPARTMENT.

FILTRATION PLANT FIRE & SECURITY RISER DIAGRAM 3 / 20-E-8
SCALE: NONE



FILTRATION PLANT MEZZANINE FIRE & SECURITY ALARM PLAN 2 / 20-E-9
SCALE: 1/4"=1'-0" (FULL SIZE DRAWING)

0 2' 4' 8' SCALE: 1/4" = 1'-0"

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

BASEMENT & MEZZANINE FIRE & SECURITY ALARM PLAN

Drawn By:JWC | Designed By:CMS | Checked By:SMR | Approved By:JWC

Rev.	Date	Description

5-1-19
5-2-19

SMR ENGINEERING, PC
Electrical, Instrumentation & Control Systems Engineering

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-E-9

PANEL No. PPA

BUS	150 AMPERE	LOCATION	ELECTRICAL ROOM
PANEL RATING	42 KAIC	MOUNTING	SURFACE
SUPPLY VOLTAGE	480V/277V	DRAWING No.	
SERVICE	3 PHASE, 4W, W/ GND BUS		

WIRING		DESCRIPTION	VA OR W			BREAKER		CKT.	BUS			CKT.	BREAKER		VA OR W			DESCRIPTION	WIRING	
# OF WIRES	CONDUIT		ØA	ØB	ØC	POLE	AMPS	NO	A	B	C	NO	POLE	AMPS	ØA	ØB	ØC		CONDUIT	WIRE
2#12, 1#12G	3/4"	LIGHTING - FILTER AREA				1	20	1	X			2	1	20				LIGHTING - EXTERIOR	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	LIGHTING - FILTER AREA				1	20	3		X		4	1	20				LIGHTING - ELEC. ROOM	3/4"	2#12, 1#12G
3#8, 1#10G	1"	UV CONTROL PANEL NO.1 (UV-1)				3	40	5			X	6	1	20				LIGHTING - GENERATOR	3/4"	2#12, 1#12G
								7	X			8	1	20				LIGHTING - BASEMENT	3/4"	2#12, 1#12G
								9		X		10	3	15				ELECTRIC UNIT HEATER NO.1 (EUH-1)	3/4"	2#12, 1#12G
3#8, 1#10G	1"	UV CONTROL PANEL NO.2 (UV-2)				3	40	11			X	12								
								13	X			14								
								15		X		16	3	15				ELECTRIC UNIT HEATER NO.1 (EUH-2)	3/4"	2#12, 1#12G
3#8, 1#10G	1"	UV CONTROL PANEL NO.3 (UV-3)				3	40	17			X	18								
								19	X			20								
								21		X		22	3	30				DUHUMIDIFIER NO.1 (DH-1)	3/4"	2#10, 1#10G
						1	20	23			X	24								
		SPARE				1	20	25	X			26								
		SPARE				1	20	27		X		28						SPACE		
		SPARE				1	20	29			X	30						SPACE		
		SPARE				1	20	31	X			32						SPACE		
		SPARE				1	20	33		X		34						SPACE		
		SPARE				1	20	35			X	36						SPACE		
		SPACE					15	37	X			38						SPACE		
		SPACE					20	39		X		40						SPACE		
		SPACE					20	41			X	42						SPACE		
		TOTAL 1										TOTAL 2								
		TOTAL 2																		
		TOTAL 1 + 2																		
		TOTAL CONNECTED LOAD																		
		AMPERES																		

MAIN BREAKER	150A 3/P	MAIN LUGS	N/A
FEEDER ENTRANCE	TOP	ENCLOSURE TYPE	NEMA 1
FEEDER SIZE	4#1/0, 1#4G, 2"C	ACCESSORIES	
SOURCE	MCC-A		
PANEL TYPE	BOLT-ON		

PANEL No. LPA

(DOUBLE PANEL)

BUS	250 AMPERE	LOCATION	ELECTRICAL ROOM
PANEL RATING	10 KAIC	MOUNTING	SURFACE
SUPPLY VOLTAGE	208Y/120V	DRAWING No.	
SERVICE	3 PHASE, 4W, W/ GND BUS		

WIRING		DESCRIPTION	VA OR W			BREAKER		CKT.	BUS			CKT.	BREAKER		VA OR W			DESCRIPTION	WIRING	
# OF WIRES	CONDUIT		ØA	ØB	ØC	POLE	AMPS	NO	A	B	C	NO	POLE	AMPS	ØA	ØB	ØC		CONDUIT	# OF WIRES
2#12, 1#12G	3/4"	RECPTACLES - SUMP PUMP				1	20	1	X			2	1	**20				FIRE ALARM PANEL **	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	RECPTACLES - BASEMENT				1	20	3		X		4	1	20				SPARE		
2#12, 1#12G	3/4"	RECPTACLES - EXTERIOR				1	20	5			X	6	1	20				SPARE		
2#12, 1#12G	3/4"	RECPTACLES - EXTERIOR				1	20	7	X			8	1	20				SPARE		
2#12, 1#12G	3/4"	RECPTACLES - LOFT AREA				1	20	9		X		10	2	25				DAC-1	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	RECPTACLES - LOFT AREA				1	20	11			X	12								
2#12, 1#12G	3/4"	RECPTACLES - ELECTRIC ROOM				1	20	13	X			14	2	20				CONDENSOR UNIT - HPC, DCC-1	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	RECPTACLES - GENERATOR ROOM				1	20	15		X		16								
2#12, 1#12G	3/4"	RECPTACLES - FILTER AREA				1	20	17			X	18	1	20				PADDLE FANS P-1,2	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	RECPTACLES - FILTER AREA				1	20	19	X			20	1	20				GAS UNIT HEATERS - GUH-2,4	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	OXIDATION CONTROL PANEL				1	20	21		X		22	1	20				GAS UNIT HEATERS - GUH-1,3	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	OVERHEAD DOOR OPENER				2	20	23			X	24	1	20				DEHUMIDIFIER-NO.2 (DH-2)	3/4"	2#12, 1#12G
								25	X			26	1	20				DEHUMIDIFIER-NO.3 (DH-3)	3/4"	2#12, 1#12G
		SPARE				1	20	27		X		28	2	30				BLOCK HEATER - GEN NO.1	3/4"	2#10, 1#10G
		SPARE				1	20	29			X	30								
		SPARE				1	20	31	X			32	1	20				BATTERY CHARGER - GEN NO.1	3/4"	2#10, 1#10G
		SPARE				1	20	33		X		34	2	30				BLOCK HEATER - GEN NO.2	3/4"	2#12, 1#12G
		SPARE				1	20	35			X	36								
		SPARE				1	20	37	X			38	1	20				BATTERY CHARGER - GEN NO.2	3/4"	2#12, 1#12G
		SPARE				1	20	39		X		40	1	20				SPARE	3/4"	2#12, 1#12G
		SPARE				1	20	41			X	42	1	20				SPARE	3/4"	2#12, 1#12G
		TOTAL 1										TOTAL 2								
		TOTAL 2																		
		TOTAL 1 + 2																		
		TOTAL CONNECTED LOAD																		
		AMPERES																		

MAIN BREAKER	250A 3/P	MAIN LUGS	N/A
FEEDER ENTRANCE	TOP	ENCLOSURE TYPE	NEMA 1
FEEDER SIZE	4#250 KCMIL, 1#4G, 2C	ACCESSORIES	
SOURCE	75 KVA XFMR 'TRA'		
PANEL TYPE	BOLT-ON		(DOUBLE PANEL)

* GFCI BREAKER
** PROVIDE LOCKOUT DEVICE

PANEL No. LPB

(DOUBLE PANEL)

BUS	250 AMPERE	LOCATION	ELECTRICAL ROOM
PANEL RATING	10 KAIC	MOUNTING	SURFACE
SUPPLY VOLTAGE	208/120V	DRAWING No.	
SERVICE	3 PHASE, 4W, W/GND BUS		

WIRING		DESCRIPTION	VA OR W			BREAKER		CKT.	BUS			CKT.	BREAKER		VA OR W			DESCRIPTION	WIRING	
# OF WIRES	CONDUIT		ØA	ØB	ØC	POLE	AMPS	NO	A	B	C	NO	POLE	AMPS	ØA	ØB	ØC		CONDUIT	# OF WIRES
2#12, 1#12G	3/4"	CHEMICAL FEED CONTROL PANEL				1	20	1	X			2	1	30				MCP PANEL	3/4"	2#10, 1#10G
2#12, 1#12G	3/4"	CHEMICAL FEED CONTROL PANEL				1	20	3		X		4	1	20				FILL STATION - PANELS	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	CHEMICAL FEED CONTROL PANEL				1	20	5			X	6	1	20				MAG METERS (FIT'S)	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	CHEMICAL FEED CONTROL PANEL				1	20	7	X			8	1	30				GREENSAND FILTER PANEL	3/4"	2#10, 1#10G
2#12, 1#12G	3/4"	CHEMICAL FEED CONTROL PANEL				1	20	9		X		10	1	20				FILL STATION PANELS	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	CHEMICAL FEED CONTROL PANEL				1	20	11			X	12	1	20				ANALYZERS (AIT'S)	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	CHEMICAL FEED CONTROL PANEL				1	20	13	X			14	1	20				LEVEL INDICATOR PANELS	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	CHEMICAL FEED CONTROL PANEL				1	20	15		X		16	1	20				MOTOR OPERATED VALVES (MOV)	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	CHEMICAL FEED CONTROL PANEL				1	20	17			X	18	1	20				MOTOR OPERATED VALVES (MOV)	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	CHEMICAL FEED CONTROL PANEL				1	20	19	X			20	1	20				MAG METERS (FIT'S)	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	PHOSP. TRANSFER PUMP C.P.				1	20	21		X		22	1	20				WEIGHT SCALE	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	PEROX. TRANSFER PUMP C.P.				1	20	23			X	24	1	20				MOTOR OPERATED VALVES (MOV)	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	NaOH TRANSFER PUMP C.P.				1	20	25	X			26	1	20				MOTOR OPERATED VALVES (MOV)	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	NaOCL TRANSFER PUMP C.P.				1	20	27		X		28	1	20				MOTOR OPERATED VALVES (MOV)	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	RIOP-1				1	20	29			X	30	1	20				MOTOR OPERATED VALVES (MOV)	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	RIOP-2				1	20	31	X			32	1	20				MOTOR OPERATED VALVES (MOV)	3/4"	2#12, 1#12G
2#12, 1#12G	3/4"	RIOP-3				1	20	33		X		34	1	20				MOTOR OPERATED VALVES (MOV)	3/4"	2#12, 1#12G
		SPARE				3	20	35			X	36	1	20				MOTOR OPERATED VALVES (MOV)	3/4"	2#12, 1#12G
		SPARE						37	X			38	1	20				SPARE		
		SPARE						39		X		40	2	20				SPARE		
		SPARE				1	20	41			X	42								
		TOTAL 1										TOTAL 2								
		TOTAL 2																		
		TOTAL 1 + 2																		
		TOTAL CONNECTED LOAD																		
		AMPERES																		

MAIN BREAKER		MAIN LUGS	250A
FEEDER ENTRANCE	TOP	ENCLOSURE TYPE	NEMA 1
FEEDER SIZE	4#4/0, 1#2G, 2"C	ACCESSORIES	
SOURCE	PPA		
PANEL TYPE	BOLT-ON		(DOUBLE PANEL)

PANEL No. DPB

BUS	600 AMPERE	LOCATION	EXISTIN WTF
PANEL RATING	30 KAIC	MOUNTING	SURFACE
SUPPLY VOLTAGE	480V/277V	DRAWING No.	
SERVICE	3 PHASE, 4W, W/ GND BUS		

WIRING		DESCRIPTION	VA OR W			BREAKER		CKT.	BUS			CKT.	BREAKER		VA OR W			DESCRIPTION	WIRING	
# OF WIRES	CONDUIT		ØA	ØB	ØC	POLE	AMPS	NO	A	B	C	NO	POLE	AMPS	ØA	ØB	ØC		CONDUIT	WIRE
3#10, 1#10G	3/4"	BLOWER MOTOR NO.1 - VFD				3	30	1	X			2	3	60				INTERMEDIATE PUMP NO.1 - VFD	1"	3#6, 1#8G
								3		X		4								
								5			X	6								
3#6, 1#8G	1"	EXIST. 30 KVA TRANSFORMER TR1				3	60	7	X			8	3	60				INTERMEDIATE PUMP NO.2 - VFD	1"	3#6, 1#8G
								9		X		10								
								11			X	12								
2#12, 1#12G	3/4"	EXIST. 3 KVA TRANSFORMER TR2				2	15	13	X			14	3	60				INTERMEDIATE PUMP NO.3- VFD	1"	3#6, 1#8G
								15		X		16								
								17			X	18								
3#6, 1#8G	1"	NEW WELL PUMP NO.1 - VFD				3	50	19	X			20	3	50				WELL PUMP NO.2- VFD	1"	3#6, 1#8G
								21		X		22								
								23			X	24								
3#2, 1#6G	2"	BOOSTER PUMP NO.1- S/S				2	100	25	X			26	3	50				WELL PUMP NO.3- VFD	1"	3#6, 1#8G
								27		X		28								
								29			X	30								
3#2, 1#6G	2"	BOOSTER PUMP NO.3- S/S				2	100	31	X			32	3	100				BOOSTER PUMP NO.2- S/S	2"	3#2, 1#6G
								33		X		34								
								35			X	36								
3#8, 1#10G	1"	EXIST. 15 KVA TRANSFORMER TRB				3	40	37	X			38	3	60				SPARE		
								39		X		40								
								41			X	42								
		TOTAL 1										TOTAL 2								
		TOTAL 2																		
		TOTAL 1 + 2																		
		TOTAL CONNECTED LOAD																		
		AMPERES																		

MAIN BREAKER	600A 3/P	MAIN LUGS	N/A
FEEDER ENTRANCE	TOP	ENCLOSURE TYPE	NEMA 1
FEEDER SIZE	2//4#350 KCMIL 1#1G, 3"C- EA	ACCESSORIES	
SOURCE	MCC-A		
PANEL TYPE	BOLT-ON		

PROJECT LIGHTING FIXTURE SCHEDULE

TYPE	MANUFACTURER	MODEL NO.	COLOR	LAMPS	MOUNTING	TYPE	VOLTAGE	REMARKS
A	HUBBELL	HBL-72LU-A2-4K-W-070-GR-ENCG OR APPROVED EQUAL	WHITE	LED	PENDANT	LED	277	MOUNT 20'-0" ABOVE FINISHED FLOOR
B	HUBBELL	LXEM-440-VL-RFA-E-U-SSL OR APPROVED EQUAL	WHITE	LED	PENDANT	LED	277	(1) 4' FIXTURE (CORROSIVE AND WET LOCATIONS) COORDINATE WITH MECHANICAL, PROCESS, EQ.
B1	HUBBELL	LCS4-40-VL-EU-CSWG4 OR APPROVED EQUAL	WHITE	LED	PENDANT	LED	277	(1) 4' FIXTURE (DRY LOCATIONS) COORDINATE WITH MECHANICAL, PROCESS, EQ.
C	SPAULDING	LMC-30LU-4K-3-2-PC4 OR APPROVED EQUAL	-	LED	SURFACE	LED	277	PROVIDE WITH PHOTO CELL, & MOTION SENSOR. MOUNT SURFACE ON WALL 12" ABOVE DOOR A.F.G.
EM	CARPENTER	NX12-36-E-N1 OR APPROVED EQUAL	GRAY	LED	WALL AT 8'-0"	EMERGENCY	277	MOUNT SURFACE ON WALL ON SIDE OF DOOR AT 8' A.F.F. PROVIDE AN ADDITIONAL REMOTE HEAD.
EMX	CARPENTER	NXLED-EX-2H OR APPROVED EQUAL	GRAY	LED	WALL AT 8'-0"	EXIT WITH EMERGENCY	277	MOUNT SURFACE ON WALL ON SIDE OF DOOR AT 8' A.F.F. PROVIDE AN ADDITIONAL REMOTE HEAD.

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: JWC | Designed By: JWC | Checked By: SMR | Approved By: RPN

LIGHTING AND PANEL SCHEDULES

Rev.	Date	Description

COMMONWEALTH OF MASSACHUSETTS JON W. GREGORY CIVIL No. 48478 REGISTERED PROFESSIONAL ENGINEER 5-1-19

COMMONWEALTH OF MASSACHUSETTS SADEGH M. RADVAR ELECTRICAL No. 37935 REGISTERED PROFESSIONAL ENGINEER 5-2-19

SMR ENGINEERING, PC
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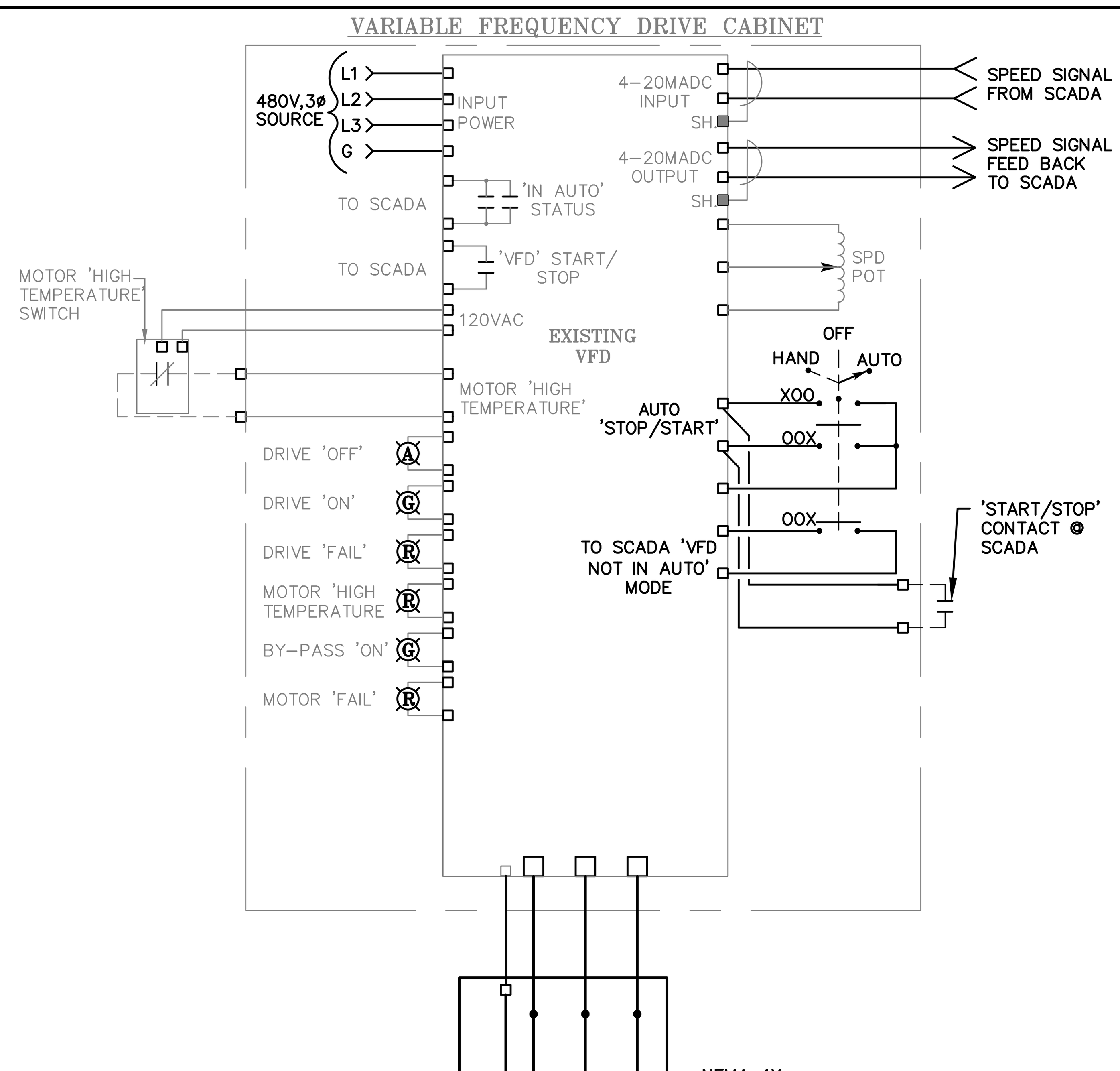
TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

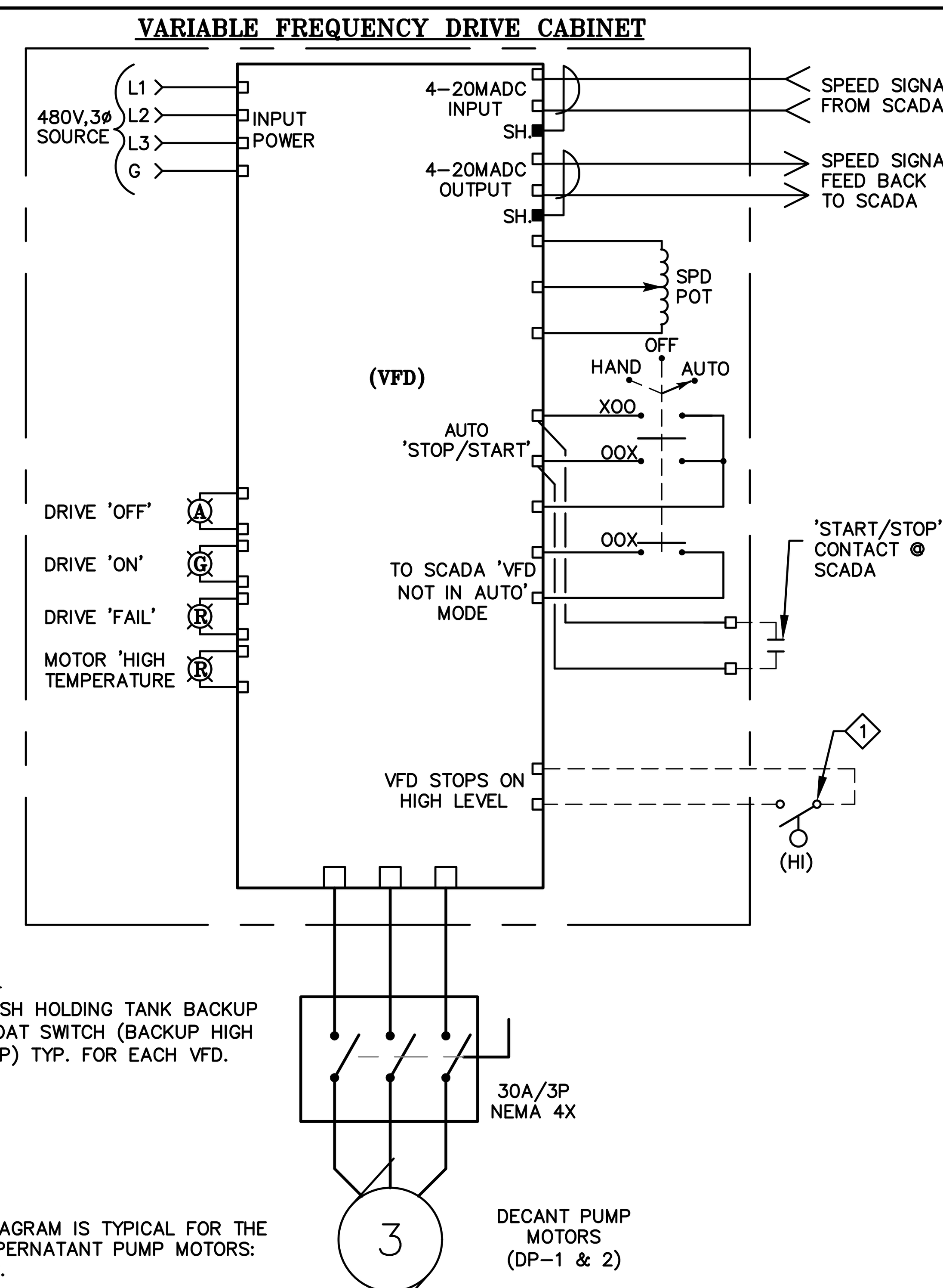
99-E-1



NOTE:

1. THIS WIRING DIAGRAM IS TYPICAL FOR THE FOLLOWING PUMP MOTORS: INTERMEDIATE PUMPS: (IP-1,2,3).
2. PROVIDE VFD WITH REQUIRED I/O CARD AND SPEED PROGRAMING TO ACHIEVE: 0-30 HERTZ (1-SEC) AND 30-60 HERTZ (30 SEC).

INTERMEDIATE PUMP VFD W.D. (TYP. OF 3) 1 / 99-E-2
SCALE: NONE



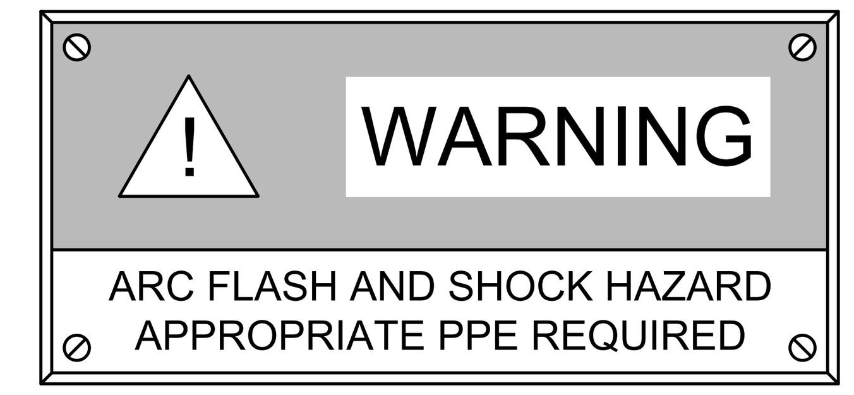
VFD NOTES:

(1) SPENT BACKWASH HOLDING TANK BACKUP HIGH LEVEL FLOAT SWITCH (BACKUP HIGH LEVEL VFD STOP) TYP. FOR EACH VFD.

NOTE:

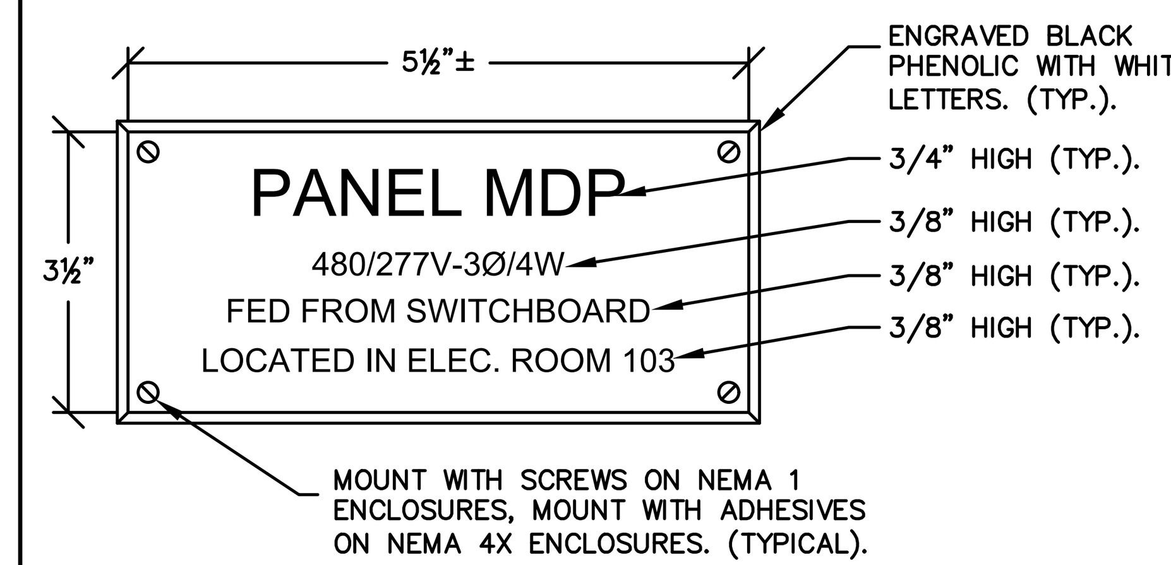
1. THIS WIRING DIAGRAM IS TYPICAL FOR THE FOLLOWING SUPERNATANT PUMP MOTORS: SNP-1, SNP-2.

DECANT PUMP VFD W.D. (TYP. OF 2) 3 / 99-E-2
SCALE: NONE

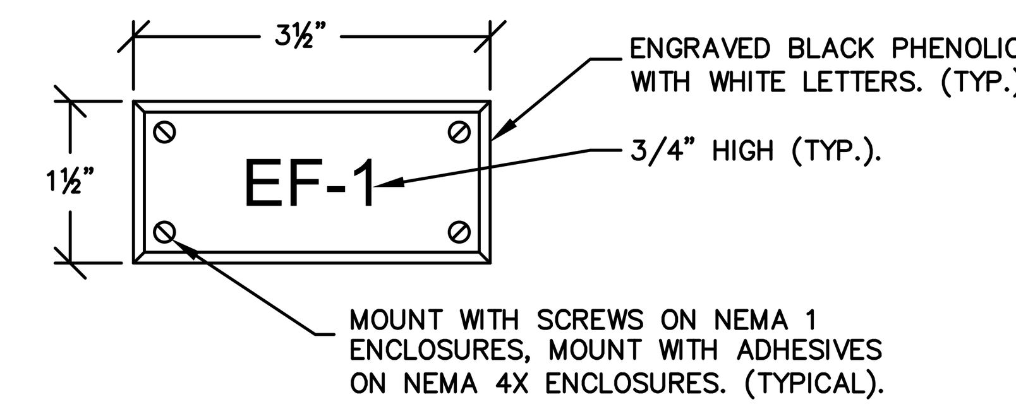


INSTALL ON ALL METER SOCKETS, SWITCHBOARDS, MOTOR CONTROL CENTERS, PANELBOARDS IN ACCORDANCE TO NEC ART 110.16 (TYPICAL).

TYPICAL FLASH PROTECTION WARNING LABEL
NO SCALE



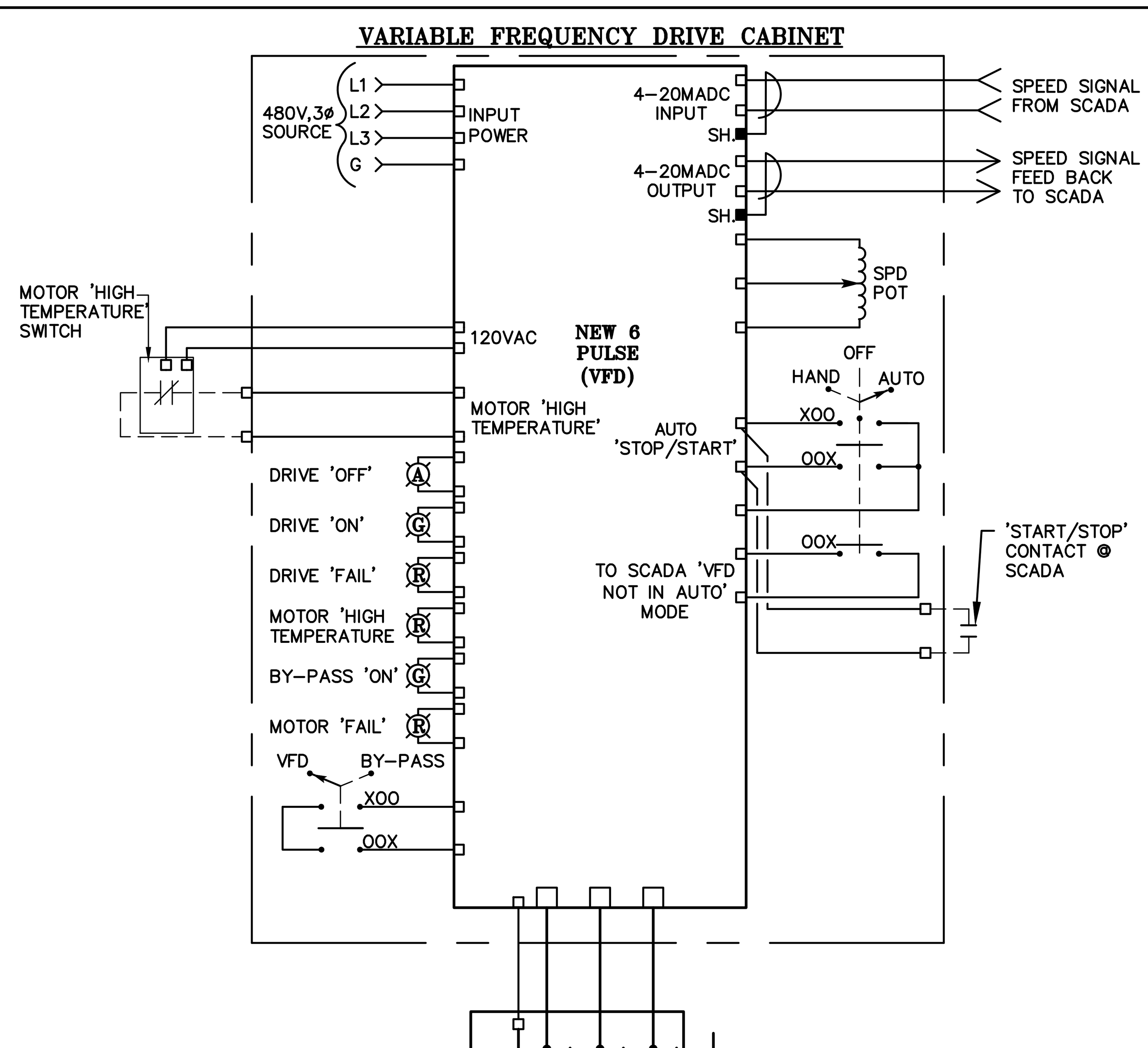
TYPICAL PANEL NAMEPLATE
NO SCALE



GENERAL NOTE:

1. NAMEPLATES ARE REQUIRED TO BE INSTALLED ON ALL ELECTRICAL EQUIPMENT FURNISHED ON PROJECT INCLUDING BUT NOT LIMITED TO: DISCONNECT SWITCHES, STARTERS, MOTOR CONTROL CENTERS, CONTROL STATIONS, SWITCHGEAR, SWITCHBOARDS, PANELBOARDS, ELECTRICAL CONTROL CENTERS (PROCESS PANELS) AND RELATED ITEMS.
2. REFER TO SPECIFICATIONS FOR NAMEPLATE REQUIREMENTS.
3. ALL NAMEPLATES TO BE 1/16" THICK PHENOLIC WITH WHITE CENTER LAMINATION

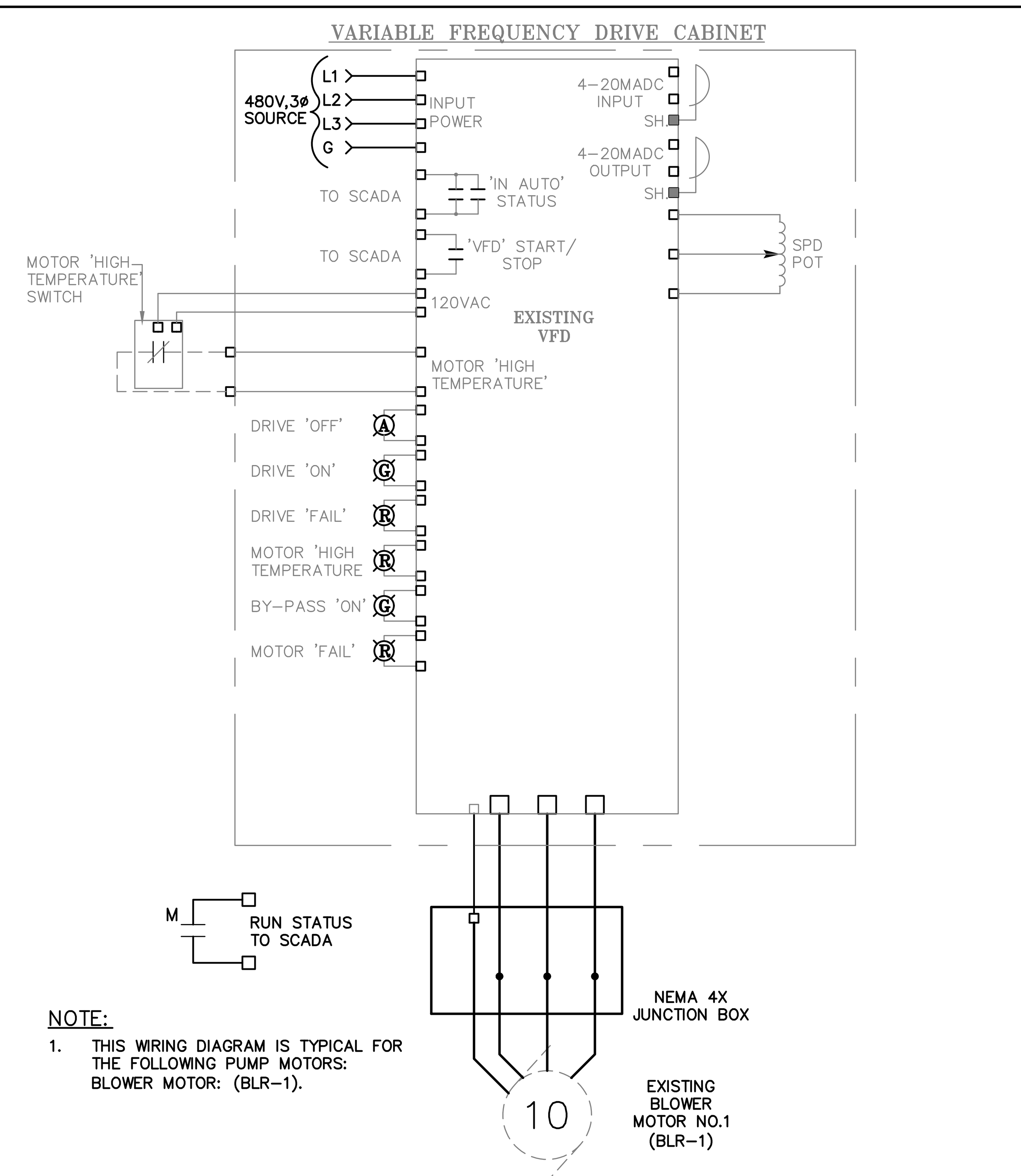
ELECTRICAL EQUIPMENT IDENTIFICATIONS (TYP.) 5 / 99-E-2
SCALE: NONE



NOTE:

1. THIS WIRING DIAGRAM IS TYPICAL FOR THE FOLLOWING PUMP MOTORS: WELL PUMPS: (WP-2&3).
2. PROVIDE VFD WITH REQUIRED I/O CARD AND SPEED PROGRAMING TO ACHIEVE: 0-30 HERTZ (1-SEC) AND 30-60 HERTZ (30 SEC).
3. LOAD SIDE SINE WAVE FILTER NOT SHOWN.

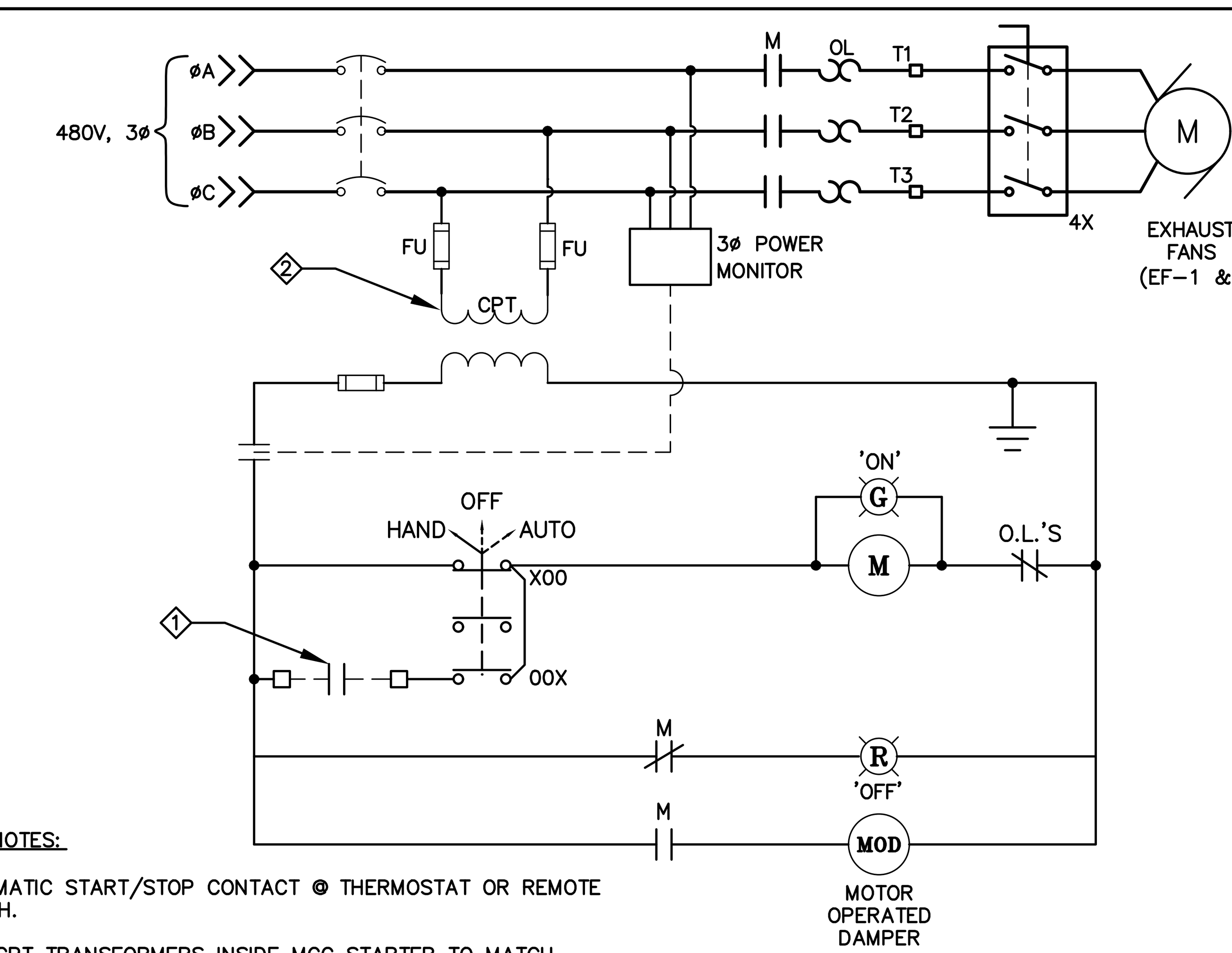
WELL PUMPS 2&3 VFD W.D. (TYP. OF 2) 2 / 99-E-2
SCALE: NONE



NOTE:

1. THIS WIRING DIAGRAM IS TYPICAL FOR THE FOLLOWING PUMP MOTORS: BLOWER MOTOR: (BLR-1).

EXISTING BLOWER VFD W.D. (TYP. OF 1) 4 / 99-E-2
SCALE: NONE



KEY NOTES:

(1) AUTOMATIC START/STOP CONTACT @ THERMOSTAT OR REMOTE SWITCH.

(2) SIZE CPT TRANSFORMERS INSIDE MCC STARTER TO MATCH ELECTRICAL LOAD OF EACH INDIVIDUAL EXHAUST FAN MOTORIZED DAMPERS AS SHOWN ON HVAC DRAWINGS AS REQUIRED.

3ø EXHAUST FAN EF-1, EF-2 W.D. (TYP. OF 2) 6 / 99-E-2
SCALE: NONE

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

WIRING DIAGRAMS AND DETAILS

Drawn By: JWC | Designed By: JWC | Checked By: SMR | Approved By: RPN

Rev.	Date	Description

5-1-19

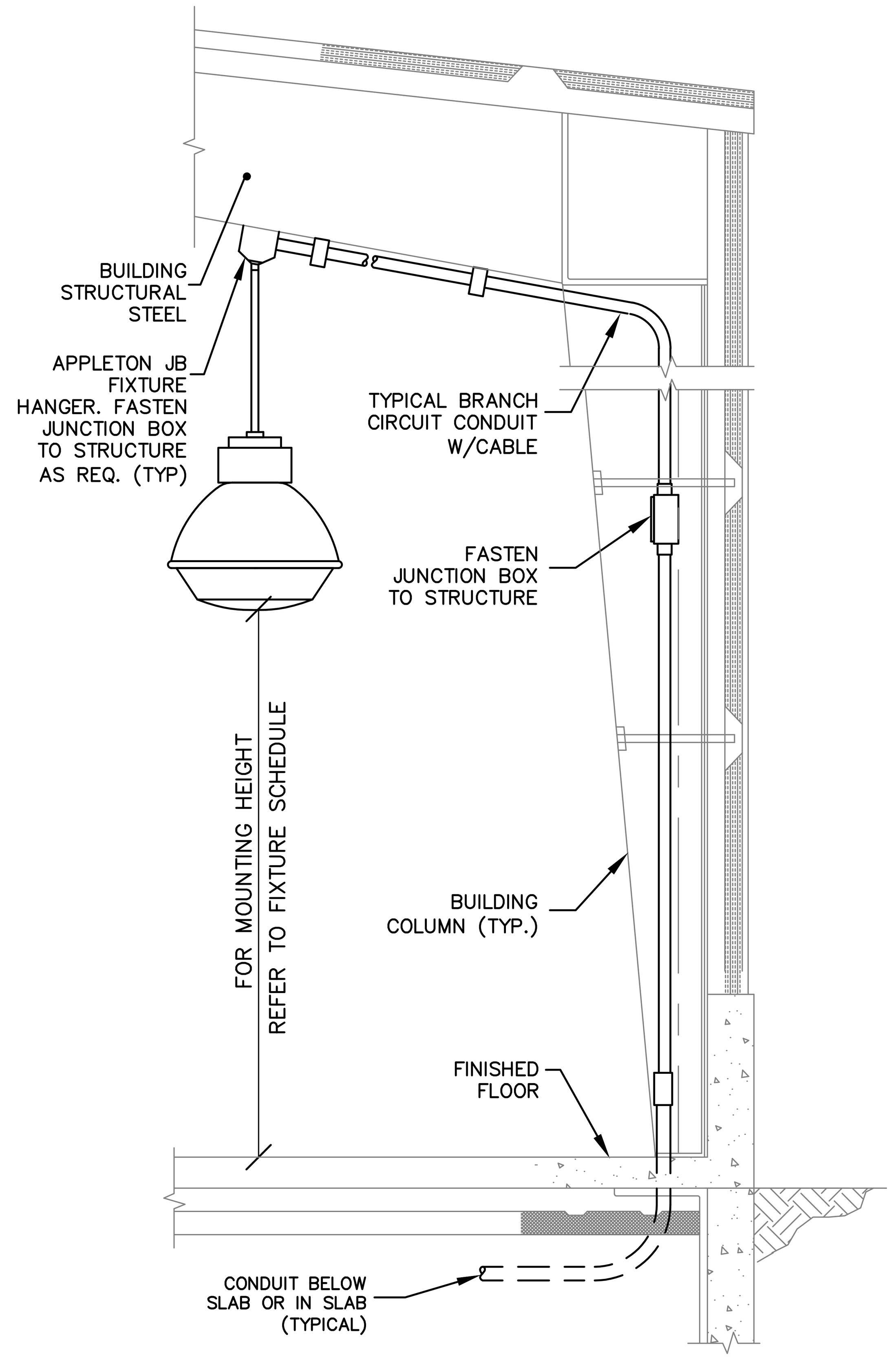
5-2-19

SMR ENGINEERING, PC
Electrical, Instrumentation & Control Systems Engineering

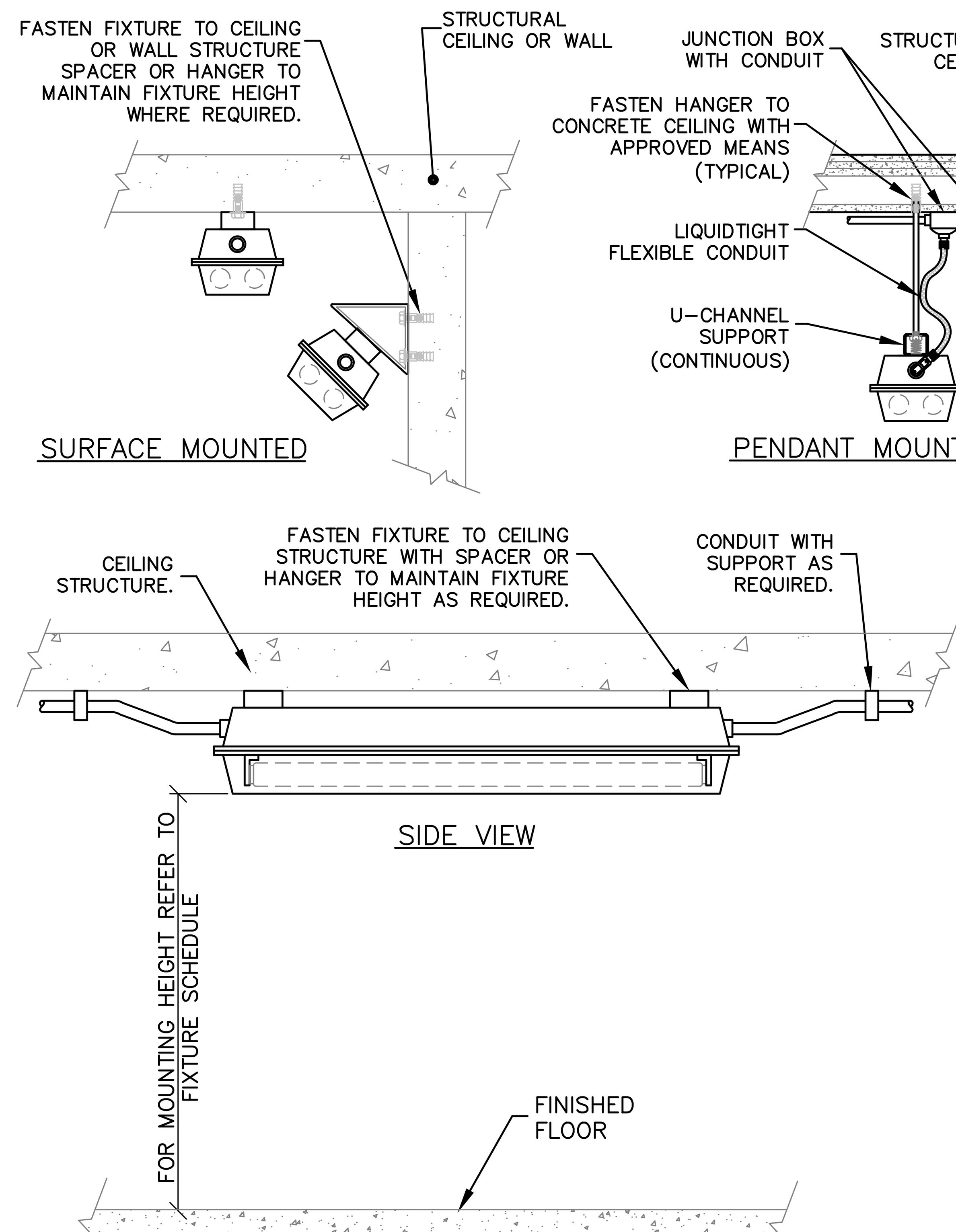
TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

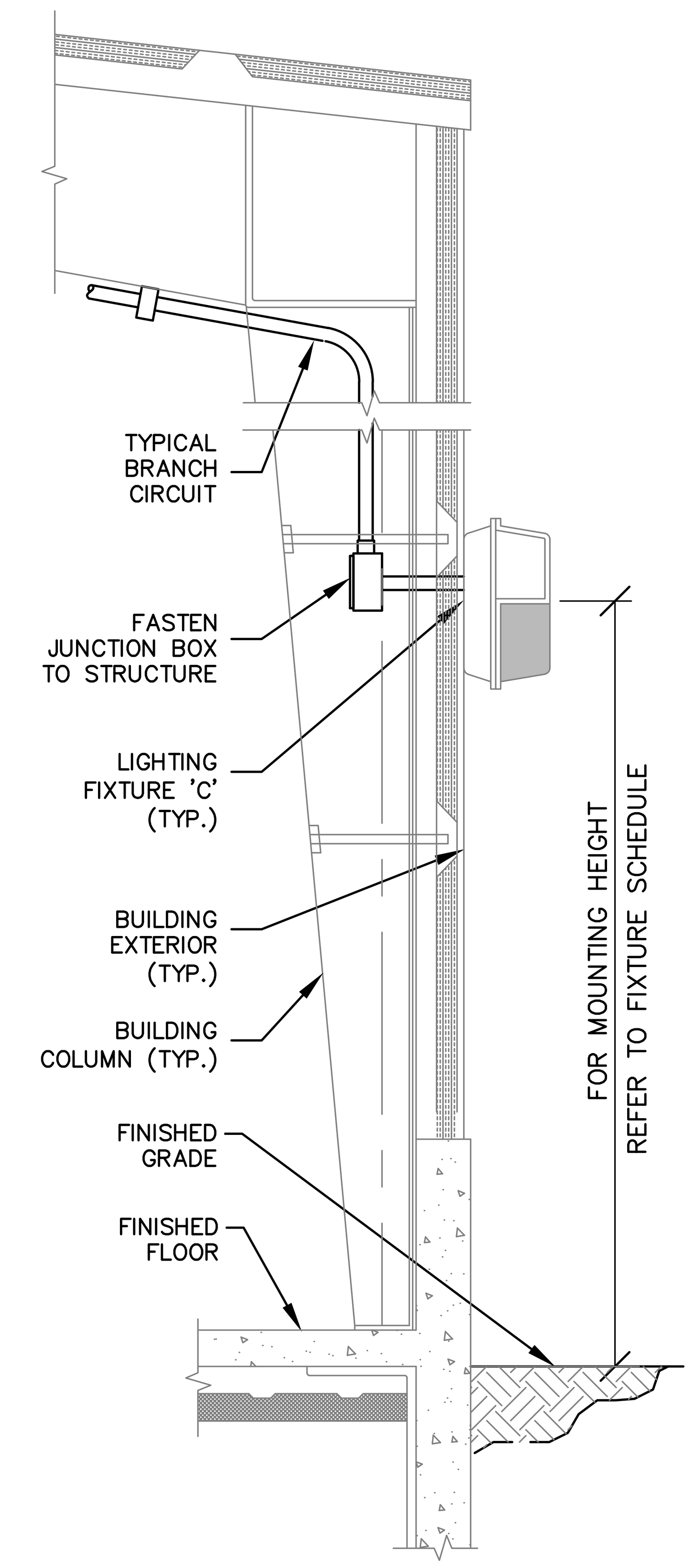
99-E-2



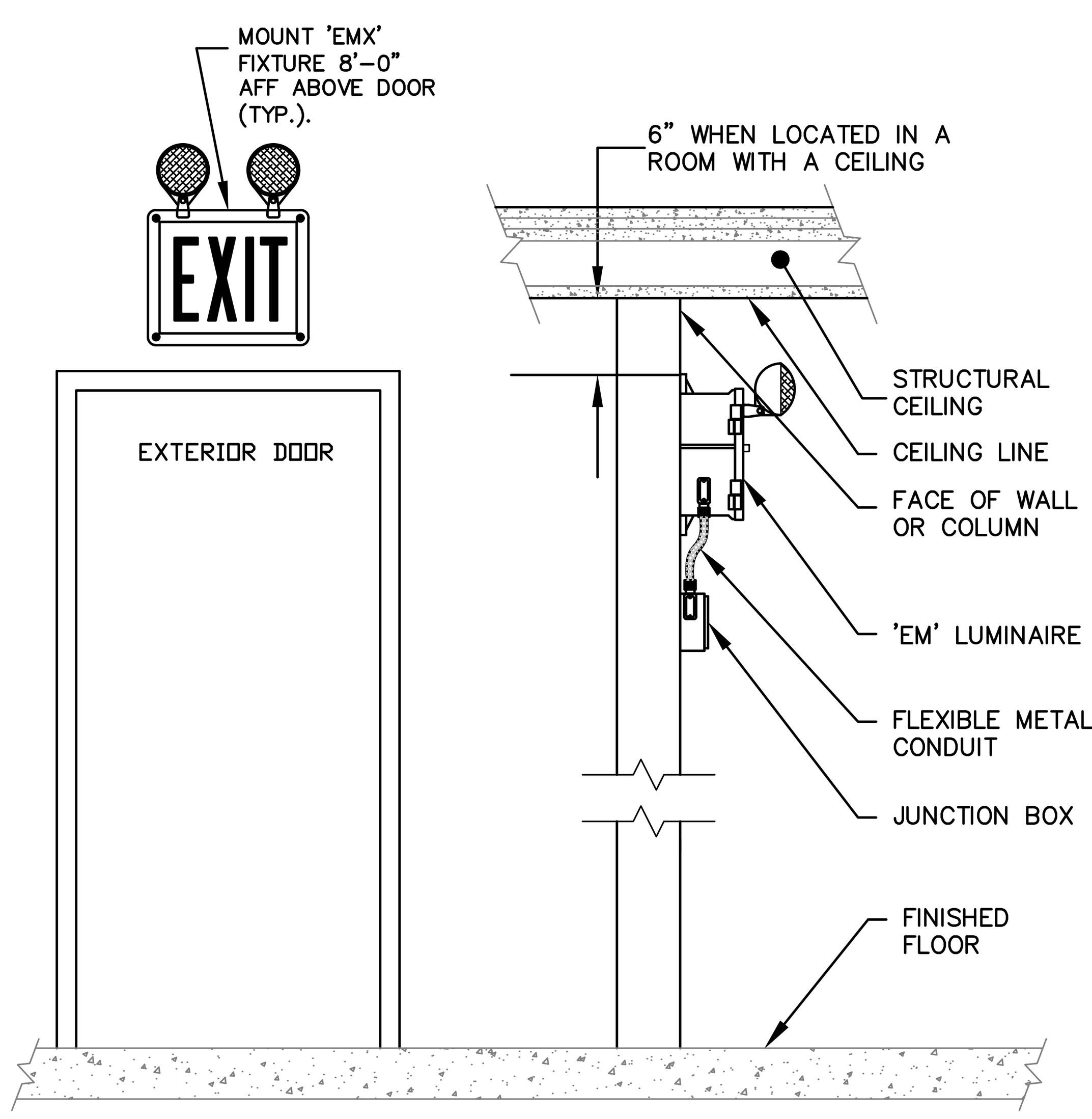
FIXTURE 'A' MOUNTING DETAIL



FIXTURE 'B', 'B1' MOUNTING DETAIL

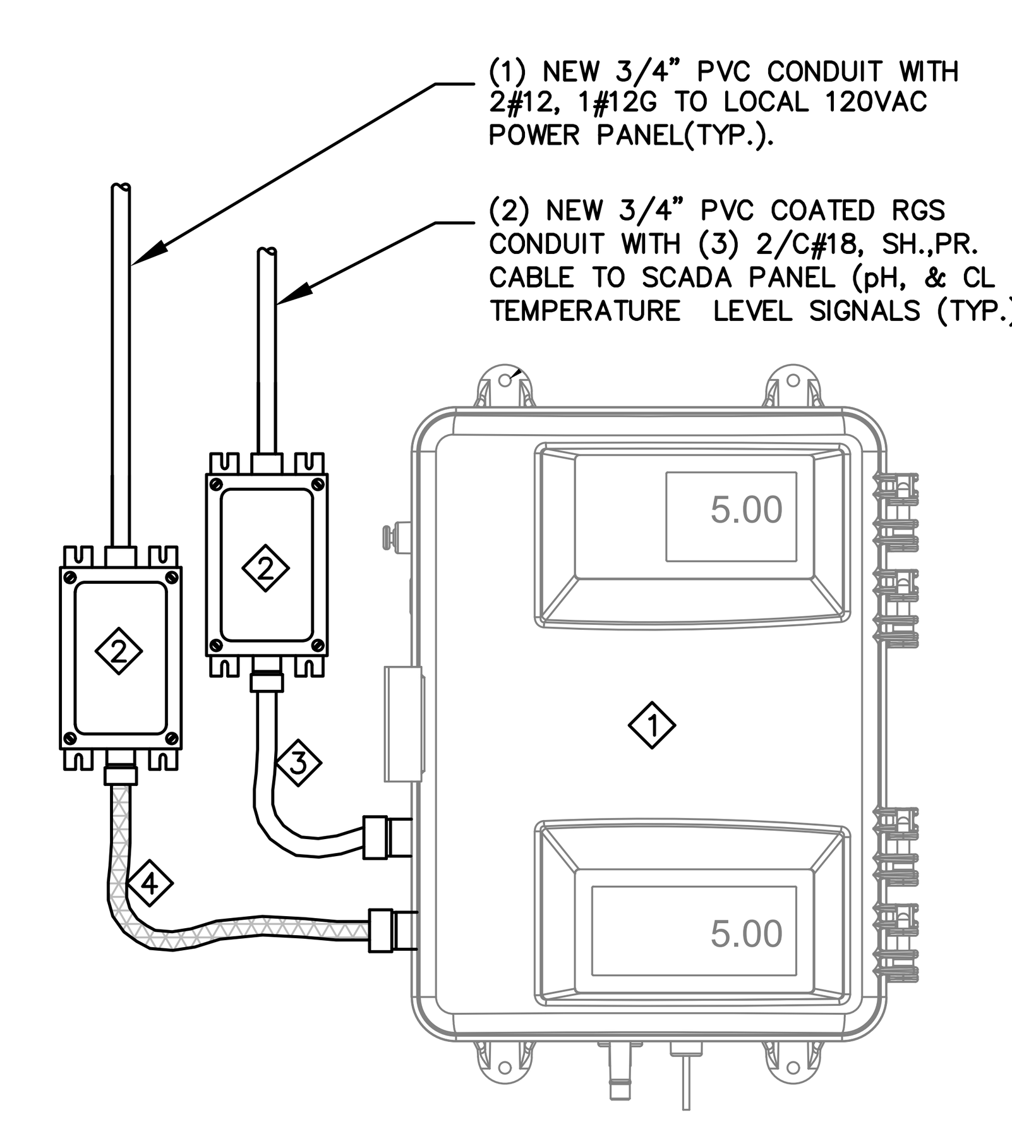


FIXTURE 'C' MOUNTING DETAIL



FIXTURE 'EM', 'EMX' MOUNTING DETAIL

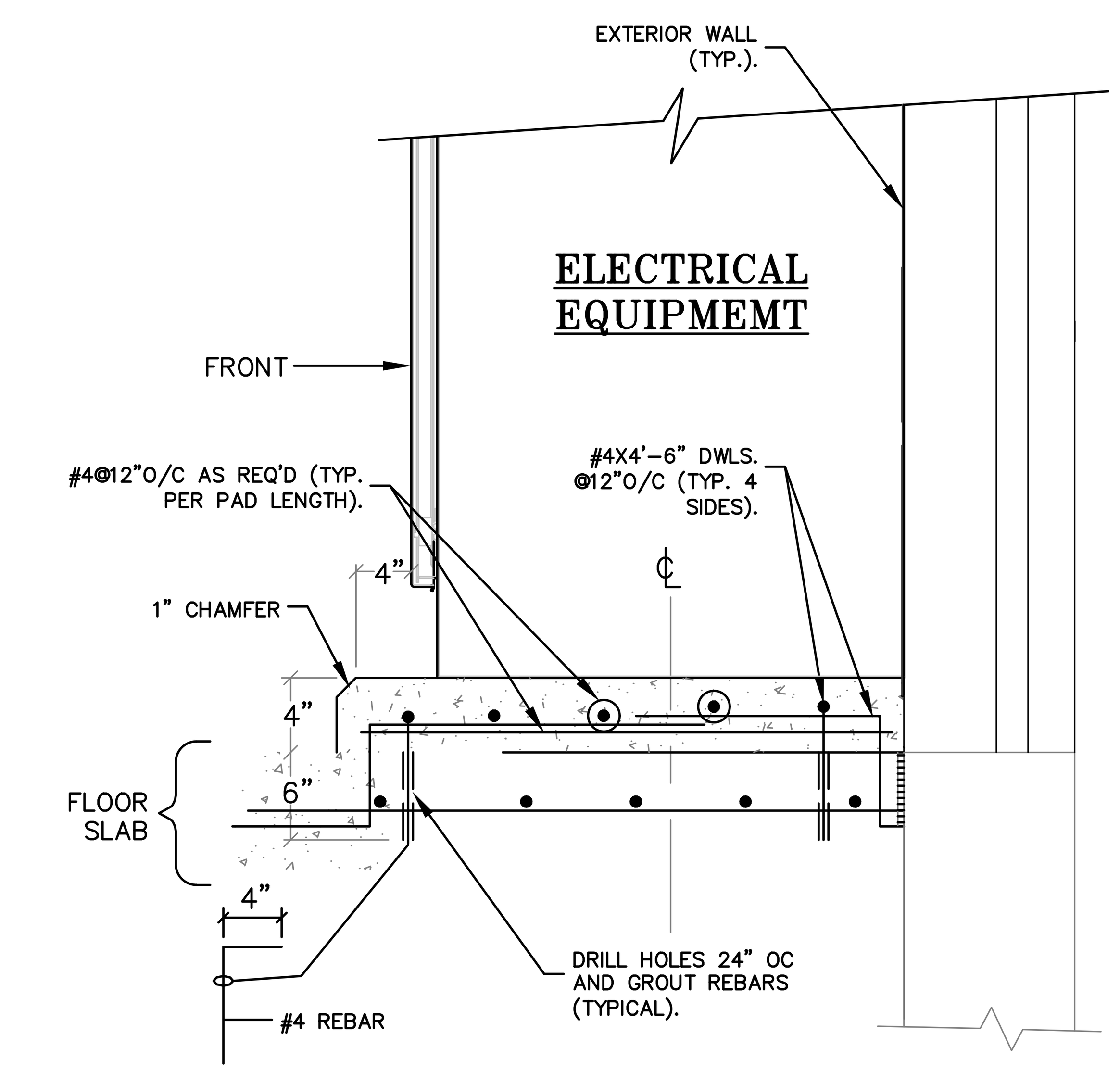
LIGHTING FIXTURE INSTALLATION DETAILS (TYP.) 1 / 99-E-3
SCALE: NONE



KEY NOTES:

1. VENDER SUPPLIED COMBINATION CHLORINE, pH, & TEMPERATURE ANALYZER PANEL FURNISHED & INSTALLED BY GC. WIRED BY EC.
2. NEMA 4X NONMETALLIC BOX JUNCTION BOX (TYPICAL). MOUNT TO WALL USING S.S. HARDWARE.
3. LIQUIDTIGHT METALLIC FLEXIBLE CONDUIT WITH U.L. LISTED CONNECTORS AND SIGNAL CABLE (TYPICAL).
4. LIQUIDTIGHT NONMETALLIC FLEXIBLE CONDUIT WITH U.L. LISTED CONNECTORS AND POWER CABLES (TYPICAL).

ANALYZER POWER/SIGNAL CONNECTION DETAIL (TYP.) 2 / 99-E-3
SCALE: NONE



4" THICK HOUSEKEEPING PAD INSTALLATION DETAIL 3 / 99-E-3
SCALE: NONE

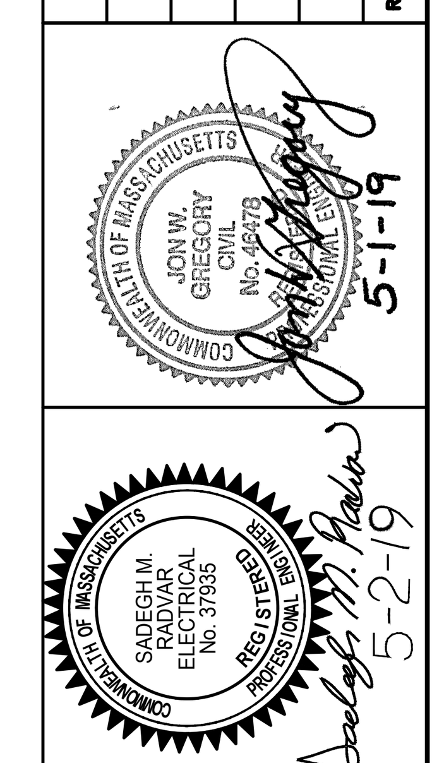
TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

WIRING DIAGRAMS AND DETAILS

Rev.	Date	Description

Drawn By: JWC | Designed By: JWC | Checked By: SMR | Approved By: RPN



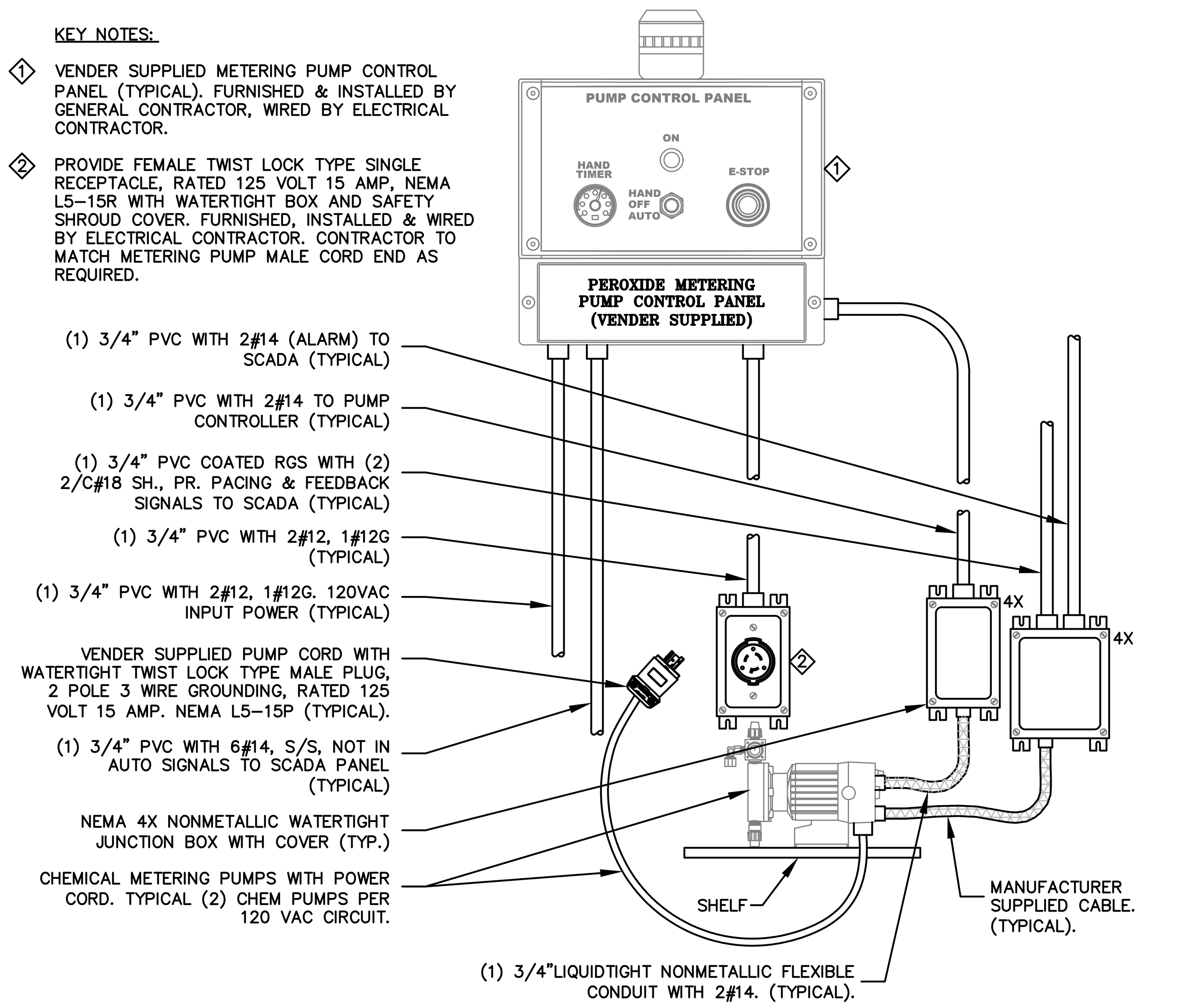
TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

99-E-3

KEY NOTES:

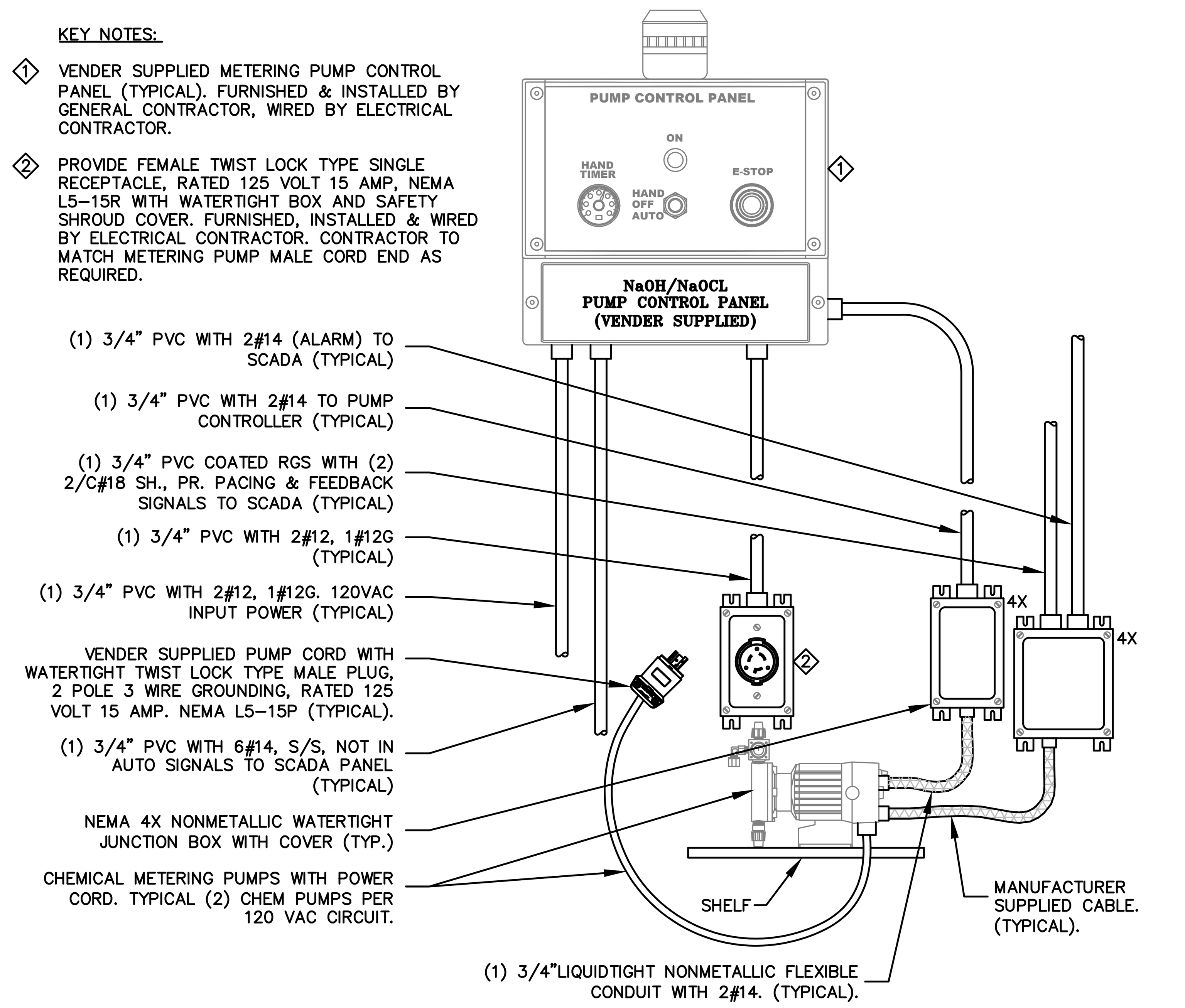
1. VENDER SUPPLIED METERING PUMP CONTROL PANEL (TYPICAL). FURNISHED & INSTALLED BY GENERAL CONTRACTOR, WIRED BY ELECTRICAL CONTRACTOR.
2. PROVIDE FEMALE TWIST LOCK TYPE SINGLE RECEPTACLE, RATED 125 VOLT 15 AMP, NEMA L5-15R WITH WATERTIGHT BOX AND SAFETY SHROUD COVER. FURNISHED, INSTALLED & WIRED BY ELECTRICAL CONTRACTOR. CONTRACTOR TO MATCH METERING PUMP MALE CORD END AS REQUIRED.



PEROXIDE METERING PUMP INSTALLATION DETAIL (TYP.) 1 / 99-E-4
SCALE: NONE

KEY NOTES:

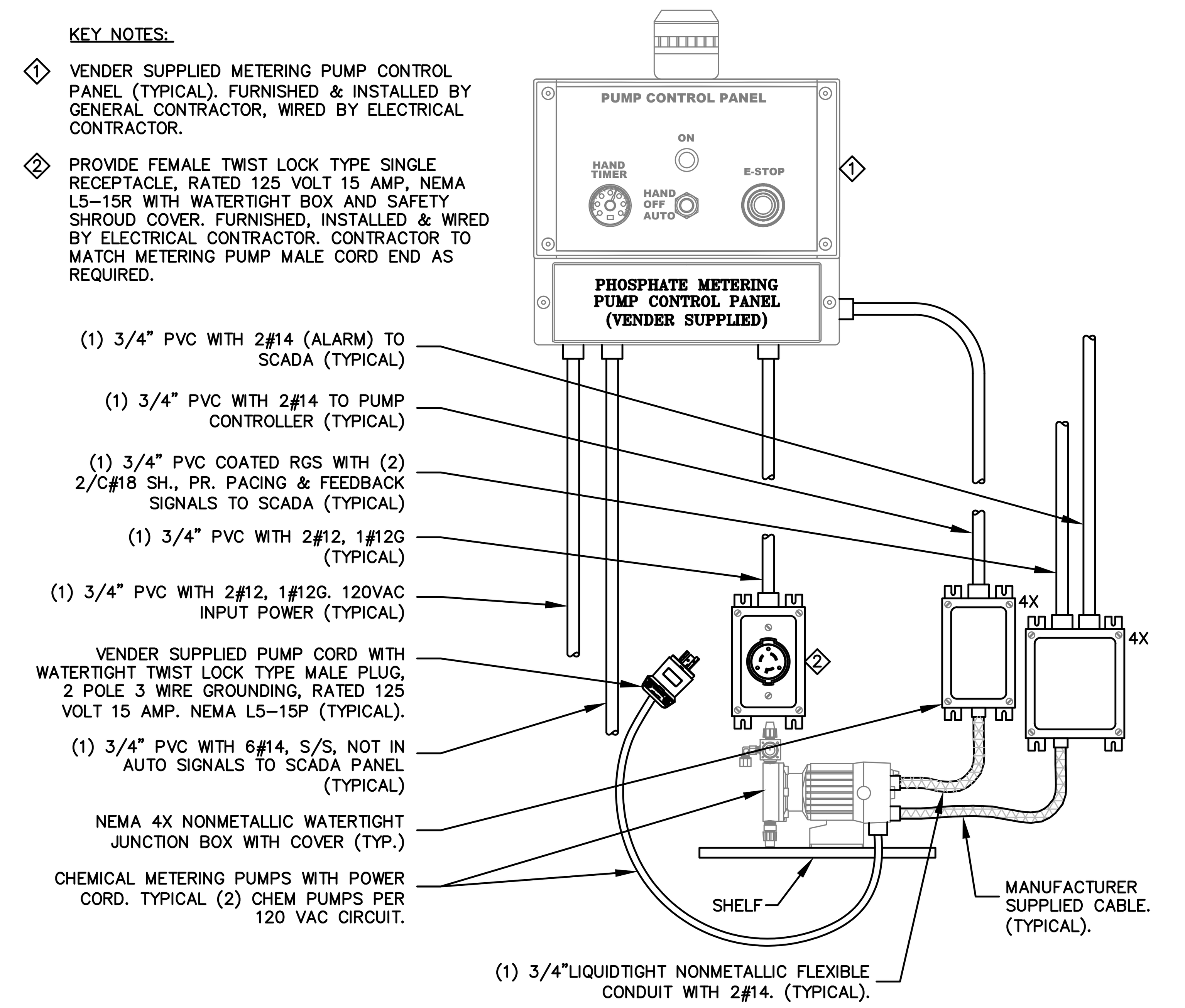
1. VENDER SUPPLIED METERING PUMP CONTROL PANEL (TYPICAL). FURNISHED & INSTALLED BY GENERAL CONTRACTOR, WIRED BY ELECTRICAL CONTRACTOR.
2. PROVIDE FEMALE TWIST LOCK TYPE SINGLE RECEPTACLE, RATED 125 VOLT 15 AMP, NEMA L5-15R WITH WATERTIGHT BOX AND SAFETY SHROUD COVER. FURNISHED, INSTALLED & WIRED BY ELECTRICAL CONTRACTOR. CONTRACTOR TO MATCH METERING PUMP MALE CORD END AS REQUIRED.



NaOH & NaOCL METERING PUMP INSTALLATION DETAIL (TYP.) 2 / 99-E-4
SCALE: NONE

KEY NOTES:

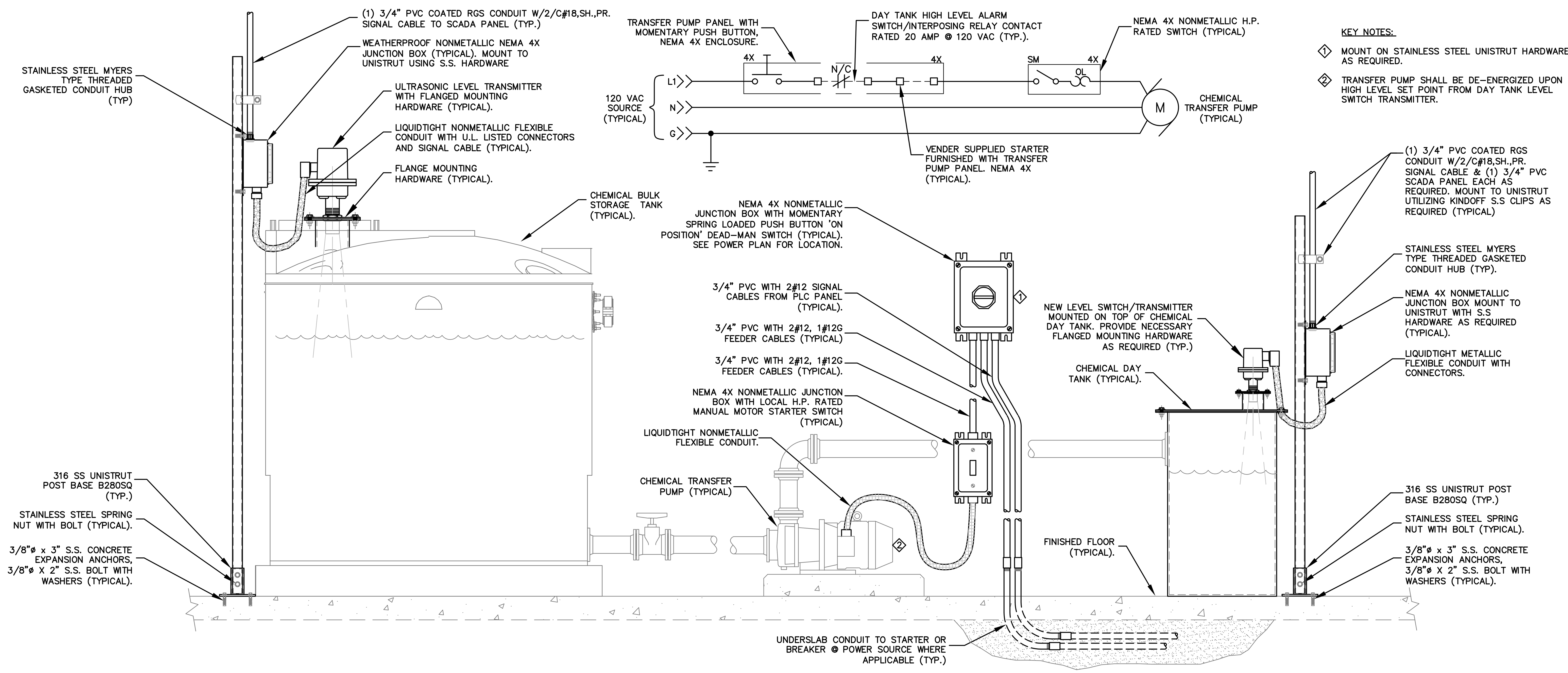
1. VENDER SUPPLIED METERING PUMP CONTROL PANEL (TYPICAL). FURNISHED & INSTALLED BY GENERAL CONTRACTOR, WIRED BY ELECTRICAL CONTRACTOR.
2. PROVIDE FEMALE TWIST LOCK TYPE SINGLE RECEPTACLE, RATED 125 VOLT 15 AMP, NEMA L5-15R WITH WATERTIGHT BOX AND SAFETY SHROUD COVER. FURNISHED, INSTALLED & WIRED BY ELECTRICAL CONTRACTOR. CONTRACTOR TO MATCH METERING PUMP MALE CORD END AS REQUIRED.



PHOSPHATE METERING PUMP INSTALLATION DETAIL (TYP.) 3 / 99-E-4
SCALE: NONE

KEY NOTES:

1. MOUNT ON STAINLESS STEEL UNISTRUT HARDWARE AS REQUIRED.
2. TRANSFER PUMP SHALL BE DE-ENERGIZED UPON HIGH LEVEL SET POINT FROM DAY TANK LEVEL SWITCH TRANSMITTER.



POWER AND SIGNAL CONNECTIONS AT CHEMICAL FEED SYSTEMS (TYP.) 4 / 99-E-4
SCALE: NONE

TOWN OF BARNSTABLE, MASSACHUSETTS

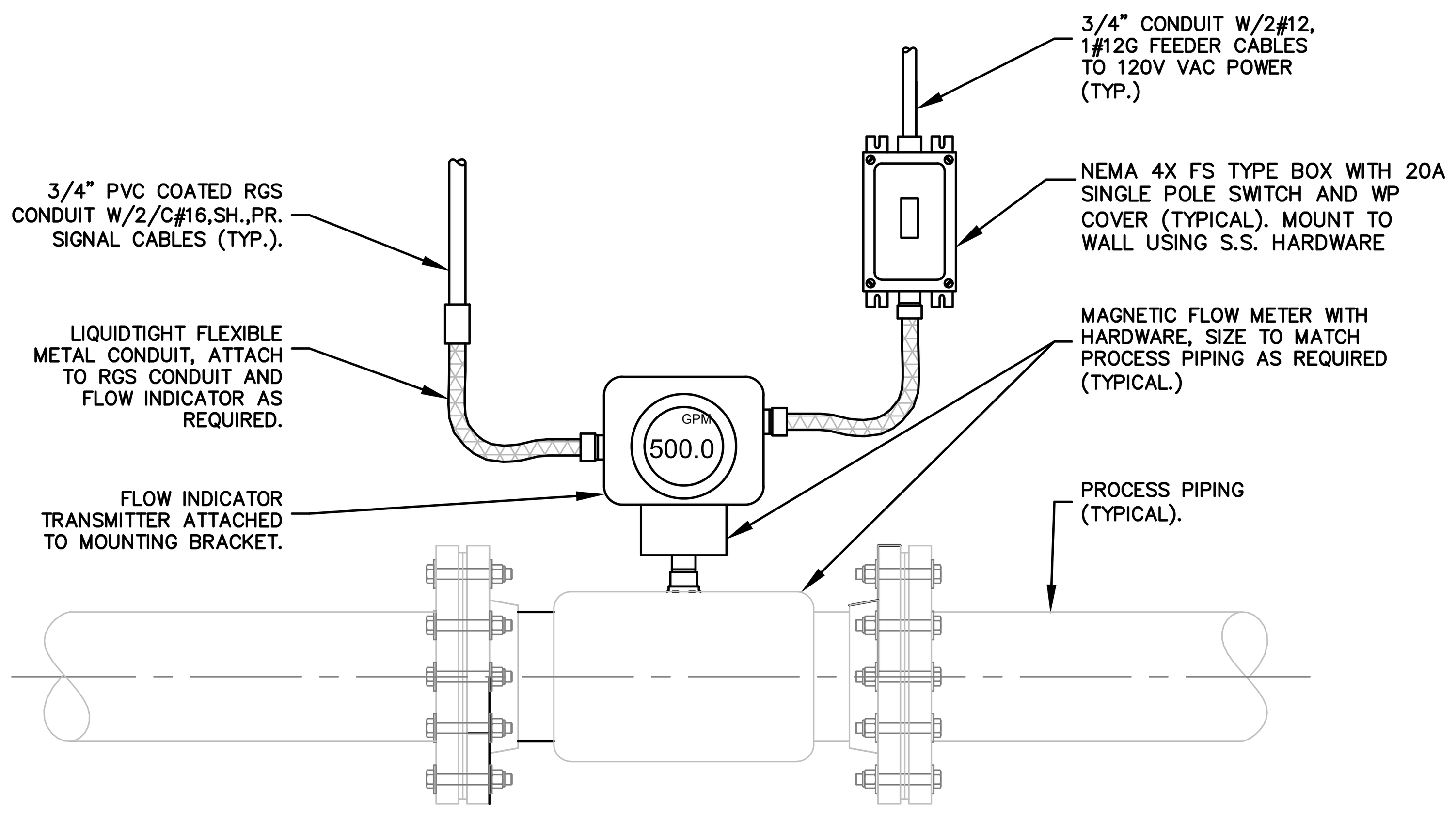
MAHER FILTRATION PLANT

WIRING DIAGRAMS AND DETAILS

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

99-E-4



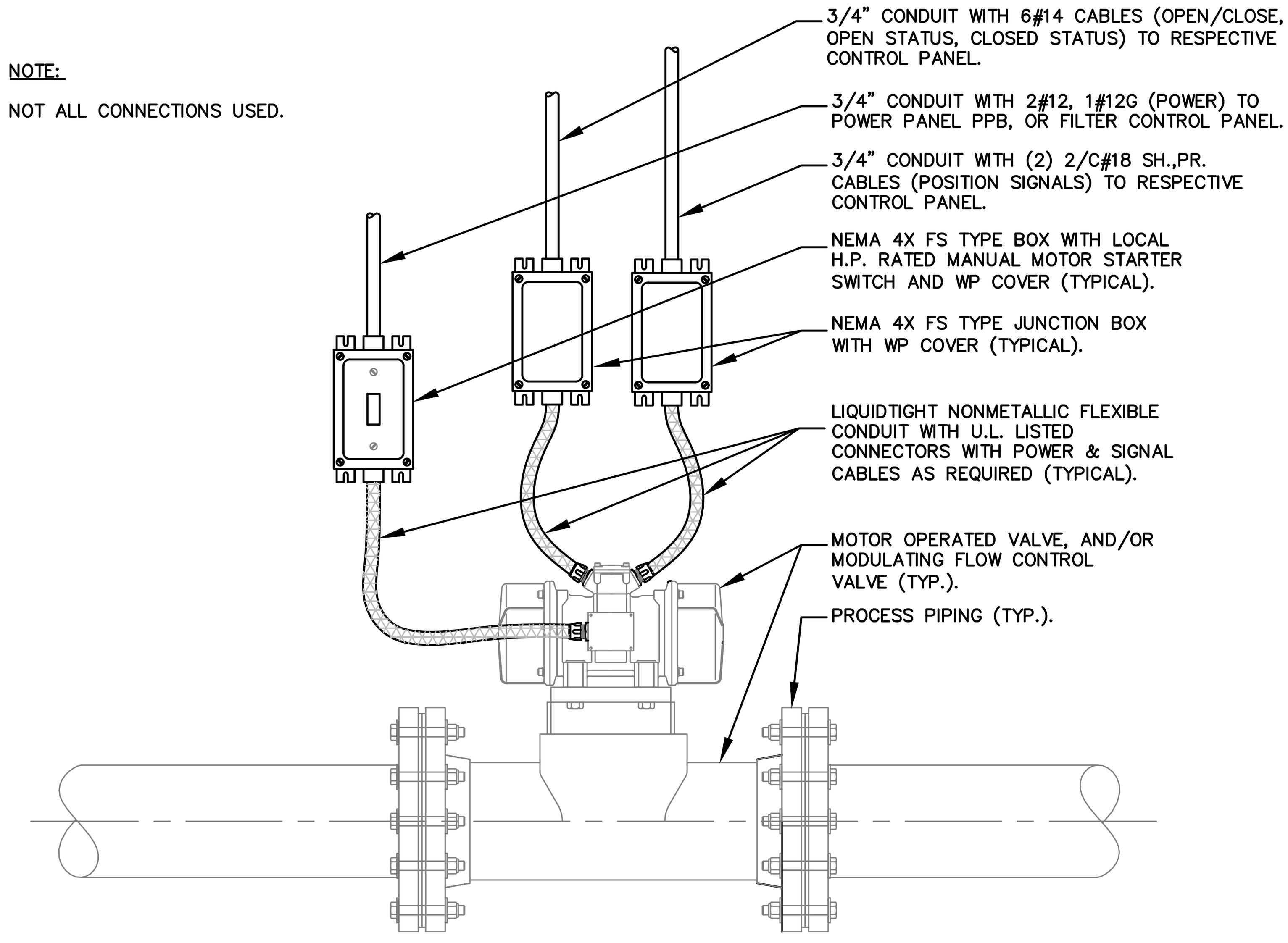
DEVICE MOUNTED INDICATOR TRANSMITTER

POWER & SIGNAL CONNECTION @ MAG METER (TYP.) 1 / 99-E-5

SCALE: NONE

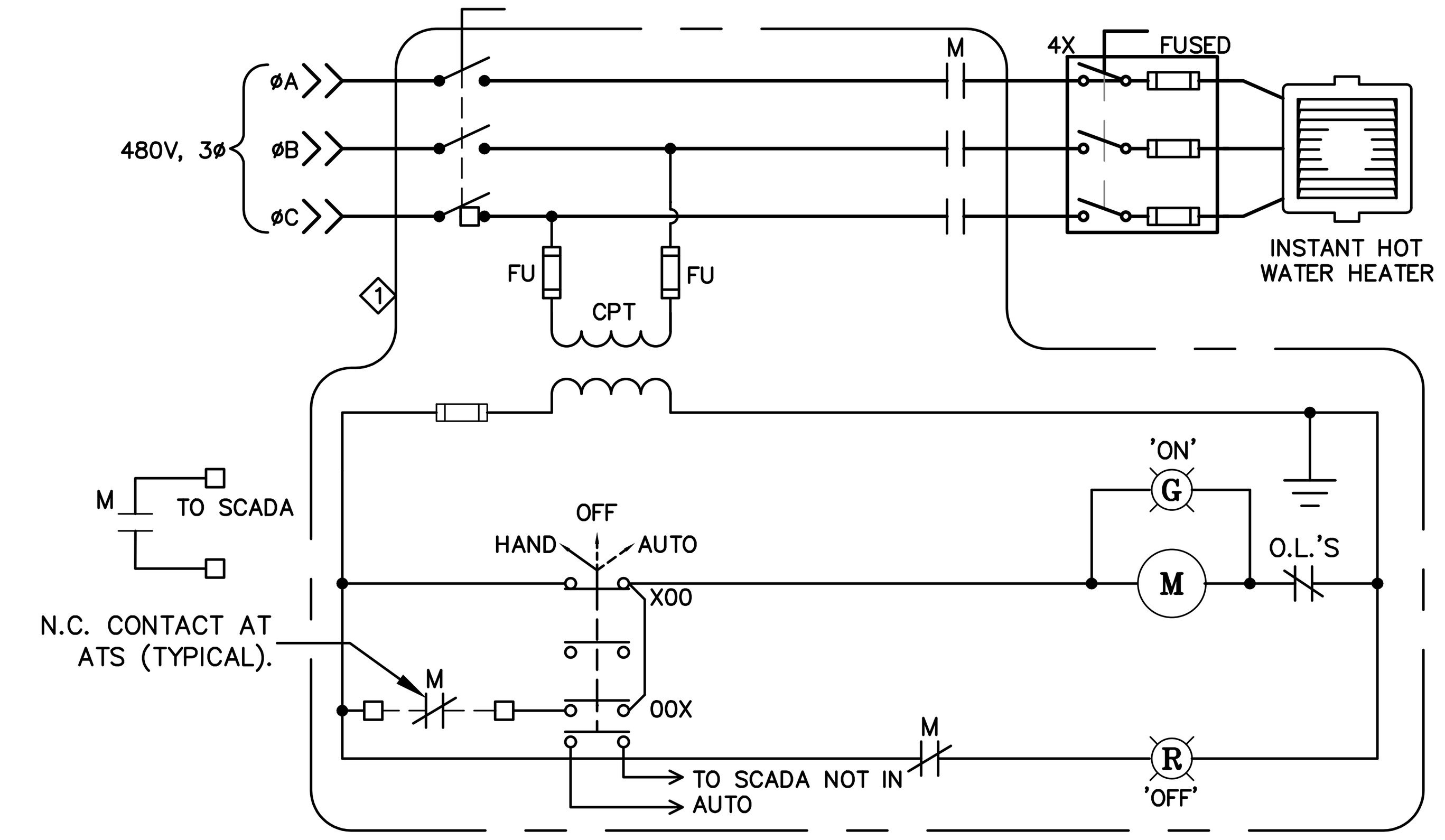
NOTE:

NOT ALL CONNECTIONS USED.



POWER & SIGNAL CONNECTION @ VALVE (TYP.) 3 / 99-E-5

SCALE: NONE

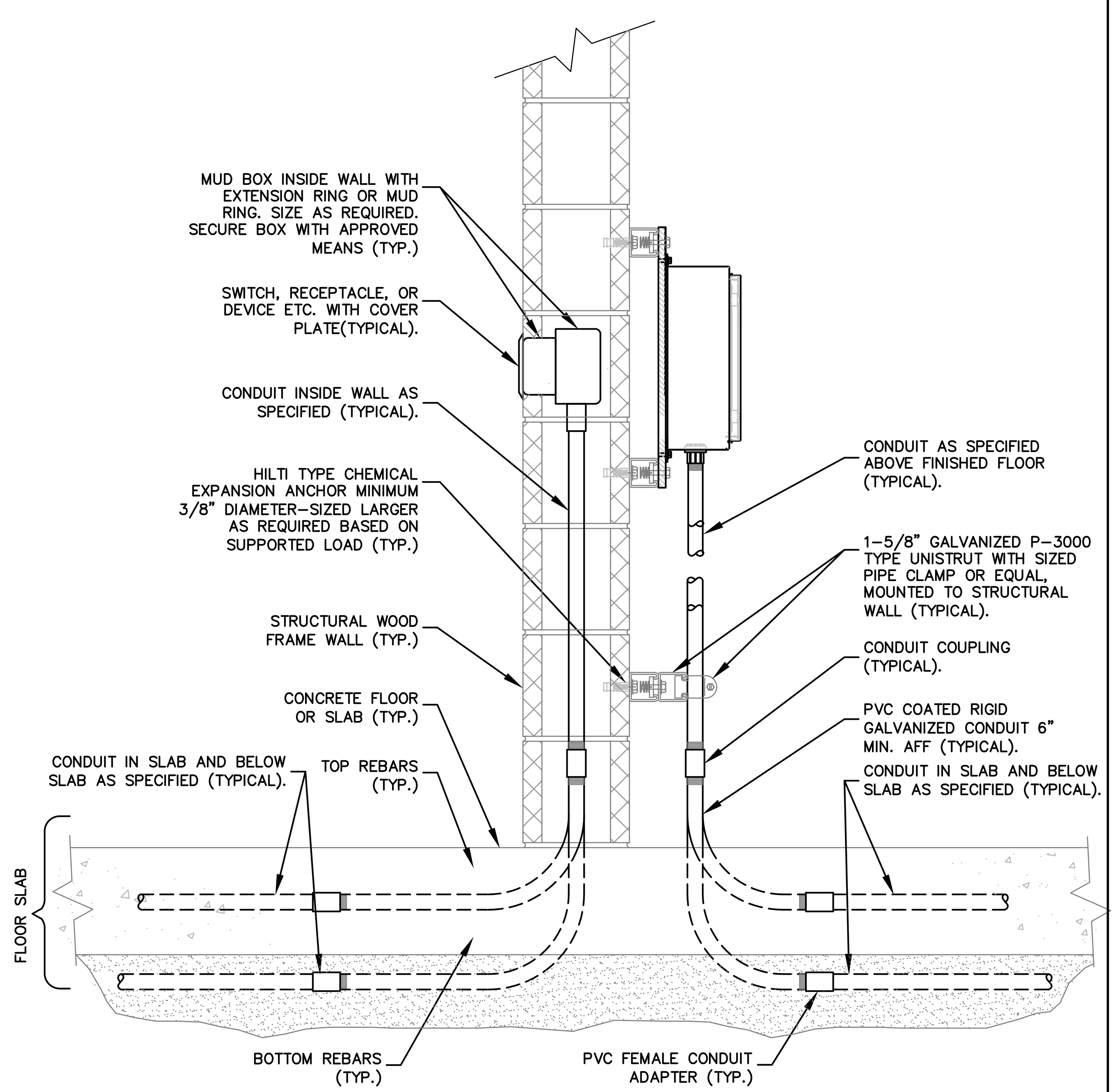


NOTE:

1. PROVIDE NEW U.L. LISTED 600V, NEMA SIZE IV COMBINATION CONTACTOR WITH DISCONNECT SWITCH IN MCC. THE CONTACTOR SHALL BE DE-ENERGIZED WHEN BUILDING IS ON STANDBY GENERATOR POWER.

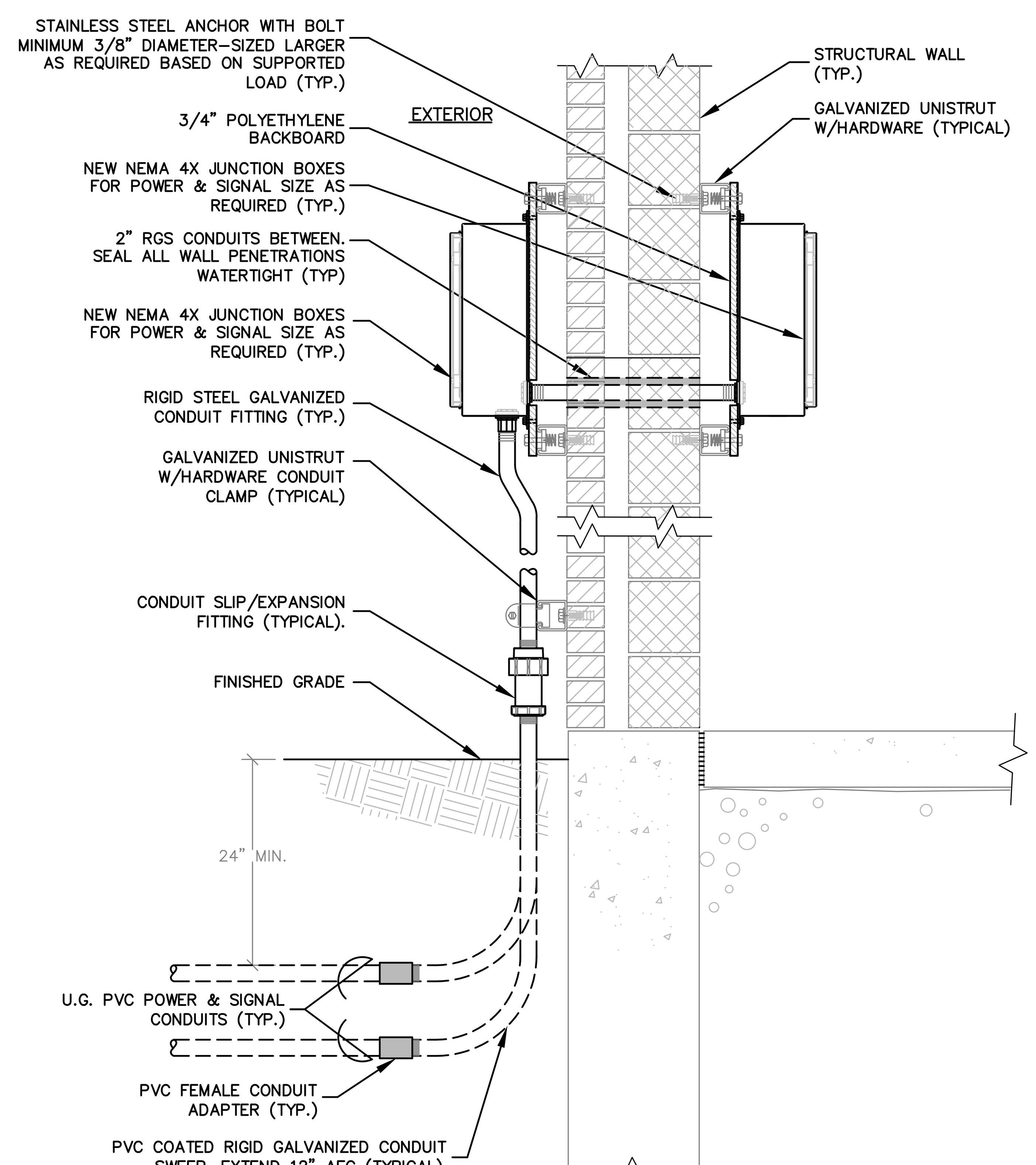
INSTANT HOT WATER UNIT WIRING DIAGRAM (TYP.) 5 / 99-E-5

SCALE: NONE



CONDUIT IN AND BELOW SLAB INSTALLATION DETAIL (TYP.) 2 / 99-E-5

SCALE: NONE



CONDUIT PENETRATION THRU EXTERIOR WALLS (TYP.) 4 / 99-E-5

SCALE: NONE

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

WIRING DIAGRAMS AND DETAILS

Drawn By:JWC | Designed By:JWC | Checked By:SMR | Approved By:RPN

Rev.	Date	Description

COMMONWEALTH OF MASSACHUSETTS JOHN W. GREGORY CIVIL REGISTERED PROFESSIONAL ENGINEER 5-1-19

SADEGH M. RAVARI ELECTRICAL REGISTERED PROFESSIONAL ENGINEER 5-2-19

SMR ENGINEERING, PC Electrical, Instrumentation & Control Systems Engineering

TATA & HOWARD

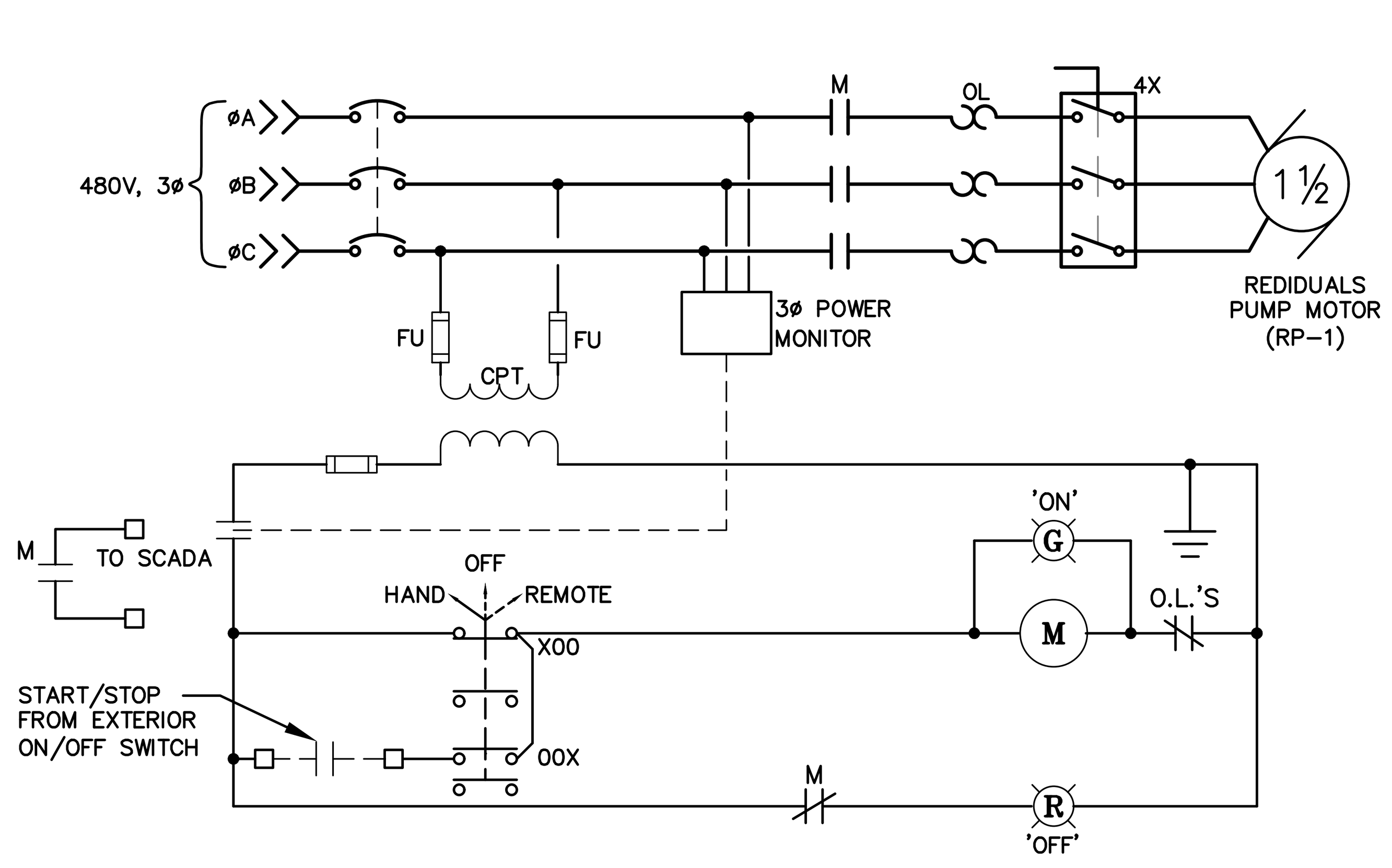
T&H NO.: 5241

DATE: MAY 2019

SCALE: AS NOTED

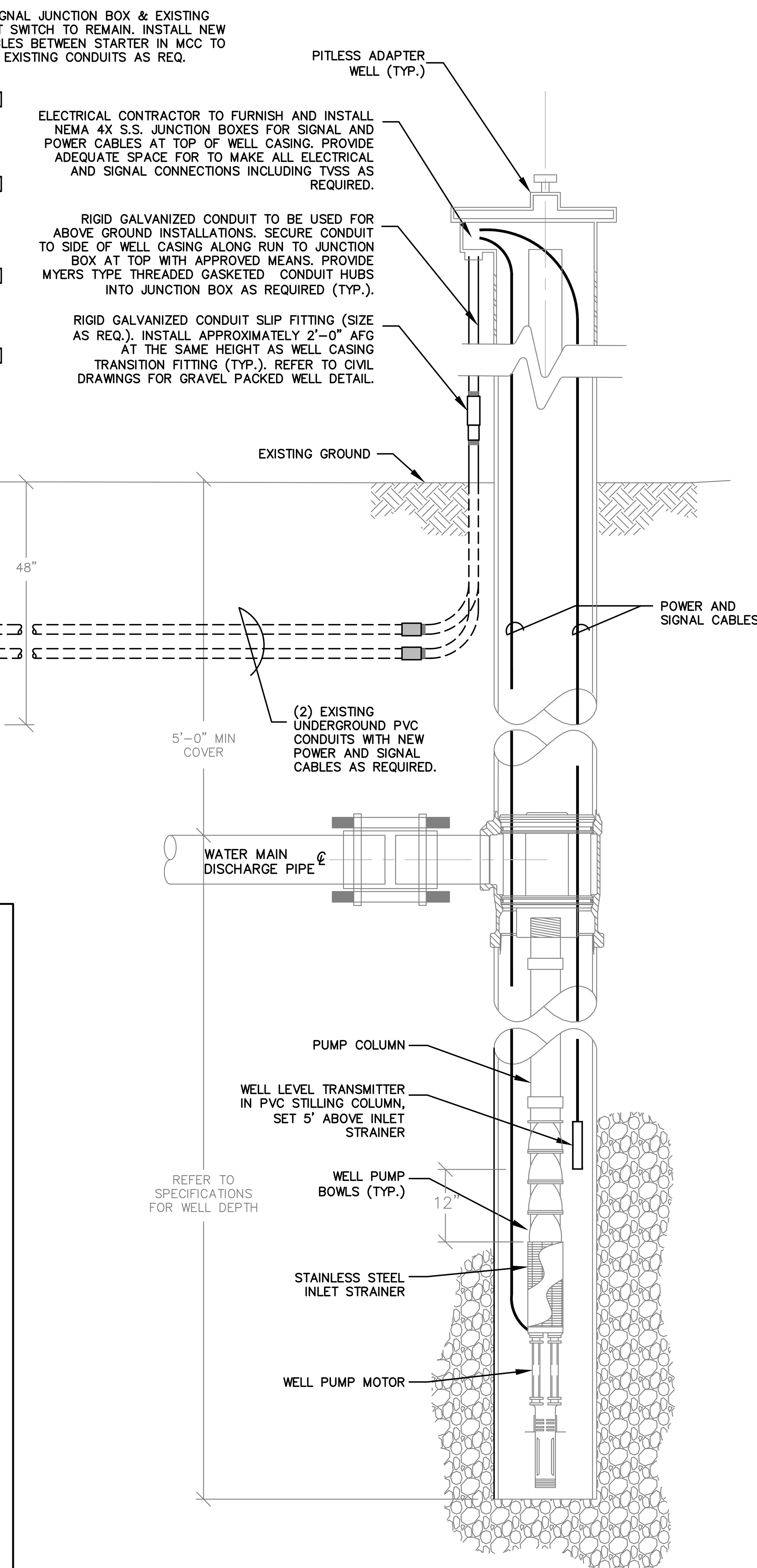
99-E-5

FILE: C:\SMR Engineering\Tata & Howard\Barnstable MA\WTF Upgrade Project\5241-99- E1-E5-WD.dwg May 02, 2019 - 12:02pm



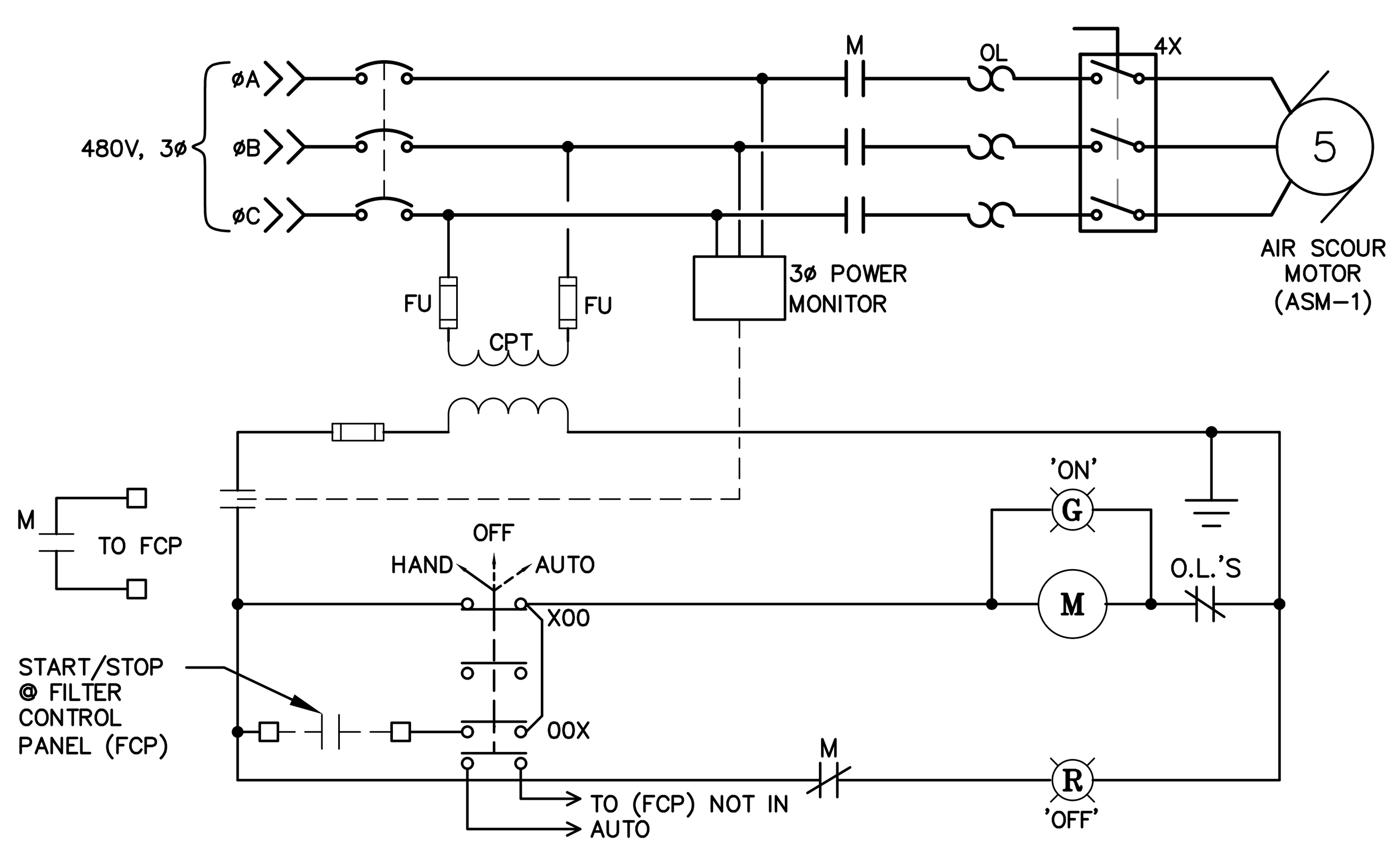
RESIDUALS PUMP VFD W.D. (TYP. OF 1) 2 / 99-E-6

SCALE: NONE



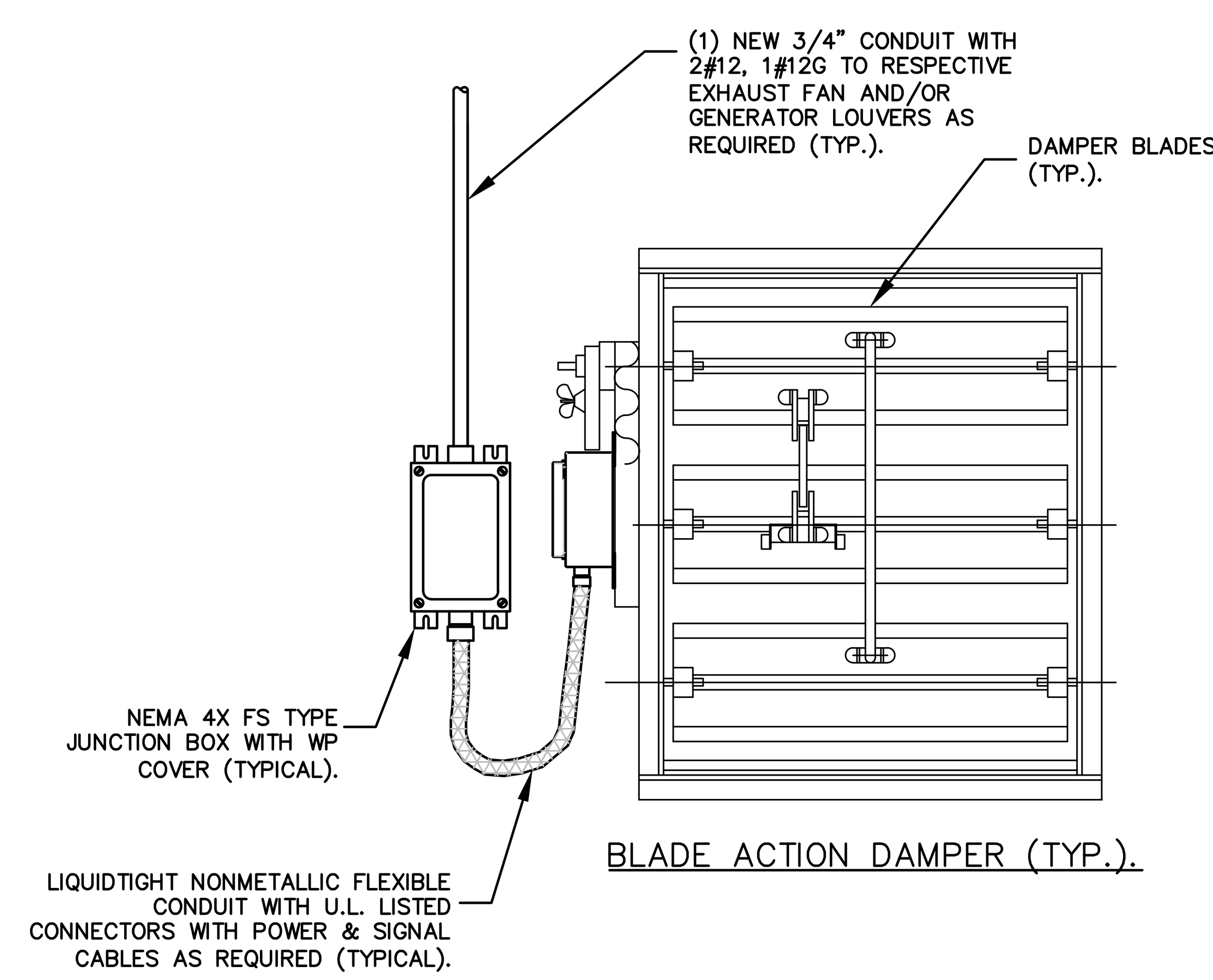
POWER & SIGNAL CONNECTION @ WELL PUMP (TYP.) 1 / 99-E-6

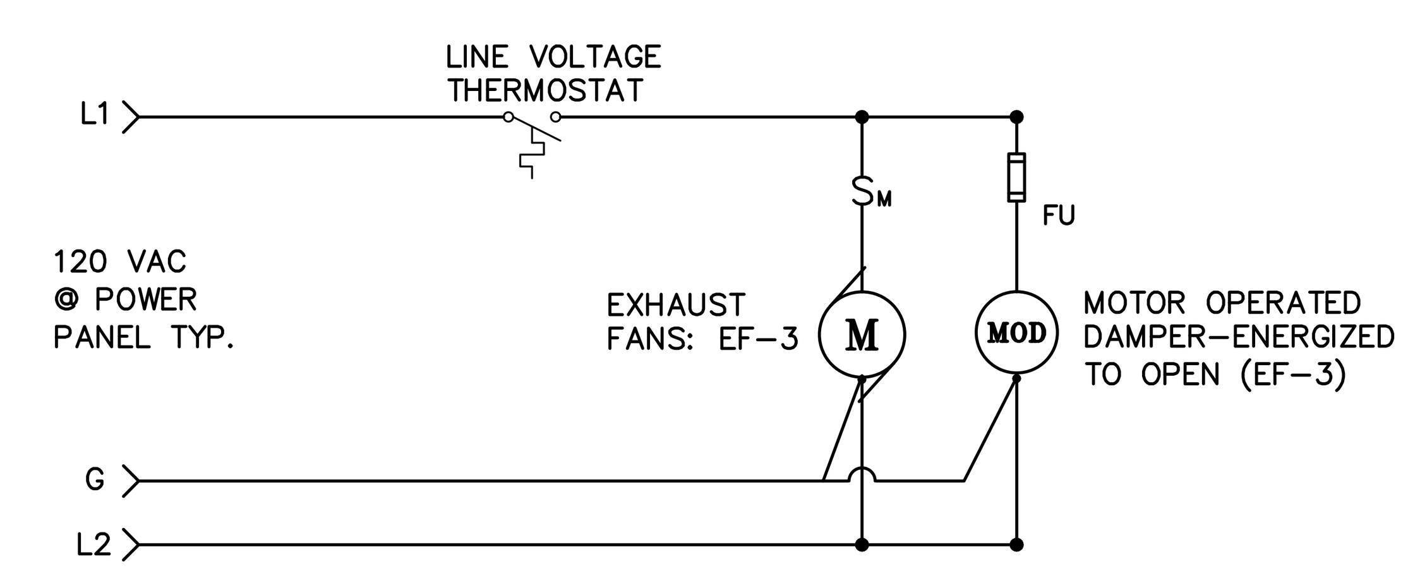
SCALE: NONE



AIR SCOUR BLOWER MOTOR W.D. (TYP. OF 1) 3 / 99-E-6

SCALE: NONE





1ø EXHAUST FAN WIRING DIAGRAM (TYP. OF 1) 5 / 99-E-6

SCALE: NONE

ELECTRICAL CONNECTION @ MOTOR OPERATED DAMPER (TYP.) 4 / 99-E-6

SCALE: NONE

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

WIRING DIAGRAMS AND DETAILS

Drawn By: JWC | Designed By: JWC | Checked By: SMR | Approved By: RPN

Rev.	Date	Description

5-1-19

5-2-19

SMR ENGINEERING, PC

TATA & HOWARD

T&H NO.: 5241

DATE: MAY 2019

SCALE: AS NOTED

99-E-6

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

INSTRUMENTATION PROCESS AND INSTRUMENTATION DIAGRAM I

Rev.	Date	Description

Designed By: RSP
Drawn By: RSP
Checked By: PBH
Approved By: JWG

INTERMEDIATE PUMP STATION (EXISTING TREATMENT FACILITY) (PCP)

NEW WATER FILTRATION PLANT (MTU)

RIOP–1A

RIOP–1B

RIOP–1C

GREENSAND FILTER SYSTEM COMPONENTS

WELL NO. 1 (RIOP– 2)

CLEARWELL

SODIUM HYPOCHLORITE FEED SYSTEM

HYDROGEN PEROXIDE FEED SYSTEM

SODIUM HYDROXIDE FEED SYSTEM

PHOSPHATE FEED SYSTEM

PROCESS AND INSTRUMENTATION DIAGRAM

SCALE: NONE

- TT–100 HI/LO TEMP. PROCESS AREA
- DI 39 GENERATOR No. 1 "RUNING"
- DI 40 GENERATOR No. 1 "TROUBLE"
- DI 41 GENERATOR No. 2 "RUNING"
- DI 42 GENERATOR No. 2 "TROUBLE"
- DI 43 PHOSPHATE EMERG. SHOWER FLOW (FS–100)
- DI 44 PEROXIDE EMERG. SHOWER FLOW (FS–200)
- DI 45 CAUSTIC/CHLORINE EMERG. SHOWER FLOW (FS–300)
- DI 46 BASEMENT EMERG. SHOWER FLOW (FS–400)
- AI 47 FIRE
- DI 48 INTRUSION
- DI 49 LOSS OF POWER (ATS)
- DI 50 LOSS OF POWER (MCP)

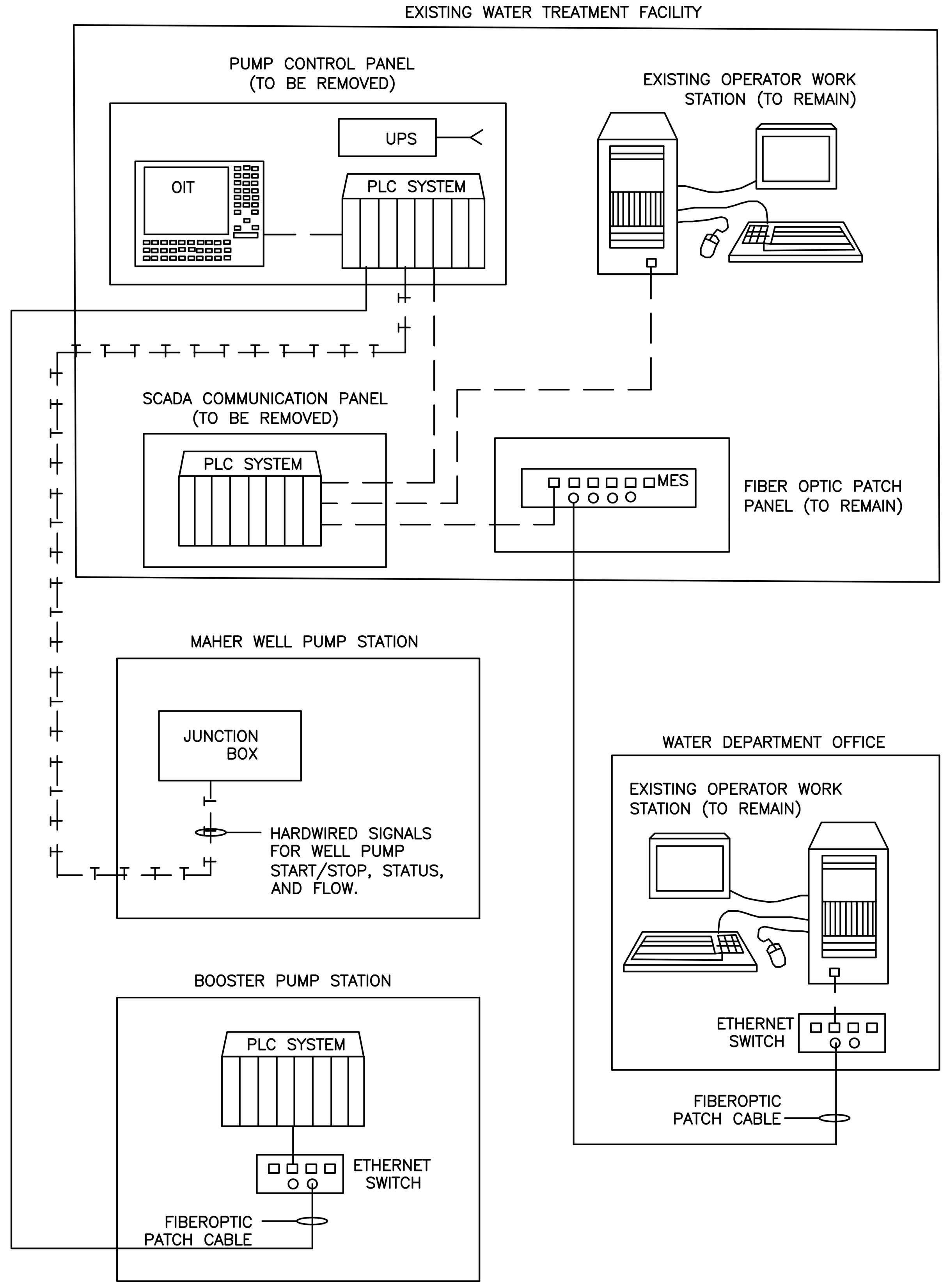
* EXISTING CHLORINE AND pH ANALYZERS LOCATED IN PUMP ROOM OF EXISTING TREATMANT BUILDING.

TATA & HOWARD

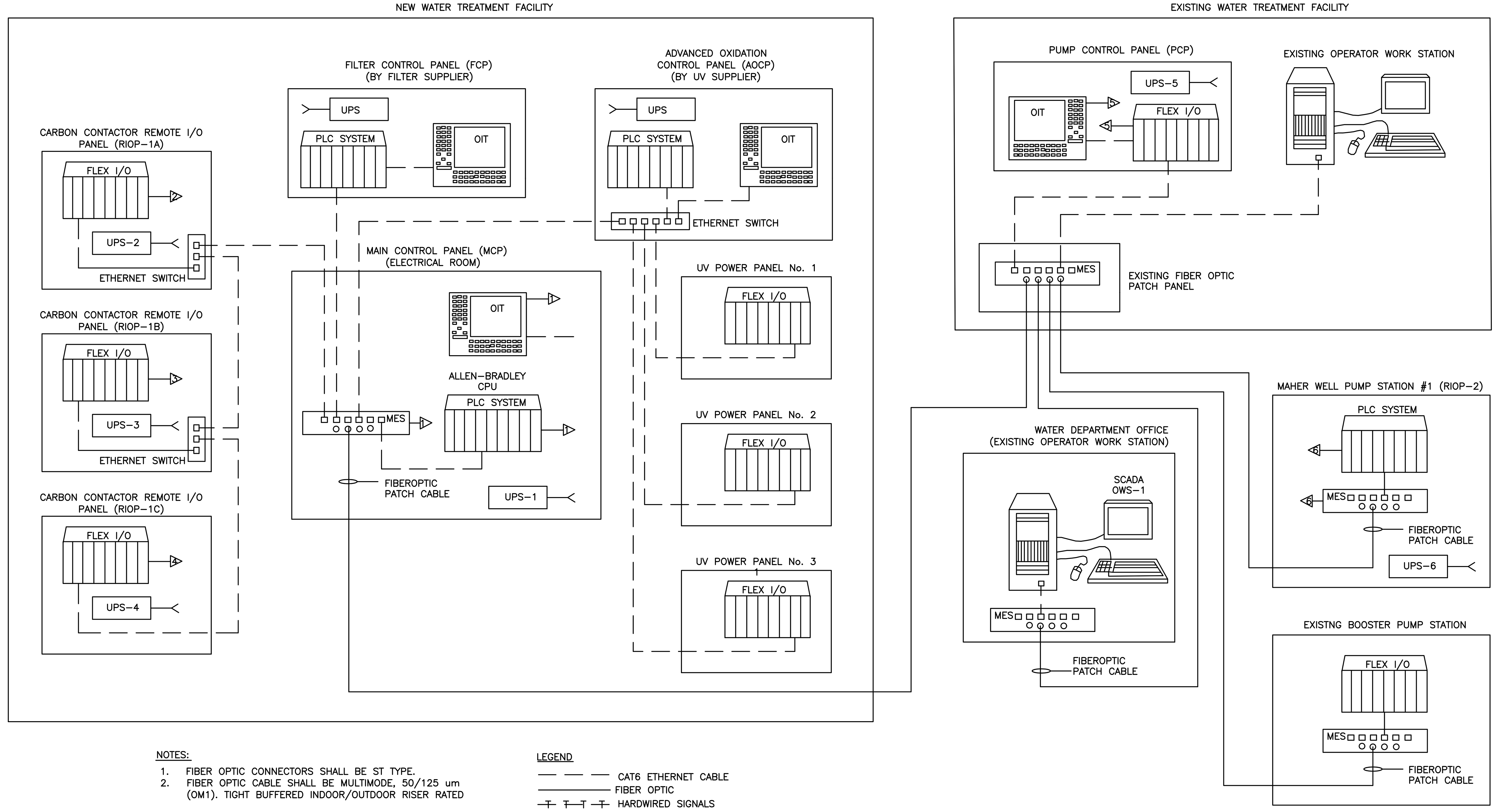
T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

04-I-1

EXISTING SCADA SYSTEM



PROPOSED SCADA SYSTEM



NOTES:

1. FIBER OPTIC CONNECTORS SHALL BE ST TYPE.
2. FIBER OPTIC CABLE SHALL BE MULTIMODE, 50/125 um (OM1). TIGHT BUFFERED INDOOR/OUTDOOR RISER RATED

LEGEND

- CAT6 ETHERNET CABLE
- FIBER OPTIC
- HARDWIRED SIGNALS
- CONNECTION TO UPS POWER
- 120 VAC. 60 HZ POWER SUPPLY

OIT – OPERATOR INTERFACE TERMINAL
UPS – UNINTERRUPTIBLE POWER SUPPLY
RIOP – REMOTE INPUT/OUTPUT PANEL
RTU – REMOTE TERMINAL UNIT
MES – MANAGED ETHERNET SWITCH
PLC – PROGRAMMABLE LOGIC CONTROLLER

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: RSP Designed By: RSP Checked By: PBH Approved By: JWG

INSTRUMENTATION
PROCESS AND INSTRUMENTATION DIAGRAM II

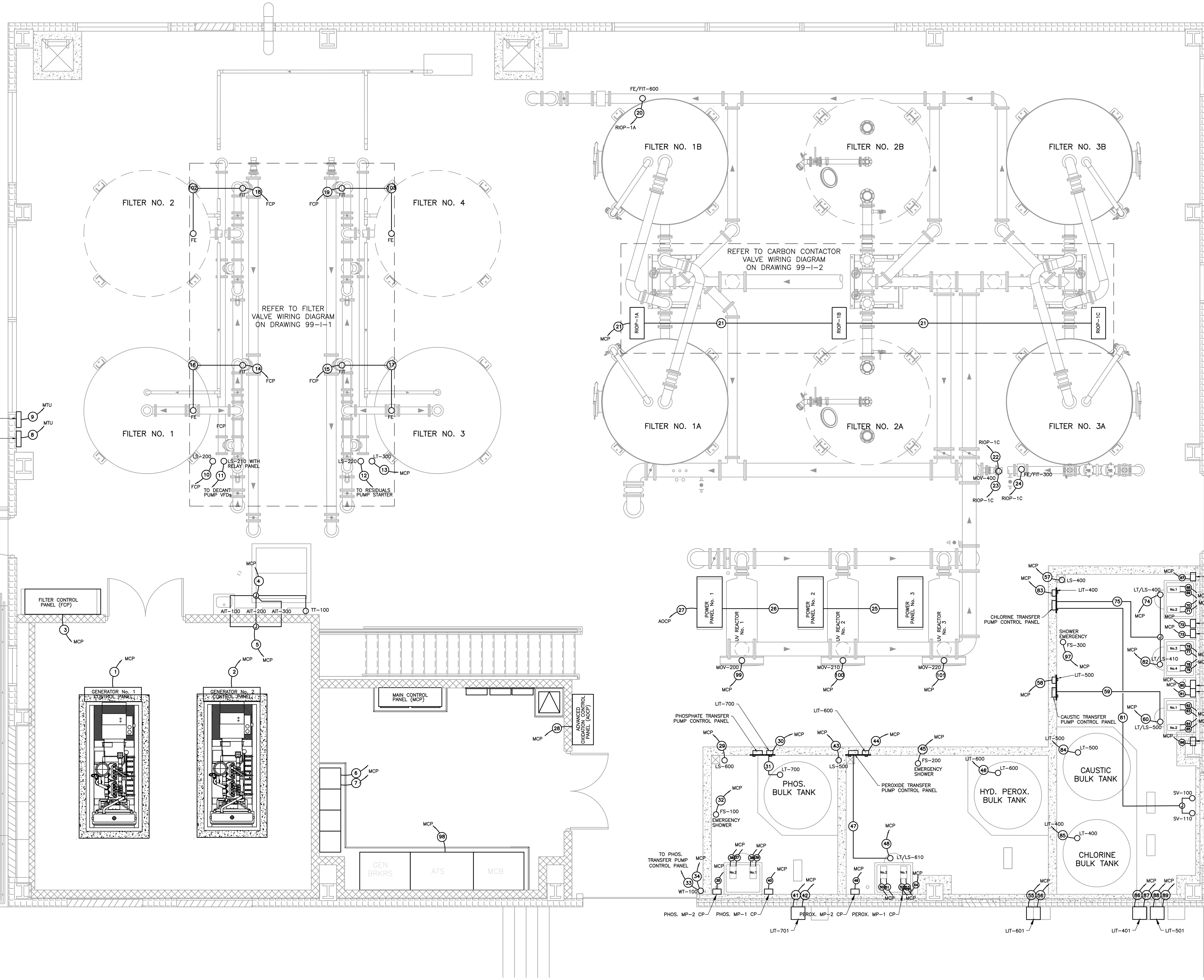
Rev.	Date	Description

5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

04-I-2



FIRST FLOOR PLAN

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

LEGEND

- A – ANALOG, D – DISCRETE, I – INPUT, O – OUTPUT — SCADA INTERFACE
- ALARM AT SCADA
- MCC/STARTER MOUNTED
- LOCALLY MOUNTED
- HARDWIRED INTERLOCK
- INDICATING LIGHT–R=RED, G=GREEN
- ELECTRICAL SIGNAL
- PROCESS LINE
- FLOW METERING DEVICE
- ALARM HORN
- FIELD MEASUREMENT DEVICE
- LRP — LEVEL RELAY PANEL

CA	COMPRESSED AIR
CAU	CAUSTIC
CHL	CHLORINE (LIQUID)
CIT	CHLORINE INDICATOR/TRANSMITTER
CL2	CHLORINE
DP	DECANT PUMP
FCP	FILTER CONTROL PANEL
FE	FLOW ELEMENT
FFP	ULTRAFILTRATION FILTER FEED PUMP
FI	FLOW INDICATOR
FIT	FLOW INDICATOR/TRANSMITTER
FWP	FINISHED WATER PUMP
HOA	HAND–OFF–AUTO SWITCH
HOR	HAND–OFF–REMOTE SWITCH
HS	HAND SWITCH
IP	INTERMEDIATE PUMP
KI	RUNNING TIME METER
LI	LEVEL INDICATOR
LIT	LEVEL INDICATOR/TRANSMITTER
LS	LEVEL SWITCH
LT	LEVEL TRANSMITTER
MCC	MOTOR CONTROL CENTER
MOV	MOTOR OPERATED VALVE
MP	METERING PUMP
OWS	OPERATOR WORK STATION
pHIT	pH INDICATOR/TRANSMITTER
PIT	PRESSURE INDICATOR/TRANSMITTER
PS	PRESSURE SWITCH
ROA	REMOTE–OFF–AUTO
SD	SMOKE DETECTOR
SV	SOLENOID VALVE
TT	TEMPERATURE TRANSMITTER
VFD	VARIABLE FREQUENCY DRIVE

- BALL VALVE
- CHECK VALVE
- BUTTERFLY VALVE
- AOV — AIR OPERATED VALVE
- SOLENOID VALVE
- MOTOR OPERATED VALVE
- BACKPRESSURE VALVE
- PRESSURE REDUCING VALVE
- GATE VALVE
- ROTOMETER

NOTES:

1. ALL DISCRETE SIGNALS SHALL BE 24 VOLT. ALL ANALOG SIGNALS SHALL BE 4–20mA.
2. ALL FCP SCREENS SHALL BE PORTRAYED ON THE SCADA WORK STATION. ALL OPERATOR–VARIABLE FCP CONTROL SETPOINTS SHALL BE ACCESSIBLE VIA THE OIT ON THE FCP.
3. ALL PROCESS EQUIPMENT, AUTOMATIC CONTROL VALVES, INSTRUMENTATION, AND CONTROLS BOUNDED BY HEAVY DASHED LINES ARE BEING FURNISHED BY THE GREENSAND FILTER MANUFACTURER FOR INSTALLATION BY THE GENERAL CONTRACTOR, EXCEPT FOR THE FCP WHICH IS TO BE INSTALLED BY THE ELECTRICAL SUBCONTRACTOR. ALL INTERCONNECTION PIPING IS TO BE FURNISHED AND INSTALLED BY THE GENERAL CONTRACTOR.
4. ALL CONDUIT AND SIGNAL WIRING SHALL BE FURNISHED AND INSTALLED BY THE ELECTRICAL SUBCONTRACTOR, EXCEPT FOR THE PLC–TO–PLC INTERCONNECTING CABLING THAT WILL BE FURNISHED UNDER SECTION 13400 FOR INSTALLATION BY THE ELECTRICAL SUBCONTRACTOR
5. A DEDICATED PHONE LINE SHALL BE INSTALLED TO THE THE FILTER CONTROL PANEL (FCP) SUPPLIED BY THE GREENSAND FILTER MANUFACTURER.

NOTES:
REFERENCE SHEET 99–I–1 FOR I/O AND CONDUIT SCHEDULES

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: RSP | Designed By: RSP | Checked By: PBH/RPN | Approved By: JWG

INSTRUMENTATION

FIRST FLOOR PLAN

Rev.	Date	Description

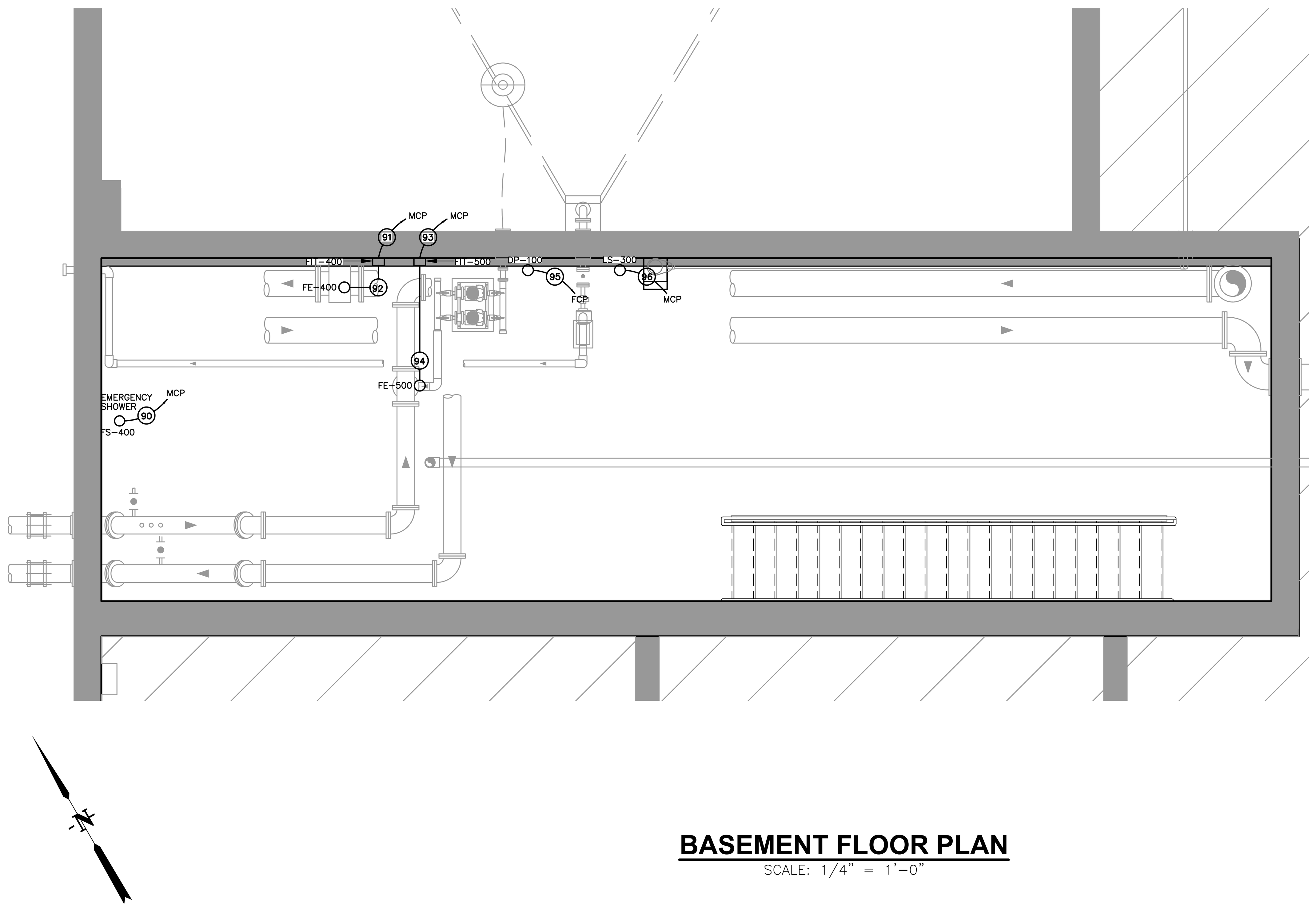
COMMONWEALTH OF MASSACHUSETTS — JON W. GREGORY — CIVIL — No. 52915 — REGISTERED PROFESSIONAL ENGINEER

5-1-19

TATA & HOWARD

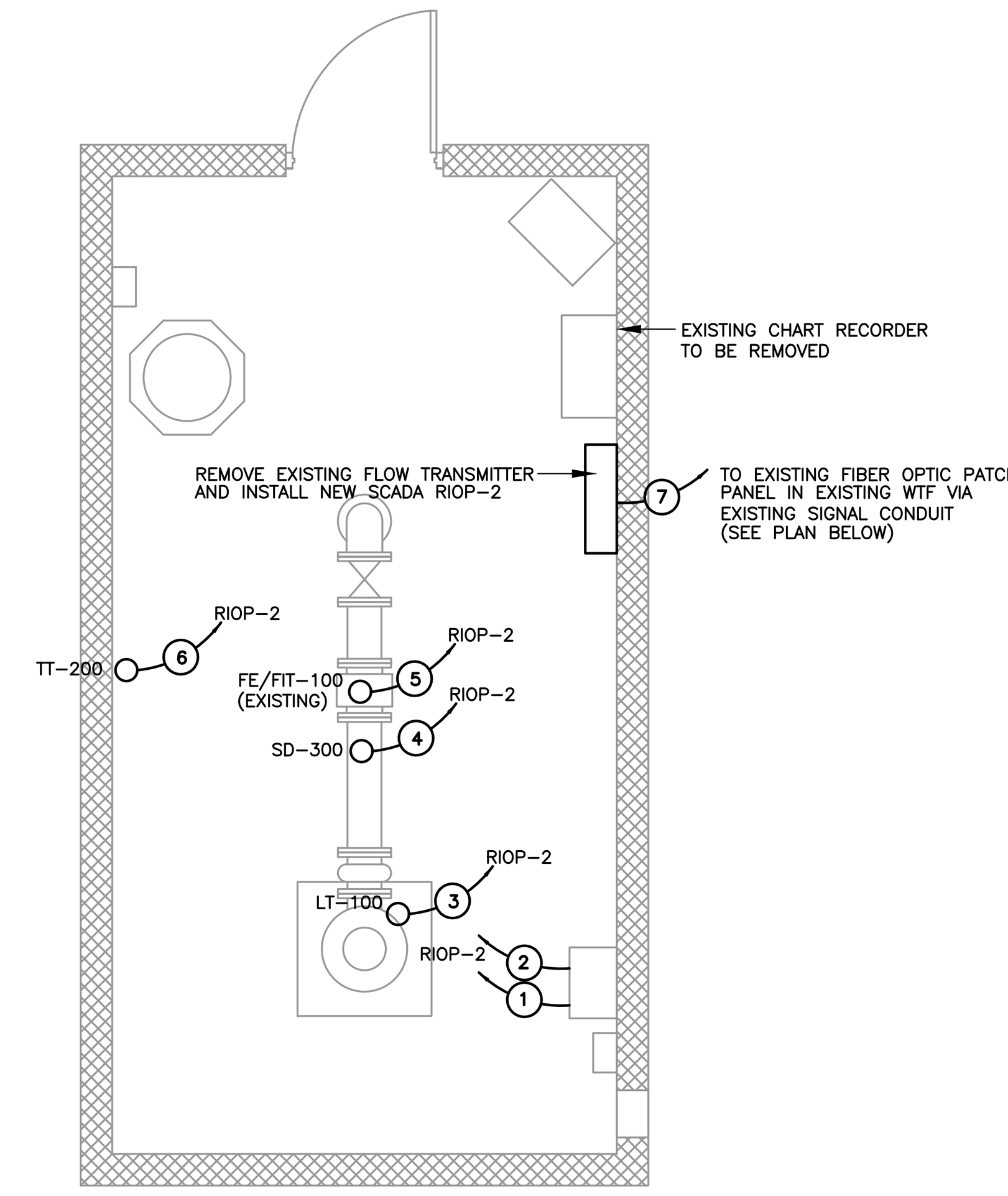
T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-I-1



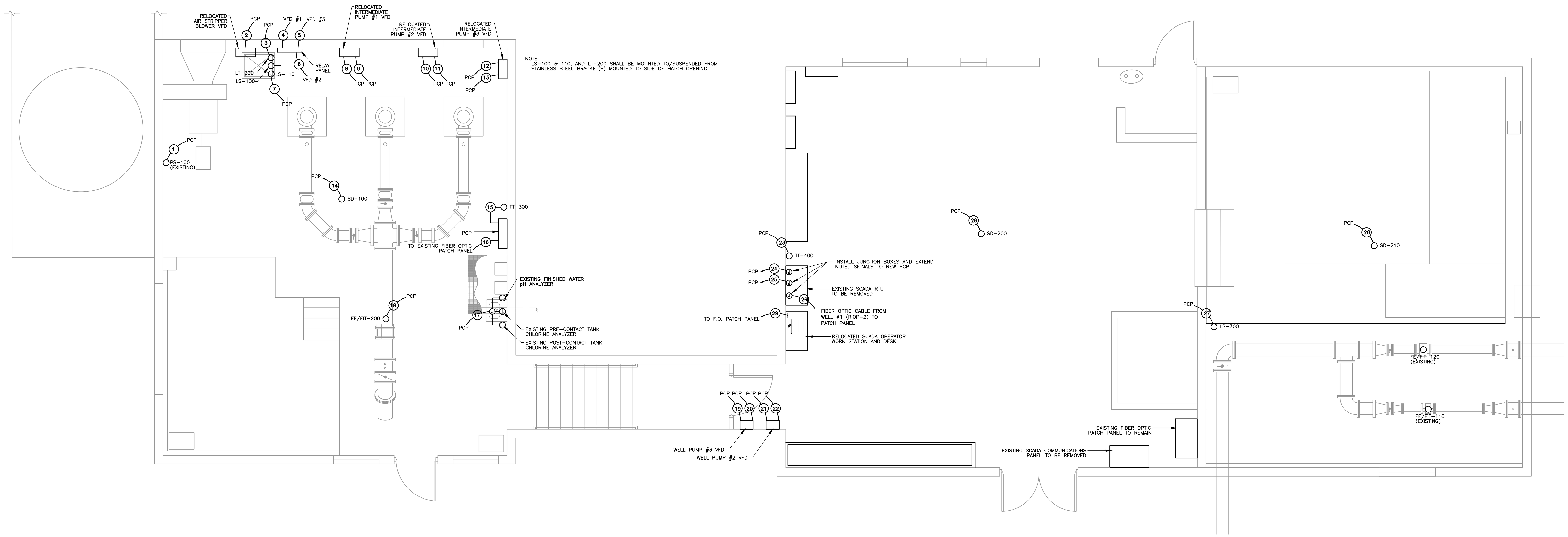
BASEMENT FLOOR PLAN

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



MAHER PUMP STATION NO. 1 FLOOR PLAN

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



EXISTING FACILITY PLAN

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

NOTES:
1. REFERENCE SHEET 99-I-1 FOR I/O AND CONDUIT SCHEDULES

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

Drawn By: RSP | Designed By: RSP | Checked By: PBH/RPN | Approved By: JWG

INSTRUMENTATION
BASEMENT, MAHER PUMP STATION NO. 1, AND EXISTING FACILITY PLANS

Rev.	Date	Description

JON W. GREGORY CIVIL No. 52815
5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

20-I-2

SCADA MCP INPUT/OUTPUT LISTING

DESCRIPTION	DISCRETE INPUT	DISCRETE OUTPUT	ANALOG INPUT	ANALOG OUTPUT
UV REACTOR #1 EFFLUENT VALVE OPEN	1			
UV REACTOR #1 EFFLUENT VALVE CLOSED	2			
UV REACTOR #2 EFFLUENT VALVE OPEN	3			
UV REACTOR #2 EFFLUENT VALVE CLOSED	4			
UV REACTOR #3 EFFLUENT VALVE OPEN	5			
UV REACTOR #3 EFFLUENT VALVE CLOSED	6			
(SPARE)	7			
(SPARE)	8			
DECANT PUMP #1 IN AUTO	9			
DECANT PUMP #2 IN AUTO	10			
HIGH BASEMENT SUMP LEVEL	11			
CHLORINE METERING PUMP #1 IN AUTO	12			
CHLORINE METERING PUMP #1 FAILURE	13			
CHLORINE METERING PUMP #2 IN AUTO	14			
CHLORINE METERING PUMP #2 FAILURE	15			
CHLORINE METERING PUMP #3 IN AUTO	16			
CHLORINE METERING PUMP #3 FAILURE	17			
CHLORINE METERING PUMP #4 IN AUTO	18			
CHLORINE METERING PUMP #4 FAILURE	19			
CHLORINE BULK TANK HI LEVEL ALARM ACKNOWLEDGE	20			
CAUSTIC METERING PUMP #1 IN AUTO	21			
CAUSTIC METERING PUMP #1 FAILURE	22			
CAUSTIC METERING PUMP #2 IN AUTO	23			
CAUSTIC METERING PUMP #2 FAILURE	24			
CAUSTIC BULK TANK HI LEVEL ALARM ACKNOWLEDGE	25			
CAUSTIC/CHLORINE CONTAINMENT AREA FLOOD	26			
PEROXIDE METERING PUMP #1 IN AUTO	27			
PEROXIDE METERING PUMP #1 FAILURE	28			
PEROXIDE METERING PUMP #2 IN AUTO	29			
PEROXIDE METERING PUMP #2 FAILURE	30			
PEROXIDE BULK TANK HI LEVEL ALARM ACKNOWLEDGE	31			
PEROXIDE CONTAINMENT AREA FLOOD	32			
PHOSPHATE METERING PUMP #1 IN AUTO	33			
PHOSPHATE METERING PUMP #1 FAILURE	34			
PHOSPHATE METERING PUMP #2 IN AUTO	35			
PHOSPHATE METERING PUMP #2 FAILURE	36			
PHOSPHATE BULK TANK HI LEVEL ALARM ACKNOWLEDGE	37			
PHOSPHATE CONTAINMENT AREA FLOOD	38			
GENERATOR #1 RUNNING	39			
GENERATOR #1 TROUBLE	40			
GENERATOR #2 RUNNING	41			
GENERATOR #2 TROUBLE	42			
EMERGENCY SHOWER FLOW – PHOSPHATE AREA	43			
EMERGENCY SHOWER FLOW – PEROXIDE AREA	44			
EMERGENCY SHOWER FLOW – CAUSTIC/CHLORINE AREA	45			
EMERGENCY SHOWER FLOW – BASEMENT	46			
FIRE ALARM	47			
INTRUSION	48			
LOSS OF POWER – AUTO. TRANSFER SWITCH	49			
LOSS OF POWER – MCP	50			
RAW WATER pH ANALYZER LOW FLOW	51			
FILTERED WATER pH/Cl2 ANALYZER LOW FLOW	52			
OXIDIZED WATER H2O2 ANALYZER LOW FLOW	53			
UV REACTOR #1 EFFLUENT VALVE OPEN		1		
UV REACTOR #1 EFFLUENT VALVE CLOSE		2		
UV REACTOR #2 EFFLUENT VALVE OPEN		3		
UV REACTOR #2 EFFLUENT VALVE CLOSE		4		
UV REACTOR #3 EFFLUENT VALVE OPEN		5		
UV REACTOR #3 EFFLUENT VALVE CLOSE		6		
START/STOP DECANT PUMP #1		7		
START/STOP DECANT PUMP #2		8		
START/STOP CHLORINE METERING PUMP #1		9		
START/STOP CHLORINE METERING PUMP #2		10		
START/STOP CHLORINE METERING PUMP #3		11		
START/STOP CHLORINE METERING PUMP #4		12		
CHLORINE BULK TANK HI LEVEL ALARM		13		
START/STOP CAUSTIC METERING PUMP #1		14		
START/STOP CAUSTIC METERING PUMP #2		15		
CAUSTIC BULK TANK HI LEVEL ALARM		16		
START/STOP PEROXIDE METERING PUMP #1		17		
START/STOP PEROXIDE METERING PUMP #2		18		
PEROXIDE BULK TANK HI LEVEL ALARM		19		
START/STOP PHOSPHATE METERING PUMP #1		20		
START/STOP PHOSPHATE METERING PUMP #2		21		
PHOSPHATE BULK TANK HI LEVEL ALARM		22		
RAW WATER pH			1	
FILTERED WATER CHLORINE RESIDUAL			2	
FILTERED WATER pH			3	
HYDROGEN PEROXIDE RESIDUAL			4	
RAW WATER TEMPERATURE			5	
(SPARE)			6	
FINISHED WATER FLOW			7	
SPENT WASHWATER TANK LEVEL			8	
DECANT PUMP #1 SPEED			9	
DECANT PUMP #2 SPEED			10	
DECANT FLOW			11	
(SPARE)			12	
BUILDING TEMPERATURE			13	
CHLORINE METERING PUMP #1 SPEED			14	
CHLORINE METERING PUMP #2 SPEED			15	
CHLORINE METERING PUMP #3 SPEED			16	
CHLORINE METERING PUMP #4 SPEED			17	
CHLORINE BULK TANK LEVEL			18	
PRE-CHLORINE DAY TANK LEVEL			19	
POST-CHLORINE DAY TANK LEVEL			20	
CAUSTIC METERING PUMP #1 SPEED			21	
CAUSTIC METERING PUMP #2 SPEED			22	
CAUSTIC BULK TANK LEVEL			23	
CAUSTIC DAY TANK LEVEL			24	
PEROXIDE METERING PUMP #1 SPEED			25	
PEROXIDE METERING PUMP #2 SPEED			26	
PEROXIDE BULK TANK LEVEL			27	
PEROXIDE DAY TANK LEVEL			28	
PHOSPHATE METERING PUMP #1 SPEED			29	
PHOSPHATE METERING PUMP #2 SPEED			30	
PHOSPHATE BULK TANK LEVEL			31	
PHOSPHATE DAY TANK WEIGHT			32	
(SPARE)				1
DECANT PUMP #1 SPEED				2
DECANT PUMP #2 SPEED				3
CHLORINE METERING PUMP #1 SPEED				4
CHLORINE METERING PUMP #2 SPEED				5
CHLORINE METERING PUMP #3 SPEED				6
CHLORINE METERING PUMP #4 SPEED				7
CHLORINE BULK TANK LEVEL				8
PEROXIDE METERING PUMP #1 SPEED				9
PEROXIDE METERING PUMP #2 SPEED				10
PEROXIDE BULK TANK LEVEL				11
CAUSTIC METERING PUMP #1 SPEED				12
CAUSTIC METERING PUMP #2 SPEED				13
CAUSTIC BULK TANK LEVEL				14
PHOSPHATE METERING PUMP #1 SPEED				15
PHOSPHATE METERING PUMP #2 SPEED				16
PHOSPHATE BULK TANK LEVEL				17

SCADA RIOP-1A, 1B, & 1C INPUT/OUTPUT LISTING

DESCRIPTION	DISCRETE INPUT	DISCRETE OUTPUT	ANALOG INPUT	ANALOG OUTPUT
FILTER A BACKWASH OUTLET VALVE OPEN	1			
FILTER A BACKWASH OUTLET VALVE CLOSED	2			
FILTER B BACKWASH OUTLET VALVE OPEN	3			
FILTER B BACKWASH OUTLET VALVE CLOSED	4			
FILTER A INFLUENT VALVE OPEN	5			
FILTER A INFLUENT VALVE CLOSED	6			
FILTER B INFLUENT VALVE OPEN	7			
FILTER B INFLUENT VALVE CLOSED	8			
FILTER A ALTERNATION VALVE OPEN	9			
FILTER A ALTERNATION VALVE CLOSED	10			
FILTER B ALTERNATION VALVE OPEN	11			
FILTER B ALTERNATION VALVE CLOSED	12			
FILTER A EFFLUENT VALVE OPEN	13			
FILTER A EFFLUENT VALVE CLOSED	14			
FILTER B EFFLUENT VALVE OPEN	15			
FILTER B EFFLUENT VALVE CLOSED	16			
FILTER A BACKWASH INLET VALVE OPEN	17			
FILTER A BACKWASH INLET VALVE CLOSED	18			
FILTER B BACKWASH INLET VALVE OPEN	19			
FILTER B BACKWASH INLET VALVE CLOSED	20			
FILTER A BACKWASH OUTLET VALVE OPEN		1		
FILTER A BACKWASH OUTLET VALVE CLOSE		2		
FILTER B BACKWASH OUTLET VALVE OPEN		3		
FILTER B BACKWASH OUTLET VALVE CLOSE		4		
FILTER A INFLUENT VALVE OPEN		5		
FILTER A INFLUENT VALVE CLOSE		6		
FILTER B INFLUENT VALVE OPEN		7		
FILTER B INFLUENT VALVE CLOSE		8		
FILTER A ALTERNATION VALVE OPEN		9		
FILTER A ALTERNATION VALVE CLOSE		10		
FILTER B ALTERNATION VALVE OPEN		11		
FILTER B ALTERNATION VALVE CLOSE		12		
FILTER A EFFLUENT VALVE OPEN		13		
FILTER A EFFLUENT VALVE CLOSE		14		
FILTER B EFFLUENT VALVE OPEN		15		
FILTER B EFFLUENT VALVE CLOSE		16		
FILTER A BACKWASH INLET VALVE OPEN		17		
FILTER A BACKWASH INLET VALVE CLOSE		18		
FILTER B BACKWASH INLET VALVE OPEN		19		
FILTER B BACKWASH INLET VALVE CLOSE		20		
FILTER A DIFFERENTIAL PRESSURE			1	
FILTER B DIFFERENTIAL PRESSURE			2	
YARMOUTH SUPPLY VALVE CLOSE (RIOP-1C ONLY)	21			
CARBON CONTACTOR BACKWASH FLOW (RIOP-1A ONLY)			3	
YARMOUTH SUPPLY FLOW (RIOP-1C ONLY)			4	
YARMOUTH SUPPLY VALVE POSITION (RIOP-1C ONLY)			5	
YARMOUTH SUPPLY FLOW CONTROL (RIOP-1C ONLY)				1

SCADA MCP/RIOP-1A, B, & C CONDUIT SCHEDULE

CONDUIT NO.	CONDUIT SIZE	CONDUCTORS	SCADA I/O REFERENCE
1	3/4"	8-#14	DI-39,40 SPARE
2	3/4"	8-#14	DI-41,42 SPARE
3	1"	CAT-6 CABLE	TO MCP
4	3/4"	6-2C/#18TS	AI-1,2,3,5,13 SPARE
5	3/4"	6-#14	DI-51,52,53
6	3/4"	4-2C/#18TS	AI-9,10 AO-2,3
7	1"	16-#14	DI-9,10 DO-7,8 SPARE
8	3/4"	6-#14	DI-47 SPARE
9	3/4"	6-#14	DI-48 SPARE
10	3/4"	2-#14	TO FCP
11	3/4"	2-#14	TO DECANT PUMP #1 & #2 VFDs
12	3/4"	2-#14	TO RESIDUALS PUMP STARTER
13	3/4"	1-2C/#18TS	AI-8
14	3/4"	1-2C/#18TS	TO FCP
15	3/4"	1-2C/#18TS	TO FCP
16	3/4"	MANUFACTURER	SUPPLIED CABLE
17	3/4"	MANUFACTURER	SUPPLIED CABLE
18	3/4"	1-2C/#18TS	TO FCP
19	3/4"	1-2C/#18TS	TO FCP
20	3/4"	1-2C/#18TS	TO RIOP-1A (AI-3)
21	3/4"	CAT-6	TO MCP
22	3/4"	2-#14	TO RIOP-1C (DI-21)
23	3/4"	2-2C/#18TS	TO RIOP-1C (AI-5 AO-1)
24	1"	1-2C/#18TS	TO RIOP-1C (AI-4)
25	3/4"	CAT-6	TO AOCP
26	3/4"	CAT-6	TO AOCP
27	3/4"	CAT-6	TO AOCP
28	3/4"	CAT-6	TO AOCP
29	3/4"	2-#14	DI-38
30	3/4"	1-2C/#18TS	AI-31
31	3/4"	MANUFACTURER	SUPPLIED CABLE
32	3/4"	2-#14	DI-43
33	3/4"	3-#14	TO PHOS. TRANSFER PUMP CP
34	3/4"	1-2C/#18TS	AI-32
35	3/4"	6-#14	DI-35 DO-21 SPARE
36	3/4"	4-#14	DI-36 SPARE
37	3/4"	2-2C/#18TS	AI-30 AO-16
38	3/4"	2-2C/#18TS	AI-29 AO-15
39	3/4"	4-#14	DI-34 SPARE
40	3/4"	6-#14	DI-33 DO-20 SPARE
41	3/4"	1-2C/#18TS	AO-17
42	3/4"	6-#14	DI-37 DO-22 SPARE
43	3/4"	2-#14	DI-32
44	3/4"	1-2C/#18TS	AI-27
45	3/4"	2-#14	DI-44
46	3/4"	MANUFACTURER	SUPPLIED CABLE
47	3/4"	3-#14	TO PEROXIDE TRANSFER PUMP CP
48	3/4"	1-2C/#18TS	AI-28
49	3/4"	6-#14	DI-29 DO-18 SPARE
50	3/4"	4-#14	DI-30 SPARE
51	3/4"	2-2C/#18TS	AI-26 AO-10
52	3/4"	2-2C/#18TS	AI-25 AO-9
53	3/4"	4-#14	DI-28 SPARE
54	3/4"	6-#14	DI-27 DO-17 SPARE
55	3/4"	1-2C/#18TS	AO-11
56	3/4"	6-#14	DI-31 DO-19 SPARE
57	3/4"	2-#14	DI-26
58	3/4"	1-2C/#18TS	AI-23
59	3/4"	6-#14	TO CAUSTIC TRANSFER PUMP CP
60	3/4"	1-2C/#18TS	AI-24
61	3/4"	6-#14	DI-21 DO-14 SPARE
62	3/4"	4-#14	DI-22 SPARE
63	3/4"	2-2C/#18TS	AI-21, AO-12
64	3/4"	4-#14	DI-24 SPARE
65	3/4"	2-2C/#18TS	AI-22, AO-13
66	3/4"	6-#14	DI-23, DO-15 SPARE
67	3/4"	6-#14	DI-12, DO-9 SPARE
68	3/4"	2-2C/#18TS	AI-14, AO-4
69	3/4"	4-#14	DI-13 SPARE
70	3/4"	2-2C/#18TS	AI-15, AO-5
71	3/4"	4-#14	DI-15 SPARE
72	3/4"	6-#14	DI-14 DO-10 SPARE
73	3/4"	6-#14	DI-16 DO-11
74	3/4"	1-2C/#18TS	AI-19
75	3/4"	4-#14	TO CL2 TRANSFER PUMP CONTROL PANEL
76	3/4"	4-#14	DI-17 SPARE
77	3/4"	2-2C/#18TS	AI-16 AO-6
78	3/4"	2-2C/#18TS	AI-17 AO-7
79	3/4"	4-#14	DI-19 SPARE
80	3/4"	6-#14	DI-18 DO-12 SPARE
81	3/4"	6-#14	CL2 TRANSFER PUMP CP TO SOL. VALVES
82	3/4"	1-2C/#18TS	AI-20
83	3/4"	1-2C/#18TS	AI-18
84	3/4"	MANUFACTURER	SUPPLIED CABLE
85	3/4"	MANUFACTURER	SUPPLIED CABLE
86	3/4"	1-2C/#18TS	AO-8
87	3/4"	6-#14	DI-20 DO-13 SPARE
88	3/4"	1-2C/#18TS	AO-14
89	3/4"	6-#14	DI-25 DO-16 SPARE
90	3/4"	2-#14	DI-46
91	3/4"	1-2C/#18TS	AI-7
92	3/4"	MANUFACTURER	SUPPLIED CABLE
93	3/4"	1-2C/#18TS	AI-11
94	3/4"	MANUFACTURER	SUPPLIED CABLE
95	3/4"	1-2C/#18TS	TO FCP
96	3/4"	2-#14	DI-11
97	3/4"	2-#14	DI-45
98	3/4"	8-#14	DI-49 SPARE
99	3/4"	8-#14	DI-1,2 DO-1,2
100	3/4"	8-#14	DI-3,4 DO-3,4
101	3/4"	8-#14	DI-1,2 DO-1,2
102	3/4"	MANUFACTURER	SUPPLIED CABLE
103	3/4"	MANUFACTURER	SUPPLIED CABLE

SCADA PCP INPUT/OUTPUT LISTING

DESCRIPTION	DISCRETE INPUT	DISCRETE OUTPUT	ANALOG INPUT	ANALOG OUTPUT
WELL PUMP #2 IN AUTO	1			
WELL PUMP #3 IN AUTO	2			
AIR STRIPPER BLOWER IN AUTO	3			
AIR STRIPPER BLOWER STATUS	4			
AIR STRIPPER BLOWER LOW PRESSURE	5			
HIGH CLEARWELL LEVEL	6			
INTERMEDIATE PUMP #1 IN AUTO	7			
INTERMEDIATE PUMP #2 IN AUTO	8			
INTERMEDIATE PUMP #3 IN AUTO	9			
(SPARE)	10			
LOSS OF POWER – PCP	11			
FLOOD	12			
YARMOUTH SUPPLY VALVE CLOSED	13			
INTERMEDIATE PUMP ROOM FIRE	14			
MAINTENANCE AREA FIRE.	15			
START/STOP WELL PUMP #2		1		
START/STOP WELL PUMP #3		2		
START/STOP AIR STRIPPER BLOWER		3		
START/STOP INTERMEDIATE PUMP #1		4		
START/STOP INTERMEDIATE PUMP #2		5		
START/STOP INTERMEDIATE PUMP #3		6		
WELL #2 LEVEL			1	
WELL #3 LEVEL			2	
WELL #2 FLOW			3	
WELL #3 FLOW			4	
WELL PUMP #2 SPEED			5	
WELL PUMP #3 SPEED			6	
CLEARWELL LEVEL			7	
INTERMEDIATE PUMP #1 SPEED			8	
INTERMEDIATE PUMP #2 SPEED			9	
INTERMEDIATE PUMP #3 SPEED			10	
AERATED WATER FLOW			11	
TREATED WATER CL2 RESIDUAL (PRE-CONTACT TANK)			12	
FILTERED WATER CL2 RESIDUAL (POST-CONTACT TANK)			13	
FILTERED WATER pH (POST-CONTACT TANK)			14	
INTERMEDIATE PUMP ROOM TEMPERATURE			15	
MAINTENANCE ROOM TEMPERATURE			16	
YARMOUTH SUPPLY FLOW			17	
YARMOUTH SUPPLY VALVE POSITION			18	
CONTACT TANK LEVEL			19	
WELL PUMP #2 SPEED				1
WELL PUMP #3 SPEED				2
INTERMEDIATE PUMP #1 SPEED				3
INTERMEDIATE PUMP #2 SPEED				4
INTERMEDIATE PUMP #3 SPEED				5
YARMOUTH SUPPLY FLOW CONTROL				6

SCADA PCP CONDUIT SCHEDULE

CONDUIT NO.	CONDUIT SIZE	CONDUCTORS	SCADA I/O REFERENCE
SCADA PUMP CONTROL PANEL (PCP)			
1	3/4"	2-#14	DI-5
2	3/4"	8-#14	DI-3,4 DO-3 SPARE
3	3/4"	1-2C/#18TS	AI-7
4	3/4"	2-#14	TO IP VFD #1
5	3/4"	2-#14	TO IP VFD #3
6	3/4"	2-#14	TO IP VFD #2
7	3/4"	2-#14	DI-6
8	3/4"	2-2C/#18TS	AI-8 AO-3
9	3/4"	6-#14	DI-7 DO-4 SPARE
10	3/4"	2-2C/#18TS	AI-9 AO-4
11	3/4"	6-#14	DI-8 DO-5 SPARE
12	3/4"	2-2C/#18TS	AI-10 AO-5
13	3/4"	6-#14	DI-9 DO-6 SPARE
14	3/4"	5-#14	DI-14
15	3/4"	1-2C/#18TS	AI-15
16	1"	FIBER OPTIC CABLE	TO PATCH PANEL
17	3/4"	3-2C/#18TS	AI-12,13,14
18	3/4"	1-2C/#18TS	AI-11
19	3/4"	2-2C/#18TS	AI-6 AO-2
20	3/4"	6-#14	DI-2 DO-2 SPARE
21	3/4"	2-2C/#18TS	AI-5 AO-1
22	3/4"	6-#14	DI-1 DO-1 SPARE
23	3/4"	1-2C/#18TS	AI-16
24	3/4"	2-#14	DI-13
25	1"	10-2C/#18TS	AI-1,2,3,4,17,18,19 AO-6 SPARE
26	1"	FIBER OPTIC CABLE	FROM PS #1 TO PATCH PANEL
27	3/4"	2-#14	DI-12
28	3/4"	5-#14	DI-15
29	3/4"	CAT-6 CABLE	TO PATCH PANEL

SCADA RIOP-2 (WELL NO. 1) INPUT/OUTPUT LISTING

DESCRIPTION	DISCRETE INPUT	DISCRETE OUTPUT	ANALOG INPUT	ANALOG OUTPUT
WELL PUMP #1 IN AUTO	1			
FIRE	2			
LOSS OF POWER (RIOP)	3			
START/STOP WELL PUMP #1		1		
WELL PUMP #1 SPEED			1	
WELL #1 FLOW			2	
WELL LEVEL			3	
WELL PUMP STATION #1 TEMPERATURE			4	
WELL PUMP #1 SPEED				1

SCADA RIOP-2 (WELL NO. 1) CONDUIT SCHEDULE

CONDUIT NO.	CONDUIT SIZE	CONDUCTORS	SCADA I/O REFERENCE
1	3/4"	4-#14	DI-1 DO-1
2	3/4"	2-2C/#18TS	AI-1 AO-1
3	3/4"	1-2C/#18TS	AI-3
4	3/4"	5-#14	DI-2
5	3/4"	1-2C/#18TS	AI-2
6	3/4"	1-2C/#18TS	AI-25
7	3/4"	FIBER OPTIC CABLE	TO PATCH PANEL IN EXISTING WTP

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

INSTRUMENTATION

I/O AND CONDUIT SCHEDULES

Rev.	Date	Description

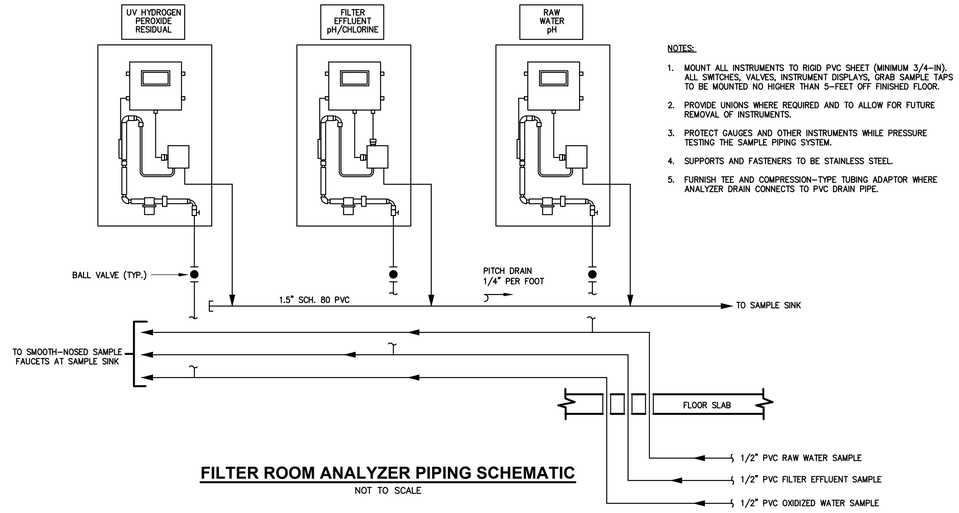
Approved By: JWG
Checked By: PBH
Designed By: RSP
Drawn By: RSP

COMMONWEALTH OF MASSACHUSETTS JON W. GREGORY No. 34109 REGISTERED PROFESSIONAL ENGINEER 5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

99-I-1

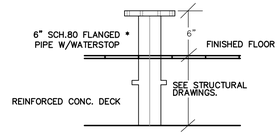


NOTES:

1. MOUNT ALL INSTRUMENTS TO RIGID PVC SHEET (MINIMUM 3/4-IN). ALL SWITCHES, VALVES, INSTRUMENT DISPLAYS, GRAB SAMPLE TAPS TO BE MOUNTED NO HIGHER THAN 5-FEET OFF FINISHED FLOOR.
2. PROVIDE UNIONS WHERE REQUIRED AND TO ALLOW FOR FUTURE REMOVAL OF INSTRUMENTS.
3. PROTECT GAUGES AND OTHER INSTRUMENTS WHILE PRESSURE TESTING THE SAMPLE PIPING SYSTEM.
4. SUPPORTS AND FASTENERS TO BE STAINLESS STEEL.
5. FURNISH TEE AND COMPRESSION-TYPE TUBING ADAPTOR WHERE ANALYZER DRAIN CONNECTS TO PVC DRAIN PIPE.

FILTER ROOM ANALYZER PIPING SCHEMATIC

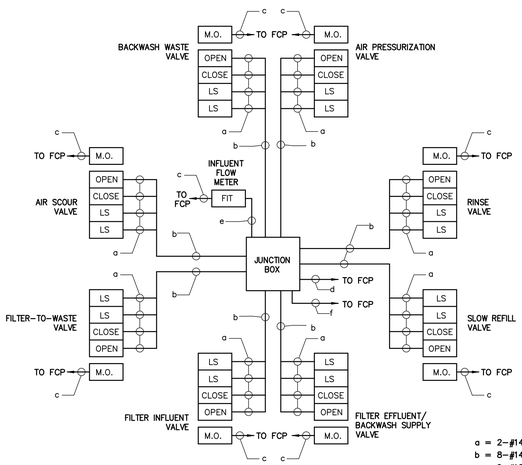
NOT TO SCALE



* CONTRACTOR SHALL CONFIRM REQUIRED DIAMETER PIPE WITH LEVEL TRANSMITTER SUPPLIER TO MITIGATE SIDE WALL EFFECTS.

DETAIL
LEVEL TRANSMITTER/FLOAT SWITCH MOUNT

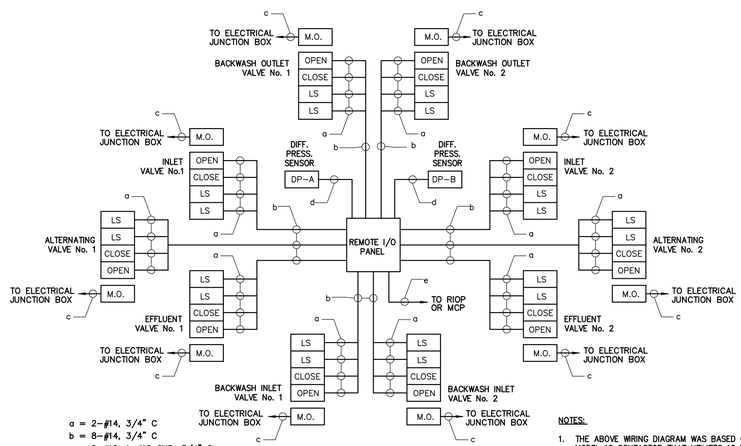
NO SCALE



a = 2-#14, 3/4" C
b = 8-#14, 3/4" C
c = 2-#12, 1-#12 GND. 3/4" C (120V POWER)
d = 68-#14, 2" C
e = 2C/#18 TSP, 3/4" C
f = 2-2C/#18 TSP, 3/4" C
M.O. = MOTOR OPERATOR
LS = LIMIT SWITCH

FILTER CONTROL VALVE/FLOW METER WIRING TYPICAL, 4 FILTERS

SCALE: NONE



a = 2-#14, 3/4" C
b = 8-#14, 3/4" C
c = 2-#12, 1-#12 GND. 3/4" C
d = 2C/#18 TSP, 3/4" C
e = ETHERNET CABLES
M.O. = MOTOR OPERATOR
LS = LIMIT SWITCH

NOTES:

1. THE ABOVE WIRING DIAGRAM WAS BASED ON THE CALGON CARBON MODEL 10 CONTACTOR THAT UTILIZES 10 MOTORIZED VALVES. OTHER APPROVED MANUFACTURERS MAY UTILIZE A DIFFERENT VALVE/PIPING ARRANGEMENT. NO ADDITIONAL COMPENSATION WILL BE ALLOWED FOR USE OF AN ALTERNATE SUPPLIER'S DESIGN.
2. RIOP-1A WILL INCLUDE CONTACTOR SPENT WASH WATER FLOW METER 4-20mA SIGNAL.
3. RIOP-1C WILL INCLUDE YARMOUTH INTERCONNECTION FLOW METER 4-20mA SIGNAL IN ADDITION TO THE YARMOUTH CONTROL VALVE SIGNALS INDICATED ON DWG. 04-I-1.
4. SEE ELECTRICAL DRAWINGS FOR LOCATION OF JUNCTION BOXES AND CIRCUITS FOR POWERING OF MOTORIZED VALVES FOR EACH PAIR OF CARBON CONTACTORS.

CARBON CONTACTOR VALVE/ PRESSURE TRANSMITTER WIRING TYPICAL, 3 PLACES

SCALE: NONE

TOWN OF BARNSTABLE, MASSACHUSETTS

MAHER FILTRATION PLANT

INSTRUMENTATION

DETAILS

Designed By: RSP
Drawn By: RSP
Checked By: PBH
Approved By: JWG

Description | Date | Rev.

COMMONWEALTH OF MASSACHUSETTS JOHN W. GREGORY PE No. 42078 REGISTERED PROFESSIONAL ENGINEER 5-1-19

TATA & HOWARD

T&H NO.: 5241
DATE: MAY 2019
SCALE: AS NOTED

99-I-2

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

SITE SPECIFIC HEALTH AND SAFETY PLAN

Airport PFAS Mitigation Project
480 Barnstable Road
Hyannis, Massachusetts

Project Number: 14105

August 13, 2020

Revision History

Date	Version	Description	Author(s)	Reviewer(s)	Date of Review(s)

TABLE OF CONTENTS

APPENDICES

Introduction

The Horsley Witten Group, Inc. ("HW"), has prepared this Health and Safety Plan ("HASP") consistent with the requirements of the Occupational Safety and Health Administration ("OSHA") 29 CRF 1910.120. The HASP has been prepared for PFAS Mitigation Project and continued soil and groundwater assessments at the Barnstable Municipal Airport located at 480 Barnstable Road in Hyannis, Massachusetts (the "Site"). The HASP will be utilized by HW personnel involved with intrusive soil activities.

Site Information and Scope of Work

The Site is an active airport were PFAS has been detected in soil and groundwater relating to the historic release of aqueous film forming foam during training exercises. HW has designed a soil caping system to reduce the infiltration of PFAS to groundwater. Construction of the capping system is scheduled to begin on August 17, 2020. HW also proposes to advance soil borings, install groundwater monitoring wells, and conduct groundwater sampling and analysis through the Site and adjoining rights-of-way.

1.0 Health and Safety Plan Implementation and Management

The HASP provides general guidance that will be consulted throughout the planning phases and during any subsurface work at the Site. This HASP only addresses risks associated with contaminated soils. No other occupational hazards are addressed in this HASP. Strict adherence to this HASP will reduce threats associated with the planned field activities. HW does not guarantee the health and safety of on-site personnel or individuals who may come in contact with contaminated soils or other hazards at the Site. It is the responsibility of on-site personnel to report all potential hazards to the Site Safety and Health Officer ("SSHO") who is responsible for the implementation and enforcement of this HASP.

1.1 Organizational Structure

1.1.1 Project Manager

The Project Manager will be responsible for implementing all safety measures and procedures established in the HASP. Responsibilities of the Project Manager include:

- Preparing and coordinating the Site work plan;
- Providing Site supervisor(s) with work assignments and overseeing their performance;
- Coordinating safety and health efforts with the SSHO;
- Serving as primary Site liaison with public agencies and officials and Site contractors.

1.1.2 Site Safety and Health Officer (SSHO)

The SSHO will be designated by the Project Manager and will serve as the on-site health and safety representative during the completion of the project specific requirements. During intrusive activities with contaminated soil, the SSHO must have a current 40-Hour OSHA HAZWOPER with appropriate 8-hour refresher training. The SSHO is responsible for ensuring that Field Staff have the required training for the project specific requirements. Records of HW OSHA HAZWOPER training will be verified by the Project Manager prior to the commencement of work. The SSHO shall maintain a record of all Field Staff and visitors associated with the project, including signed acknowledgement by each Field Staff and visitor that they have reviewed and understand the content and provisions of the HASP (Appendix B). If emergency conditions arise, operational changes occur or are anticipated, or unexpected conditions are encountered during project activities, the SSHO shall immediately contact the Project Manager to determine the necessary actions(s). The primary responsibilities of the SSHO are:

- Managing the safety and health functions on Site;
- Conduct tailgate safety meetings and maintain attendance logs and records;
- Serving as the Site's point of contact for safety and health matters;

- Ensuring site monitoring, worker training, and effective selection and use of PPE;
- Assessing site conditions for unsafe acts and conditions and providing corrective action;
- Assisting in the preparation and review of the HASP;
- Maintaining effective safety and health records as described in this HASP; and
- Coordinating with the Site Supervisor(s), Field Staff, Project Manager, and others as necessary for safety and health efforts.

1.1.3 Field Staff

All workers who may come in contact with contaminated soil located at the Site must maintain current 40-hour Occupational Safety and Health Administration ("OSHA") Hazardous Waste Operations and Emergency Response Standard ("HAZWOPER") training along with applicable 8-hour refreshers. All Field Staff are responsible for complying with the HASP, using proper personal protection equipment, and reporting unsafe acts and conditions.

2.0 Site Control

The Site Control Program is designed to reduce the spread of hazardous substances from contaminated areas to clean areas, to identify and isolate contaminated areas of the Site, to facilitate emergency evacuation and medical care, to prevent unauthorized entry to the Site, and to deter vandalism and theft.

2.1 Site Access

Access to this Site will be restricted during activities that have the potential for contact with contaminated soils (i.e., during invasive soil activities). Visitors who want to enter the area where soil sampling is being conducted must provide documentation that they have the required training and must receive a site-specific briefing about protecting themselves from Site hazards, recognizing site zones demarcations, and following emergency evacuation procedures prior to entry. The SSHO is responsible for accompanying all visitors that enter the project area. Only approved visitors (i.e., vendor deliveries, equipment support, regulatory inspections) associated with the project are allowed to visit the Site. People visiting the Site for the first time shall be informed of the potential presence of soil contamination and risk reduction measures in place. The SSHO is responsible for reviewing the content and provisions of the HASP with the visitor. The SSHO will require each visitor to sign an acknowledgement form documenting their understanding of the HASP (Appendix B). The SSHO shall maintain these records on-site throughout the duration of the project.

2.2 Site Security

Security at the Site will be maintained during working hours were exposure to contaminated soil is possible (i.e., during invasive soil activities). The Site security will be provided by Field Staff and the SSHO to prevent unauthorized entry; removal of contaminated material from the exclusion zone; exposure of unauthorized, unprotected people to site hazards; and increased hazards due to vandalism and theft.

2.3 Site Work Zones

The Site is divided into three zones as described below. These zones are characterized by the presence or assumption of chemical hazards and the activities performed within them. These zones will be determined in the field by the SSHO.

2.3.1 Exclusion Zone

The Exclusion Zone is the area where hazardous substances are known or suspected to be present and pose the greatest potential for exposure. The exclusion zone is the area were soil samples will be collected. Appropriate personnel protective equipment ("PPE") is required and no eating, smoking, or drinking is allowed in this area. Details about PPE are set forth in Section 6.1.

2.3.2 Contamination reduction zone

The Contamination Reduction Zone ("CRZ") is located between the Exclusion Zone and the Support Zone (clean zone). Its primary purpose is for decontamination of equipment. The CRZ also serves as a buffer between the Exclusion Zone and Support Zone, to limit the potential for contamination to spread to the Support Zone and outlying areas.

2.3.3 Support Zone

The Support Zone is the clean area of the Site, beyond the outer boundary of the CRZ. There should be no contamination in this zone. Administrative, clerical, and other support functions are based in the Support Zone.

3.0 Site Specific Hazard Evaluation

3.1 Chemical Hazards in Soil

PFAS has been detected in Site soils and a Method 3 Risk Assessment has determined that a Hazard Index less than 1 exists for a construction worker exposure scenario. To maintain a consistent level of safety and control over the Site, all subsurface soil will be managed as potentially contaminated soil. In the event that unexpected conditions are observed during excavation (i.e. strong odors, intact drums, distinct soil staining indicative of gross contamination, any petroleum based liquids, etc.), the SSHO shall immediately cease work, take appropriate measures to protect personnel, and notify the Project Manager. OSHA Permissible Exposure Limits ("PELs") Tables Z-1 through Z-3 is included in Appendix C.

Table 1 – PFAS and other Common Concentrations of OHM found in soil

Contaminant	Maximum Concentration at Site(mg/kg)	OSHA Permissible Exposure limits (Table Z-1 through Z-3, mg/m^3)
PFAS (Sum of 6)	0.222 mg/kg	NL
Antimony	Unknown	0.5
Arsenic	Unknown	0.5
Barium	Unknown	0.5
Beryllium	Unknown	0.0001
Chromium III	Unknown	0.5
Chromium VI	Unknown	0.0025
Copper	Unknown	1
Lead	Unknown	0.03
Manganese	Unknown	5
Mercury	Unknown	0.1*
Nickel	Unknown	1
Silver	Unknown	0.01
Vanadium	Unknown	0.5*
Zinc	Unknown	NL
Acenaphthene	Unknown	NL

Contaminant	Maximum Concentration at Site(mg/kg)	OSHA Permissible Exposure limits (Table Z-1 through Z-3, mg/m^3)
Contaminant	**Maximum Concentration (mg/kg)**	**OSHA Permissible Exposure limits (Table Z-1 through Z-3, mg/m^3)**
Acenaphthylene	Unknown	NL
Anthracene	Unknown	0.2
Benzene	Unknown	25 ppm
Benzo(a)anthracene	Unknown	NL
Benzo(a)pyrene	Unknown	0.2
Benzo(b)fluoranthene	Unknown	NL
Benzo(g,h,i)perylene	Unknown	NL
Benzo(k)fluoranthene	Unknown	NL
Carbazole	Unknown	NL
Chrysene	Unknown	0.2
Dibenzo(a,h)anthracene	Unknown	NL
Dibenzofuran	Unknown	NL
Ethyl benzene	Unknown	435
Fluoranthene	Unknown	NL
Fluorene	Unknown	0.2
Indeno(1,2,3-cd)pyrene	Unknown	NL
Naphthalene	Unknown	50
Phenanthrene	Unknown	0.2
Pyrene	Unknown	0.2
Toluene	Unknown	300 ppm
TPH	Unknown	NL
Xylene	Unknown	435

Notes:

1. mg/kg – milligrams per kilogram (parts per million).
2. mg/m3 – milligram per cubic meter
3. Maximum concentrations established during soil investigation activities conducted by others in June and July 2017 and documented in the report titled *Phase III CSO Program GSI Conceptual Design Report*, dated October 3, 2017 and provided by NBC.
4. NS – No soil standard
5. NL = No OSHA Limit
6. Bold indicates exceedance of RIDEM Direct Exposure Criteria
7. * = Applicable Ceiling Concentrations, all other concentrations are 8-hour time weighted averages.

HW calculated a Site specific action level ("SSAL") for dust at the Site using a very conservative lead concentration (a common contaminant in soil concentration with the lowest PEL) of 1,000 mg/kg and compared it to the National Ambient Air Quality Standard for PM_{10} (150 micrograms per cubic meter, [ug/m^3]). The SSAL is calculated as follows

$$\frac{\text{Contaminant Concentration (mg/Kg)}}{\text{Million Parts of Soil}} = \frac{\text{PEL of Contaminant (mg/M}^3\text{)}}{\text{Airborne Concentration Needed to Attain PEL}} \Rightarrow$$

$$\frac{1000 \text{ mg/kg}}{1{,}000{,}000 \text{ parts of soil}} = \frac{0.05 \text{ mg/m}^3}{\text{Airborne Concentration Needed to Attain PEL}} \Rightarrow$$

= **50 mg/m^3 or 50,000 ug/m^3**

This calculation verifies that it is unlikely for exceedance of the PEL since visible dust generation is unlikely at the Site and the dust concentration needed to achieve the PEL is significantly above the National Ambient Air Quality Standard of 150 ug/m^3.

HW calculated a second SSAL for dust at the Site using a very conservative fluorine concentration (PFAS does not have a PEL but total fluorine can be representative of various PFAS compounds) of 1,000 mg/kg and compared it to the National Ambient Air Quality Standard for PM_{10} (150 micrograms per cubic meter, [ug/m^3]). The SSAL is calculated as follows:

$$\frac{\text{Contaminant Concentration (mg/Kg)}}{\text{Million Parts of Soil}} = \frac{\text{PEL of Contaminant (mg/M}^3\text{)}}{\text{Airborne Concentration Needed to Attain PEL}} \Rightarrow$$

$$\frac{1000 \text{ mg/kg}}{1{,}000{,}000 \text{ parts of soil}} = \frac{0.1 \text{ mg/m}^3}{\text{Airborne Concentration Needed to Attain PEL}} \Rightarrow$$

= **100 mg/m^3 or 100,000 ug/m^3**

This calculation verifies that it is unlikely for exceedance of the PEL since visible dust generation is unlikely at the Site and the dust concentration needed to achieve the PEL is significantly above the National Ambient Air Quality Standard of 150 ug/m^3.

3.2 Equipment Decontamination Materials Brought on-Site

The use of cleaning products such as Alconox®, methanol, and/or deionized water will be used at the Site as necessary to clean non-disposable sample collection equipment. Copies of Safety Data Sheets ("SDS") for these products are included in Appendix D. All personnel will be briefed by the SSHO on the hazards associated with the cleaning products and the availability of MSDS sheets. All cleaning products will be properly labeled to indicate the contents and potential health hazards (i.e., flammability, reactivity, etc.). No other cleaning products can be utilized at the Site unless the SSHO has granted approval and an SDS sheet is obtained. Appropriate PPE will be utilized during cleaning product use.

3.3 Slips, Trips, and Falls

Slips, trips, and falls can occur from a variety of activities that may result in injury. To prevent injury, always keep the work area clean, keep walkways free of debris and objects and place sand and deicing materials on walking surfaces during winter months, as necessary. Footwear with slip and chemical resistant soles should be worn. Slip, trip and fall accidents should be reported to the SSHO, first aid implemented, and the wound progression tracked. Seek medical attention as necessary.

3.4 Underground Utilities

Prior to the start of any subsurface work, a utility notification is mandatory (*i.e*., DigSafe). If insufficient data is available to determine the location of underground utility line(s), alternative measures including the use of ground penetrating radar or soft dig techniques such as vacuum excavation to a minimum of five feet below ground surface will be utilized. In all instances, a ten foot buffer will be used between the mast of a drill rig or excavator arm and overhead lines and no borings or test pits will be advanced within five feet in any direction of marked underground lines without the approval of the Project Manager and SSHO.

3.5 Heavy Machinery

The use of heavy machinery (i.e., drilling equipment) is necessary at the Site, and high visible clothing (*i.e.*, yellow safety vest) and hard hats shall be worn at all times when in proximity to heavy machinery. Eye contact must be maintained with the equipment operator when approaching heavy machinery to reduce the potential for injury.

3.6 Work within Right-of-Ways

Work within roadway right-of-ways may be necessary. Prior to conducting work within the right-of-way, a police detail must be obtained to control the flow of traffic within proximity to the work area. The necessary traffic control equipment (cones, traffic signage, etc.) will be selected and provided by HW based upon recommendations by local law enforcement, Department of Public Works, and/or the Department of Transportation. High visible clothing (*i.e.*, yellow safety vest) and hard hats shall be worn at all times when conducting work within the right-of-way in additional to traffic control equipment.

3.7 Noise Exposure

Noise exposure above 85 decibels may be encountered with the use of heavy machinery at the Site. All personnel located within proximity of heavy machinery above 85 decibels must wear hearing protection.

3.8 Venomous Animals

Some animals such as snakes and spiders have the ability to inject venom. Poisonous spiders are rare in Massachusetts and no poisonous snakes are known to exist. Bites from all animals should be reported to the SSHO, first aid implemented, and the wound progression tracked. Seek medical attention as necessary.

3.9 Poisonous Plants

Plants such as Poison Ivy and Poison Sumac should be avoided and not touched. Do not touch any plants that you are not absolutely sure of their identity and that they are safe to touch. Under no circumstances should wild plants and berries at the Site be consumed. Reactions from poisonous plants should be reported to the SSHO, first aid implemented, and the reaction progression tracked. Seek medical attention as necessary.

3.10 Insects

Insects such as mosquitoes, ticks, bees, and wasps may be encountered at the Site. Mosquitoes and ticks can carry disease and bees and wasps can sting. Insect repellent can be worn to reduce the potential for exposure to mosquitoes and ticks. Areas where bee and wasps nests are observed should be avoided. Medical attention should be sought immediately by those individuals that are allergic to stings. Reactions from insects should be reported to the SSHO, first aid implemented, and the reaction progression tracked.

3.11 Weather Hazards

The SSHO will monitor the daily weather report each morning. Weather related hazards correlate directly to the planed weather. For example, slip, trip, and fall hazards can increase due to slippery surfaces related to rain, ice, or snow. Care should be taken during weather related hazards to reduce the potential for injury. In the event of severe weather (i.e., high winds, flash floods, or snow storms) work shall be suspended until it is safe to presume. For lightning and thunder, work will immediately stop until 30 minutes have passed since the last observed thunder or lightning strike.

3.12 Heat Stress

Site-specific environmental conditions (temperature, humidity, and air movement), employee work loads, and PPE may expose employees to hazards resulting in injury or illness related to heat stress. The SSHO is responsible for monitoring work area heat conditions and worker physiological parameters, and for ensuring that employees are trained to recognize the signs and symptoms of heat stress illnesses or injury and what to do if these occur. Symptoms of heat related illness obtained from the Centers for Disease Control and Prevention and what to do are as follows:

Table 2 – Heat Related Illnesses

HEAT-RELATED ILLNESSES

WHAT TO LOOK FOR	WHAT TO DO
HEAT STROKE	
• High body temperature (103°F or higher) • Hot, red, dry, or damp skin • Fast, strong pulse • Headache • Dizziness • Nausea • Confusion • Losing consciousness (passing out)	• Call 911 right away-heat stroke is a medical emergency • Move the person to a cooler place • Help lower the person's temperature with cool cloths or a cool bath • Do not give the person anything to drink
HEAT EXHAUSTION	
• Heavy sweating • Cold, pale, and clammy skin • Fast, weak pulse • Nausea or vomiting • Muscle cramps • Tiredness or weakness • Dizziness • Headache • Fainting (passing out)	• Move to a cool place • Loosen your clothes • Put cool, wet cloths on your body or take a cool bath • Sip water **Get medical help right away if:** • You are throwing up • Your symptoms get worse • Your symptoms last longer than 1 hour
HEAT CRAMPS	
• Heavy sweating during intense exercise • Muscle pain or spasms	• Stop physical activity and move to a cool place • Drink water or a sports drink • Wait for cramps to go away before you do any more physical activity **Get medical help right away if:** • Cramps last longer than 1 hour • You're on a low-sodium diet • You have heart problems
SUNBURN	
• Painful, red, and warm skin • Blisters on the skin	• Stay out of the sun until your sunburn heals • Put cool cloths on sunburned areas or take a cool bath • Put moisturizing lotion on sunburned areas • Do not break blisters
HEAT RASH	
• Red clusters of small blisters that look like pimples on the skin (usually on the neck, chest, groin, or in elbow creases)	• Stay in a cool, dry place • Keep the rash dry • Use powder (like baby powder) to soothe the rash

Table obtained from the Centers for Disease Control and Prevention

3.13 Cold Stress

Exposure to the cold can happen during the winter months. Work will cease under unusually hazardous conditions (i.e., wind chill less than 0°F or heavy snow). The SSHO is responsible for monitoring site conditions and worker physiological parameters, and for ensuring that employees are trained to recognize the signs and symptoms of cold illnesses or injury and proper treatment. Symptoms of cold related illness obtained from the Centers for Disease Control and Prevention and proper treatment procedures are as follows:

Hypothermia

When exposed to cold temperatures, your body begins to lose heat faster than it can be produced. Prolonged exposure to cold will eventually use up your body's stored energy. The result is hypothermia, or abnormally low body temperature. A body temperature that is too low affects the brain, making the victim unable to think clearly or move well. This makes hypothermia particularly dangerous because a person may not know it is happening and will not be able to do anything about it.

Symptoms of hypothermia can vary depending on how long you have been exposed to the cold temperatures.

Early Symptoms

- Shivering
- Fatigue
- Loss of coordination
- Confusion and disorientation

Late Symptoms

- No shivering
- Blue skin
- Dilated pupils
- Slowed pulse and breathing
- Loss of consciousness

First Aid

Take the following steps to treat a worker with hypothermia:

- Alert the SSHO and request medical assistance.
- Move the victim into a warm room or shelter.
- Remove their wet clothing.
- Warm the center of their body first-chest, neck, head, and groin-using an electric blanket, if available; or use skin-to-skin contact under loose, dry layers of blankets, clothing, towels, or sheets.

- Warm beverages may help increase the body temperature, but do not give alcoholic beverages. Do not try to give beverages to an unconscious person.
- After their body temperature has increased, keep the victim dry and wrapped in a warm blanket, including the head and neck.
- If victim has no pulse, begin cardiopulmonary resuscitation (CPR).

Frostbite

Frostbite is an injury to the body that is caused by freezing. Frostbite causes a loss of feeling and color in the affected areas. It most often affects the nose, ears, cheeks, chin, fingers, or toes. Frostbite can permanently damage body tissues, and severe cases can lead to amputation. In extremely cold temperatures, the risk of frostbite is increased in workers with reduced blood circulation and among workers who are not dressed properly.

Symptoms:

- Reduced blood flow to hands and feet (fingers or toes can freeze)
- Numbness
- Tingling or stinging
- Aching
- Bluish or pail, waxy skin

First Aid

Workers suffering from frostbite should:

- Get into a warm room as soon as possible.
- Unless absolutely necessary, do not walk on frostbitten feet or toes. This can increase the damage.
- Immerse the affected area in warm-not hot-water (the temperature should be comfortable to the touch for unaffected parts of the body).
- Warm the affected area using body heat; for example, the heat of an armpit can be used to warm frostbitten fingers.
- Do not rub or massage the frostbitten area; doing so may cause more damage.
- Do not use a heating pad, heat lamp, or the heat of a stove, fireplace, or radiator for warming. Affected areas are numb and can be easily burned.

Trench Foot

Trench foot, also known as immersion foot, is an injury of the feet resulting from prolonged exposure to wet and cold conditions. Trench foot can occur at temperatures as high as 60 ^{o}F if the feet are constantly wet. Injury occurs because wet feet lose heat 25-times faster than dry feet. Therefore, to prevent heat loss, the body constricts blood vessels to shut down circulation in the feet. Skin tissue begins to die because of lack of oxygen and nutrients and due to the buildup of toxic products.

Symptoms

- Reddening of the skin
- Numbness
- Leg cramps
- Swelling
- Tingling pain
- Blisters or ulcers
- Bleeding under the skin
- Gangrene (the foot may turn dark purple, blue, or gray)

First Aid

Workers suffering from trench foot should:

- Remove shoes/boots and wet socks.
- Dry their feet.
- Avoid walking on feet, as this may cause tissue damage.

Chilblains

Chilblains are caused by the repeated exposure of skin to temperatures just above freezing to as high as 60 degrees F. The cold exposure causes damage to the capillary beds (groups of small blood vessels) in the skin. This damage is permanent, and the redness and itching will return with additional exposure. The redness and itching typically occurs on cheeks, ears, fingers, and toes.

Symptoms

- Redness
- Itching
- Possible blistering
- Inflammation
- Possible ulceration in severe cases

First Aid

Workers suffering from chilblains should:

- Avoid scratching
- Slowly warm the skin
- Use corticosteroid creams to relieve itching and swelling
- Keep blisters and ulcers clean and covered

4.0 Risk Reduction Measures

Risk of harm from exposure to the contaminants summarized in Table 1 is through long-term exposure through dermal contact, ingestion, or inhalation of contaminated dust. Accordingly, risk reduction measures are designated to reduce the potential for these exposures during site activities involving contact with potentially contaminated soil.

4.1 Personnel Protective Equipment

Based on an evaluation of the anticipated hazards, at a minimum, Level D PPE, in accordance with OSHA HAZWOPER 29 CFR 1910.120, will be required for any Field Staff who may come in contact with contaminated soil. All Level D PPE (eye protection, gloves, hard hat, etc.) will be provided by HW.

The following PPE will be used, at a minimum, for all Field Staff engaged in activities requiring Level D PPE:

- Coveralls/uniform
- Cold weather gear (if necessary, based on temperature)
- High visibility vest
- Safety boots
- Gloves
- Eye protection
- Hard hat
- Hearing protection

4.2 Personnel and Equipment Decontamination

HW will establish a decontamination area within the CRZ. Personnel decontamination will occur at the end of each work day, and upon project completion. Personnel decontamination will consist of the removal and disposal of any disposable PPE (i.e. coveralls, gloves) and surface cleaning of any hand tools. HW shall maintain replacement PPE in the decontamination area to facilitate PPE replacement during work activities.

4.3 Equipment Decontamination

Before equipment leaves the Exclusion Zone, all visible soil will be physically removed, collected, and returned to the subsurface. Any wash water generated in the exclusion zone relating to the rinsing of equipment will be discharged to the subsurface within the Exclusion Zone. Methanol will be containerized for appropriate off-site disposal. During project demobilization, and prior to leaving the Site, heavy machinery shall be inspected by the SSHO for visible signs of soil. Soil shall be removed by brush, to the extent practicable. Soil shall be collected and returned to the subsurface within the Exclusion Zone or containerized for proper disposal if evidence of gross contamination is observed.

4.4 Dust Control

During intrusive activities associated with PFAS mitigation, dust generation will be monitored in real-time using particulate dust monitors. A Site-specific action level of 150 ug/m^3 has been established at

the Site. Monitoring will be conducted at one upwind and two downwind locations. Visible dust generation or exceedance of the Site-specific action limit will require work to immediately stop and dust suppression methodologies will be employed. Dust is not anticipated to be generated during sample collection at the Site.

4.5 Ambient Air Monitoring for Total Organic Vapors

Ambient air monitoring for total organic vapors ("TOVs") will be conducted within the Exclusion Zone with a photo-ionization detector ("PID") during sample colection. A site-specific action level of 1 part per million by volume ("ppmv") above background has been established at the Site. This action level is based on benzene. Work will cease if the action level is exceeded and the Project Manager will be contacted to determine the appropriate action.

Ambient air monitoring for VOCs will not be conducted during the PFAS Mitigation project since TOVs are not a concern for PFAS compounds.

4.6 Medical Surveillance Program

Medical surveillance requirements are based on a worker's potential for exposure as determined by the hazard analysis. Based on the limited potential for worker exposure to hazardous substances at or above the PELs or other published exposure limits (less than 30 days per year); limited use of respirators (less than 30 days per year); and the absence of an employee-staffed HAZMAT team, the medical surveillance program required at the Site is also limited. The Site medical surveillance program provides that:

1. Workers assigned to tasks requiring the use of respirators receive medical examinations in accordance with 29 CFR 1910.134(e) to ensure they are physically capable to perform the work and use the equipment.
2. If a worker is injured, becomes ill, or develops signs or symptoms of possible over-exposure to hazardous substances or health hazards, medical examinations are provided to that worker as soon as possible after the occurrence and as required by the attending physician.

Medical examinations and procedures are performed by or under the supervision of a licensed physician and are provided to employees free of cost, without loss of pay, and at a reasonable time and place. The need to implement a more comprehensive medical surveillance program will be re-evaluated in the event of an over-exposure incident or the hazard analysis of the Site is changed.

5.0 Hazard Communication

The SSHO is responsible for communicating all project related hazards and safety regulations to field personnel. At a minimum, the SSHO shall hold daily safety meetings with all field personnel and provide an overview of proper PPE and worker sanitation, project monitoring requirements (if applicable), and emergency response procedures.

6.0 Spill Prevention

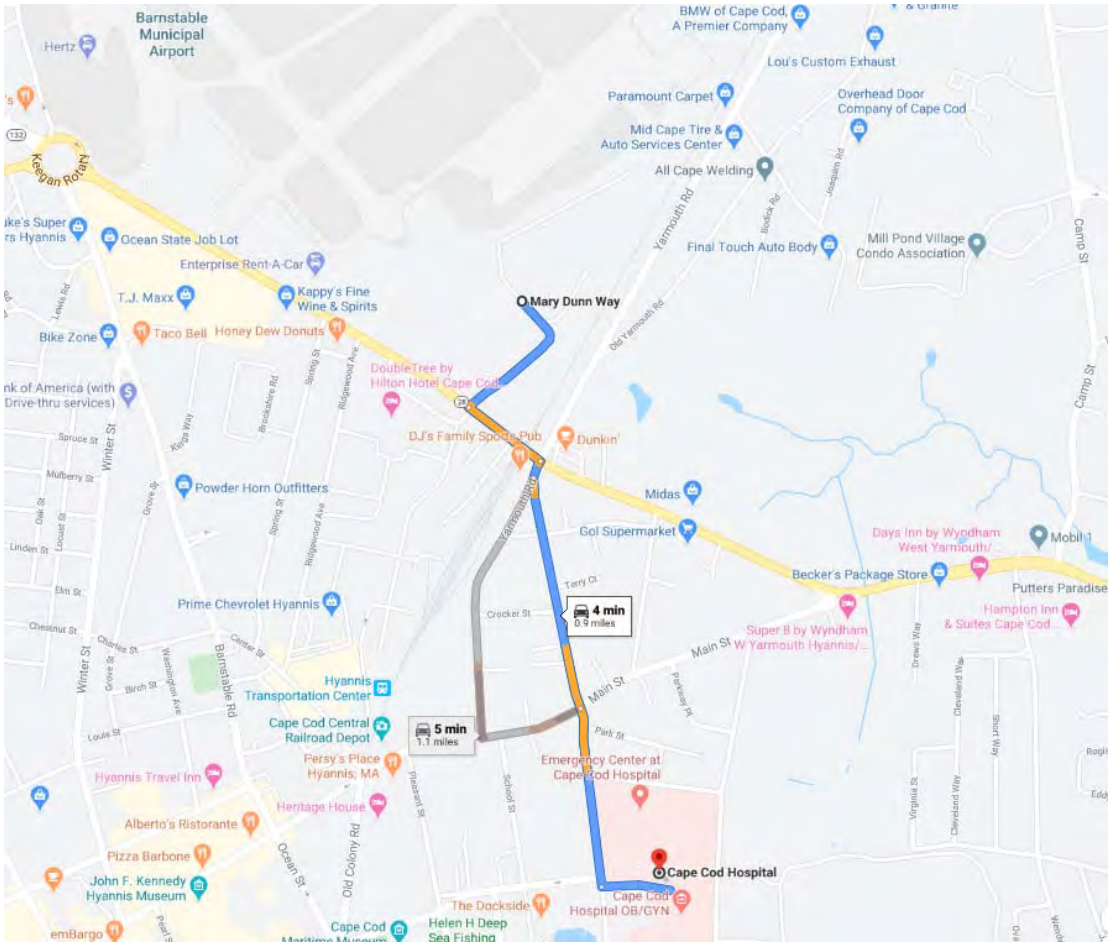
An evaluation was conducted to determine the potential for hazardous substance spills at the Site. That evaluation indicates that there is no potential for a hazardous substance spill of a sufficient quantity to require containment planning, equipment, and procedures. For that reason, no spill containment program is implemented at this Site.

7.0 Emergency Response Procedures

In the event of an emergency, the SSHO will be notified as soon as possible. The SSHO shall notify the Project Manager as soon as possible. Emergency contact information can be found below.

CONTACT	TELEPHONE
Barnstable Fire Department	911 or 508-539-1454
Barnstable Police Department	911 or 508-477-1212
Massachusetts Poison Control Center	800-222-1222
MassDEP Spill Hotline	888-304-1133
Bryan Massa Project Manager	781-243-1527
Cape Cod Hospital	508-771-1800

8.0 Nearest Medical Facility



Cape Cod Hospital
27 Park Street
Hyannis, MA 02601
508-771-1800

DIRECTIONS FROM SITE TO FALMOUTH HOSPITAL (19 MINUTE DRIVE)

1. Head southeast on Marry Dunn Way towards Brook Road (0.2 miles)
2. Turn left onto Iyannough Road (0.1 miles)
3. Turn right onto Yarmouth Road (112 feet)
4. Slight left onto Camp Street (0.3 miles)
5. Continue onto Lewis Bay Road (0.2 miles)
6. Turn left onto Jeffrey Way (436 feet)
7. Arrive at Cape Cod Hospital

9.0 Plan Approval and Acknowledgement

Prior to any work on the Site that has the potential to disturb soil, the designated Project Manager and SSHO must acknowledge and approve the Health and Safety Plan, dated August 13, 2020. The Health and Safety Plan was prepared for the Barnstable Municipal Airport, located at 480 Barnstable Road, Hyannis, Massachusetts, by Horsley Witten Group, Inc. The Plan is not to be used for any other site.

_____

Project Manager

Senior Scientist_____

Title

08/13/2020_____

Date

Josephine Ibanez_____

Site Safety and Health Officer

Environmental Scientist_____

Title

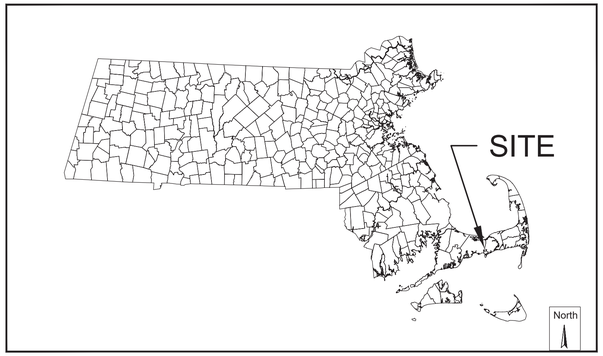
08/13/2020_____

Date:

Appendix A – Site Map

HYA SOIL CAPPING & DRAINAGE FOR PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) MITIGATION
FINAL CONSTRUCTION PLANS
BARNSTABLE, MASSACHUSETTS

MAY 2020

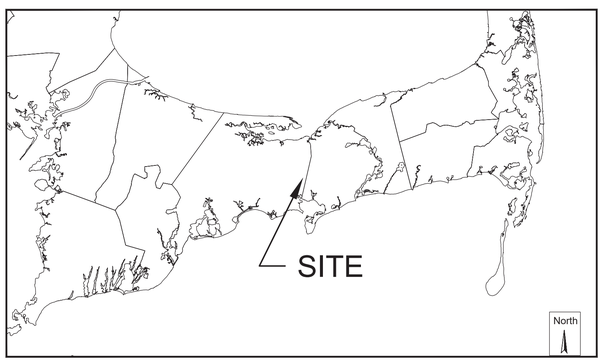


MASSACHUSETTS

Graphic Scale

0 150000

SCALE IN FEET
1:150000



BARNSTABLE

Graphic Scale

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SCALE IN FEET
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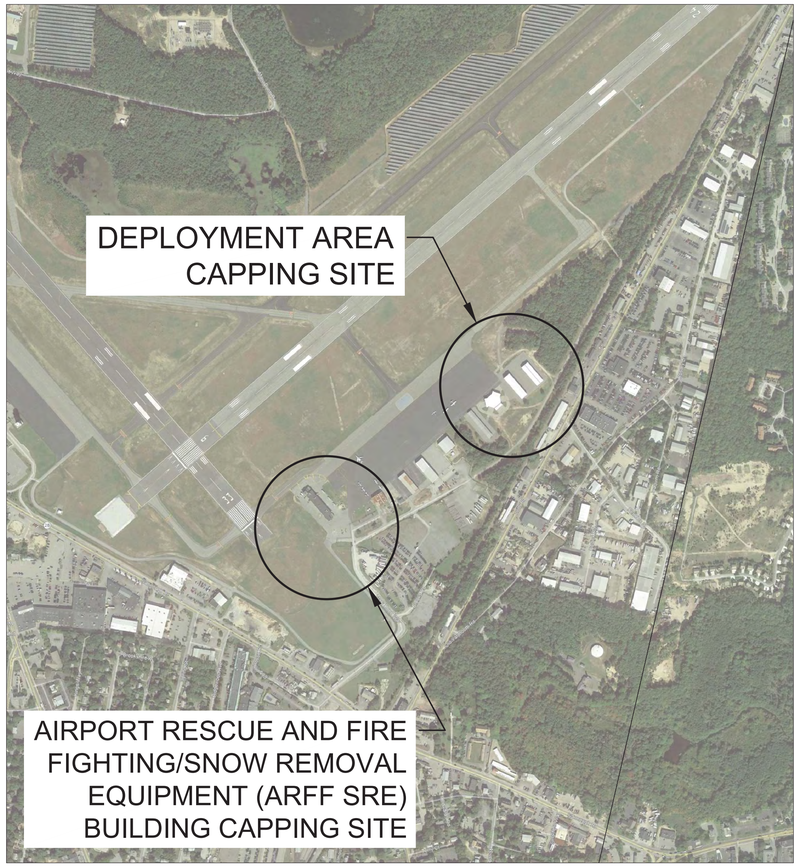

CAPPING SITES

1 INCH = 500 FEET

0 500

SCALE IN FEET
1:500

Sheet List Table	
Sheet Number	Sheet Title
1	COVER & SHEET INDEX
2	CONSTRUCTION NOTES & DETAILS
3	EROSION & SEDIMENTATION CONTROL PLAN
4	SITE PLAN (ARFF SRE BUILDING)
5	SITE PLAN (DEPLOYMENT AREA)
6	CONSTRUCTION SAFETY AND PHASING PLAN - GENERAL NOTES
7	CONSTRUCTION SAFETY AND PHASING PLAN - DETAILS
8	CONSTRUCTION SAFETY AND PHASING PLAN - SITE PLAN
9	CONSTRUCTION SAFETY AND PHASING PLAN - WORK AREA I
10	CONSTRUCTION SAFETY AND PHASING PLAN - WORK AREA II

GENERAL NOTES:

1. THIS PLAN SET IS FOR BIDDING/PRICING AND NOT FOR CONSTRUCTION.

Plan Set:

HYA SOIL CAPPING & DRAINAGE FOR PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) MITIGATION
FINAL CONSTRUCTION PLANS
BARNSTABLE, MASSACHUSETTS

Prepared For:

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Revisions

Rev.	Date	By	Appr.	Description
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Project Number: 17027A

Sheet Number: 1 of 10

Drawing Number: C - 1

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SURVEY NOTES:

1. THE EXISTING CONDITIONS DEPICTED IN THIS PLAN SET WERE TAKEN FROM THE SURVEY PLANS ENTITLED "EAST RAMP EXISTING CONDITIONS PLAN," PRODUCED BY DANIEL W. MACKENZIE, PLS OF THE HORSLEY WITTEN GROUP, INC. ON 2/7/20. THESE SURVEY PLANS WERE BASED ON A FIELD SURVEY CONDUCTED BY THE HORSLEY WITTEN GROUP ON NOVEMBER 19, AND NOVEMBER 22, 2019.
2. THIS PLAN DOES NOT SHOW ANY RECORDED OR UNWRITTEN EASEMENTS WHICH MAY EXIST. HOWEVER, THIS DOES NOT CONSTITUTE A GUARANTEE THAT NO SUCH EASEMENTS EXIST.
3. THE ELEVATIONS DEPICTED HEREON WERE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988.
4. ALL PROPERTY AND BOUNDARY LINES DEPICTED ARE APPROXIMATE ONLY.
5. EXISTING CONTOUR INTERVALS ARE EQUAL TO ONE FOOT.
6. THE ACCURACY OF MEASURED PIPE INVERTS AND PIPE SIZES IS SUBJECT TO FIELD CONDITIONS, THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS AND OTHER CONDITIONS

GENERAL CONSTRUCTION NOTES:

1. ALL SITE WORK TO COMPLETE THIS PROJECT AS INDICATED ON THE DRAWINGS AND IN THE SPECIFICATIONS IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
2. IMMEDIATELY CONTACT AND COORDINATE WITH THE ENGINEER AND OWNER IF ANY DEVIATION OR ALTERATION OF THE WORK PROPOSED ON THESE DRAWINGS IS REQUIRED.
3. UTILIZE ALL PRECAUTIONS AND MEASURES TO ENSURE THE SAFETY OF THE PUBLIC, ALL PERSONNEL AND PROPERTY DURING CONSTRUCTION IN ACCORDANCE WITH OSHA STANDARDS, INCLUDING THE INSTALLATION OF TEMPORARY FENCING BARRICADES, SAFETY LIGHTING, CONES, POLICE DETAIL AND/OR FLAGMEN AS DETERMINED NECESSARY BY THE TOWN/CITY/LOCAL MUNICIPALITY. THE CONTRACTOR IS RESPONSIBLE FOR THE COST OF POLICE DETAIL AND FOR COORDINATING WITH THE LOCAL OR STATE POLICE DEPARTMENT FOR ALL REQUIRED POLICE DETAIL.
4. MAKE ALL NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN ALL NECESSARY CONSTRUCTION PERMITS, PAY ALL FEES INCLUDING POLICE DETAILS AND POST ALL BONDS, IF NECESSARY, ASSOCIATED WITH THE SAME, AND COORDINATE WITH THE OWNER AND THE ENGINEER.
5. ALL EXISTING CONDITIONS SHOWN ARE APPROXIMATE AND ARE BASED ON THE BEST INFORMATION AVAILABLE. PRIOR TO THE START OF CONSTRUCTION VERIFY THAT THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS DO NOT CONFLICT WITH ANY KNOWN EXISTING OR OTHER PROPOSED IMPROVEMENTS. IF ANY CONFLICTS ARE DISCOVERED, NOTIFY THE OWNER AND THE ENGINEER PRIOR TO INSTALLING ANY PORTION OF THE SITE WORK WHICH WOULD BE AFFECTED.
6. THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AND STRUCTURES AS INDICATED ON THE DRAWINGS ARE BASED ON RECORDS OF VARIOUS UTILITY COMPANIES, AND WHEREVER POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED UPON AS BEING EXACT OR COMPLETE. VERIFY THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES IN THE FIELD PRIOR TO THE START OF CONSTRUCTION. CONTACT THE APPROPRIATE UTILITY COMPANY, ANY GOVERNING PERMITTING AUTHORITY IN THE TOWN, AND "DIGSAFE" (1-888-344-7233) AT LEAST THREE BUSINESS DAYS PRIOR TO ANY EXCAVATION WORK IN PREVIOUSLY UNALTERED AREAS TO REQUEST EXACT FIELD LOCATION OF UTILITIES. THE CONTRACTOR MUST RESOLVE CONFLICTS BETWEEN THE PROPOSED UTILITIES AND FIELD-LOCATED UTILITIES AND REPORT ANY DISCREPANCIES TO THE ENGINEER IMMEDIATELY. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR DAMAGES INCURRED AS A RESULT OF UTILITIES OMITTED, INCOMPLETELY OR INACCURATELY SHOWN. THE CONTRACTOR MUST MAINTAIN ACCURATE RECORDS OF THE LOCATION AND ELEVATION OF ALL WORK INSTALLED AND EXISTING UTILITIES FOUND DURING CONSTRUCTION FOR THE PREPARATION OF THE AS-BUILT PLAN.
7. COORDINATE AND MAKE ALL CONNECTION ARRANGEMENTS WITH UTILITY COMPANIES, AS REQUIRED.
8. THE CONTRACTOR MUST MAINTAIN ALL EXISTING UTILITIES IN WORKING ORDER AND FREE FROM DAMAGE DURING THE ENTIRE DURATION OF THE PROJECT. REPAIR ANY DAMAGE TO EXISTING UTILITY LINES OR STRUCTURES INCURRED DURING CONSTRUCTION OPERATIONS AT NO COST TO THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR ALL COST RELATED TO THE REPAIR OF UTILITIES. EXCAVATION REQUIRED WITHIN THE PROXIMITY OF EXISTING UTILITY LINES MUST BE DONE BY HAND.
9. COORDINATE ALL TRENCHING WORK WITHIN ROADWAYS WITH THE PROPER LOCAL & STATE AGENCY. THE CONTRACTOR IS RESPONSIBLE FOR ALL TRENCH SAFETY INCLUDING ANY LOCAL AND/OR STATE PERMITS REQUIRED FOR THE TRENCH WORK. IF THIS WORK IS REQUIRED TO OCCUR OUTSIDE THE AGREED UPON HOURS OF OPERATION FOR THE FACILITY, THE CONTRACTOR MUST PLAN ACCORDINGLY.
10. SAWCUT ALL TRENCH WORK WITHIN EXISTING PAVEMENT AS INDICATED ON THE DRAWINGS. BACKFILL AND COMPACT TRENCH WORK AS INDICATED ON THE DRAWING AND IN THE SPECIFICATIONS. IF SETTLEMENT OCCURS DUE TO INADEQUATE COMPACTION, AS DETERMINED BY THE ENGINEER, WITHIN THE WARRANTY PERIOD, CONTRACTOR IS REQUIRED TO REMOVE, PATCH AND REPAVE AFTER ONE COMPLETE 12-MONTH CYCLE.
11. IMPORT ONLY CLEAN MATERIAL. MATERIAL FROM AN EXISTING OR FORMER 21E SITE AS DEFINED BY THE MASSACHUSETTS CONTINGENCY PLAN 310 CMR 40.0000 WILL NOT BE ACCEPTED . ANALYTICAL TESTING OF BACKFILL MATERIAL FOR PFAS IS REQUIRED TO BE SUBMITTED TO THE OWNER AND ENGINEER FOR APPROVAL PRIOR TO PLACEMENT.
12. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH AND MAINTAIN ALL CONTROL POINTS AND BENCHMARKS DURING CONSTRUCTION INCLUDING BENCHMARK LOCATIONS AND ELEVATIONS AT CRITICAL AREAS. COORDINATE WITH THE ENGINEER THE LOCATION OF ALL CONTROL POINTS AND BENCHMARKS.
13. SITE LAYOUT SURVEY REQUIRED FOR CONSTRUCTION MUST BE PROVIDED BY THE CONTRACTOR AND PERFORMED BY A MASSACHUSETTS' REGISTERED PROFESSIONAL LAND SURVEYOR. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH THE SURVEYOR FOR ALL SITE SURVEY WORK.
14. MAINTAIN ALL GRADE STAKES SET BY THE SURVEYOR. GRADE STAKES ARE TO REMAIN UNTIL A FINAL INSPECTION OF THE ITEM HAS BEEN COMPLETED BY THE ENGINEER. RE-STAKING OF PREVIOUSLY SURVEYED SITE FEATURES IS THE RESPONSIBILITY (INCLUDING COST) OF THE CONTRACTOR.
15. UNLESS OTHERWISE INDICATED ON THE DRAWINGS AND/OR IN THE SPECIFICATIONS, ALL SITE CONSTRUCTION MATERIALS AND METHODOLOGIES ARE TO CONFORM TO THE MOST RECENT VERSION OF THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS (THE COMMONWEALTH OF MASSACHUSETTS DEPARTEMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGES 2020 EDITION).
16. PROVIDE ALL CONSTRUCTION SERVICE IN ACCORDANCE WITH APPLICABLE LAWS AND REGULATIONS REGARDING NOISE, VIBRATION, DUST, SEDIMENTATION CONTAINMENT, AND TRENCH WORK.
17. COLLECT SOLID WASTES AND STORE IN A SECURED DUMPSTER. THE DUMPSTER MUST MEET ALL LOCAL AND STATE SOLID WASTE MANAGEMENT REGULATIONS.
18. RESTORE ALL SURFACES EQUAL TO THEIR ORIGINAL CONDITION AFTER CONSTRUCTION IS COMPLETE PER SPECIFICATIONS. LEAVE ALL AREAS NOT DISTURBED BY CONSTRUCTION IN THEIR NATURAL STATE. TAKE CARE TO PREVENT DAMAGE TO SHRUBS, TREES, OTHER LANDSCAPING AND/OR NATURAL FEATURES. WHEREAS THE PLANS DO NOT SHOW ALL LANDSCAPE FEATURES, EXISTING CONDITIONS MUST BE VERIFIED BY THE CONTRACTOR IN ADVANCE OF THE WORK.
19. REGULARLY INSPECT THE PERIMETER OF THE PROPERTY TO CLEAN UP AND REMOVE LOOSE CONSTRUCTION DEBRIS BEFORE IT LEAVES THE SITE. PROMPTLY REMOVE ALL DEMOLITION DEBRIS FROM THE SITE TO AN APPROVED DUMP SITE.
20. ALL TRUCKS LEAVING THE SITE MUST BE COVERED.
21. DO NOT WASH ANY CONCRETE OR MORTAR ONSITE. REMOVE BY HAND ANY CEMENT OR CONCRETE DEBRIS LEFT IN THE DISTURBED AREA.
22. BURIAL OF ANY STUMPS, SOLID DEBRIS, AND/OR STONES/BOULDERS ONSITE IS PROHIBITED.
23. AT THE END OF CONSTRUCTION, REMOVE ALL CONSTRUCTION DEBRIS AND SURPLUS MATERIALS FROM THE SITE. PERFORM A THOROUGH INSPECTION OF THE WORK PERIMETER. COLLECT AND REMOVE ALL MATERIALS AND BLOWN OR WATER CARRIED DEBRIS FROM THE SITE.
24. THE WORK AREA IS A DISPOSAL SITE AS DEFINED BY THE MASSACHUSETTS CONTINGENCY PLAN 310 CMR 40.0000. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DEVELOP A SITE SPECIFIC HEALTH AND SAFETY PLAN FOR INTRUSIVE SOIL ACTIVITIES IN AN AREA WITH KNOWN PFAS CONTAMINATION. THE OWNER WILL PROVIDE OVERSIGHT AND DUST MONITORING UNDER THE DIRECTION OF A LICENSED SITE PROFESSIONAL.
25. DETAILS REGARDING PFAS CONCENTRATIONS IN SOIL ARE SET FORTH IN THE REPORT TITLED, "*FINAL IMMEDIATE RESPONSE ACTION PLAN MODIFICATION*," PREPARED BY HORSLEY WITTEN GROUP DATED DECEMBER 2019. THE MAXIMUM CONCENTRATION OF THE MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION SUM OF SIX PFAS IN SOIL IS 87.9 µg / kg. REFER TO THE ATTACHED REPORT FOR ADDITIONAL DETAILS.
26. THE CONTRACTOR IS RESPONSIBLE FOR DUST CONTROL. AT NO TIME IS VISIBLE DUST GENERATION ACCEPTABLE. DUST SUPPRESSION INCLUDING THE USE OF WATER IS CONSIDERED INCIDENTAL TO THIS PROCESS.
27. SOIL REMOVED FROM ARFF SRE AREA IS TO BE USED IN GRADING AND SHAPING WITHIN THE DEPLOYMENT AREA. AT NO TIME IS ADDITIONAL SOIL FROM THE ARFF SRE OR DEPLOYMENT AREA TO BE DISTURBED OR REMOVED WITHOUT APPROVAL FROM OWNER OR ENGINEER.

GENERAL DEMOLITION NOTES:

1. THIS PLAN SET DOES NOT INCLUDE DETAILS & SPECIFICATIONS FOR ALL DEMOLITION WORK REQUIRED WITHIN THE PROPOSED CONSTRUCTION LIMITS. UNLESS OTHERWISE NOTED, THE CONTRACTOR IS RESPONSIBLE FOR THE RELOCATION, DEMOLITION, REMOVAL AND DISPOSAL, IN A LOCATION APPROVED BY ALL GOVERNING AUTHORITIES, OF ALL EXISTING SITE ELEMENTS AND STRUCTURES INCLUDING, BUT NOT LIMITED TO: ROADWAYS, PARKING AREAS, BITUMINOUS CONCRETE, CEMENT CEMENT CONCRETE, GRAVEL, BERMS, AND ALL OTHER STRUCTURES SHOWN AND NOT SHOWN WITHIN CONSTRUCTION LIMITS, AND WHERE NEEDED, TO ALLOW FOR NEW CONSTRUCTION. ALL FACILITIES TO BE REMOVED ARE TO BE UNDERCUT TO SUITABLE MATERIAL AND BROUGHT TO GRADE WITH SUITABLE FILL MATERIAL, COMPACTED IF NECESSARY, PER SPECIFICATIONS.
2. OBTAIN ANY PERMITS REQUIRED FOR DEMOLITION AND DISPOSAL.
3. REMOVE ALL DEBRIS FROM THE SITE AND DISPOSE OF THE DEBRIS IN A PROPER AND LEGAL MANNER.
4. PRIOR TO DEMOLITION OCCURRING, ALL EROSION CONTROL DEVICES ARE TO BE INSTALLED.

BASIC CONSTRUCTION SEQUENCE:

THE FOLLOWING CONSTRUCTION SEQUENCE IS TO BE USED AS A GENERAL GUIDELINE. COORDINATE WITH THE OWNER AND ENGINEER AND SUBMIT A PROPOSED CONSTRUCTION SEQUENCE FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.

1. SURVEY AND STAKE THE PROPOSED LIMIT OF DISTURBANCE, THE PROPOSED MATERIAL/EQUIPMENT STORAGE AREA, AND SEDIMENTATION BARRIER EXTENTS.
2. PLACE SEDIMENTATION BARRIERS AS INDICATED ON DRAWINGS AND STAKED OUT IN THE FIELD. UNDER NO CIRCUMSTANCES IS THE LIMIT OF WORK TO EXTEND BEYOND THE SEDIMENTATION BARRIERS/LIMIT OF DISTURBANCE AS INDICATED ON DRAWINGS.
3. INSTALL DRAINAGE MANHOLES, CATCH BASINS, DRAINAGE PIPES, AND UNDERGROUND DRAINAGE STRUCTURES. BEGIN WORK AT THE STORMWATER MANAGEMENT AREAS AND PROGRESS UP-GRADIENT. THE STORMWATER MANAGEMENT AREA(S) AND DRAINAGE NETWORK ARE TO BE PROTECTED FROM SEDIMENTATION UNTIL ALL UN-STABILIZED AREAS ARE STABILIZED. INSTALL SEDIMENT BARRIERS AT ALL POINTS OF ENTRY INTO THE DRAINAGE NETWORK. TAKE PARTICULAR CARE TO PROTECT THE UNDERGROUND STRUCTURES FROM SEDIMENT.
4. STRIP TOPSOIL FROM THE AREA OF THE PROPOSED CAPPING AND STOCKPILE IT IN APPROVED LOCATIONS. TOPSOIL STOCKPILES MUST BE PROTECTED BY A SEDIMENT BARRIER.
5. BEGIN ROUGH GRADING AREAS FOR CAPPING. BRING ROUGH GRADING TO PROPER ELEVATIONS AS SOON AS PRACTICABLE. COORDINATE WORK TO MINIMIZE TIME SOILS ARE UN-STABILIZED.
6. PERFORM CAPPING INSTALLATION AND TRENCHING.
7. FINISH PERMANENT VEGETATIVE STABILIZATION.
8. SWEEP THE ADJACENT PAVED WORK AREAS TO REMOVE ALL SEDIMENTS. REPAIR DRAINAGE OUTLETS AND BASINS AS REQUIRED. CLEAN AND FLUSH THE DRAINAGE STRUCTURES AND PIPES AT THE END OF CONSTRUCTION AND REMOVE ALL ACCUMULATED SEDIMENTS IN THE STORMWATER MANAGEMENT AREAS. CONTRACTOR MUST INSPECT THE DRAINAGE NETWORK AND REPAIR ANY DAMAGE IMMEDIATELY.
9. ENGINEER TO APPROVE THE REMOVAL OF ALL TEMPORARY SOIL EROSION AND SEDIMENTATION CONTROL MEASURES FOLLOWING ESTABLISHMENT OF ALL DISTURBED AREAS AND DETERMINE WHEN THE CONTRIBUTING AREA HAS REACHED A MINIMUM OF 80% STABILIZATION.

GENERAL GRADING AND DRAINAGE NOTES:

1. ALL CUT AND FILL SLOPES SHALL BE 3:1 OR FLATTER UNLESS OTHERWISE NOTED.
2. ADJUST AND/OR CUT EXISTING PAVEMENT AS NECESSARY TO ASSURE A SMOOTH FIT AND CONTINUOUS GRADE.
3. PROPOSED ELEVATIONS ARE SHOWN TO FINISH PAVEMENT OR GRADE UNLESS NOTED OTHERWISE.
4. ALL EARTHWORK AND SITE PREPARATION MUST BE DONE IN STRICT ACCORDANCE WITH THE RECOMMENDATIONS OF ANY SUBSURFACE INVESTIGATION OR GEOTECHNICAL REPORTS PREPARED FOR THIS SITE.

STORMWATER FACILITY OPERATION & MAINTENANCE:

THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER INSPECTION AND MAINTENANCE OF ALL DRAINAGE/STORMWATER MANAGEMENT FACILITIES AS OUTLINED BELOW DURING CONSTRUCTION AND UNTIL SUCH TIME THAT THE PROJECT IS ACCEPTED BY THE OWNER AND THE ENGINEER.

1. INSPECT AND RESTORE/CLEAN ALL NEWLY CONSTRUCTED OR ALTERED EXISTING FACILITIES (INLETS, MANHOLES, PIPES, AND UNDERGROUND INFILTRATION STRUCTURES) OF ACCUMULATED SEDIMENT AND DEBRIS PRIOR TO THE OWNER'S ACCEPTANCE.
2. REMOVE AND DISPOSE ALL SEDIMENT AND DEBRIS TO A PRE-APPROVED LOCATION.
3. REFER TO THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) FOR ADDITIONAL INFORMATION PERTAINING TO STORMWATER FACILITY OPERATION AND MAINTENANCE REQUIREMENTS. MAINTAIN A WORKING COPY OF THE SWPPP ON SITE AT ALL TIMES.
4. AT A MINIMUM INSPECT MONTHLY AND AFTER STORM EVENTS GREATER THAN OR EQUAL TO 1" OF RAINFALL AS NECESSARY FOR THE ENTIRE DURATION OF THE CONSTRUCTION PROJECT AND THE FIRST 3 MONTHS AFTER CONSTRUCTION TO ENSURE PROPER OPERATION AND EFFECTIVE SITE STABILIZATION.
5. SPECIFIC MAINTENANCE REQUIRED DURING CONSTRUCTION:
   A. DRAINAGE STRUCTURES (INLETS, MANHOLES, CATCHBASINS, UNDERGROUND INFILTRATION STRUCTURES): MONITOR AND REGULARLY INSPECT ALL EXISTING AND PROPOSED DRAINAGE STRUCTURES. FOR PROPER OPERATION, COLLECTION OF LITTER OR TRASH, AND STRUCTURAL DETERIORATION. CLEAN AND REMOVE SEDIMENT FRO THE STRUCTURES (INCLUDING SUMPS) AS NECESSARY, AND REPAIR WHEN REQUIRED.
   B. ROUTINE MAINTENANCE: OTHER ROUTINE MAINTENANCE INCLUDES THE REMOVAL OF TRASH AND LITTER FROM PAVED AND PERIMETER AREAS, AND STREET AND PARKING LOT SWEEPING UPON COMPLETION OF CONSTRUCTION TO AVOID EXCESSIVE ACCUMULATION OF SEDIMENT IN THE DRAINAGE SYSTEM. INSPECT THE PIPES AND STRUCTURES FOR SEDIMENT ACCUMULATION AND PROPER FLOW.

LEGEND:

GENERAL

39

40

UTILITIES

G

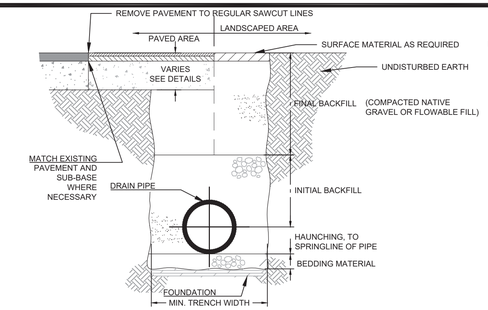
E/T/C

EROSION & SEDIMENT CONTROL

SF

SS

SYMBOLS	
CAPPING AREA	EL:98.45 EXISTING SPOT GRADE
MAJOR CONTOUR	EL.95.00 SPOT GRADE
MINOR CONTOUR	S SEWER MANHOLE
EDGE OF PAVEMENT	E ELECTRIC MANHOLE
LIMIT OF WORK	T TELEPHONE MANHOLE
PAVEMENT SAWCUT	MH MANHOLE
RECLAIMED ASPHALT MILLINGS	D DRAIN MANHOLE
STORMWATER AREA	CATCHBASIN
	INLET PROTECTION
DRAIN PIPE	W WATER VALVE
GAS LINE	G GAS VALVE
UNDERGROUND E/T/C	CO CLEAN OUT
	PIPE STUB
SILT FENCE	HYDRANT
SILT SOCK	MW MONITORING WELL



NOTES:

1. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR TO EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH A SUITABLE COMPACTED GRAVEL MATERIAL OR AS AN ALTERNATIVE AND AT THE DISCRETION OF THE ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A WOVEN GEOTEXTILE FABRIC.
2. BEDDING, HAUNCHING AND INITIAL BACKFILL: SUITABLE MATERIAL TO CONSIST OF CLEAN, HARD, PARTICLES OF GRAVEL MEETING THE FOLLOWING:

SIEVE SIZE	PERCENT PASSING
3/8"	85-95
NO. 4	5-15
NO. 8	0-2

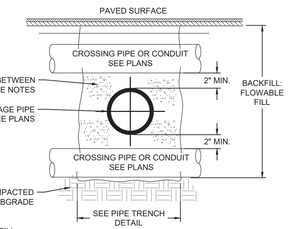
MATERIAL TO BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.

MINIMUM BEDDING THICKNESS TO BE 4" (100mm) FOR 4"-24" PIPE (100-600mm).

3. MINIMUM TRENCH WIDTHS TO BE AS FOLLOWS:

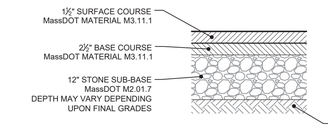
NOMINAL Ø inches	MIN. RECOMMENDED TRENCH WIDTH inches
8	36
12	36

STORM DRAIN PIPE TRENCH
NOT TO SCALE



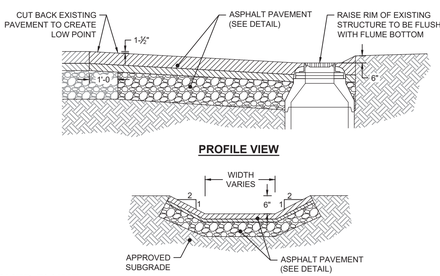
GENERAL BACKFILL:
1. WHERE TWO UTILITIES CROSS, USE FLOWABLE FILL FOR BACKFILL (INCLUDING DISTURBED AREAS SURROUNDING TRENCHES) AT THE AREA OF THE PIPE CROSSINGS.
2. THE FLOWBALE FILL MIX MUST BE FINE ENOUGH TO FILL THE VOID SPACE BETWEEN THE CROWN OF THE PIPE BELOW AND THE BOTTOM OF PIPE ABOVE.
3. THE FLOW ABLE FILL MUST ENCOMPASS THE ENTIRE SPACE BETWEEN THE PIPES AS WELL AS AROUND THE PIPES.

STORM DRAIN PIPE/UTILITY CROSSING
NOT TO SCALE



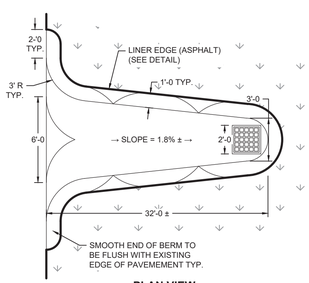
GENERAL NOTES:
1. SUB-GRADE (EXISTING MATERIAL) SHALL CONSIST OF INERT MATERIAL THAT IS HARD, DURABLE STONE AND/OR COARSE SAND, FREE FROM LOAM AND CLAY TO A DEPTH NOT LESS THAN 4 FEET BELOW THE FINISH PAVEMENT SURFACE. EXCAVATE SANDY-LOAM AND/OR LOAMY-SAND TOPSOIL MATERIAL FROM ALL PAVED AREAS PRIOR TO SUB-BASE INSTALLATION.
2. PLACE SUB-BASE IN MAXIMUM 6" LIFTS (COMPACTED TO 95%).
3. COMPACT SUB-GRADE FILL TO 95% COMPACTION.
4. SEE SITE LAYOUT PLAN FOR PAVEMENT WIDTH AND LOCATION.
5. SEE GRADING PLANS FOR PAVEMENT SLOPE AND CROSS SLOPE.

TYPICAL BITUMINOUS PAVEMENT
NOT TO SCALE

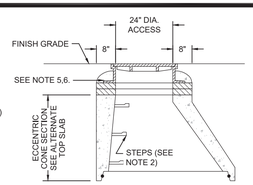


PAVED FLUME
NOT TO SCALE

CHANNEL SECTION VIEW

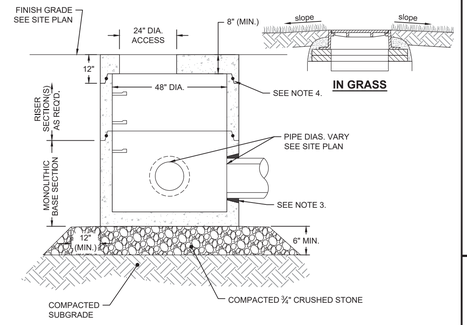


PLAN VIEW

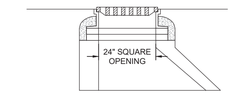


ALTERNATE TOP SLAB

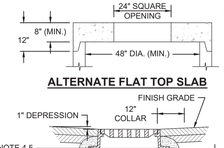
NOTES:
1. ALL SECTIONS TO BE DESIGNED FOR H-20 LOADING.
2. COPOLYMER MANHOLE STEPS TO BE INSTALLED AT 12" O.C. FOR THE FULL DEPTH OF THE STRUCTURE.
3. PROVIDE "V" KNOCKOUTS FOR PIPES WITH 2" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
4. JOINT SEALANT BETWEEN PRECAST SECTIONS TO BE PREFORMED BUTYL RUBBER.
5. DRAIN MANHOLE FRAME AND COVER TO BE SET IN FULL 12" MORTAR BED. ADJUST TO GRADE WITH PRECAST CONCRETE RISER OR BRICK.
6. DO NOT PLACE MORTAR BED AROUND STRUCTURE UNTIL IT IS AT THE REQUIRED FINISH ELEVATION AND ALIGNMENT.
7. FRAME AND COVER TO CONFORM TO MASSACHUSETTS STANDARDS HEAVY DUTY (EAST JORDAN, NEENAH, OR APPROVED EQUIVALENT).



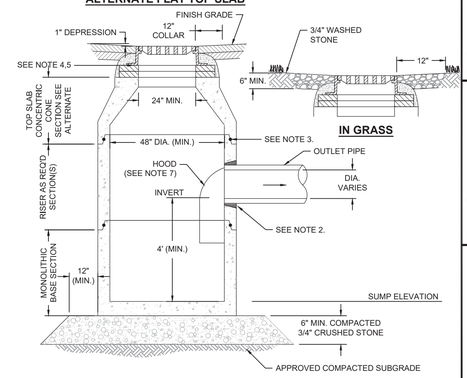
PRECAST DRAIN MANHOLE (DMH)
NOT TO SCALE



ALTERNATE ECCENTRIC CONE SECTION

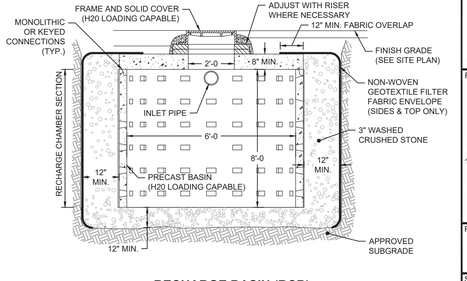


ALTERNATE FLAT TOP SLAB



IN GRASS

PRECAST CONCRETE CATCH BASIN (CB) WITH HOOD
NOT TO SCALE



RECHARGE BASIN (RCB)
NOT TO SCALE

Revisions

Rev.	Date	By	Appr.	Description

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Designed By: MDL | Drawn By: MCL | Checked By: BM | Date: MAY 2020

Plan Set: HYA SOIL CAPPING & DRAINAGE FOR PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) MITIGATION

Plan Title: CONSTRUCTION NOTES & DETAILS

Prepared For:
Barnstable Municipal Airport
480 Barnstable Road
Hyannis, MA 02601
Phone: (508) 775-2020
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Survey Provided By:
Horsley Witten Group, Inc.
90 Route 6A
Sandwich, MA 02563
Phone: (508) 833-6600
Fax: —
Dated: January 2019

Registration:

COMMONWEALTH OF MASSACHUSETTS
RICHARD A. CLAYTOR
CIVIL
NO. 45116
REGISTERED PROFESSIONAL ENGINEER

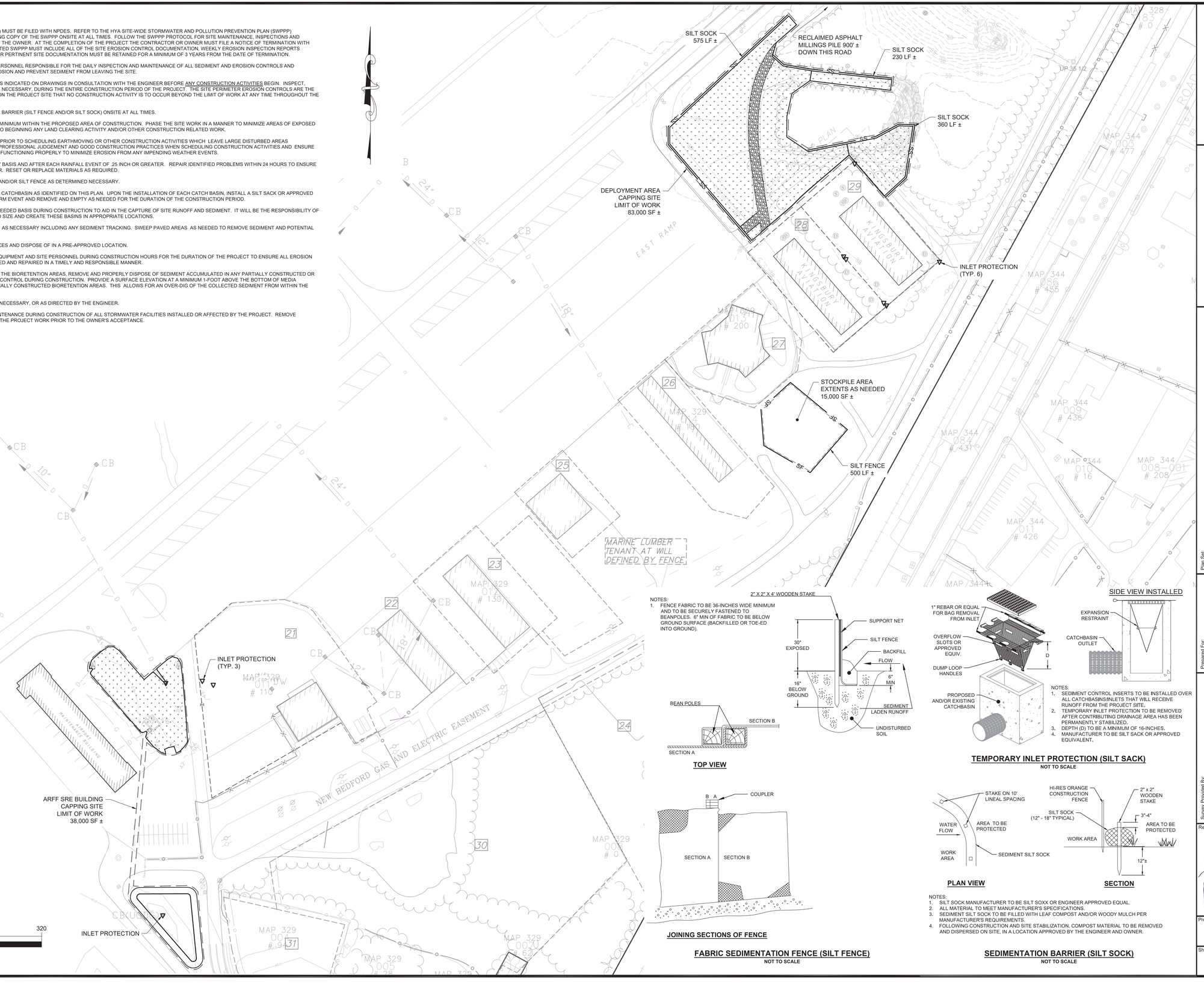
5-11-2020

Project Number: 17027A
Sheet : 2 of 10
Sheet Number: C - 2

last modified: 03/23/20 printed: 05/11/20 by ml H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\Drawings\17027A DE.dwg

EROSION & SEDIMENT CONTROL NOTES:

1. PRIOR TO THE START OF CONSTRUCTION A NOTICE OF INTENT (NOI) MUST BE FILED WITH NPDES. REFER TO THE HYA SITE-WIDE STORMWATER AND POLLUTION PREVENTION PLAN (SWPPP) REGARDING ALL EROSION CONTROL MATTERS. MAINTAIN A WORKING COPY OF THE SWPPP ONSITE AT ALL TIMES. FOLLOW THE SWPPP PROTOCOL FOR SITE MAINTENANCE, INSPECTIONS AND PROPER DOCUMENTATION UNTIL THE SITE HAS BEEN ACCEPTED BY THE OWNER. AT THE COMPLETION OF THE PROJECT THE CONTRACTOR OR OWNER MUST FILE A NOTICE OF TERMINATION WITH NPDES. IN ACCORDANCE WITH NPDES REGULATIONS, THE COMPLETED SWPPP MUST INCLUDE ALL OF THE SITE EROSION CONTROL DOCUMENTATION, WEEKLY EROSION INSPECTION REPORTS COMPLETED BY THE DESIGNATED SITE PERSONNEL, AND ANY OTHER PERTINENT SITE DOCUMENTATION MUST BE RETAINED FOR A MINIMUM OF 3 YEARS FROM THE DATE OF TERMINATION.
2. DESIGNATE THE SITE CONSTRUCTION FOREMAN AS THE ON-SITE PERSONNEL RESPONSIBLE FOR THE DAILY INSPECTION AND MAINTENANCE OF ALL SEDIMENT AND EROSION CONTROLS AND IMPLEMENTATION OF ALL NECESSARY MEASURES TO CONTROL EROSION AND PREVENT SEDIMENT FROM LEAVING THE SITE.
3. INSTALL ALL EROSION AND SEDIMENT CONTROL (ESC) MEASURES AS INDICATED ON DRAWINGS IN CONSULTATION WITH THE ENGINEER BEFORE ANY CONSTRUCTION ACTIVITIES BEGIN. INSPECT, MAINTAIN REPAIR AND REPLACE EROSION CONTROL MEASURES, AS NECESSARY, DURING THE ENTIRE CONSTRUCTION PERIOD OF THE PROJECT. THE SITE PERIMETER EROSION CONTROLS ARE THE DESIGNATED LIMIT OF WORK. INFORM ALL PERSONNEL WORKING ON THE PROJECT SITE THAT NO CONSTRUCTION ACTIVITY IS TO OCCUR BEYOND THE LIMIT OF WORK AT ANY TIME THROUGHOUT THE CONSTRUCTION PERIOD.
4. MAINTAIN A MINIMUM SURPLUS OF 100 FEET OF EROSION CONTROL BARRIER (SILT FENCE AND/OR SILT SOCK) ONSITE AT ALL TIMES.
5. KEEP THE LIMIT OF CLEARING, GRADING AND DISTURBANCES TO A MINIMUM WITHIN THE PROPOSED AREA OF CONSTRUCTION. PHASE THE SITE WORK IN A MANNER TO MINIMIZE AREAS OF EXPOSED SOIL. PROPERLY INSTALL THE SEDIMENTATION CONTROLS PRIOR TO BEGINNING ANY LAND CLEARING ACTIVITY AND/OR OTHER CONSTRUCTION RELATED WORK.
6. MONITOR LOCAL WEATHER REPORTS DURING CONSTRUCTION AND PRIOR TO SCHEDULING EARTHMOVING OR OTHER CONSTRUCTION ACTIVITIES WHICH LEAVE LARGE DISTURBED AREAS UNSTABILIZED. IF INCLEMENT WEATHER IS PREDICTED, USE BEST PROFESSIONAL JUDGEMENT AND GOOD CONSTRUCTION PRACTICES WHEN SCHEDULING CONSTRUCTION ACTIVITIES AND ENSURE THE NECESSARY EROSION CONTROL DEVICES ARE INSTALLED AND FUNCTIONING PROPERLY TO MINIMIZE EROSION FROM ANY IMPENDING WEATHER EVENTS.
7. INSPECT EROSION AND SEDIMENT CONTROL DEVICES ON A WEEKLY BASIS AND AFTER EACH RAINFALL EVENT OF .25 INCH OR GREATER. REPAIR IDENTIFIED PROBLEMS WITHIN 24 HOURS TO ENSURE EROSION AND SEDIMENT CONTROLS ARE IN GOOD WORKING ORDER. RESET OR REPLACE MATERIALS AS REQUIRED.
8. SURROUND THE PERIMETER OF SOIL STOCKPILES WITH SILT SOCK AND/OR SILT FENCE AS DETERMINED NECESSARY.
9. INSTALL A SILT SACK OR APPROVED EQUIVALENT IN EACH EXISTING CATCHBASIN AS IDENTIFIED ON THIS PLAN. UPON THE INSTALLATION OF EACH CATCH BASIN, INSTALL A SILT SACK OR APPROVED EQUIVALENT. INSPECT SILT SACKS, AFTER EACH SIGNIFICANT STORM EVENT AND REMOVE AND EMPTY AS NEEDED FOR THE DURATION OF THE CONSTRUCTION PERIOD.
10. SMALL SEDIMENTATION BASINS MAY BE CONSTRUCTED ON AN AS-NEEDED BASIS DURING CONSTRUCTION TO AID IN THE CAPTURE OF SITE RUNOFF AND SEDIMENT. IT WILL BE THE RESPONSIBILITY OF THE SITE CONTRACTOR, IN CONSULTATION WITH THE ENGINEER, TO SIZE AND CREATE THESE BASINS IN APPROPRIATE LOCATIONS.
11. CONTAIN ALL SEDIMENT ONSITE. SWEEP ALL EXITS FROM THE SITE AS NECESSARY INCLUDING ANY SEDIMENT TRACKING. SWEEP PAVED AREAS AS NEEDED TO REMOVE SEDIMENT AND POTENTIAL POLLUTANTS ACCUMULATED DURING SITE CONSTRUCTION.
12. REMOVE ACCUMULATED SEDIMENT FROM ALL TEMPORARY PRACTICES AND DISPOSE OF IN A PRE-APPROVED LOCATION.
13. PROVIDE ON SITE OR MAKE READILY AVAILABLE THE NECESSARY EQUIPMENT AND SITE PERSONNEL DURING CONSTRUCTION HOURS FOR THE DURATION OF THE PROJECT TO ENSURE ALL EROSION AND SEDIMENTATION CONTROL DEVICES ARE PROPERLY MAINTAINED AND REPAIRED IN A TIMELY AND RESPONSIBLE MANNER.
14. PRIOR TO THE INSTALLATION OF FILTER FABRIC AND MEDIA WITHIN THE BIORETENTION AREAS, REMOVE AND PROPERLY DISPOSE OF SEDIMENT ACCUMULATED IN ANY PARTIALLY CONSTRUCTED OR TEMPORARY BIORETENTION/DRAINAGE AREA USED FOR SEDIMENT CONTROL DURING CONSTRUCTION. PROVIDE A SURFACE ELEVATION AT A MINIMUM 1-FOOT ABOVE THE BOTTOM OF MEDIA ELEVATION AS SHOWN IN THE BIORETENTION SCHEDULE FOR PARTIALLY CONSTRUCTED BIORETENTION AREAS. THIS ALLOWS FOR AN OVER-DIG OF THE COLLECTED SEDIMENT FROM WITHIN THE BIORETENTION AREA PRIOR TO MEDIA/FABRIC INSTALLATION.
15. CONTROL DUST BY WATERING OR OTHER APPROVED METHODS AS NECESSARY, OR AS DIRECTED BY THE ENGINEER.
16. THE CONTRACTOR IS RESPONSIBLE FOR THE INSPECTION AND MAINTENANCE DURING CONSTRUCTION OF ALL STORMWATER FACILITIES INSTALLED OR AFFECTED BY THE PROJECT. REMOVE SEDIMENT OR DEBRIS COLLECTED WITHIN THESE FACILITIES FROM THE PROJECT WORK PRIOR TO THE OWNER'S ACCEPTANCE.



GRAPHIC SCALE

80 0 40 80 160 320

(in feet)

1 INCH = 80 FEET

NOTES:
1. FENCE FABRIC TO BE 36-INCHES WIDE MINIMUM AND TO BE SECURELY FASTENED TO BEANPOLES. 6" MIN OF FABRIC TO BE BELOW GROUND SURFACE (BACKFILLED OR TOE-ED INTO GROUND).

TOP VIEW

JOINING SECTIONS OF FENCE

FABRIC SEDIMENTATION FENCE (SILT FENCE)
NOT TO SCALE

NOTES:
1. SEDIMENT CONTROL INSERTS TO BE INSTALLED OVER ALL CATCHBASINS\INLETS THAT WILL RECEIVE RUNOFF FROM THE PROJECT SITE.
2. TEMPORARY INLET PROTECTION TO BE REMOVED AFTER CONTRIBUTING DRAINAGE AREA HAS BEEN PERMANENTLY STABILIZED.
3. DEPTH (D) TO BE A MINIMUM OF 16-INCHES.
4. MANUFACTURER TO BE SILT SACK OR APPROVED EQUIVALENT.

TEMPORARY INLET PROTECTION (SILT SACK)
NOT TO SCALE

PLAN VIEW **SECTION**

NOTES:
1. SILT SOCK MANUFACTURER TO BE SILT SOXX OR ENGINEER APPROVED EQUAL.
2. ALL MATERIAL TO MEET MANUFACTURER'S SPECIFICATIONS.
3. SEDIMENT SILT SOCK TO BE FILLED WITH LEAF COMPOST AND/OR WOODY MULCH PER MANUFACTURER'S REQUIREMENTS.
4. FOLLOWING CONSTRUCTION AND SITE STABILIZATION, COMPOST MATERIAL TO BE REMOVED AND DISPERSED ON SITE, IN A LOCATION APPROVED BY THE ENGINEER AND OWNER.

SEDIMENTATION BARRIER (SILT SOCK)
NOT TO SCALE

Revisions

Rev.	Date	By	Appr.	Description

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Drawn By: MDL | Checked By: BM | Designed By: MDL | Date: MAY 2020

Plan Set: HYA SOIL CAPPING & DRAINAGE FOR PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) MITIGATION
FINAL CONSTRUCTION PLANS
BARNSTABLE, MASSACHUSETTS

Plan Title: EROSION & SEDIMENTATION CONTROL PLAN

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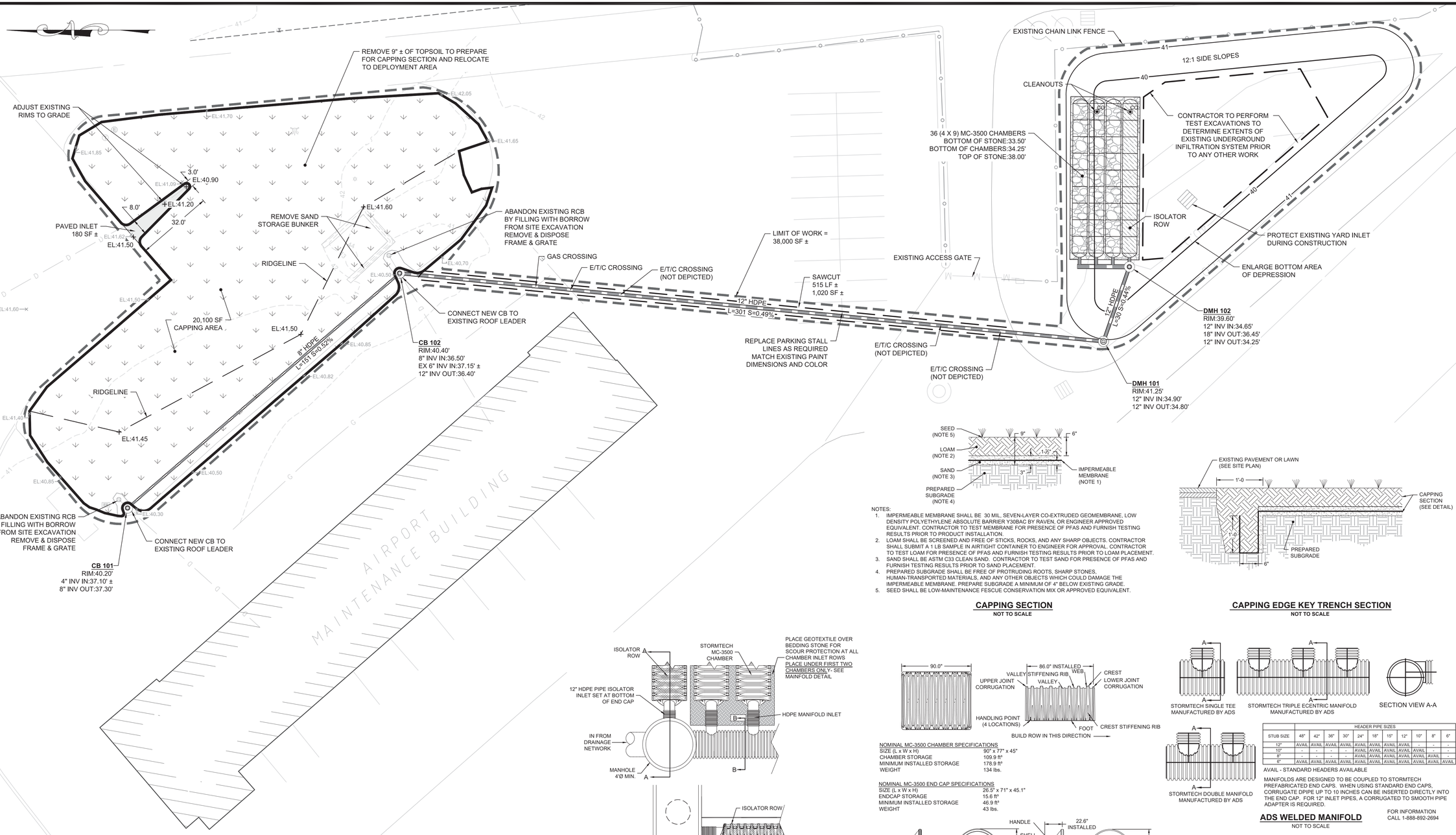
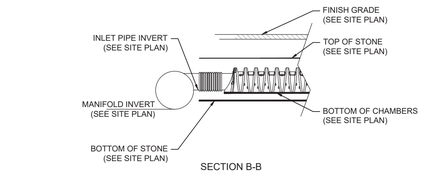


NOTES:
1. IMPERMEABLE MEMBRANE SHALL BE 30 MIL, SEVEN-LAYER CO-EXTRUDED GEOMEMBRANE, LOW DENSITY POLYETHYLENE ABSOLUTE BARRIER Y30BAC BY RAVEN, OR ENGINEER APPROVED EQUIVALENT. CONTRACTOR TO TEST MEMBRANE FOR PRESENCE OF PFAS AND FURNISH TESTING RESULTS PRIOR TO PRODUCT INSTALLATION.
2. LOAM SHALL BE SCREENED AND FREE OF STICKS, ROCKS, AND ANY SHARP OBJECTS. CONTRACTOR SHALL SUBMIT A 1 LB SAMPLE IN AIRTIGHT CONTAINER TO ENGINEER FOR APPROVAL. CONTRACTOR TO TEST LOAM FOR PRESENCE OF PFAS AND FURNISH TESTING RESULTS PRIOR TO LOAM PLACEMENT.
3. SAND SHALL BE ASTM C33 CLEAN SAND. CONTRACTOR TO TEST SAND FOR PRESENCE OF PFAS AND FURNISH TESTING RESULTS PRIOR TO SAND PLACEMENT.
4. PREPARED SUBGRADE SHALL BE FREE OF PROTRUDING ROOTS, SHARP STONES, HUMAN-TRANSPORTED MATERIALS, AND ANY OTHER OBJECTS WHICH COULD DAMAGE THE IMPERMEABLE MEMBRANE. PREPARE SUBGRADE A MINIMUM OF 4" BELOW EXISTING GRADE.
5. SEED SHALL BE LOW-MAINTENANCE FESCUE CONSERVATION MIX OR APPROVED EQUIVALENT.

CAPPING SECTION
NOT TO SCALE

CAPPING EDGE KEY TRENCH SECTION
NOT TO SCALE

SECTION A-A



SECTION B-B

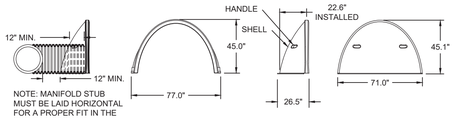
STORMTECH SYSTEM DETAIL
NOT TO SCALE

NOMINAL MC-3500 CHAMBER SPECIFICATIONS

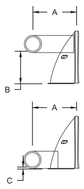
SIZE (L x W x H)	90" x 77" x 45"
CHAMBER STORAGE	109.9 ft³
MINIMUM INSTALLED STORAGE	178.9 ft³
WEIGHT	134 lbs.

NOMINAL MC-3500 END CAP SPECIFICATIONS

SIZE (L x W x H)	26.5" x 71" x 45.1"
ENDCAP STORAGE	15.6 ft³
MINIMUM INSTALLED STORAGE	46.9 ft³
WEIGHT	43 lbs.



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN THE END CAP OPENING.



PART NUMBERS ENDING WITH "B" ARE FOR STUBS AT BOTTOM OF END CAP.
PART NUMBERS ENDING WITH "T" ARE FOR STUBS AT TOP OF END CAP.

PART#	STUB	B	C
MC3500TEPE12T	12" [300 mm]	26.36" (670 mm)	N/A
MC3500TEPE12B	12" [300 mm]	N/A	1.35" [34 mm]
MC3500TEPE15T	15" [375 mm]	23.39" [594 mm]	N/A
MC3500TEPE15B	15" [375 mm]	N/A	1.50" [38 mm]
MC3500TEPE18T	18" [450 mm]	20.03" [509 mm]	N/A
MC3500TEPE18B	18" [450 mm]	N/A	1.77" [45 mm]
MC3500TEPE24T	24" [600 mm]	14.48" [368 mm]	N/A
MC3500TEPE24B	24" [600 mm]	N/A	2.06" [52 mm]

NOTE: ALL DIMENSIONS ARE NOMINAL

CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST.
INVENTORIED MANIFOLDS INCLUDE 12" - 24" SIZE ON SIZE AND
15" THROUGH 48" ECCENTRIC MANIFOLDS.

STORMTECH MC-3500 TECHNICAL DETAILS
NOT TO SCALE

	HEADER PIPE SIZES									
STUB SIZE	48"	42"	36"	30"	24"	18"	15"	12"	10"	8"	6"
12"	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	-	-	-
10"	-	-	-	-	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	-	-
8"	-	-	-	-	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	-
6"	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL

AVAIL - STANDARD HEADERS AVAILABLE

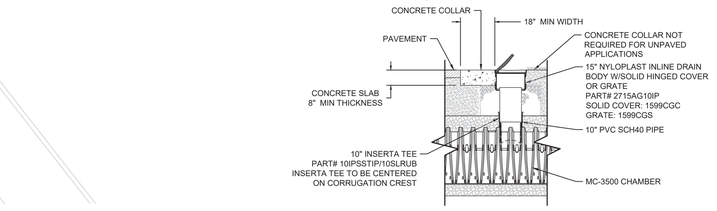
MANIFOLDS ARE DESIGNED TO BE COUPLED TO STORMTECH PREFABRICATED END CAPS. WHEN USING STANDARD END CAPS, CORRUGATE DPIPE UP TO 10 INCHES CAN BE INSERTED DIRECTLY INTO THE END CAP. FOR 12" INLET PIPES, A CORRUGATED TO SMOOTH PIPE ADAPTER IS REQUIRED.

ADS WELDED MANIFOLD
NOT TO SCALE

FOR INFORMATION
CALL 1-888-892-2694

STORMTECH GENERAL NOTES

1. STORMTECH LLC ("STORMTECH") REQUIRES INSTALLING CONTRACTORS TO USE AND UNDERSTAND STORMTECH'S LATEST INSTALLATION INSTRUCTIONS PRIOR TO BEGINNING SYSTEM INSTALLATION.
2. OUR TECHNICAL SERVICES DEPARTMENT OFFERS INSTALLATION CONSULTATIONS TO INSTALLING CONTRACTORS. CONTACT OUR TECHNICAL SERVICES REPRESENTATIVE AT LEAST 30 DAYS PRIOR TO SYSTEM INSTALLATION TO ARRANGE A PRE-INSTALLATION CONSULTATION. OUR REPRESENTATIVES CAN THEN ANSWER QUESTIONS OR ADDRESS COMMENTS ON THE STORMTECH CHAMBER SYSTEM AND INFORM THE INSTALLING CONTRACTOR OF THE MINIMUM INSTALLATION REQUIREMENTS BEFORE BEGINNING THE SYSTEM'S CONSTRUCTION. CALL 1-888-892-2694 TO SPEAK TO A TECHNICAL SERVICE REPRESENTATIVE OR VISIT WWW.STORMTECH.COM TO RECEIVE A COPY OF OUR INSTALLATION INSTRUCTIONS.
3. STORMTECH'S REQUIREMENTS FOR SYSTEMS WITH PAVEMENT DESIGN (ASPHALT, CONCRETE PAVERS, ETC.): MINIMUM COVER IS 18 INCHES NOT INCLUDING PAVEMENT; MAXIMUM COVER IS 96 INCHES INCLUDING PAVEMENT. FOR INSTALLATIONS THAT DO NOT INCLUDE PAVEMENT, WHERE RUTTING FROM VEHICLES MAY OCCUR, MINIMUM REQUIRED COVER IS 24 INCHES, MAXIMUM COVER IS 96 INCHES.
4. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE DESIGN ENGINEER.
5. AASHTO M288 CLASS 2 NON-WOVEN GEOTEXTILE (FILTER FABRIC) MUST BE USED AS INDICATED IN THE PROJECT PLANS.
6. STONE PLACEMENT BETWEEN CHAMBERS ROWS AND AROUND PERIMETER MUST FOLLOW INSTRUCTIONS AS INDICATED IN THE MOST CURRENT VERSION OF STORMTECH'S INSTALLATION INSTRUCTIONS.
7. BACKFILLING OVER THE CHAMBERS MUST FOLLOW REQUIREMENTS AS INDICATED IN THE MOST CURRENT VERSION OF STORMTECH'S INSTALLATION INSTRUCTIONS.
8. THE CONTRACTOR MUST REFER TO STORMTECH'S INSTALLATION INSTRUCTIONS FOR A TABLE OF ACCEPTABLE VEHICLE LOADS AT VARIOUS DEPTHS OF COVER. THIS INFORMATION IS ALSO AVAILABLE AT STORMTECH'S WEBSITE: WWW.STORMTECH.COM. THE CONTRACTOR IS RESPONSIBLE FOR PREVENTING VEHICLES THAT EXCEED STORMTECH'S REQUIREMENTS FROM TRAVELING ACROSS OR PARKING OVER THE STORMWATER SYSTEM. TEMPORARY FENCING, WARNING TAPE AND APPROPRIATELY LOCATED SIGNS ARE COMMONLY USED TO PREVENT UNAUTHORIZED VEHICLES FROM ENTERING SENSITIVE CONSTRUCTION AREAS.
9. THE CONTRACTOR MUST APPLY EROSION AND SEDIMENT CONTROL MEASURES TO PROTECT THE STORMWATER SYSTEM DURING ALL PHASES OF SITE CONSTRUCTION PER LOCAL CODES AND DESIGN ENGINEER'S SPECIFICATIONS.
10. STORMTECH PRODUCT WARRANTY IS LIMITED. SEE CURRENT PRODUCT WARRANTY FOR DETAILS. TO ACQUIRE A COPY CALL STORMTECH AT 1-888-892-2694 OR VISIT WWW.STORMTECH.COM.



NOTES:
1. ALL SCHEDULE 40 FITTINGS TO BE SOLVENT CEMENTED.
2. INSPECTION PORTS TO BE INSTALLED IN THE MIDDLE CHAMBER OF EACH CHAMBER ROW
3. FOR STORMTECH INFORMATION CALL 1-888-892-2694

CLEANOUT
NOT TO SCALE

GRAPHIC SCALE
20 0 10 20 40 80
(in feet)
1 INCH = 20 FEET

Revisions

Rev.	Date	By	Appr.	Description

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Date: MAY 2020

Plan Set: HYA SOIL CAPPING & DRAINAGE FOR PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) MITIGATION
FINAL CONSTRUCTION PLANS
BARNSTABLE, MASSACHUSETTS

Plan Title: SITE PLAN (ARFF SRE BUILDING)

Prepared For:
Barnstable Municipal Airport
480 Barnstable Road
Hyannis, MA 02601
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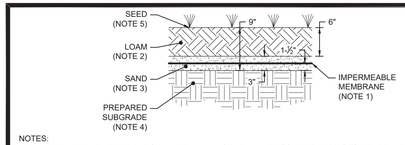

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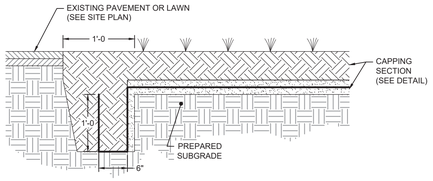
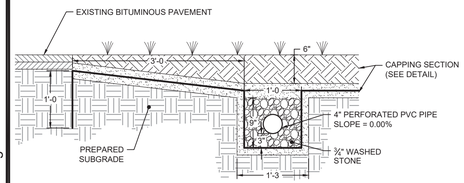
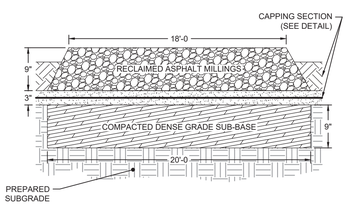
CAPPING SECTION
NOT TO SCALE



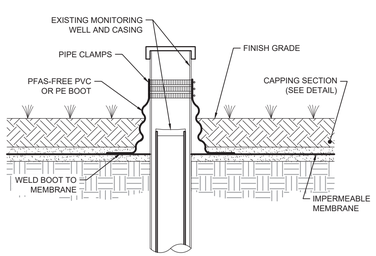
CAPPING EDGE KEY TRENCH SECTION
NOT TO SCALE



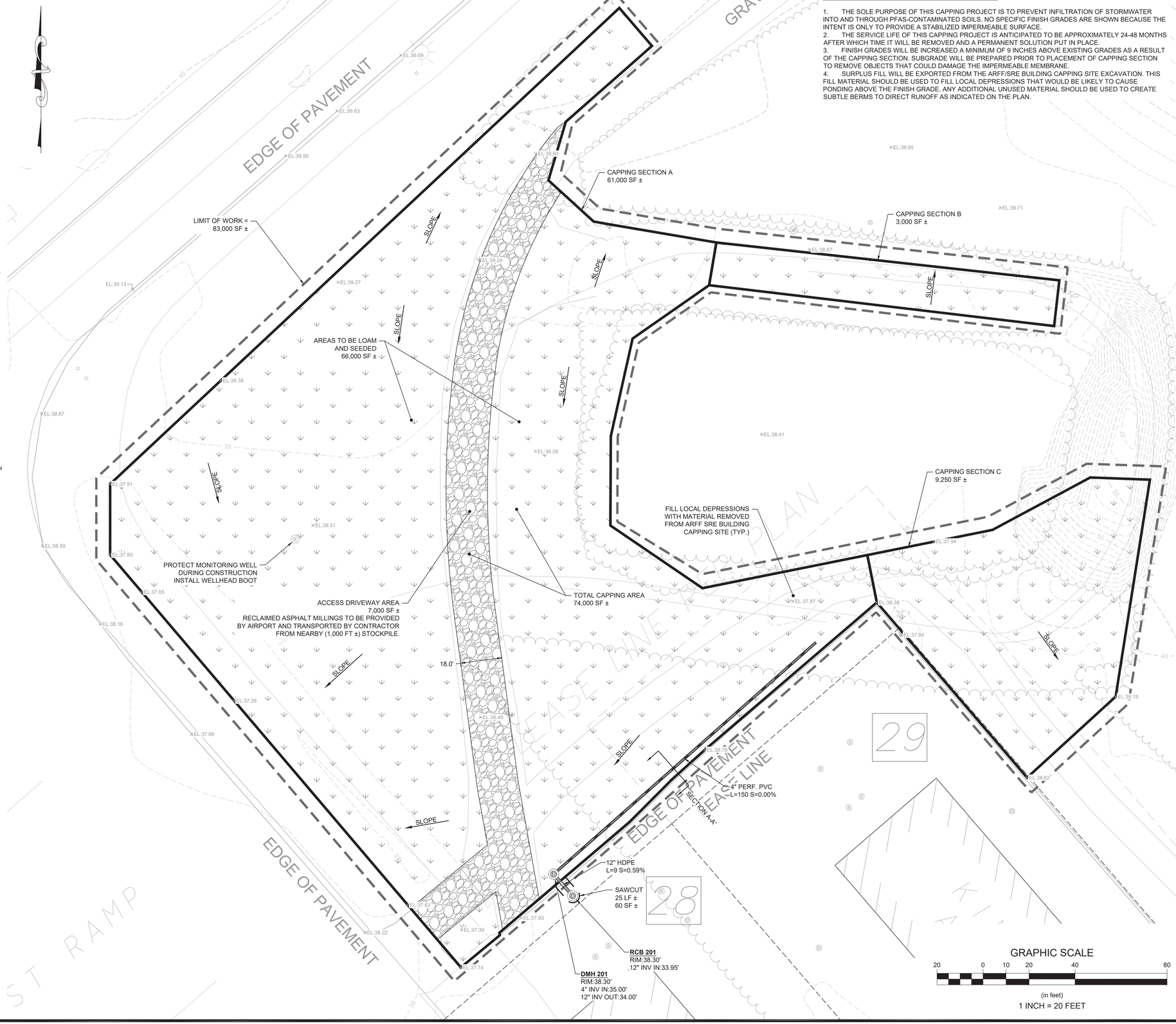
CAPPING WEEP TRENCH SECTION A-A'
NOT TO SCALE



ACCESS DRIVEWAY SECTION
NOT TO SCALE



WELLHEAD BOOT
NOT TO SCALE



DEPLOYMENT AREA GRADING AND DRAINAGE NOTES:

1. THE SOLE PURPOSE OF THIS CAPPING PROJECT IS TO PREVENT INFILTRATION OF STORMWATER INTO AND THROUGH PFAS-CONTAMINATED SOILS. NO SPECIFIC FINISH GRADES ARE SHOWN BECAUSE THE INTENT IS ONLY TO PROVIDE A STABILIZED IMPERMEABLE SURFACE.
2. THE SERVICE LIFE OF THIS CAPPING PROJECT IS ANTICIPATED TO BE APPROXIMATELY 24-48 MONTHS AFTER WHICH TIME IT WILL BE REMOVED AND A PERMANENT SOLUTION PUT IN PLACE.
3. FINISH GRADES WILL BE INCREASED A MINIMUM OF 9 INCHES ABOVE EXISTING GRADES AS A RESULT OF THE CAPPING SECTION. SUBGRADE WILL BE PREPARED PRIOR TO PLACEMENT OF CAPPING SECTION TO REMOVE OBJECTS THAT COULD DAMAGE THE IMPERMEABLE MEMBRANE.
4. SURPLUS FILL WILL BE EXPORTED FROM THE ARFF/SRE BUILDING CAPPING SITE EXCAVATION. THIS FILL MATERIAL SHOULD BE USED TO FILL LOCAL DEPRESSIONS THAT WOULD BE LIKELY TO CAUSE PONDING ABOVE THE FINISH GRADE. ANY ADDITIONAL UNUSED MATERIAL SHOULD BE USED TO CREATE SUBTLE BERMS TO DIRECT RUNOFF AS INDICATED ON THE PLAN.

Revisions

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Designed By: MDL
Date: MAY 2020

Plan Set: HYA SOIL CAPPING & DRAINAGE FOR PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) MITIGATION FINAL CONSTRUCTION PLANS
BARNSTABLE, MASSACHUSETTS

Plan Title: SITE PLAN (DEPLOYMENT AREA)

Prepared For:
Barnstable Municipal Airport
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Dated: January 2019

Registration:
COMMONWEALTH OF MASSACHUSETTS
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5-11-2020

Project Number: 17027A
Sheet: 5 of 10
Sheet Number: C - 5

last modified: 03/25/20 printed: 05/11/20 by ml H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\Drawings\17027A ST.dwg

GENERAL NOTES

AIRPORT MANAGER

1. THE AIRPORT MANAGER AND/OR HIS/HER DESIGNEE HAVE THE AUTHORITY TO OPEN AND CLOSE AIRPORT FACILITIES, ISSUE AND CANCEL NOTAM'S AND TO COORDINATE WITH AIRPORT USERS. THE AIRPORT MANAGER IS THE SOLE AUTHORITY WITH RESPECT TO AIRPORT OPERATIONS, SAFETY AND SECURITY.

AIRPORT SAFETY AND SECURITY

2. THE CONTRACTOR SHALL INSTALL AND MAINTAIN SAFETY AND SECURITY MEASURES THROUGHOUT THE PROJECT, INCLUDING BUT NOT LIMITED TO: WORKER SAFETY, PEDESTRIAN SITE ACCESS AND SAFETY, AIRFIELD AND OFF-AIRPORT TRAFFIC SAFETY DIRECTLY IMPACTED BY THE PROJECT, PEDESTRIAN ACCESS AND SAFETY MEASURES FOR ACCESSING AIRPORT FACILITIES THAT ARE IMPACTED BY THE PROJECT.

3. THE CONTRACTOR SHALL COMPLY WITH ALL AIRPORT SECURITY REQUIREMENTS AS DIRECTED BY THE AIRPORT MANAGER OR HIS/HER DESIGNEE. THE CONTRACTOR SHALL COMPLY WITH BADGING PER AIRPORT REQUIREMENTS.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTROLLING ACCESS TO THE WORK AREA AND ENSURING THAT SECURITY WITHIN THE CONTRACTOR'S LIMIT OF WORK IS MAINTAINED AT ALL TIMES. THE FAA CAN IMPOSE SIGNIFICANT FINES FOR SECURITY VIOLATIONS AND INCURSIONS INTO ACTIVE AIRCRAFT OPERATION AREAS (AOA). THE CONTRACTOR SHALL PAY ALL FINES ASSESSED AGAINST THE AIRPORT DUE TO VIOLATIONS CAUSED BY THE CONTRACTOR AND HIS/HER PERSONNEL, SUBCONTRACTORS AND VENDORS.

5. PARKING PERSONAL VEHICLES SHALL BE IN DESIGNATED LOCATIONS ONLY, BUT NOT WITHIN AN ACTIVE CONSTRUCTION AREA. THE CONTRACTOR, AS A SUBSIDIARY OBLIGATION, SHALL PROVIDE ADEQUATE AND SAFE TRANSPORTATION FOR HIS/HER EMPLOYEES, AND FOR ITS SUBCONTRACTORS AND VENDORS, BETWEEN THE WORK AREAS AND THE LOCATION OF THE PERSONAL VEHICLES. EMPLOYEES AND DRIVERS OF WORK VEHICLES SHALL BE INSTRUCTED AS TO PROPER ACCESS ROADS AND SHALL BE CAUTIONED THAT UNAUTHORIZED ACCESS AND USE OF AIRPORT PAVEMENTS OR OTHER AREAS OUTSIDE THE DESIGNATED WORK AREAS MAY LEAD TO THEIR ARREST AND SUBSEQUENT PAYMENT OF FINES. NO PERSONAL VEHICLES FOR EMPLOYEES OR REPRESENTATIVES OF THE CONTRACTOR OR ITS SUBCONTRACTORS OR VENDORS ARE ALLOWED WITHIN THE AIRCRAFT OPERATIONS AREA.

6. THE CONTRACTOR SHALL PROVIDE INSTRUCTION TO ALL OF ITS EMPLOYEES ENGAGED IN THE PROJECT AS WELL AS ALL SUBCONTRACTORS AND VENDORS INCLUDING MATERIAL SUPPLIERS REGARDING THE AIRPORT ACCESS PROCEDURES TO BE FOLLOWED BY THEIR DELIVERY DRIVERS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ESCORTS OF NON-BADGED EMPLOYEES INCLUDING BUT NOT LIMITED TO MANAGEMENT STAFF, AS WELL AS VENDORS, SUBCONTRACTORS, VISITORS, DELIVERY DRIVERS, AND OTHERS UNDER THE AUTHORITY OF THE CONTRACTOR WHILE ON THE AIRPORT.

7. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER AND THE OWNER PRIOR TO THE START OF WORK, A WRITTEN CONSTRUCTION MANAGEMENT PLAN WHICH DETAILS AMONG OTHER THINGS, THE PRECAUTIONS HE/SHE PROPOSES FOR THE CONTROL OF ITS WORK INCLUDING VEHICLE TRAFFIC INCLUDING POLICE DETAILS, FLAG PERSONS, SIGNS, BARRICADES AND ANY OTHER MEASURES HE/SHE PROPOSES. THE OWNER AND ENGINEER WILL REVIEW AND APPROVE THE PROPOSED PLAN; THE CONTRACTOR SHALL COMPLY WITH THE APPROVED DOCUMENT. STOPPAGE OF WORK BY THE OWNER FOR NON-CONFORMANCE SHALL NOT CONSTITUTE A VALID REASON FOR EXTENDING CONTRACT TIME OR FOR ANY CLAIM OF ADDITIONAL COMPENSATION BY THE CONTRACTOR.

8. THE CONTRACTOR'S PERSONNEL AND CONTRACTOR'S VEHICLES SHALL BE RESTRICTED TO AND SHALL REMAIN WITHIN THE WORK AREAS, HAUL AND ACCESS ROUTES, AND THE STAGING AREAS AS SHOWN ON THE CONTRACT PLANS.

9. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING SECURITY WHEN USING AIRPORT GATES TO ACCESS THE CONSTRUCTION SITE. GATES SHALL BE CLOSED AND LOCKED WHEN NOT IN USE. WHEN GATE(S) ARE IN USE IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE A DEDICATED GATE GUARD TO MONITOR THE CONSTRUCTION TRAFFIC, AS WELL AS VEHICULAR AND PEDESTRIAN ACCESS WHICH MAY CONFLICT WITH THE CONTRACTOR'S OPERATION. LIQUIDATED DAMAGES MAY BE APPLICABLE FOR A VIOLATION OF THIS REQUIREMENT – SEE SPECIFICATIONS.

AIRCRAFT OPERATIONS AREA (AOA)

10. IN GENERAL, THE WORK ASSOCIATED WITH THIS PROJECT WILL REQUIRE THE CONTRACTOR TO BE NEAR OR WITHIN THE AIRCRAFT OPERATIONS AREA (AOA). THE AOA IS ANY AREA OF AN AIRPORT USED OR INTENDED TO BE USED FOR LANDING, TAKEOFF, OR SURFACE MANEUVERING OF AIRCRAFT. AN AOA INCLUDES SUCH PAVED OR TURF AREAS THAT ARE USED OR INTENDED TO BE USED FOR THE UNOBSTRUCTED MOVEMENT OF AIRCRAFT IN ADDITION TO ITS ASSOCIATED RUNWAY, TAXIWAY, OR APRON.

11. FOR THIS PROJECT, THE CONTRACTOR SHALL KEEP HIS/HER PERSONNEL AND EQUIPMENT OUTSIDE OF THE TAXIWAY / RUNWAY SAFETY AREAS PER THE CONSTRUCTION SAFETY AND PHASING PLAN (CSPP).

12. THE CONTRACTOR SHALL FURNISH, INSTALL, MAINTAIN, AND RELOCATE SAFETY BARRICADES. THE CONTRACTOR SHALL MAINTAIN THE BARRICADES ON A REGULAR BASIS AND IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED CONSTRUCTION MANAGEMENT PLAN.

13. PRIOR TO THE RE-OPENING OF THE WORK AREA(S), THE CONTRACTOR SHALL RELOCATE ALL MATERIALS AND EQUIPMENT OUT OF THE AOA TO THE STAGING AREA, REMOVE STOCKPILES, BACKFILL AND COMPACT TRENCHES AND EXCAVATIONS, AND RESTORE GRADES PER THE CONTRACT DOCUMENTS, AND MECHANICALLY SWEEP ALL PAVED AREAS TO REMOVE ALL DEBRIS, MAKING SURE THAT CLEANUP AND SWEEPING OPERATIONS ARE COMPLETED WITH NO ADVERSE IMPACT TO AIRPORT OPERATIONS. STREET SWEEPING AND OTHER SOIL INTRUSIVE ACTIVITES SHALL BE CONDUCTED IN A MANNER THAT DOES NOT GENERATE FUGITIVE DUST EMISSIONS. SITE SOILS CONTAIN PFAS. APPROPRIATE DUST SUPPRESSION TECHNIQUES ARE CONSIDERED INCIDENTAL TO THE PROJECT. THE OWNER WILL PROVIDE DUST MONITORING AT THE SITE UNDER THE DIRECTION OF A LICENSED SITE PROFESSIONAL.

14. THE CONTRACTOR SHALL KEEP ACTIVE PAVED SURFACES CLEAN AND CLEAR OF CONSTRUCTION MATERIAL, FOREIGN OBJECTS, DIRT, GRAVEL, AND DEBRIS, AND SHALL REMOVE SUCH MATERIALS FROM ACTIVE PAVED SURFACES WITHIN 15 MINUTES OF VERBAL NOTICE FROM THE AIRPORT MANAGER OR HIS/HER DESIGNEE OR THE ENGINEER. THE CONTRACTOR SHALL PROVIDE A MANNED VAC SWEEPER DURING ALL TIMES WHEN ACTIVE AOA PAVEMENTS ARE CROSSED AT NO ADDITIONAL COST TO THE OWNER.

15. THE CONTRACTOR MUST STAY WITHIN THE LIMITS OF THE WORK AREA, DESIGNATED HAUL ROADS, AND STAGING AREAS AT ALL TIMES WHILE OPERATING AT THE AIRPORT. THE CONTRACTOR SHALL PAY CAREFUL ATTENTION TO WORK AREA REQUIREMENTS AND ENSURE THAT ITS OWN PERSONNEL AS WELL AS SUBCONTRACTORS AND VENDORS UNDERSTAND WHICH AREAS ARE ACTIVE (TO AIRCRAFT MOVEMENT) AND WHICH AREAS ARE CLOSED DURING CONSTRUCTION ACTIVITIES.

16. ALL OF THE CONTRACTOR'S EQUIPMENT AND VEHICLES, INCLUDING ESCORT VEHICLES, SHALL BE EQUIPPED WITH A 3' X 3' CHECKERED ORANGE AND WHITE FLAG WITH COMPANY IDENTIFICATION PLAINLY VISIBLE ON BOTH SIDES OF THE VEHICLE, AS WELL AS AMBER FLASHING ROTATING BEACONS.

OPEN TRENCHES OR EXCAVATIONS

17. THE CONTRACTOR WILL NOT BE PERMITTED TO LEAVE TRENCHES OR OTHER EXCAVATIONS OPEN AT NIGHT, ON WEEKENDS, OR AT OTHER TIMES WHEN THE CONTRACTOR IS NOT ON THE WORK SITE, UNLESS APPROVAL IS RECEIVED BY THE AIRPORT MANAGER AND THE CONTRACTOR PROTECTS THE EXCAVATION AS MAY BE APPROPRIATE TO MAINTAIN SAFETY AND SECURITY, INCLUDING BUT NOT LIMITED TO THE USE OF STEEL PLATES, BARRICADES, AND LIGHTING, AS APPROVED BY THE ENGINEER.

    IN ADDITION, NO EXCAVATION EXCEEDING 3 INCHES IN DEPTH SHALL BE LEFT OPEN WITHIN THE AOA, AS DESCRIBED ABOVE, WHILE THE WORK AREA(S) ARE IN USE UNLESS THE EXCAVATIONS ARE COVERED WITH APPROVED STEEL PLATES AND/OR OTHER MEASURES AS MAY BE REQUIRED TO MAINTAIN SAFETY AND SECURITY. STEEL PLATES SHALL BE CAPABLE OF BEARING THE HEAVIEST AIRCRAFT/VEHICLE USING THE AIRPORT OVER THE SPAN OF TIME IN WHICH THEY ARE TO BE USED.

18. ALL EXCAVATIONS SHALL BE BACK FILLED, COMPACTED AND THE PAVEMENT REPAIRED AND PROPERLY CURED PRIOR TO THE AREA BEING REOPENED TO TRAFFIC. ALL EXCAVATION REQUIRED SHALL BE CONSTRUCTED PER THE CONTRACT DOCUMENTS, INCLUDING DEPTH OF EXCAVATION, SIDEWALL STABILIZATION, BACKFILL, COMPACTION, ETC.

DEBRIS AND DUST CONTROL

19. THE CONTRACTOR SHALL STRICTLY CONTROL DEBRIS AND LITTER AT ITS WORK SITE(S) FOR THE PROJECT. MUD, STONES OR OTHER DEBRIS RESULTING FROM CONSTRUCTION OPERATIONS SHALL BE PROMPTLY AND COMPLETELY REMOVED FROM ALL PAVEMENTS TO FACILITATE DAILY AIRCRAFT OPERATIONS AND A CLEAN ENVIRONMENT. DUST CONTROL MEASURES SHALL BE TAKEN AS NECESSARY BY THE CONTRACTOR TO ENSURE THAT NO DUST PRODUCED BY CONSTRUCTION ACTIVITY IS ALLOWED TO DRIFT INTO THE AOA, INTO LOCATIONS WHERE AIRCRAFT ARE PARKED AT ANY TIME, OR SURROUNDING RESIDENCES OR BUSINESSES. THE CONTRACTOR SHALL ENSURE THAT ALL PUBLIC ROADS ARE CONTINUOUSLY MAINTAINED FREE OF MUD AND DEBRIS THAT MAY RESULT FROM ITS OPERATIONS INCLUDING OPERATIONS ASSOCIATED WITH ITS SUBCONTRACTOR AND VENDORS. DEBRIS AND DUST CONTROL MEASURES SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT. THE CONTRACTOR SHALL PROVIDE A MANNED VAC SWEEPER DURING ALL TIMES WHEN ACTIVE AOA PAVEMENTS ARE CROSSED AT NO ADDITIONAL COST TO THE OWNER.

CONTRACTOR'S STAGING AREAS

20. THE CONTRACTOR SHALL USE THE AREAS SHOWN ON THE PLANS FOR HIS/HER STAGING AREA(S). NO OTHER AREAS ARE APPROVED WITHOUT THE EXPLICIT CONSENT OF THE AIRPORT MANAGER AND THE ENGINEER. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL IMPROVEMENT AND RESTORATION OF THE DESIGNATED STAGING AREAS SUCH AS GRUBBING, GRADING, AND CONSTRUCTION OF STABILIZED ACCESS ROADS, THAT IS NECESSARY FOR THE UTILIZATION OF THE AREA. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR ANY TEMPORARY ACCESS PERMITS AND ASSOCIATED FEES FOR ACCESS TO THE ADJACENT ROAD NETWORK. THERE WILL BE NO SEPARATE PAYMENT FOR THIS WORK. THE COST FOR ALL WORK NECESSARY TO ESTABLISH, USE AND RESTORE THE STAGING AREA(S) SHALL BE DEEMED INCIDENTAL TO THE OVERALL PROJECT.

21. THE CONTRACTOR SHALL MAINTAIN THE STAGING AREA(S), AND THE PROJECT SITE, IN A NEAT MANNER AND PREVENT TRASH, DUST, AND DEBRIS FROM BLOWING INTO ABUTTING AREAS.

GENERAL NOTES

22. IF THE OWNER REQUIRES WEEKLY JOB MEETINGS, THE TIME AND DATE WILL BE DETERMINED BY MUTUAL AGREEMENT OF THE OWNER, CONTRACTOR AND ENGINEER. ENGINEER WILL CONDUCT THE MEETING. AT A MINIMUM THE CONTRACTOR SHALL PROVIDE IT'S PROJECT MANAGER, SITE SUPERINTENDENT(S) AND OTHER KEY PERSONNEL THAT THE CONTRACTOR FEELS IS NECESSARY TO ATTEND THE MEETING. THE MEETING SHALL ALSO BE ATTENDED BY A REPRESENTATIVE OF EACH SUBCONTRACTOR THAT IS PERFORMING WORK AT THE TIME OF THE MEETING, OR BY A SUBCONTRACTOR THAT MAY PLAY A CRITICAL ROLE IN ANY PARTICULAR MEETING. THE MEETING MAY ALSO BE ATTENDED BY THE AIRPORT MANAGER OR HIS/HER DESIGNEE, AND OTHER INVITED PARTIES.

23. THE CONTRACTOR SHALL PROVIDE A WRITTEN UPDATE TO THE PROJECT SCHEDULE AT EACH WEEKLY JOB MEETING; AN ELECTRONIC COPY OF THE SCHEDULE SHALL ALSO BE PROVIDED TO THE OWNER AND ENGINEER VIA EMAIL ON THE DATE OF EACH WEEKLY JOB MEETING. AT A MINIMUM, THE PROJECT SCHEDULE SHALL INCLUDE THE STATUS OF EACH PAY ITEM BY NOTING THE PERCENT COMPLETE TO DATE AND THE CORRESPONDING ANTICIPATED COMPLETION DATE. THE CONTRACTOR SHALL ALSO INDICATE THE STATUS OF THE OVERALL PROJECT INDICATING WHETHER THE PROJECT IS ON SCHEDULE, AHEAD OF SCHEDULE, OR BEHIND SCHEDULE.

24. THE CONTRACTOR SHALL SUBMIT A CONSTRUCTION MANAGEMENT PLAN FOR REVIEW AND APPROVAL BY ENGINEER. AT A MINIMUM, THIS PLAN SHALL INCLUDE, BUT NOT LIMITED TO, THE FOLLOWING ELEMENTS:
    a. PROJECT SCHEDULE – UPDATED WEEKLY
    b. 24-HOUR CONTACT INFORMATION FOR KEY PERSONNEL, INCLUDING: PROJECT MANAGER, SITE SUPERINTENDENT(S), AND 24-HOUR CONTACT INFORMATION FOR ALL SUBCONTRACTORS.
    c. SITE SECURITY PLAN
    d. DUST CONTROL
    e. CONSTRUCTION SAFETY MEASURES PURSUANT TO THE CONSTRUCTION SAFETY AND PHASING PLAN

CLOSEOUT DELIVERABLES AND FINAL PAYMENT

25. THE CONTRACTOR SHALL COMPLETE AND PROVIDE THE FOLLOWING DOCUMENTS AND DELIVERABLES BEFORE FINAL PAYMENT:

    a. AS-BUILT PLANS, STAMPED BY PLS SUBCONTRACTOR
    b. AUTOCAD DRAWING OF AS-BUILT PLANS
    c. PROJECT PHOTOGRAPHS
    d. CONTRACTOR WARRANTY
    e. LIEN WAIVERS
    f. FINAL CERTIFIED PAYROLL
    g. EQUIPMENT / O&M MANUALS, AS REQUIRED

26. THE CONTRACTOR IS RESPONSIBLE FOR THE PREPARATION OF ITS OWN HEALTH AND SAFETY PLAN CONSISTENT WITH OSHA. PFAS IS LOCATED WITHIN SITE SOILS. REFER TO DOCUMENT TITLED " FINAL IMMEDIATE RESPONSE ACTION PLAN MODIFICATION", PREPARED BY THE HORSELY WITTEN GROUP, INC. AND DATED DECEMBER 2019

ASG

NO.	DATE	DESCRIPTION	BY

PROJECT: PFAS MITIGATION

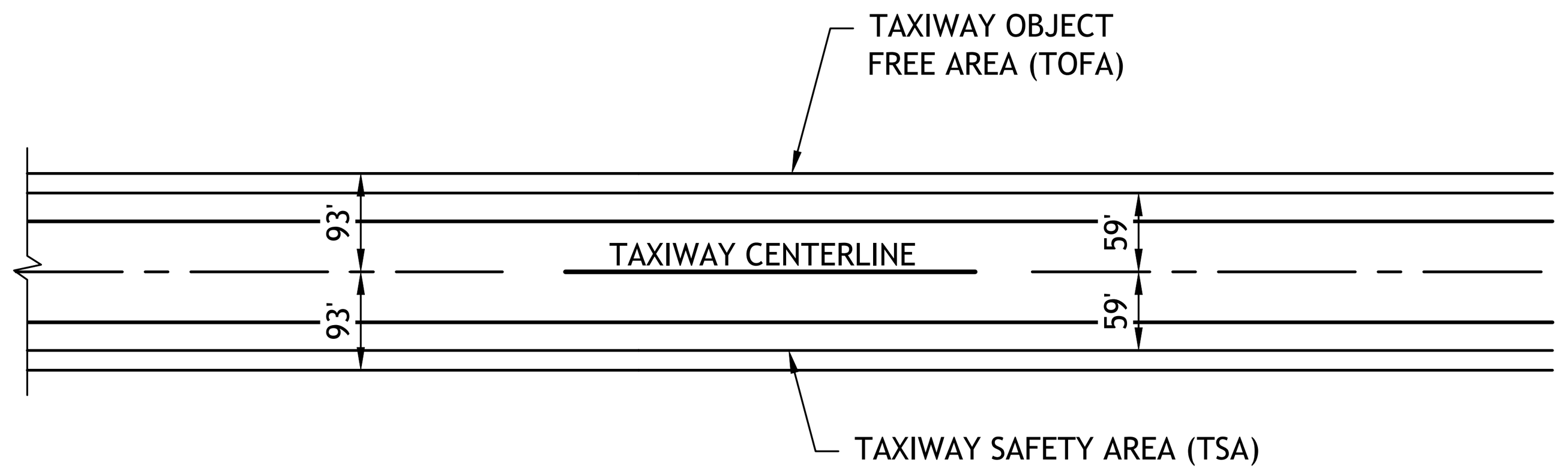
OWNER: BARNSTABLE MUNICIPAL AIRPORT
480 Barnstable Road • Hyannis, MA 02601
(508) 775-2020

PROJECT NO.	17027A
DESIGNED BY	PEJ
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	MARCH 2020
DRAWING SCALE	N.T.S

SHEET TITLE: CONSTRUCTION SAFETY AND PHASING PLAN - GENERAL NOTES

GRAPHIC SCALE: N.T.S.

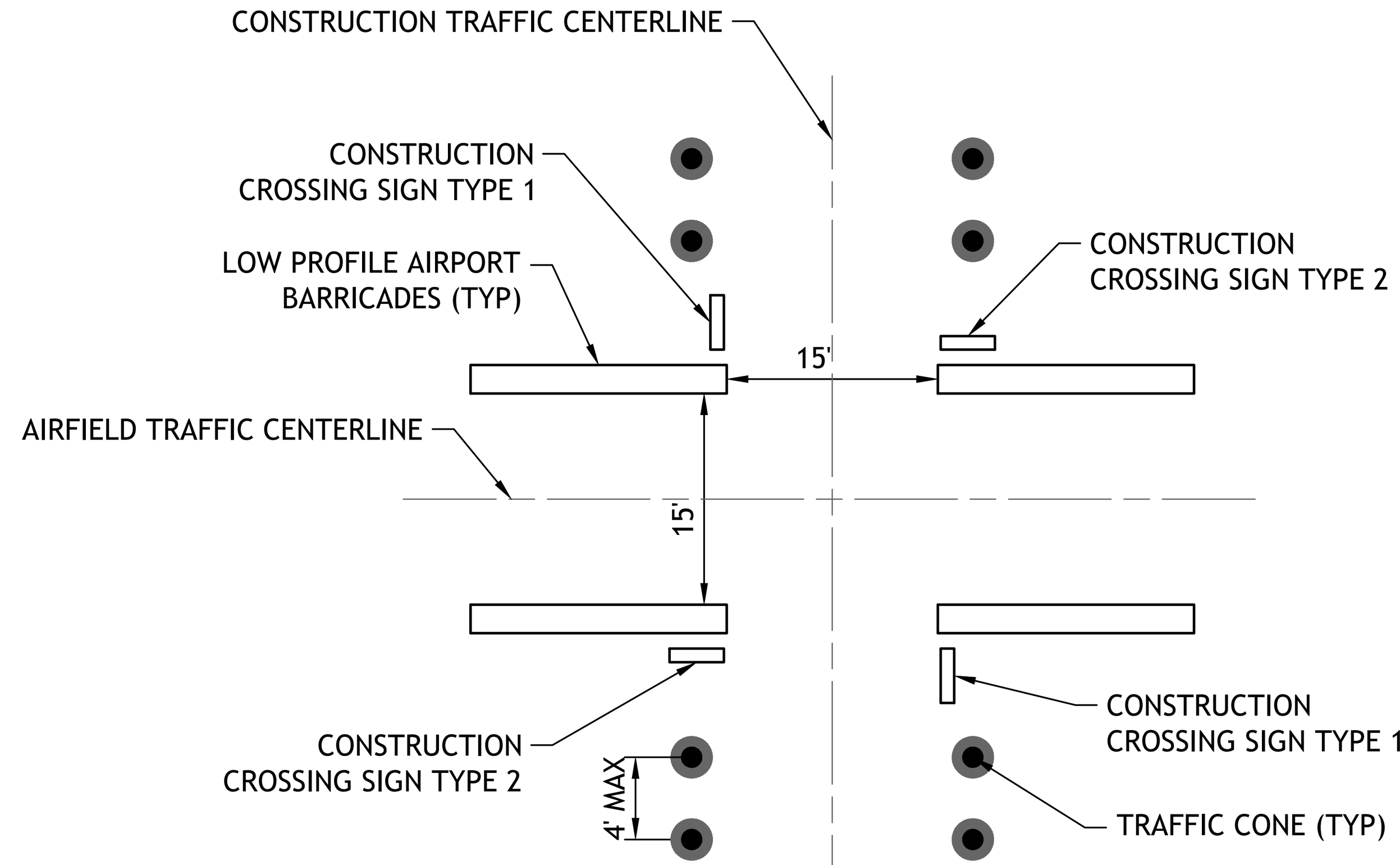
DRAWING NO.
S1.1



NOTE: NO WORK MAY OCCUR WITHIN THE TSA WITHOUT CLOSING DOWN THE TAXIWAY.

TAXIWAYS B RESTRICTED CONSTRUCTION AREAS

SCALE: N.T.S.



NOTE: CONSTRUCTION SITE CROSSING TO BE IMPLEMENTED DURING WORK AREA IB.

CONSTRUCTION SITE CROSSING

SCALE: N.T.S.

CONSTRUCTION CROSSING SIGN TYPE 1

SCALE: N.T.S.

CONSTRUCTION CROSSING SIGN TYPE 2

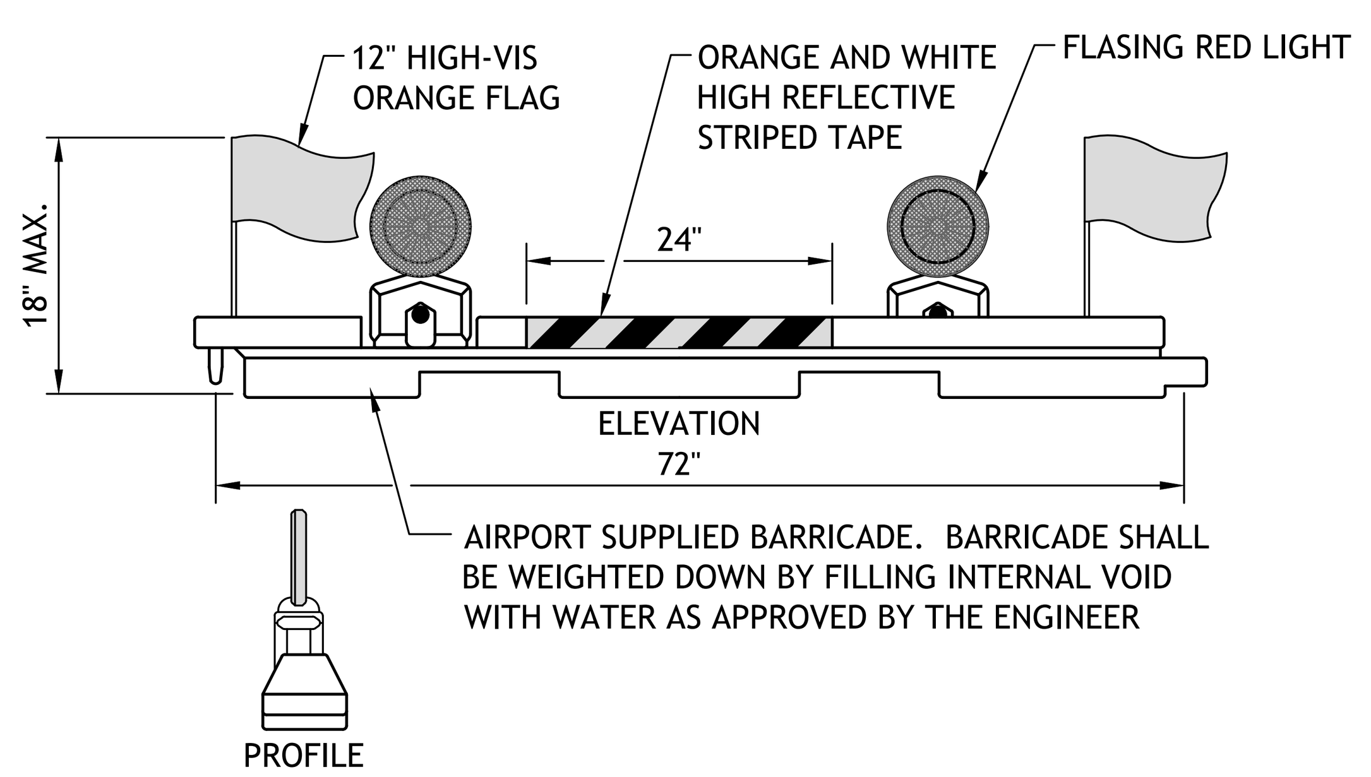
SCALE: N.T.S.

NOTES:

1. "WATCH FOR CROSSING TRAFFIC" SIGNS SHALL BE DESIGNED PER W20-1 SIGN IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), 2009 EDITION.
2. "DO NOT TURN" SIGNS SHALL BE DESIGNED PER R3-3 SIGN IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), 2009 EDITION.
3. SIGNS SHALL CONFORM TO THE DIMENSIONS AND MATERIAL REQUIRED IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), 2009 EDITION.
4. SIGN MOUNTING TO BE APPROVED BY ENGINEER.
5. SIGNS SHALL BE OF RETROREFLECTIVE MATERIAL AND MEET THE MINIMUM REQUIREMENTS LISTED IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), 2009 EDITION.
6. SIGNS SHALL BE PLACED AS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER OR AIRPORT.

TEMPORARY CONSTRUCTION SIGNS

SCALE: N.T.S.

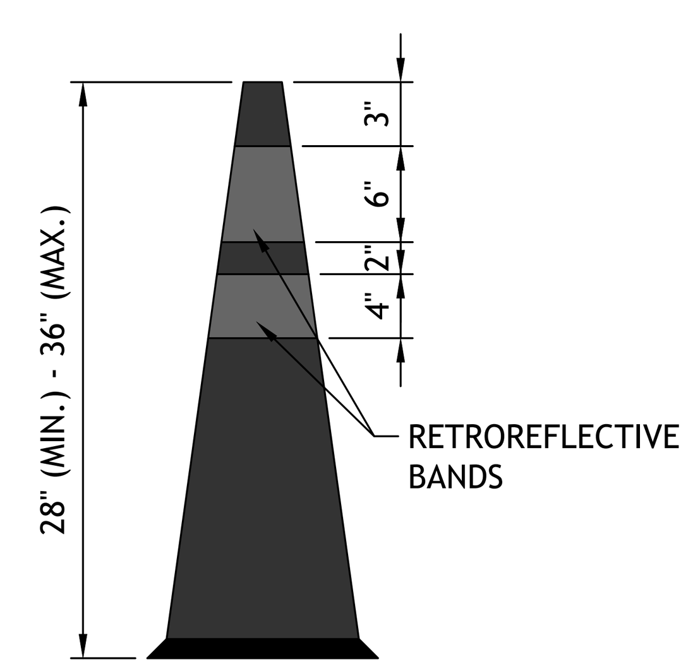


NOTES

1. THE AIRPORT WILL SUPPLY 210 BARRICADES. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT THE BARRICADES MEET FAA REQUIREMENTS FOR VISIBILITY, PER ADVISORY CIRCULAR 150/5370-2G, OR LATEST EDITION, SUCH AS PROVIDING NEW LIGHTS, REPLACEMENT OF BATTERIES, PROVIDING NEW FLAGS, ETC.
2. IT IS THE CONTRACTORS RESPONSIBILITY TO TRANSPORT AND PLACE THE BARRICADES FROM THEIR CURRENT LOCATION ON THE AIRPORT TO THE WORK AREA. IT IS ALSO THE RESPONSIBILITY OF THE CONTRACTOR TO RETURN THE BARRICADES BACK TO THEIR ORIGINAL AIRPORT STORAGE AREA UPON COMPLETION OF THE PROJECT.
3. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT THE BARRICADES ARE RETURNED IN A LIKE OR BETTER CONDITION. ANY BARRICADES DAMAGED BY THE CONTRACTOR SHALL BE REPLACED IN KIND BY THE CONTRACTOR AT THEIR COST.
4. BARRICADE LIGHTS SHALL HAVE RED LENSES AND LED LAMPS AND ORANGE FLAGS.
5. DURING CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE THE NECESSARY SAFETY BARRICADES TO ENSURE THE SAFETY OF AIRCRAFT, AIRCRAFT PASSENGERS, AIRFIELD EMPLOYEES, THE PUBLIC, AND THE CONTRACTOR'S EMPLOYEES.
6. BARRICADES SHALL BE IN PLACE EACH DAY TO DELINEATE THE WORK AREA AND TO RESTRICT ANY AIRCRAFT FROM TAXIING INTO THE ACTIVE WORK AREA. PLACEMENT AND LOCATION OF BARRICADES SHALL BE APPROVED BY THE ENGINEER ON A DAILY BASIS AND COORDINATED WITH THE AIRPORT MANAGER.
7. BARRICADES SHALL BE WEIGHTED WITH WATER TO RESIST WIND, PROP WASH, AND JET BLAST.
8. MAXIMUM ALLOWABLE HEIGHT IS 18 INCHES. STANDARD TYPE HIGHWAY BARRICADES, BARRELS, AND CONES ARE NOT ACCEPTABLE FOR AIRPORT BARRICADES.
9. THE BARRICADES SHOWN ON THE PLAN DO NOT REPRESENT THE QUANTITY OF BARRICADES BUT REPRESENTS THE LOCATION.

LOW PROFILE AIRPORT BARRICADE

SCALE: N.T.S.



NOTES:

1. TRAFFIC CONES MUST MEET THE REQUIREMENTS OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
2. DURING CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE THE NECESSARY TRAFFIC CONES TO ENSURE THE SAFETY OF AIRCRAFT, AIRCRAFT PASSENGERS, AIRFIELD EMPLOYEES, THE PUBLIC, AND THE CONTRACTOR'S EMPLOYEES.
3. CONES SHALL BE IN PLACE EACH DAY TO DELINEATE THE WORK AREA AND TO RESTRICT ANY AIRCRAFT FROM TAXIING INTO THE ACTIVE WORK AREA. PLACEMENT AND LOCATION OF CONES SHALL BE APPROVED BY THE ENGINEER ON A DAILY BASIS AND COORDINATED WITH THE AIRPORT MANAGER.
4. CONES SHALL BE WEIGHTED TO RESIST WIND, PROP WASH, AND JET BLAST.
5. MAXIMUM ALLOWABLE SPACING OF CONES IS TEN (10) FEET. SEE DRAWINGS.

TRAFFIC CONE

SCALE: N.T.S.

NO.	DATE	DESCRIPTION	BY

PROJECT
PFAS MITIGATION

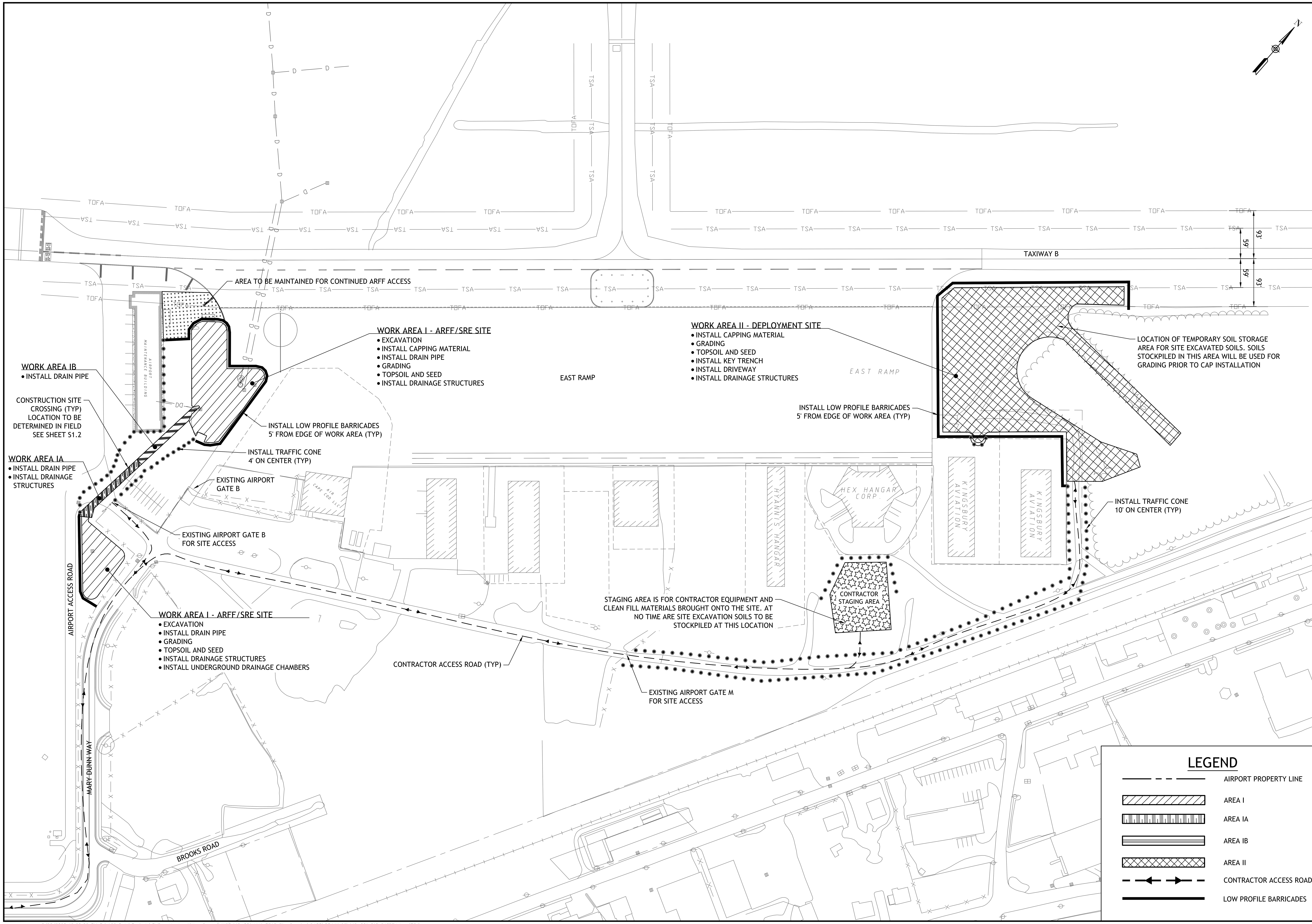
OWNER
BARNSTABLE MUNICIPAL AIRPORT
480 Barnstable Road • Hyannis, MA 02601
(508) 775-2020

PROJECT NO.	17027A
DESIGNED BY	PEJ
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	MARCH 2020
DRAWING SCALE	N.T.S

SHEET TITLE
CONSTRUCTION SAFETY AND PHASING PLAN - DETAILS

GRAPHIC SCALE
N.T.S.

DRAWING NO.
S1.2



TAXIWAY B
AREA TO BE MAINTAINED FOR CONTINUED ARFF ACCESS
WORK AREA I - ARFF/SRE SITE
• EXCAVATION
• INSTALL CAPPING MATERIAL
• INSTALL DRAIN PIPE
• GRADING
• TOPSOIL AND SEED
• INSTALL DRAINAGE STRUCTURES
WORK AREA II - DEPLOYMENT SITE
• INSTALL CAPPING MATERIAL
• GRADING
• TOPSOIL AND SEED
• INSTALL KEY TRENCH
• INSTALL DRIVEWAY
• INSTALL DRAINAGE STRUCTURES
LOCATION OF TEMPORARY SOIL STORAGE AREA FOR SITE EXCAVATED SOILS. SOILS STOCKPILED IN THIS AREA WILL BE USED FOR GRADING PRIOR TO CAP INSTALLATION
WORK AREA IB
• INSTALL DRAIN PIPE
EAST RAMP
EAST RAMP
CONSTRUCTION SITE CROSSING (TYP) LOCATION TO BE DETERMINED IN FIELD SEE SHEET S1.2
INSTALL LOW PROFILE BARRICADES 5' FROM EDGE OF WORK AREA (TYP)
INSTALL LOW PROFILE BARRICADES 5' FROM EDGE OF WORK AREA (TYP)
WORK AREA IA
• INSTALL DRAIN PIPE
• INSTALL DRAINAGE STRUCTURES
INSTALL TRAFFIC CONE 4' ON CENTER (TYP)
EXISTING AIRPORT GATE B
EXISTING AIRPORT GATE B FOR SITE ACCESS
INSTALL TRAFFIC CONE 10' ON CENTER (TYP)
HEX HANGAR CORP.
KINGSBURY AVIATION
KINGSBURY AVIATION
HYANNIS HANGAR
CAPE AIR CAPE COD LLC
AIRPORT MAINTENANCE BUILDING
STAGING AREA IS FOR CONTRACTOR EQUIPMENT AND CLEAN FILL MATERIALS BROUGHT ONTO THE SITE. AT NO TIME ARE SITE EXCAVATION SOILS TO BE STOCKPILED AT THIS LOCATION
CONTRACTOR STAGING AREA
WORK AREA I - ARFF/SRE SITE
• EXCAVATION
• INSTALL DRAIN PIPE
• GRADING
• TOPSOIL AND SEED
• INSTALL DRAINAGE STRUCTURES
• INSTALL UNDERGROUND DRAINAGE CHAMBERS
CONTRACTOR ACCESS ROAD (TYP)
EXISTING AIRPORT GATE M FOR SITE ACCESS
AIRPORT ACCESS ROAD
MARY DUNN WAY
BROOKS ROAD
LEGEND
AIRPORT PROPERTY LINE
AREA I
AREA IA
AREA IB
AREA II
CONTRACTOR ACCESS ROAD
LOW PROFILE BARRICADES

ASG AIRPORT SOLUTIONS GROUP, LLC

AIRPORT CONSULTANT • BURLINGTON, MASSACHUSETTS

NO.	DATE	DESCRIPTION	BY

PROJECT
PFAS MITIGATION

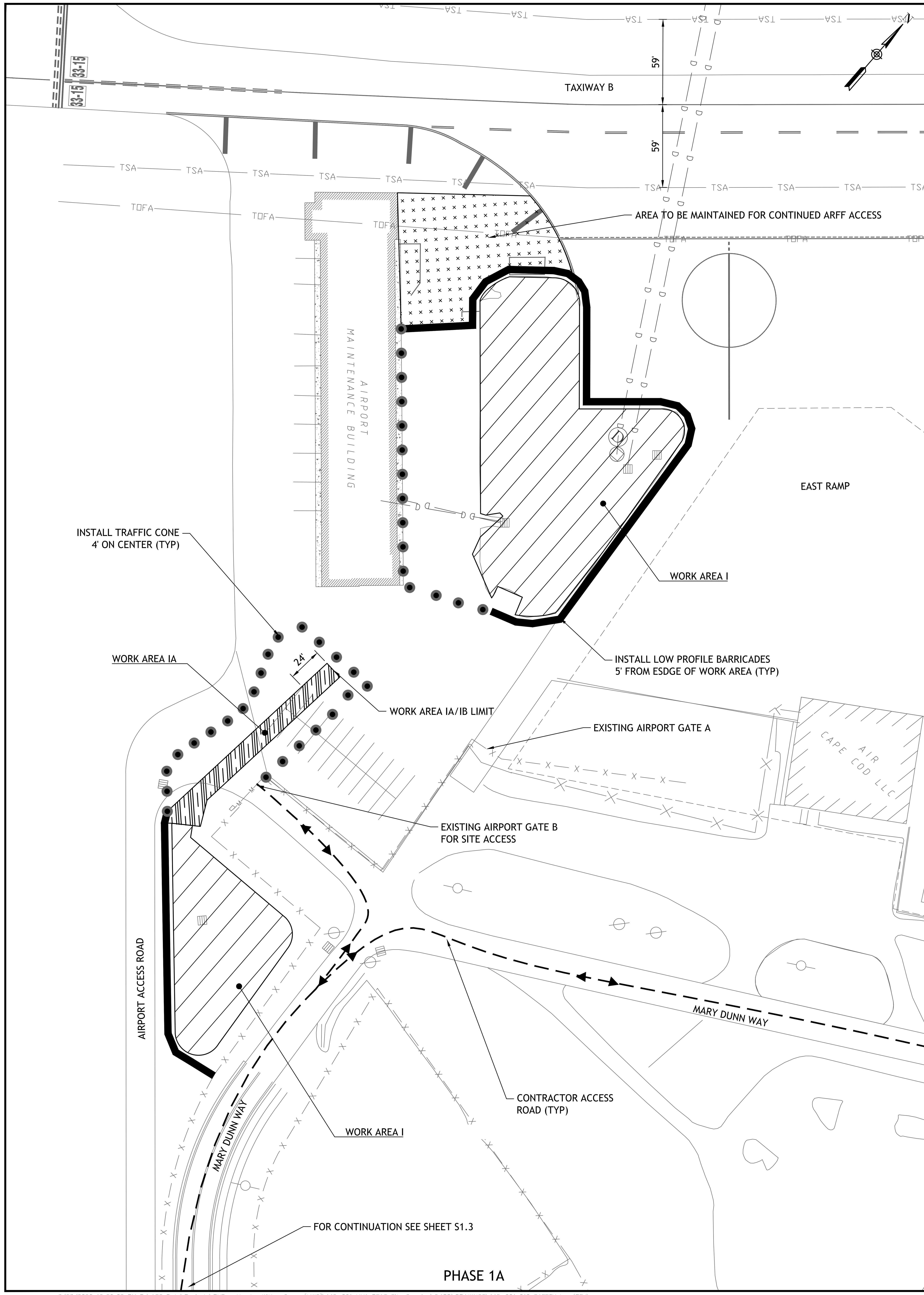
OWNER
BARNSTABLE MUNICIPAL AIRPORT
480 Barnstable Road • Hyannis, MA 02601
(508) 775-2020

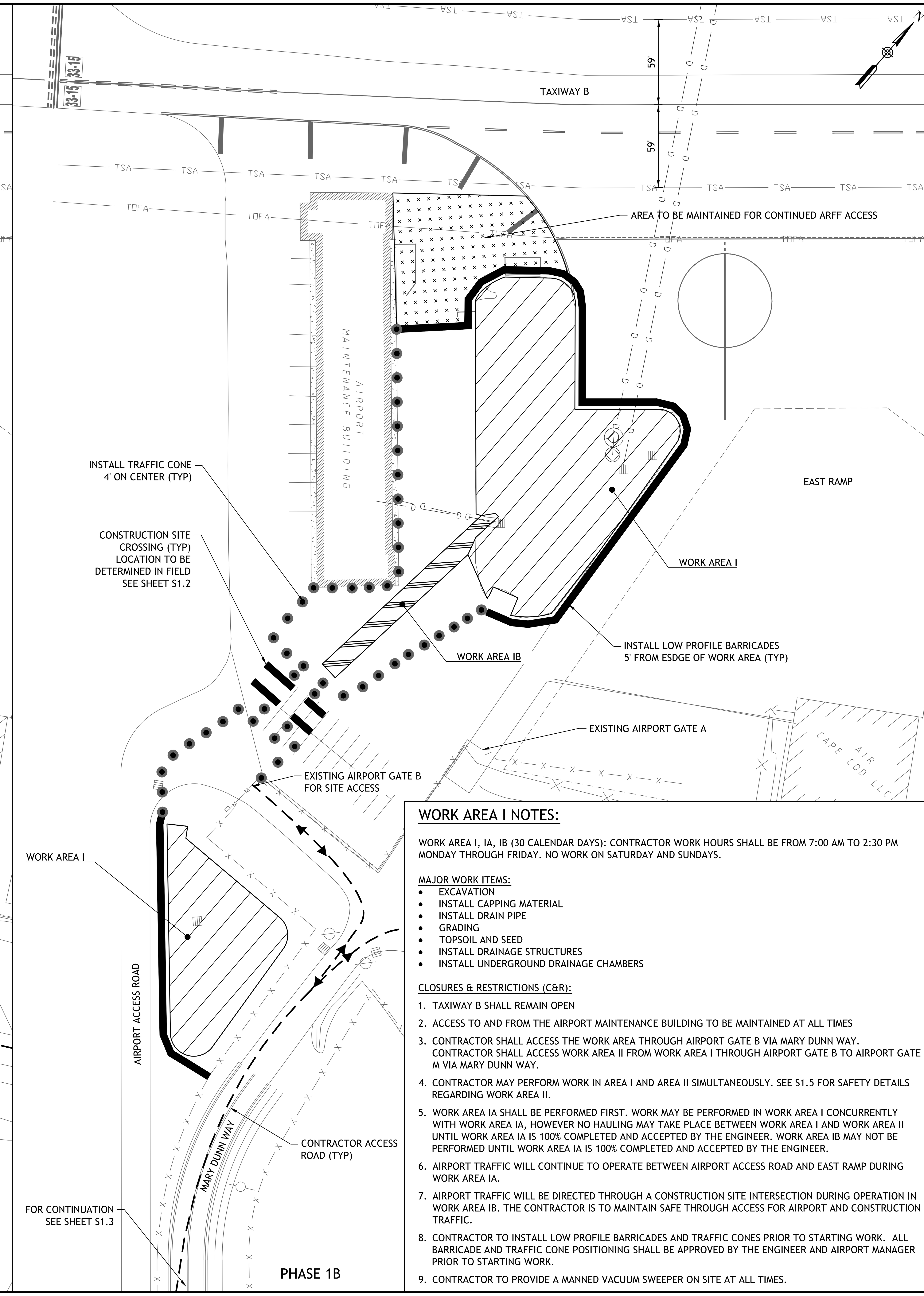
PROJECT NO.	17027A
DESIGNED BY	PEJ
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	MARCH 2020
DRAWING SCALE	1" = 80'

SHEET TITLE
CONSTRUCTION SAFETY AND PHASING PLAN - SITE PLAN

GRAPHIC SCALE 0 40' 80' 160'

DRAWING NO.
S1.3





WORK AREA I NOTES:

WORK AREA I, IA, IB (30 CALENDAR DAYS): CONTRACTOR WORK HOURS SHALL BE FROM 7:00 AM TO 2:30 PM MONDAY THROUGH FRIDAY. NO WORK ON SATURDAY AND SUNDAYS.

MAJOR WORK ITEMS:

- EXCAVATION
- INSTALL CAPPING MATERIAL
- INSTALL DRAIN PIPE
- GRADING
- TOPSOIL AND SEED
- INSTALL DRAINAGE STRUCTURES
- INSTALL UNDERGROUND DRAINAGE CHAMBERS

CLOSURES & RESTRICTIONS (C&R):

1. TAXIWAY B SHALL REMAIN OPEN
2. ACCESS TO AND FROM THE AIRPORT MAINTENANCE BUILDING TO BE MAINTAINED AT ALL TIMES
3. CONTRACTOR SHALL ACCESS THE WORK AREA THROUGH AIRPORT GATE B VIA MARY DUNN WAY. CONTRACTOR SHALL ACCESS WORK AREA II FROM WORK AREA I THROUGH AIRPORT GATE B TO AIRPORT GATE M VIA MARY DUNN WAY.
4. CONTRACTOR MAY PERFORM WORK IN AREA I AND AREA II SIMULTANEOUSLY. SEE S1.5 FOR SAFETY DETAILS REGARDING WORK AREA II.
5. WORK AREA IA SHALL BE PERFORMED FIRST. WORK MAY BE PERFORMED IN WORK AREA I CONCURRENTLY WITH WORK AREA IA, HOWEVER NO HAULING MAY TAKE PLACE BETWEEN WORK AREA I AND WORK AREA II UNTIL WORK AREA IA IS 100% COMPLETED AND ACCEPTED BY THE ENGINEER. WORK AREA IB MAY NOT BE PERFORMED UNTIL WORK AREA IA IS 100% COMPLETED AND ACCEPTED BY THE ENGINEER.
6. AIRPORT TRAFFIC WILL CONTINUE TO OPERATE BETWEEN AIRPORT ACCESS ROAD AND EAST RAMP DURING WORK AREA IA.
7. AIRPORT TRAFFIC WILL BE DIRECTED THROUGH A CONSTRUCTION SITE INTERSECTION DURING OPERATION IN WORK AREA IB. THE CONTRACTOR IS TO MAINTAIN SAFE THROUGH ACCESS FOR AIRPORT AND CONSTRUCTION TRAFFIC.
8. CONTRACTOR TO INSTALL LOW PROFILE BARRICADES AND TRAFFIC CONES PRIOR TO STARTING WORK. ALL BARRICADE AND TRAFFIC CONE POSITIONING SHALL BE APPROVED BY THE ENGINEER AND AIRPORT MANAGER PRIOR TO STARTING WORK.
9. CONTRACTOR TO PROVIDE A MANNED VACUUM SWEEPER ON SITE AT ALL TIMES.

ASG AIRPORT SOLUTIONS GROUP, LLC
Innovation By Design
AIRPORT CONSULTANT • BURLINGTON, MASSACHUSETTS
PHONE (781) 491-0083 FAX (781) 491-0360

NO.	DATE	DESCRIPTION	BY

PROJECT
PFAS MITIGATION

OWNER
BARNSTABLE MUNICIPAL AIRPORT
480 Barnstable Road • Hyannis, MA 02601
(508) 775-2020

PROJECT NO.	17027A
DESIGNED BY	PEJ
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	MARCH 2020
DRAWING SCALE	1" = 40'

SHEET TITLE
CONSTRUCTION SAFETY AND PHASING PLAN - WORK AREA I

GRAPHIC SCALE 0 20' 40' 80'

DRAWING NO.
S1.4

WORK AREA II NOTES:

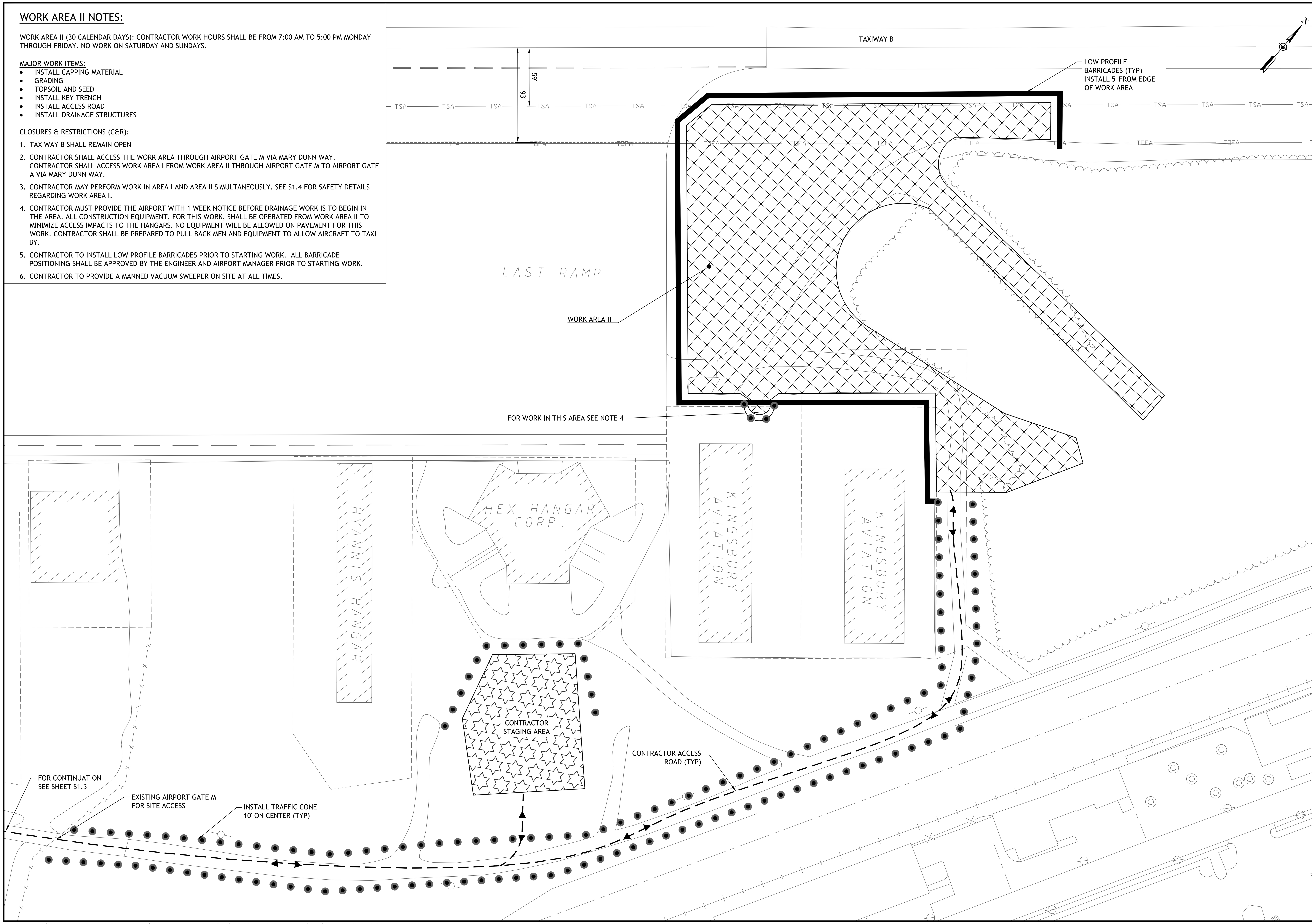
WORK AREA II (30 CALENDAR DAYS): CONTRACTOR WORK HOURS SHALL BE FROM 7:00 AM TO 5:00 PM MONDAY THROUGH FRIDAY. NO WORK ON SATURDAY AND SUNDAYS.

MAJOR WORK ITEMS:

- INSTALL CAPPING MATERIAL
- GRADING
- TOPSOIL AND SEED
- INSTALL KEY TRENCH
- INSTALL ACCESS ROAD
- INSTALL DRAINAGE STRUCTURES

CLOSURES & RESTRICTIONS (C&R):

1. TAXIWAY B SHALL REMAIN OPEN
2. CONTRACTOR SHALL ACCESS THE WORK AREA THROUGH AIRPORT GATE M VIA MARY DUNN WAY. CONTRACTOR SHALL ACCESS WORK AREA I FROM WORK AREA II THROUGH AIRPORT GATE M TO AIRPORT GATE A VIA MARY DUNN WAY.
3. CONTRACTOR MAY PERFORM WORK IN AREA I AND AREA II SIMULTANEOUSLY. SEE S1.4 FOR SAFETY DETAILS REGARDING WORK AREA I.
4. CONTRACTOR MUST PROVIDE THE AIRPORT WITH 1 WEEK NOTICE BEFORE DRAINAGE WORK IS TO BEGIN IN THE AREA. ALL CONSTRUCTION EQUIPMENT, FOR THIS WORK, SHALL BE OPERATED FROM WORK AREA II TO MINIMIZE ACCESS IMPACTS TO THE HANGARS. NO EQUIPMENT WILL BE ALLOWED ON PAVEMENT FOR THIS WORK. CONTRACTOR SHALL BE PREPARED TO PULL BACK MEN AND EQUIPMENT TO ALLOW AIRCRAFT TO TAXI BY.
5. CONTRACTOR TO INSTALL LOW PROFILE BARRICADES PRIOR TO STARTING WORK. ALL BARRICADE POSITIONING SHALL BE APPROVED BY THE ENGINEER AND AIRPORT MANAGER PRIOR TO STARTING WORK.
6. CONTRACTOR TO PROVIDE A MANNED VACUUM SWEEPER ON SITE AT ALL TIMES.



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NO.	DATE	DESCRIPTION	BY

PROJECT: PFAS MITIGATION

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480 Barnstable Road • Hyannis, MA 02601
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PROJECT NO.	17027A
DESIGNED BY	PEJ
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CHECKED BY	CAS
DATE	MARCH 2020
DRAWING SCALE	1" = 40'

SHEET TITLE: CONSTRUCTION SAFETY AND PHASING PLAN - WORK AREA II

GRAPHIC SCALE 0 20' 40' 80'

DRAWING NO.

S1.5

Appendix B – HASP Signature Page

SITE WORKER AND VISITOR NOTIFICATION LOG

Barnstable Municipal Airport
Hyannis, MA

PROJECT CONTRACTOR: _____

PROJECT DESCRIPTION: _____

SITE HEALTH AND SAFETY OFFICER: _____

All site workers and visitors must be informed of the Health and Safety Plan (HASP) prior to working on or visiting the Site. By signing below you acknowledge the requirements of the HASP and agree to comply with all requirements established in the HASP.

NAME	COMPANY	SIGNATURE	DATE

Appendix C – OSHA Permissible Exposure Limits Tables Z-1 Through Z-3

Note: This table only includes occupational exposure limits (OELs) for substances listed in the OSHA Z-1 Table. OELs for hundreds of additional substances have been adopted by Cal/OSHA, NIOSH, and ACGIH. These organizations periodically make revisions to their OELs and so they should be consulted directly for their most current values and substances, as well as special notations such as for skin absorption. The TLVs® and BEIs® are copyrighted by ACGIH® and are not publicly available. However, they can be purchased in their entirety on the ACGIH® website. Permission must be requested from ACGIH® to reproduce the TLVs® and BEIs®. Click here for permission request form.

OSHA Annotated Table Z-1[(a)]

***Go to list of all footnotes**

Substance	CAS No.[(c)]	Regulatory Limits			Recommended Limits	
		OSHA PEL[(b)]		Cal/OSHA PEL[(f)] *(as of 4/4/2018)*	NIOSH REL[(g)] *(as of 7/7/16)*	ACGIH® 2018 TLV® [(h)]
		ppm [(d)]	mg/m³ [(e)]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Acetaldehyde	75-07-0	200	360	(C) 25 ppm	Ca See Appendix A See Appendix C	(C) 25 ppm
Acetic acid	64-19-7	10	25	10 ppm (ST) 15 ppm (C) 40 ppm	10 ppm (ST) 15 ppm	10 ppm (ST) 15 ppm
Acetic anhydride	108-24-7	5	20	(C) 5 ppm	(C) 5 ppm	1 ppm (ST) 3 ppm
Acetone	67-64-1	1000	2400	500 ppm (ST) 750 ppm (C) 3000 ppm	250 ppm	250 ppm (ST) 500 ppm
Acetonitrile	75-05-8	40	70	40 ppm (ST) 60 ppm	20 ppm	20 ppm
2-Acetylaminofluorene; see 1910.1014	53-96-3			See Section 5209	Ca See Appendix A	
Acetylene dichloride; see 1,2-Dichloroethylene						
Acetylene tetrabromide	79-27-6	1	14	1 ppm	See Appendix D	0.1 ppm (IFV)
Acrolein	107-02-8	0.1	0.25	(C) 0.1 ppm	0.1 ppm (ST) 3 ppm	(C) 0.1 ppm
Acrylamide	79-06-1		0.3	0.03 mg/m³		0.03 mg/m³ (IFV)

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
					Ca 0.03 mg/m³ See Appendix A	
Acrylonitrile; see 1910.1045	107-13-1			2 ppm Section 5213	Ca 1 ppm (C) 10 ppm [15-min] See Appendix A	2 ppm
Aldrin	309-00-2		0.25	0.25 mg/m³	Ca 0.25 mg/m³ See Appendix A	0.05 mg/m³ (IFV)
Allyl alcohol	107-18-6	2	5	0.5 ppm (ST) 4 ppm	2 ppm (ST) 4 ppm	0.5 ppm
Allyl chloride	107-05-1	1	3	1 ppm (ST) 2 ppm	1 ppm (ST) 2 ppm	1 ppm (ST) 2 ppm
Allyl glycidyl ether (AGE)	106-92-3	(C) 10	(C) 45	0.2 ppm	5 ppm (ST) 10 ppm	1 ppm
Allyl propyl disulfide	2179-59-1	2	12	2 ppm (ST) 3 ppm	2 ppm	0.5 ppm
alpha-Alumina	1344-28-1			see PNOR	See Appendix D	See *TLV®* for Aluminum, metal and insoluble compounds
Total dust			15	10 mg/m³		
Respirable fraction			5	5 mg/m³		
Aluminum Metal (as Al)	7429-90-5					
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction;			5	5 mg/m³	5 mg/m³	1 mg/m³
4-Aminodiphenyl see 1910.1011	92-67-1			See Section 5209	Ca See Appendix A	Exposure by all routes should be carefully controlled to levels as low as possible
2-Aminoethanol; see Ethanolamine						
2-Aminopyridine	504-29-0	0.5	2	0.5 ppm	0.5 ppm	0.5 ppm
Ammonia	7664-41-7	50	35	25 ppm (ST) 35 ppm	25 ppm (ST) 35 ppm	25 ppm (ST) 35 ppm
Ammonium sulfamate	7773-06-0					
Total dust			15	10 mg/m³	10 mg/m³	10 mg/m³
Respirable fraction			5	5 mg/m³	5 mg/m³	

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
n-Amyl acetate	628-63-7	100	525	50 ppm (ST) 100 ppm	100 ppm	50 ppm (ST) 100 ppm
sec-Amyl acetate	626-38-0	125	650	50 ppm (ST) 100 ppm	125 ppm	50 ppm (ST) 100 ppm
Aniline and homologs	62-53-3	5	19	2 ppm (aniline only)	Ca See Appendix A	2 ppm (aniline only)
Anisidine (o-,p-isomers)	29191-52-4		0.5	0.5 mg/m³	Ca 0.5 mg/m³ See Appendix A	0.5 mg/m³
Antimony and compounds (as Sb)	7440-36-0		0.5	0.5 mg/m³	0.5 mg/m³	0.5 mg/m³
ANTU (alpha Naphthylthiourea)	86-88-4		0.3	0.3 mg/m³	0.3 mg/m³	0.3 mg/m³
Arsenic, inorganic compounds (as As) see 1910.1018	7440-38-2			0.01 mg/m³ See Section 5214	Ca (C) 0.002 mg/m³ [15-min] See Appendix A	0.01 mg/m³
Arsenic, organic compounds (as As)	7440-38-2		0.5	0.2 mg/m³	None	
Arsine	7784-42-1	0.05	0.2	0.05 ppm	Ca 0.002 mg/m³ [15-min] See Appendix A	0.005 ppm
Asbestos; see 1910.1001	Varies with compound			See Section 5208	Ca 0.1 f/cm³ See Appendix A See Appendix C	0.1 f/cc (resp. fiber)
Azinphos-methyl	86-50-0		0.2	0.2 mg/m³	0.2 mg/m³	0.2 mg/m³ (IFV)
Barium, soluble compounds (as Ba)	7440-39-3		0.5	0.5 mg/m³	0.5 mg/m³	0.5 mg/m³
Barium sulfate	7727-43-7			see PNOR		
Total dust			15	10 mg/m³	10 mg/m³	5 mg/m³ (no asbestos and < 1% crystalline silica)
Respirable fraction			5	5 mg/m³	5 mg/m³	
Benomyl	17804-35-2				See Appendix D	1 mg/m³ (IHL)
Total dust			15	10 mg/m³		
Respirable fraction			5	5 mg/m³		
Benzene; See 1910.1028; See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028[j]	71-43-2			1 ppm (ST) 5 ppm See Section 5218	Ca 0.1 ppm (ST) 1 ppm See Appendix A	0.5 ppm (ST) 2.5 ppm

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Benzidine; See 1910.1010	92-87-5			See Section 5209	Ca See Appendix A See Appendix C	Exposure by all routes should be carefully controlled to levels as low as possible
p-Benzoquinone; see Quinone						
Benzo(a)pyrene; see Coal tar pitch volatiles						
Benzoyl peroxide	94-36-0		5	5 mg/m³	5 mg/m³	5 mg/m³
Benzyl chloride	100-44-7	1	5	0.03 ppm	(C) 1 ppm [15 min]	1 ppm
Beryllium and beryllium compounds (as Be); see 1910.1024[o]	7440-41-7					
Biphenyl; see Diphenyl						
Bismuth telluride, Undoped	1304-82-1					
Total dust			15	10 mg/m³	10 mg/m³	10 mg/m³
Respirable fraction			5	5 mg/m³	5 mg/m³	
Boron oxide	1303-86-2					
Total dust			15	10 mg/m³	10 mg/m³	10 mg/m³
Boron trifluoride	7637-07-2	(C) 1	(C) 3	(C) 1 ppm	(C) 1 ppm	0.1 ppm (C) 0.7 ppm
Bromine	7726-95-6	0.1	0.7	(C) 0.1 ppm	0.1 ppm (ST) 0.3 ppm	0.1 ppm (ST) 0.2 ppm
Bromoform	75-25-2	0.5	5	0.5 ppm	0.5 ppm	0.5 ppm
Butadiene (1,3-Butadiene); See 29 CFR 1910.1051; 29 CFR 1910.19(l)	106-99-0	1 ppm / 5 ppm STEL		1 ppm (ST) 5 ppm See Section 5201	Ca See Appendix A	2 ppm
Butanethiol; see Butyl mercaptan						
2-Butanone (Methyl ethyl ketone)	78-93-3	200	590	200 ppm (ST) 300 ppm	200 ppm (ST) 300 ppm	200 ppm (ST) 300 ppm
2-Butoxyethanol	111-76-2	50	240	20 ppm	5 ppm	20 ppm
n-Butyl-acetate	123-86-4	150	710	150 ppm (ST) 200 ppm	150 ppm (ST) 200 ppm	[n]
sec-Butyl acetate	105-46-4	200	950	200 ppm	200 ppm	[n]
tert-Butyl-acetate	540-88-5	200	950	200 ppm	200 ppm	[n]
n-Butyl alcohol	71-36-3	100	300	(C) 50 ppm	(C) 50 ppm	20 ppm

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
sec-Butyl alcohol	78-92-2	150	450	100 ppm	100 ppm (ST) 150 ppm	100 ppm
tert-Butyl alcohol	75-65-0	100	300	100 ppm (ST) 150 ppm	100 ppm (ST) 150 ppm	100 ppm
Butylamine	109-73-9	(C) 5	(C) 15	(C) 5 ppm	(C) 5 ppm	(C) 5 ppm
tert-Butyl chromate (as CrO_3)[m]; see 1910.1026	1189-85-1			(C) 0.1 mg/m³	Ca 0.001 mg/m³ CR (VI) See Appendix A See Appendix C	(C) 0.1 mg/m³
n-Butyl glycidyl ether (BGE)	2426-08-6	50	270	25 ppm	(C) 5.6 ppm [15-min]	3 ppm
Butyl mercaptan	109-79-5	10	35	0.5 ppm	(C) 0.5 ppm [15-min]	0.5 ppm
p-tert-Butyltoluene	98-51-1	10	60	1 ppm (ST) 20 ppm	10 ppm (ST) 20 ppm	1 ppm
Cadmium (as Cd); see 1910.1027	7440-43-9			0.005 mg/m³ see Sections 1532 & 5207	Ca See Appendix A	0.01 mg/m³ (total) 0.002 mg/m³ (resp.)
Calcium Carbonate	1317-65-3			see PNOR		See *TLV® book* Appendix G
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	
Calcium hydroxide	1305-62-0					
Total dust			15	5 mg/m³	5 mg/m³	5 mg/m³
Respirable fraction			5			
Calcium oxide	1305-78-8		5	2 mg/m³	2 mg/m³	2 mg/m³
Calcium silicate	1344-95-2			see PNOR		1 mg/m³, natural as Wollastonite (IHL, no asbestos and < 1% crystalline silica)
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	
Calcium sulfate	7778-18-9			see PNOR		1 mg/m³, natural as Wollastonite (IHL, no asbestos and < 1% crystalline silica)
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Camphor, synthetic	76-22-2		2	2 mg/m³	2 mg/m³	2 ppm (ST) 3 ppm
Carbaryl (Sevin)	63-25-2		5	5 mg/m³	5 mg/m³	0.5 mg/m³ (IFV)
Carbon black	1333-86-4		3.5	3.5 mg/m³	3.5 mg/m³ (without PAHs); when PAHs are present, NIOSH considers carbon black to be a potential occupational carcinogen. See Appendix A, See Appendix C	3 mg/m³ (IHL)
Carbon dioxide	124-38-9	5000	9000	5000 ppm (ST) 30,000 ppm	5000 ppm (ST) 30,000 ppm	5000 ppm (ST) 30,000 ppm
Carbon disulfide	75-15-0	See Annotated Z-2		See Annotated Z-2		
Carbon monoxide	630-08-0	50	55	25 ppm (C) 200 ppm	35 ppm (C) 200 ppm	25 ppm
Carbon tetrachloride	56-23-5	See Annotated Z-2		See Annotated Z-2		
Cellulose	9004-34-6			see PNOR		
Total dust			15	10 mg/m³	10 mg/m³	10 mg/m³
Respirable fraction			5	5 mg/m³	5 mg/m³	
Chlordane	57-74-9		0.5	0.5 mg/m³	Ca 0.5 mg/m³ See Appendix A	0.5 mg/m³
Chlorinated camphene	8001-35-2		0.5	0.5 mg/m³ (ST) 1 mg/m³	Ca See Appendix A	0.5 mg/m³ (ST) 1 mg/m³
Chlorinated diphenyl oxide	55720-99-5		0.5	0.5 mg/m³	0.5 mg/m³	0.5 mg/m³ (ortho isomer)
Chlorine	7782-50-5	(C) 1	(C) 3	0.5 ppm (ST) 1 ppm	(C) 0.5 ppm [15-min]	0.1 ppm (ST) 0.4 ppm
Chlorine dioxide	10049-04-4	0.1	0.3	0.1 ppm (ST) 0.3 ppm	0.1 ppm (ST) 0.3 ppm	(C) 0.1 ppm
Chlorine trifluoride	7790-91-2	(C) 0.1	(C) 0.4	(C) 0.1 ppm	(C) 0.1 ppm	(C) 0.1 ppm
Chloroacetaldehyde	107-20-0	(C) 1	(C) 3	(C) 1 ppm	(C) 1 ppm	(C) 1 ppm
a-Chloroacetophenone (Phenacyl chloride)	532-27-4	0.05	0.3	0.05 ppm	0.05 ppm	0.05 ppm

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Chlorobenzene	108-90-7	75	350	10 ppm	See Appendix D	10 ppm
o-Chlorobenzylidene malononitrile	2698-41-1	0.05	0.4	(C) 0.05 ppm	(C) 0.05 ppm	(C) 0.05 ppm
Chlorobromomethane	74-97-5	200	1050	200 ppm	200 ppm	200 ppm
2-Chloro-1,3-butadiene; See beta-Chloroprene						
Chlorodiphenyl (42% Chlorine) (PCB)	53469-21-9		1	1 mg/m³	Ca 0.001 mg/m³ See Appendix A	1 mg/m³
Chlorodiphenyl (54% Chlorine) (PCB)	11097-69-1		0.5	0.5 mg/m³	Ca 0.001 mg/m³ See Appendix A	0.5 mg/m³
1-Chloro-2,3-epoxypropane; See Epichlorohydrin						
2-Chloroethanol; See Ethylene chlorohydrin						
Chloroethylene; see Vinyl chloride						
Chloroform (Trichloromethane)	67-66-3	(C) 50	(C) 240	2 ppm	Ca (ST) 2 ppm [60-min] See Appendix A	10 ppm
bis(Chloromethyl) ether; see 1910.1008	542-88-1			0.001 ppm See Section 5209	Ca See Appendix A	0.001 ppm
Chloromethyl methyl ether see 1910.1006	107-30-2			See Section 5209	Ca See Appendix A	Exposure by all routes should be carefully controlled to levels as low as possible.
1-Chloro-1-nitropropane	600-25-9	20	100	2 ppm	2 ppm	2 ppm
Chloropicrin	76-06-2	0.1	0.7	0.1 ppm	0.1 ppm	0.1 ppm
beta-Chloroprene	126-99-8	25	90	10 ppm	Ca (C) 1 ppm [15-min] See Appendix A	1 ppm
2-Chloro-6-(trichloromethyl)pyridine	1929-82-4					
Total dust			15	10 mg/m³	10 mg/m³ (ST) 20 mg/m³	10 mg/m³ (ST) 20 mg/m³
Respirable fraction			5	5 mg/m³	5 mg/m³	
Chromium (II) compounds (as Cr)	7440-47-3		0.5	0.5 mg/m³	0.5 mg/m³ See Appendix C	
Chromium (III) compounds (as Cr)	7440-47-3		0.5	0.5 mg/m³	0.5 mg/m³ See Appendix C	0.003 mg/m³-(IHL), water soluble
Chromium (VI) compounds See 1910.1026[k]				0.005 mg/m³ as Cr (C) 0.1 mg/m³		0.0002 mg/m³ (IHL) (ST) 0.0005 mg/m³

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
				See Sections 1532.2, 5206, and 8359	Ca 0.0002 mg/m³ (8-hr-TWA) See Appendix A See Appendix C	(IHL), water soluble (includes chromic acid and chromates)
Chromium metal and insol. salts (as Cr)	7440-47-3		1	0.5 mg/m³	0.5 mg/m³ See Appendix C	0.5 mg/m³(IHL) (metallic chromium)
Chrysene; see Coal tarpitch volatiles						Exposure by all routes should be carefully controlled to levels as low as possible.
Clopidol	2971-90-6					3 mg/m³ (IFV)
Total dust			15	10 mg/m³	10 mg/m³ (ST) 20 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	
Coal dust (less than 5% SiO_2, respirable fraction)		See Annotated Z-3		See Annotated Z-3		
Coal dust (greater than or equal to 5% SiO_2 respirable fraction)		See Annotated Z-3		See Annotated Z-3		
Coal tar pitch volatiles (benzene soluble fraction), anthracene, BaP, phenanthrene, acridine, chrysene, pyrene)	65966-93-2		0.2	0.2 mg/m³	Ca 0.1 mg/m³ (cyclohexane-extractable fraction) See Appendix A See Appendix C	0.2 mg/m³(as benzene soluble aerosol)
Cobalt metal, dust, and fume (as Co)	7440-48-4		0.1	0.02 mg/m³	0.05 mg/m³	0.02 mg/m³
Coke oven emissions; see 1910.1029				0.15 mg/m³ See Section 5211	Ca 0.2 mg/m³(benzene-soluble fraction) See Appendix A See Appendix C	
Copper	7440-50-8					
Fume (as Cu)			0.1	0.1 mg/m³	0.1 mg/m³	0.2 mg/m³
Dusts and mists (as Cu)			1	1 mg/m³	1 mg/m³	1 mg/m³
Cotton dust[i], see 1910.1043			1	1 mg/m³ (in waste processing) See Section 5190	< 0.200 mg/m³ See Appendix C	0.1 mg/m³ (Thor.) (raw untreated)
Crag herbicide (Sesone)	136-78-7					
Total dust			15	10 mg/m³	10 mg/m³	10 mg/m³

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Respirable fraction			5	5 mg/m³	5 mg/m³	
Cresol, all isomers	1319-77-3	5	22	5 ppm	2.3 ppm	20 mg/m³ (IFV)
Crotonaldehyde	123-73-9 / 4170-30-3	2	6	(C) 0.3 ppm	2 ppm See Appendix C (Aldehydes)	(C) 0.3 ppm
Cumene	98-82-8	50	245	50 ppm	50 ppm	50 ppm
Cyanides (as CN)	Varies with compound		5	5 mg/m³	(C) 5 mg/m³ [10-min]	(C) 5 mg/m³, salts
Cyclohexane	110-82-7	300	1050	300 ppm	300 ppm	100 ppm
Cyclohexanol	108-93-0	50	200	50 ppm	50 ppm	50 ppm
Cyclohexanone	108-94-1	50	200	25 ppm	25 ppm	20 ppm (ST) 50 ppm
Cyclohexene	110-83-8	300	1015	300 ppm	300 ppm	300 ppm
Cyclopentadiene	542-92-7	75	200	75 ppm	75 ppm	75 ppm
2,4-D (Dichlorophen-oxyacetic acid)	94-75-7		10	10 mg/m³	10 mg/m³	10 mg/m³ (IHL)
Decaborane	17702-41-9	0.05	0.3	0.05 ppm (ST) 0.15 ppm	0.05 ppm (ST) 0.15 ppm	0.05 ppm (ST) 0.15 ppm
Demeton (Systox)	8065-48-3		0.1	0.1 mg/m³	0.1 mg/m³	0.05 mg/m³ (IFV)
Diacetone alcohol (4-Hydroxy-4-methyl-2-pentanone)	123-42-2	50	240	50 ppm	50 ppm	50 ppm
1,2-Diaminoethane; see Ethylenediamine						
Diazomethane	334-88-3	0.2	0.4	0.2 ppm	0.2 ppm	0.2 ppm
Diborane	19287-45-7	0.1	0.1	0.1 ppm	0.1 ppm	0.1 ppm
1,2-Dibromo-3-chloropropane (DBCP); see 1910.1044	96-12-8			0.001 ppm See Section 5212	Ca See Appendix A	
1,2-Dibromoethane; see Ethylene dibromide						
Dibutyl phosphate	107-66-4	1	5	1 ppm (ST) 2 ppm	1 ppm (ST) 2 ppm	5 mg/m³ (IFV)
Dibutyl phthalate	84-74-2		5	5 mg/m³	5 mg/m³	5 mg/m³
o-Dichlorobenzene	95-50-1	(C) 50	(C) 300	25 ppm (C) 50 ppm	(C) 50 ppm	25 ppm (C) 50 ppm
p-Dichlorobenzene	106-46-7	75	450	10 ppm (ST) 110 ppm (C) 200 ppm	Ca See Appendix A	10 ppm

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
3,3'-Dichlorobenzidine; see 1910.1007	91-94-1			See Section 5209	Ca See Appendix A	Exposure by all routes should be carefully controlled to levels as low as possible.
Dichlorodifluoromethane	75-71-8	1000	4950	1000 ppm (C) 6200 ppm	1000 ppm	1000 ppm
1,3-Dichloro-5,5-dimethyl hydantoin	118-52-5		0.2	0.2 mg/m³ (ST) 0.4 mg/m³	0.2 mg/m³ (ST) 0.4 mg/m³	0.2 mg/m³ (ST) 0.4 mg/m³
Dichlorodiphenyltrichloroethane (DDT)	50-29-3		1	1 mg/m³	Ca 0.5 mg/m³ See Appendix A	1 mg/m³
1,1-Dichloroethane	75-34-3	100	400	100 ppm	100 ppm See Appendix C (Chloroethanes)	100 ppm
1,2-Dichloroethane; see Ethylene dichloride						
1,2-Dichloroethylene	540-59-0	200	790	200 ppm	200 ppm	200 ppm
Dichloroethyl ether	111-44-4	(C) 15	(C) 90	5 ppm (ST) 10 ppm	Ca 5 ppm (ST) 10 ppm See Appendix A	5 ppm (ST) 10 ppm
Dichloromethane; see Methylene chloride						
Dichloromono fluoromethane	75-43-4	1000	4200	10 ppm	10 ppm	10 ppm
1,1-Dichloro-1-nitroethane	594-72-9	(C) 10	(C) 60	2 ppm	2 ppm	2 ppm
1,2-Dichloropropane; see Propylene dichloride						
Dichlorotetrafluoroethane	76-14-2	1000	7000	1000 ppm	1000 ppm	1000 ppm
Dichlorvos (DDVP)	62-73-7		1	1 mg/m³	1 mg/m³	0.1 mg/m³ (IFV)
Dicyclopentadienyl iron	102-54-5					
Total dust			15	10 mg/m³	10 mg/m³	10 mg/m³ as Fe
Respirable fraction			5	5 mg/m³	5 mg/m³	
Dieldrin	60-57-1		0.25	0.25 mg/m³	Ca 0.25 mg/m³ See Appendix A	0.1 mg/m³ (IFV)
Diethylamine	109-89-7	25	75	(C) 5 ppm	10 ppm (ST) 25 ppm	5 ppm (ST) 15 ppm
2-Diethylaminoethanol	100-37-8	10	50	2 ppm	10 ppm	2 ppm
Diethyl ether; see Ethyl ether						

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Difluorodibromomethane	75-61-6	100	860	100 ppm	100 ppm	100 ppm
Diglycidyl ether (DGE)	2238-07-5	(C) 0.5	(C) 2.8	0.1 ppm	Ca 0.1 ppm See Appendix A	0.01 ppm
Dihydroxybenzene; see Hydroquinone						
Diisobutyl ketone	108-83-8	50	290	25 ppm	25 ppm	25 ppm
Diisopropylamine	108-18-9	5	20	5 ppm	5 ppm	5 ppm
4-Dimethylaminoazo-benzene; see 1910.1015	60-11-7			See Section 5209	Ca See Appendix A	
Dimethoxymethane; see Methylal						
Dimethyl acetamide	127-19-5	10	35	10 ppm	10 ppm	10 ppm
Dimethylamine	124-40-3	10	18	5 ppm (ST) 15 ppm	10 ppm	5 ppm (ST) 15 ppm
Dimethylaminobenzene; see Xylidine						
Dimethylaniline (N,N-Dimethylaniline)	121-69-7	5	25	5 ppm (ST) 10 ppm	5 ppm (ST) 10 ppm	5 ppm (ST) 10 ppm
Dimethylbenzene; see Xylene						
Dimethyl-1,2-dibromo-2,2-dichloroethylphosphate	300-76-5		3	3 mg/m³	3 mg/m³	0.1 mg/m³ (IFV)
Dimethylformamide	68-12-2	10	30	10 ppm	10 ppm	5 ppm
2,6-Dimethyl-4-heptanone; see Diisobutyl ketone						
1,1-Dimethylhydrazine	57-14-7	0.5	1	0.01 ppm	Ca (C) 0.06 ppm [2-hr] See Appendix A	0.01 ppm
Dimethylphthalate	131-11-3		5	5 mg/m³	5 mg/m³	5 mg/m³
Dimethyl sulfate	77-78-1	1	5	0.1 ppm	Ca 0.1 ppm See Appendix A	0.1 ppm
Dinitrobenzene (all isomers)			1	0.15 ppm	1 mg/m³	0.15 ppm
(ortho)	528-29-0					
(meta)	99-65-0					
(para)	100-25-4					
Dinitro-o-cresol	534-52-1		0.2	0.2 mg/m³	0.2 mg/m³	0.2 mg/m³
Dinitrotoluene	25321-14-6		1.5	0.15 mg/m³		0.2 mg/m³

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
					Ca 1.5 mg/m³ See Appendix A	
Dioxane (Diethylene dioxide)	123-91-1	100	360	0.28 ppm	Ca (C) 1 ppm [30-min] See Appendix A	20 ppm
Diphenyl (Biphenyl)	92-52-4	0.2	1	0.2 ppm	0.2 ppm	0.2 ppm
Diphenylmethane diisocyanate; see Methylene bisphenylisocyanate						
Dipropylene glycol methyl ether	34590-94-8	100	600	100 ppm (ST) 150 ppm	100 ppm (ST) 150 ppm	100 ppm (ST) 150 ppm
Di-sec octyl phthalate (Di-(2-ethylhexyl) phthalate)	117-81-7		5	5 mg/m³	Ca 5 mg/m³ (ST) 10 mg/m³ See Appendix A	5 mg/m³
Emery	12415-34-8			see PNOR	See Appendix D	See *TLV®* for Aluminum metal and insoluble compounds
Total dust			15	10 mg/m³		
Respirable fraction			5	5 mg/m³		
Endrin	72-20-8		0.1	0.1 mg/m³	0.1 mg/m³	0.1 mg/m³
Epichlorohydrin	106-89-8	5	19	0.05 ppm	Ca See Appendix A	0.5 ppm
EPN	2104-64-5		0.5	0.1 mg/m³	0.5 mg/m³	0.1 mg/m³ (IHL)
1,2-Epoxypropane; see Propylene oxide						
2,3-Epoxy-1-propanol; see Glycidol						
Ethanethiol; see Ethyl mercaptan						
Ethanolamine	141-43-5	3	6	3 ppm (ST) 6 ppm	3 ppm (ST) 6 ppm	3 ppm (ST) 6 ppm
2-Ethoxyethanol (Cellosolve)	110-80-5	200	740	5 ppm	0.5 ppm	5 ppm
2-Ethoxyethyl acetate (Cellosolve acetate)	111-15-9	100	540	5 ppm	0.5 ppm	5 ppm
Ethyl acetate	141-78-6	400	1400	400 ppm	400 ppm	400 ppm
Ethyl acrylate	140-88-5	25	100	5 ppm (ST) 25 ppm	Ca See Appendix A	5 ppm (ST) 15 ppm
Ethyl alcohol (Ethanol)	64-17-5	1000	1900	1000 ppm	1000 ppm	(ST) 1000 ppm
Ethylamine	75-04-7	10	18	(C) 5 ppm	10 ppm	

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
						5 ppm (ST) 15 ppm
Ethyl amyl ketone (5-Methyl-3-heptanone)	541-85-5	25	130	25 ppm	25 ppm	10 ppm
Ethyl benzene	100-41-4	100	435	5 ppm (ST) 30 ppm	100 ppm (ST) 125 ppm	20 ppm
Ethyl bromide	74-96-4	200	890	5 ppm	See Appendix D	5 ppm
Ethyl butyl ketone (3-Heptanone)	106-35-4	50	230	50 ppm (ST) 75 ppm	50 ppm	50 ppm (ST) 75 ppm
Ethyl chloride	75-00-3	1000	2600	100 ppm	See Appendix C (Chloroethanes)	100 ppm
Ethyl ether	60-29-7	400	1200	400 ppm (ST) 500 ppm	See Appendix D	400 ppm (ST) 500 ppm
Ethyl formate	109-94-4	100	300	100 ppm	100 ppm	(ST) 100 ppm
Ethyl mercaptan	75-08-1	(C) 10	(C) 25	0.5 ppm	(C) 0.5 ppm [15-min]	0.5 ppm
Ethyl silicate	78-10-4	100	850	10 ppm	10 ppm	10 ppm
Ethylene chlorohydrin	107-07-3	5	16	(C) 1 ppm	(C) 1 ppm	(C) 1 ppm
Ethylenediamine	107-15-3	10	25	10 ppm	10 ppm	10 ppm
Ethylene dibromide	106-93-4	See Annotated Z-2		See Annotated Z-2		
Ethylene dichloride (1,2-Dichloroethane)	107-06-2	See Annotated Z-2		See Annotated Z-2		
Ethylene glycol dinitrate	628-96-6	(C) 0.2	(C) 1	0.05 ppm for exposures to mixture of ethylene glycol dinitrate and nitroglycerin	(ST) 0.1 mg/m³	0.05 ppm
Ethylene glycol methylacetate; see Methylcellosolve acetate						
Ethyleneimine; see 1910.1012	151-56-4			0.5 ppm See Section 5209	Ca See Appendix A	0.05 ppm (ST) 0.1 ppm
Ethylene oxide; see 1910.1047	75-21-8			1 ppm (ST) 5 ppm See Section 5220	Ca < 0.1 ppm (C) 5 ppm [10-min/day] See Appendix A	1 ppm
Ethylidene chloride; see 1,1-Dichlorethane						

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Ferbam	14484-64-1					
Total dust		.....	15	10 mg/m³	10 mg/m³	5 mg/m³ (IHL)
Ferrovanadium dust	12604-58-9	.....	1	1 mg/m³ (ST) 3 mg/m³	1 mg/m³ (ST) 3 mg/m³	1 mg/m³ (ST) 3 mg/m³
Fluorides (as F)	Varies with compound	.....	2.5	2.5 mg/m³	2.5 mg/m³	2.5 mg/m³
Fluorine	7782-41-4	0.1	0.2	0.1 ppm	0.1 ppm	1 ppm (ST) 2 ppm
Fluorotrichloromethane (Trichlorofluoromethane)	75-69-4	1000	5600	(C) 1000 ppm	(C) 1000 ppm	(C) 1000 ppm
Formaldehyde; see 1910.1048	50-00-0			0.75 ppm (ST) 2 ppm See Section 5217	Ca 0.016 ppm (C) 0.1 ppm [15-min] See Appendix A	0.1 ppm (ST) 0.3 ppm
Formic acid	64-18-6	5	9	5 ppm (ST) 10 ppm	5 ppm	5 ppm (ST) 10 ppm
Furfural	98-01-1	5	20	2 ppm	See Appendix D	0.2 ppm
Furfuryl alcohol	98-00-0	50	200	10 ppm (ST) 15 ppm	10 ppm (ST) 15 ppm	0.2 ppm
Grain dust (oat, wheat barley)			10	10 mg/m³	4 mg/m³	4 mg/m³
Glycerin (mist)	56-81-5			PNOR	See Appendix D	
Total dust			15	10 mg/m³		
Respirable fraction			5	5 mg/m³		
Glycidol	556-52-5	50	150	2 ppm	25 ppm	2 ppm
Glycol monoethyl ether; see 2-Ethoxyethanol						
Graphite, natural respirable dust	7782-42-5	See Annotated Z-3		See Annotated Z-3		
Graphite, synthetic						
Total dust			15	10 mg/m³	See Appendix D	
Respirable Fraction			5	5 mg/m³		2 mg/m³ (all forms except fibers)
Guthion; see Azinphos methyl						
Gypsum	13397-24-5			PNOR		See calcium sulfate

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Respirable fraction			5	5 mg/m³	5 mg/m³	
Hafnium	7440-58-6		0.5	0.5 mg/m³	0.5 mg/m³	0.5 mg/m³
Heptachlor	76-44-8		0.5	0.05 mg/m³	Ca 0.5 mg/m³ See Appendix A	0.05 mg/m³
Heptane (n-Heptane)	142-82-5	500	2000	400 ppm (ST) 500 ppm	85 ppm (ST) 440 ppm [15-min]	400 ppm (ST) 500 ppm
Hexachloroethane	67-72-1	1	10	1 ppm	Ca 1 ppm See Appendix A See Appendix C (Chloroethanes)	1 ppm
Hexachloronaphthalene	1335-87-1		0.2	0.2 mg/m³	0.2 mg/m³	0.2 mg/m³
n-Hexane	110-54-3	500	1800	50 ppm	50 ppm	50 ppm
2-Hexanone (Methyl n-butyl ketone)	591-78-6	100	410	1 ppm (ST) 10 ppm	1 ppm	5 ppm (ST) 10 ppm
Hexone (Methyl isobutyl ketone)	108-10-1	100	410	50 ppm (ST) 75 ppm	50 ppm (ST) 75 ppm	20 ppm (ST) 75 ppm
sec-Hexyl acetate	108-84-9	50	300	50 ppm	50 ppm	50 ppm
Hydrazine	302-01-2	1	1.3	0.01 ppm	Ca (C) 0.03 ppm [2-hr] See Appendix A	0.01 ppm
Hydrogen bromide	10035-10-6	3	10	(C) 3 ppm	(C) 3 ppm	(C) 2 ppm
Hydrogen chloride	7647-01-0	(C) 5	(C) 7	0.3 ppm (C) 2 ppm	(C) 5 ppm	(C) 2 ppm
Hydrogen cyanide	74-90-8	10	11	(C) 4.7 ppm	(ST) 4.7 ppm	(C) 4.7 ppm
Hydrogen fluoride (as F)	7664-39-3	See Annotated Z-2		See Annotated Z-2		
Hydrogen peroxide	7722-84-1	1	1.4	1 ppm	1 ppm	1 ppm
Hydrogen selenide (as Se)	7783-07-5	0.05	0.2	0.05 ppm	0.05 ppm	0.05 ppm
Hydrogen sulfide	7783-06-4	See Annotated Z-2		See Annotated Z-2		
Hydroquinone	123-31-9	.....	2	2 mg/m³	(C) 2 mg/m³ [15-min]	1 mg/m³
Iodine	7553-56-2	(C) 0.1	(C) 1	(C) 0.1 ppm	(C) 0.1 ppm	0.01 ppm (IFV) (ST) 0.1 ppm (V)

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Iron oxide	1309-37-1		10 (fume)	5 mg/m³ (fume)	5 mg/m³ (dust and fume)	5 mg/m³ (resp.)
Isomyl acetate	123-92-2	100	525	50 ppm (ST) 100 ppm	100 ppm	50 ppm (ST) 100 ppm
Isomyl alcohol (primary and secondary)	123-51-3	100	360	100 ppm (ST) 125 ppm	100 ppm (ST) 125 ppm	100 ppm (ST) 125 ppm
Isobutyl acetate	110-19-0	150	700	150 ppm	150 ppm	[n]
Isobutyl alcohol	78-83-1	100	300	50 ppm	50 ppm	50 ppm
Isophorone	78-59-1	25	140	4 ppm	4 ppm	(C) 5 ppm
Isopropyl acetate	108-21-4	250	950	250 ppm (ST) 310 ppm	See Appendix D	(p)
Isopropyl alcohol	67-63-0	400	980	400 ppm (ST) 500 ppm	400 ppm (ST) 500 ppm	200 ppm (ST) 400 ppm
Isopropylamine	75-31-0	5	12	5 ppm (ST) 10 ppm	See Appendix D	5 ppm (ST) 10 ppm
Isopropyl ether	108-20-3	500	2100	250 ppm	500 ppm	250 ppm (ST) 310 ppm
Isopropyl glycidyl ether (IGE)	4016-14-2	50	240	50 ppm (ST) 75 ppm	(C) 50 ppm [15-min]	50 ppm (ST) 75 ppm
Kaolin	1332-58-7					
Total dust			15		10 mg/m³	
Respirable fraction			5	2 mg/m³ (no asbestos, < 1% crystalline silica)	5 mg/m³	2 mg/m³ (no asbestos and < 1% crystalline silica)
Ketene	463-51-4	0.5	0.9	0.5 ppm (ST) 1.5 ppm	0.5 ppm (ST) 1.5 ppm	0.5 ppm (ST) 1.5 ppm
Lead inorganic (as Pb); see 1910.1025	7439-92-1			0.05 mg/m³ See Section 5198	0.05 mg/m³ See Appendix C	0.05 mg/m³
Limestone	1317-65-3			see PNOR		See calcium carbonate
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	
Lindane	58-89-9		0.5	0.5 mg/m³	0.5 mg/m³	0.5 mg/m³
Lithium hydride	7580-67-8		0.025	0.025 mg/m³	0.025 mg/m³	(C) 0.05 mg/m³ (IHL)
L.P.G. (Liquified petroleum gas)	68476-85-7	1000	1800	1000 ppm	1000 ppm	See *TLV® book* Appendix F (D, EX)

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV® [h]
		ppm [d]	mg/m³ [e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Magnesite	546-93-0			See PNOR		See *TLV® book* Appendix G
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	
Magnesium oxide fume - Total Particulate	1309-48-4		15	10 mg/m³	See Appendix D	10 mg/m³ (IHL)
Malathion - Total dust	121-75-5		15	10 mg/m³	10 mg/m³	1 mg/m³ (IFV)
Maleic anhydride	108-31-6	0.25	1	0.1 ppm	1 mg/m³	0.01 mg/m³ (IFV)
Manganese compounds (as Mn)	7439-96-5		(C) 5	0.2 mg/m³	1 mg/m³ (ST) 3 mg/m³	0.02 mg/m³ (resp.) 0.1 mg/m³ (IHL) (for elemental and inorganic compounds)
Manganese fume (as Mn)	7439-96-5		(C) 5	0.2 mg/m³	1 mg/m³ (ST) 3 mg/m³	0.02 mg/m³ (resp.) 0.1 mg/m³ (IHL) (for elemental and inorganic compounds)
Marble	1317-65-3			See PNOR		
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	
Mercury (aryl and inorganic) (as Hg)	7439-97-6	See Annotated Z-2		See Annotated Z-2		
Mercury (organo) alkylcompounds (as Hg)	7439-97-6	See Annotated Z-2		See Annotated Z-2		
Mercury (vapor) (as Hg)	7439-97-6	See Annotated Z-2		See Annotated Z-2		
Mesityl oxide	141-79-7	25	100	15 ppm (ST) 25 ppm	10 ppm	15 ppm (ST) 25 ppm
Methanethiol; see Methyl mercaptan						
Methoxychlor - Total dust	72-43-5		15	10 mg/m³	Ca See Appendix A	10 mg/m³
2-Methoxyethanol; (Methyl cellosolve)	109-86-4	25	80	5 ppm	0.1 ppm	0.1 ppm
2-Methoxyethyl acetate (Methyl cellosolve acetate)	110-49-6	25	120	5 ppm	0.1 ppm	0.1 ppm
Methyl acetate	79-20-9	200	610	200 ppm (ST) 250 ppm	200 ppm (ST) 250 ppm	200 ppm (ST) 250 ppm
Methyl acetylene (Propyne)	74-99-7	1000	1650	1000 ppm	1000 ppm	1000 ppm (EX)
Methyl acetylene propadiene mixture (MAPP)		1000	1800			

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV® [h]
		ppm [d]	mg/m³ [e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
				1000 ppm (ST) 1250 ppm	1000 ppm (ST) 1250 ppm	1000 ppm (EX) (ST) 1250 ppm (EX)
Methyl acrylate	96-33-3	10	35	10 ppm	10 ppm	2 ppm
Methylal (Dimethoxy-methane)	109-87-5	1000	3100	1000 ppm	1000 ppm	1000 ppm
Methyl alcohol	67-56-1	200	260	200 ppm (ST) 250 ppm (C) 1000 ppm	200 ppm (ST) 250 ppm	200 ppm (ST) 250 ppm
Methylamine	74-89-5	10	12	5 ppm (ST) 15 ppm	10 ppm	5 ppm (ST) 15 ppm
Methyl amyl alcohol; see Methyl Isobutylcarbinol						
Methyl n-amyl ketone	110-43-0	100	465	50 ppm	100 ppm	50 ppm
Methyl bromide	74-83-9	(C) 20	(C) 80	1 ppm (ST) 20 ppm	Ca See Appendix A	1 ppm
Methyl butyl ketone; see 2-Hexanone						
Methyl cellosolve; see 2-Methoxyethanol						
Methyl cellosolve acetate; see 2-Methoxyethylacetate						
Methyl chloride	74-87-3	See Annotated Z-2		See Annotated Z-2		
Methyl chloroform (1,1,1-Trichloro-ethane)	71-55-6	350	1900	350 ppm (ST) 450 ppm (C) 800 ppm	(C) 350 ppm [15-min] See Appendix C (Chloroethanes)	350 ppm (ST) 450 ppm
Methylcyclohexane	108-87-2	500	2000	400 ppm	400 ppm	400 ppm
Methylcyclohexanol	25639-42-3	100	470	50 ppm	50 ppm	50 ppm
o-Methylcyclohexanone	583-60-8	100	460	50 ppm (ST) 75 ppm	50 ppm (ST) 75 ppm	50 ppm (ST) 75 ppm
Methylene chloride	75-09-2	See Annotated Z-2		See Annotated Z-2		
Methyl ethyl ketone (MEK); see 2-Butanone						
Methyl formate	107-31-3	100	250	100 ppm (ST) 150 ppm	100 ppm (ST) 150 ppm	50 ppm (ST) 100 ppm
Methyl hydrazine (Monomethylhydrazine)	60-34-4	(C) 0.2	(C) 0.35	0.01 ppm	Ca (C) 0.04 ppm [2-hr] See Appendix A	0.01 ppm
Methyl iodide	74-88-4	5	28	2 ppm		2 ppm

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
					Ca 2 ppm See Appendix A	
Methyl isoamyl ketone	110-12-3	100	475	50 ppm	50 ppm	20 ppm (ST) 50 ppm
Methyl isobutyl carbinol	108-11-2	25	100	25 ppm (ST) 40 ppm	25 ppm (ST) 40 ppm	25 ppm (ST) 40 ppm
Methyl isobutyl ketone; see Hexone						
Methyl isocyanate	624-83-9	0.02	0.05	0.02 ppm (ST) 0.06 ppm	0.02 ppm (ST) 0.06 ppm	0.02 ppm (ST) 0.06 ppm
Methyl mercaptan	74-93-1	(C) 10	(C) 20	0.5 ppm	(C) 0.5 ppm [15-min]	0.5 ppm
Methyl methacrylate	80-62-6	100	410	50 ppm (ST) 100 ppm	100 ppm	50 ppm (ST) 100 ppm
Methyl propyl ketone; see 2-Pentanone						
alpha-Methyl styrene	98-83-9	(C) 100	(C) 480	50 ppm (ST) 100 ppm	50 ppm (ST) 100 ppm	10 ppm
Methylene bisphenyl isocyanate (MDI)	101-68-8	(C) 0.02	(C) 0.2	0.005 ppm	0.05 mg/m³ (C) 0.2 mg/m³ [10-min]	0.005 ppm
Mica; see Silicates		See Annotated Z-3		See Annotated Z-3		
Molybdenum (as Mo)	7439-98-7					
Soluble compounds			5	0.5 mg/m³	See Appendix D	0.5 mg/m³ (resp.)
Insoluble Compounds - Total dust			15	10 mg/m³	See Appendix D	
Insoluble Compounds				3 mg/m³ (resp.)		10 mg/m³ (IHL) 3 mg/m³ (resp.)
Monomethyl aniline	100-61-8	2	9	0.5 ppm	0.5 ppm	0.5 ppm
Monomethyl hydrazine; see Methyl hydrazine						
Morpholine	110-91-8	20	70	20 ppm (ST) 30 ppm	20 ppm (ST) 30 ppm	20 ppm
Naphtha (Coal tar)	8030-30-6	100	400	100 ppm	100 ppm	See *TLV® book* Appendix H
Naphthalene	91-20-3	10	50	0.1 ppm	10 ppm (ST) 15 ppm	10 ppm (ST) 15 ppm
alpha-Naphthylamine; see 1910.1004	134-32-7			See Section 5209	Ca See Appendix A	

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
beta-Naphthylamine; see 1910.1009	91-59-8			See Section 5209	Ca See Appendix A	Exposure by all routes should be carefully controlled to levels as low as possible.
Nickel carbonyl (as Ni)	13463-39-3	0.001	0.007	0.001 ppm	Ca 0.001 ppm See Appendix A	(C) 0.05 ppm
Nickel, metal and insoluble compounds (as Ni)	7440-02-0		1	metal 0.5 mg/m³ insoluble 0.1 mg/m³	Ca 0.015 mg/m³ See Appendix A	elemental: 1.5 mg/m³ (IHL); insoluble inorganic compounds: 0.2 mg/m³ (IHL)
Nickel, soluble compounds (as Ni)	7440-02-0		1	0.05 mg/m³	Ca 0.015 mg/m³	soluble inorganic compounds: 0.1 mg/m³ (IHL)
Nicotine	54-11-5		0.5	0.075 ppm	0.5 mg/m³	0.5 mg/m³
Nitric acid	7697-37-2	2	5	2 ppm (ST) 4 ppm	2 ppm (ST) 4 ppm	2 ppm (ST) 4 ppm
Nitric oxide	10102-43-9	25	30	25 ppm	25 ppm	25 ppm
p-Nitroaniline	100-01-6	1	6	3 mg/m³	3 mg/m³	3 mg/m³
Nitrobenzene	98-95-3	1	5	1 ppm	1 ppm	1 ppm
p-Nitrochlorobenzene	100-00-5		1	0.1 ppm	Ca See Appendix A	0.1 ppm
4-Nitrodiphenyl; see 1910.1003	92-93-3			See Section 5209	Ca See Appendix A	Exposure by all routes should be carefully controlled to levels as low as possible.
Nitroethane	79-24-3	100	310	100 ppm	100 ppm	100 ppm
Nitrogen dioxide	10102-44-0	(C) 5	(C) 9	(ST) 1 ppm	(ST) 1 ppm	0.2 ppm
Nitrogen trifluoride	7783-54-2	10	29	10 ppm	10 ppm	10 ppm
Nitroglycerin	55-63-0	(C) 0.2	(C) 2	0.05 ppm for mixture of nitroglycerine and ethylene glycol dinitrate (ST) 0.1 mg/m³	(ST) 0.1 mg/m³	0.05 ppm
Nitromethane	75-52-5	100	250	2 ppm	See Appendix D	20 ppm
1-Nitropropane	108-03-2	25	90	25 ppm	25 ppm	25 ppm

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
2-Nitropropane	79-46-9	25	90	10 ppm	Ca See Appendix A	10 ppm
N-Nitrosodimethylamine; see 1910.1016				See Section 5209	Ca See Appendix A	Exposure by all routes should be carefully controlled to levels as low as possible.
Nitrotoluene (all isomers)		5	30	2 ppm	2 ppm	2 ppm
o-isomer	88-72-2					
m-isomer	99-08-1					
p-isomer	99-99-0					
Nitrotrichloromethane; see Chloropicrin						
Octachloronaphthalene	2234-13-1		0.1	0.1 mg/m³ (ST) 0.3 mg/m³	0.1 mg/m³ (ST) 0.3 mg/m³	0.1 mg/m³ (ST) 0.3 mg/m³
Octane	111-65-9	500	2350	300 ppm (ST) 375 ppm	75 ppm (ST) 385 ppm [15-min]	300 ppm
Oil mist, mineral	8012-95-1		5	5 mg/m³ (excluding vapor)	5 mg/m³ (ST) 10 mg/m³	5 mg/m³ (IHL; excluding metal working fluids, pure highly and severely refined) (For poorly and mildly refined: exposure by all routes should be carefully controlled to levels as low as possible.)
Osmium tetroxide (as Os)	20816-12-0		0.002	0.002 ppm (ST) 0.006 mg/m³	0.002 ppm (ST) 0.006 mg/m³	0.0016 mg/m³ (ST) 0.0047 mg/m³
Oxalic acid	144-62-7		1	1 mg/m³ (ST) 2 mg/m³	1 mg/m³ (ST) 2 mg/m³	1 mg/m³ (ST) 2 mg/m³
Oxygen difluoride	7783-41-7	0.05	0.1	(C) 0.05 ppm	(C) 0.05 ppm	(C) 0.05 ppm
Ozone	10028-15-6	0.1	0.2	0.1 ppm (ST) 0.3 ppm	(C) 0.1 ppm	0.05-0.20 ppm depending on workload and time (See *TLV® Documentation on Ozone*)
Paraquat, respirable dust	4685-14-7		0.5			0.05 mg/m³(IHL), as the cation
	1910-42-5			0.1 mg/m³	0.1 mg/m³	

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
	2074-50-2					
Parathion	56-38-2		0.1	0.1 mg/m³	0.05 mg/m³	0.05 mg/m³ (IFV)
Particulates Not Otherwise Regulated (PNOR)[i]					See Appendix D	See *TLV® book* Appendix B
Total dust			15	10 mg/m³		
Respirable fraction			5	5 mg/m³		
PCB; see Chlorodiphenyl (42% and 54% chlorine)						
Pentaborane	19624-22-7	0.005	0.01	0.005 ppm (ST) 0.015 ppm	0.005 ppm (ST) 0.015 ppm	0.005 ppm (ST) 0.015 ppm
Pentachloronaphthalene	1321-64-8		0.5	0.5 mg/m³	0.5 mg/m³	0.5 mg/m³
Pentachlorophenol	87-86-5		0.5	0.5 mg/m³ (ST) 1 mg/m³	0.5 mg/m³ (ST) 1 mg/m³	0.5 mg/m³ (ST) 1 mg/m³
Pentaerythritol	115-77-5			See PNOR		
Total dust			15	10 mg/m³	10 mg/m³	10 mg/m³
Respirable fraction			5	5 mg/m³	5 mg/m³	
Pentane	109-66-0	1000	2950	1000 ppm	120 ppm (C) 610 ppm [15-min]	1000 ppm
2-Pentanone (Methylpropyl ketone)	107-87-9	200	700	200 ppm (ST) 250 ppm	150 ppm	(ST) 150 ppm
Perchloroethylene (Tetrachloroethylene)	127-18-4	See Annotated Z-2		See Annotated Z-2		
Perchloromethyl mercaptan	594-42-3	0.1	0.8	0.1 ppm	0.1 ppm	0.1 ppm
Perchloryl fluoride	7616-94-6	3	13.5	3 ppm (ST) 6 ppm	3 ppm (ST) 6 ppm	3 ppm (ST) 6 ppm
Petroleum distillates (Naphtha) (Rubber Solvent)		500	2000	1600 mg/m³	350 mg/m³ (C) 1800 mg/m³ [15-min]	See *TLV® book* Appendix H
Phenol	108-95-2	5	19	5 ppm	5 ppm (C) 15.6 ppm [15-min]	5 ppm
p-Phenylene diamine	106-50-3		0.1	0.1 mg/m³	0.1 mg/m³	0.1 mg/m³
Phenyl ether, vapor	101-84-8	1	7	1 ppm	1 ppm	1 ppm (ST) 2 ppm
Phenyl ether-biphenylmixture, vapor		1	7		1 ppm	
Phenylethylene; see Styrene						

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Phenyl glycidyl ether (PGE)	122-60-1	10	60	0.1 ppm	Ca (C) 1 ppm [15-min] See Appendix A	0.1 ppm
Phenylhydrazine	100-63-0	5	22	5 ppm (ST) 10 ppm	Ca (C) 0.14 ppm [2-hr] See Appendix A	0.1 ppm
Phosdrin (Mevinphos)	7786-34-7		0.1	0.01 ppm (ST) 0.03 ppm	0.01 ppm (ST) 0.03 ppm	0.01 mg/m³ (IFV)
Phosgene (Carbonyl chloride)	75-44-5	0.1	0.4	0.1 ppm	0.1 ppm (C) 0.2 ppm [15-min]	0.1 ppm
Phosphine	7803-51-2	0.3	0.4	0.3 ppm (ST) 1 ppm	0.3 ppm (ST) 1 ppm	0.05 ppm (C) 0.15 ppm
Phosphoric acid	7664-38-2		1	1 mg/m³ (ST) 3 mg/m³	1 mg/m³ (ST) 3 mg/m³	1 mg/m³ (ST) 3 mg/m³
Phosphorus (yellow)	7723-14-0		0.1	0.1 mg/m³	0.1 mg/m³	0.1 mg/m³
Phosphorus pentachloride	10026-13-8		1	0.1 ppm	1 mg/m³	0.1 ppm
Phosphorus pentasulfide	1314-80-3		1	1 mg/m³ (ST) 3 mg/m³	1 mg/m³ (ST) 3 mg/m³	1 mg/m³ (ST) 3 mg/m³
Phosphorus trichloride	7719-12-2	0.5	3	0.2 ppm (ST) 0.5 ppm	0.2 ppm (ST) 0.5 ppm	0.2 ppm (ST) 0.5 ppm
Phthalic anhydride	85-44-9	2	12	1 ppm	6 mg/m³	0.002 mg/m³ (IFV) (ST) 0.005 mg/m³ (IFV)
Picloram	1918-0-21					
Total dust			15	10 mg/m³	See Appendix D	10 mg/m³
Respirable fraction			5	5 mg/m³		
Picric acid	88-89-1		0.1	0.1 mg/m³	0.1 mg/m³ (ST) 0.3 mg/m³	0.1 mg/m³
Pindone (2-Pivalyl-1,3-indandione)	83-26-1		0.1	0.1 mg/m³	0.1 mg/m³	0.1 mg/m³
Plaster of paris	26499-65-0			See PNOR		See *TLV®* for calcium sulfate
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	
Platinum (as Pt) Metal	7440-06-4			1 mg/m³	1 mg/m³	1 mg/m³
Soluble Salts			0.002	0.002 mg/m³	0.002 mg/m³	0.002 mg/m³

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Portland cement	65997-15-1			See PNOR		
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	1 mg/m³ (no asbestos and < 1% crystalline silica)
Propane	74-98-6	1000	1800	1000 ppm	1000 ppm	See *TLV® book* Appendix F (D, EX)
beta-Propriolactone; see 1910.1013	57-57-8			0.5 ppm See Section 5209	Ca See Appendix A	0.5 ppm
n-Propyl acetate	109-60-4	200	840	200 ppm (ST) 250 ppm	200 ppm (ST) 250 ppm	(p)
n-Propyl alcohol	71-23-8	200	500	200 ppm (ST) 250 ppm	200 ppm (ST) 250 ppm	100 ppm
n-Propyl nitrate	627-13-4	25	110	25 ppm (ST) 40 ppm	25 ppm (ST) 40 ppm	25 ppm (ST) 40 ppm
Propylene dichloride	78-87-5	75	350	75 ppm (ST) 110 ppm	Ca See Appendix A	10 ppm
Propylene imine	75-55-8	2	5	2 ppm	Ca 2 ppm See Appendix A	0.2 ppm (ST) 0.4 ppm
Propylene oxide	75-56-9	100	240	2 ppm	Ca See Appendix A	2 ppm
Propyne; see Methylacetylene						
Pyrethrum	8003-34-7		5	5 mg/m³	5 mg/m³	5 mg/m³
Pyridine	110-86-1	5	15	5 ppm	5 ppm	1 ppm
Quinone	106-51-4	0.1	0.4	0.1 ppm	0.4 mg/m³	0.1 ppm
RDX: see Cyclonite						
Rhodium (as Rh), metal fume and insoluble compounds	7440-16-6		0.1	0.1 mg/m³	0.1 mg/m³	1 mg/m³
Rhodium (as Rh), soluble compounds	7440-16-6		0.001	0.001 mg/m³	0.001 mg/m³	0.01 mg/m³
Ronnel	299-84-3		15	10 mg/m³	10 mg/m³	5 mg/m³ (IFV)
Rotenone	83-79-4		5	5 mg/m³	5 mg/m³	5 mg/m³
Rouge				See PNOR	See Appendix D	See iron oxide
Total dust			15	10 mg/m³		

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Respirable fraction			5	5 mg/m³		
Selenium compounds (as Se)	7782-49-2		0.2	0.2 mg/m³	0.2 mg/m³	0.2 mg/m³
Selenium hexafluoride (as Se)	7783-79-1	0.05	0.4	0.05 ppm	0.05 ppm	0.05 ppm
Silica, amorphous, precipitated and gel	112926-00-8	See Annotated Z-3		See Annotated Z-3		
Silica, amorphous, diatomaceous earth, containing less than 1% crystalline silica	61790-53-2	See Annotated Z-3		See Annotated Z-3		
Silica, crystalline, respirable dust						
Cristobalite; see 1910.1053[m]	14464-46-1			0.05 mg/m³	Ca 0.05 mg/m³ See Appendix A	0.025 mg/m³ (resp.) for α-quartz and cristobalite
Quartz: see 1910.1053[m]	14808-60-7			0.05 mg/m³	Ca 0.05 mg/m³ See Appendix A	0.025 mg/m³ (resp.) for α-quartz and cristobalite
Tripoli (as quartz); see 1910.1053[m]	1317-95-9			0.05 mg/m³	Ca 0.05 mg/m³ See Appendix A	0.025 mg/m3 (resp.) for α-quartz and cristobalite
Tridymite; see 1910.1053[m][m]	15468-32-3			0.05 mg/m³	Ca 0.05 mg/m3 See Appendix A	See *TLV® book* Appendix G
Silica, fused, respirable dust	60676-86-0	See Annotated Z-3		See Annotated Z-3		
Silicates (less than 1% crystalline silica)						
Mica (respirable dust)	12001-26-2	See Annotated Z-3		See Annotated Z-3		
Soapstone, total dust		See Annotated Z-3		See Annotated Z-3		
Soapstone, respirable dust		See Annotated Z-3		See Annotated Z-3		
Talc (containing asbestos): use asbestos limit: see 29 CFR 1910.1001		See Annotated Z-3		See Annotated Z-3		
Talc (containing no asbestos), respirable dust	14807-96-6	See Annotated Z-3		See Annotated Z-3		
Tremolite, asbestiform; see 1910.1001		See Annotated Z-3		See Annotated Z-3		
Silicon	7440-21-3			See PNOR		

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
						See *TLV® book* Appendix G
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	
Silicon carbide	409-21-2			See PNOR		Fibrous (including whiskers) 0.1 f/cc Nonfibrous: 10 mg/m³ (IHL) (no asbestos and < 1% crystalline silica)
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	3 mg/m³ (resp., no asbestos and < 1% crystalline silica)
Silver, metal and soluble compounds (as Ag)	7440-22-4		0.01	0.01 mg/m³	0.01 mg/m³	Metal, dust, and fume: 0.1 mg/m³; Soluble compounds, as Ag: 0.01 mg/m³
Soapstone		See Annotated Z-3		See Annotated Z-3		
Sodium fluoroacetate	62-74-8		0.05	0.05 mg/m³ (ST) 0.15 mg/m³	0.05 mg/m³ (ST) 0.15 mg/m³	0.05 mg/m³
Sodium hydroxide	1310-73-2		2	(C) 2 mg/m³	(C) 2 mg/m³	(C) 2 mg/m³
Starch	9005-25-8			See PNOR		
Total dust			15	10 mg/m³	10 mg/m³	10 mg/m³
Respirable fraction			5	5 mg/m³	5 mg/m³	
Stibine	7803-52-3	0.1	0.5	0.1 ppm	0.1 ppm	0.1 ppm
Stoddard solvent	8052-41-3	500	2900	100 ppm	350 mg/m³ (C) 1800 mg/m³ [15-min]	100 ppm
Strychnine	57-24-9		0.15	0.15 mg/m³	0.15 mg/m³	0.15 mg/m³
Styrene	100-42-5	See Annotated Z-2		See Annotated Z-2		
Sucrose	57-50-1			See PNOR		
Total dust			15	10 mg/m³	10 mg/m³	10 mg/m³
Respirable fraction			5	5 mg/m³	5 mg/m³	
Sulfur dioxide	7446-09-5	5	13			(ST) 0.25 ppm

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
				2 ppm (ST) 5 ppm	2 ppm (ST) 5 ppm	
Sulfur hexafluoride	2551-62-4	1000	6000	1000 ppm	1000 ppm	1000 ppm
Sulfuric acid	7664-93-9		1	0.1 mg/m³ (ST) 3 mg/m³	1 mg/m³	0.2 mg/m³ (Thor.)
Sulfur monochloride	10025-67-9	1	6	(C) 1 ppm	(C) 1 ppm	(C) 1 ppm
Sulfur pentafluoride	5714-22-7	0.025	0.25	(C) 0.01 ppm	(C) 0.01 ppm	(C) 0.01 ppm
Sulfuryl fluoride	2699-79-8	5	20	5 ppm (ST) 10 ppm	5 ppm (ST) 10 ppm	5 ppm (ST) 10 ppm
Systox; see Demeton						
2,4,5-T (2,4,5-tri-chlorophenoxyacetic acid)	93-76-5		10	10 mg/m³	10 mg/m³	10 mg/m³
Talc; see Silicates		See Annotated Z-3		See Annotated Z-3		
Tantalum, metal and oxide dust	7440-25-7		5	5 mg/m³	5 mg/m³ (ST) 10 mg/m³	See *TLV® book* Appendix G
TEDP (Sulfotep)	3689-24-5		0.2	0.2 mg/m³	0.2 mg/m³	0.1 mg/m³ (IFV)
Tellurium and compounds (as Te)	13494-80-9		0.1	0.1 mg/m³	0.1 mg/m³	0.1 mg/m³ (excluding hydrogen telluride)
Tellurium hexafluoride (as Te)	7783-80-4	0.02	0.2	0.02 ppm	0.02 ppm	0.02 ppm
Temephos	3383-96-8					1 mg/m³ (IFV)
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	
TEPP (Tetraethyl pyrophosphate)	107-49-3		0.05	0.004 ppm	0.05 mg/m³	0.01 mg/m³ (IFV)
Terphenyls	26140-60-3	(C) 1	(C) 9	(C) 0.5 ppm	(C) 0.5 ppm	(C) 5 mg/m³
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	500	4170	500 ppm	500 ppm	100 ppm
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	500	4170	500 ppm	500 ppm	50 ppm
1,1,2,2-Tetrachloroethane	79-34-5	5	35	1 ppm	Ca 1 ppm See Appendix A See Appendix C (Chloroethanes)	1 ppm
Tetrachoroethylene; see Perchloroethylene						

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Tetrachloromethane; see Carbon tetrachloride						
Tetrachloronaphthalene	1335-88-2		2	2 mg/m³	2 mg/m³	2 mg/m³
Tetraethyl lead (as Pb)	78-00-2		0.075	0.075 mg/m³	0.075 mg/m³	0.1 mg/m³
Tetrahydrofuran	109-99-9	200	590	200 ppm (ST) 250 ppm	200 ppm (ST) 250 ppm	50 ppm (ST) 100 ppm
Tetramethyl lead, (as Pb)	75-74-1		0.075	0.075 mg/m³	0.075 mg/m³	0.15 mg/m³
Tetramethyl succinonitrile	3333-52-6	0.5	3	0.5 ppm	3 mg/m³	0.5 ppm
Tetranitromethane	509-14-8	1	8	0.005 ppm	1 ppm	0.005 ppm
Tetryl (2,4,6-Trinitrophenylmethylnitramine)	479-45-8		1.5	1.5 mg/m³	1.5 mg/m³	1.5 mg/m³
Thallium, soluble compounds (as Tl)	7440-28-0		0.1	0.1 mg/m³	0.1 mg/m³	0.02 mg/m³ (IHL)
4,4'-Thiobis (6-tert,Butyl-m-cresol)	96-69-5					1 mg/m³ (IHL)
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	
Thiram	137-26-8		5	5 mg/m³	5 mg/m³	0.05 mg/m³ (IFV)
Tin, inorganic compounds (except oxides) (as Sn)	7440-31-5		2	2 mg/m³; also tin oxide; except SnH_4	2 mg/m³; except tin oxides	metal, oxide and inorganic compounds, except tin hydride: 2 mg/m³
Tin, organic compounds (as Sn)	7440-31-5		0.1	0.1 mg/m³ (ST) 0.2 mg/m³	0.1 mg/m³ except Cyhexatin	0.1 mg/m³ (ST) 0.2 mg/m³
Titanium dioxide - Total dust	13463-67-7		15	See PNOR	Ca (ultrafine particles) 2.4 mg/m³ (fine) 0.3 mg/m³ (ultrafine) See Appendix A See Appendix C	10 mg/m³
Toluene	108-88-3	See Annotated Z-2		See Annotated Z-2		
Toluene-2,4-diisocyanate (TDI)	584-84-9	(C) 0.02	(C) 0.14	0.005 ppm (ST) 0.02 ppm (C) 0.02 ppm	Ca See Appendix A	0.001 ppm (IFV) (ST) 0.005 ppm (IFV)
o-Toluidine	95-53-4	5	22	2 ppm	Ca See Appendix A	2 ppm
Toxaphene; see Chlorinated camphene						
Tremolite		See Annotated Z-3		See Annotated Z-3		

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Tributyl phosphate	126-73-8		5	0.2 ppm	0.2 ppm	5 mg/m³ (IFV)
1,1,1-Trichloroethane; see Methyl chloroform						
1,1,2-Trichloroethane	79-00-5	10	45	10 ppm	Ca 10 ppm See Appendix A See Appendix C (Chloroethanes)	10 ppm
Trichloroethylene	79-01-6	See Annotated Z-2		See Annotated Z-2		
Trichloromethane; see Chloroform						
Trichloronaphthalene	1321-65-9		5	5 mg/m³	5 mg/m³	5 mg/m³
1,2,3-Trichloropropane	96-18-4	50	300	10 ppm	Ca 10 ppm See Appendix A	0.005 ppm
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1000	7600	1000 ppm (ST) 1250 ppm (C) 2000 ppm	1000 ppm (ST) 1250 ppm	1000 ppm (ST) 1250 ppm
Triethylamine	121-44-8	25	100	(C) 1 ppm	See Appendix D	0.5 ppm (ST) 1 ppm
Trifluorobromomethane	75-63-8	1000	6100	1000 ppm	1000 ppm	1000 ppm
2,4,6-Trinitrophenol;see Picric acid						
2,4,6-Trinitrophenyl-methyl nitramine; see Tetryl						
2,4,6-Trinitrotoluene (TNT)	118-96-7		1.5	0.5 mg/m³	0.5 mg/m³	0.1 mg/m³
Triorthocresyl phosphate	78-30-8		0.1	0.1 mg/m³	0.1 mg/m³	0.02 mg/m³ (IFV)
Triphenyl phosphate	115-86-6		3	3 mg/m³	3 mg/m³	3 mg/m³
Turpentine	8006-64-2	100	560	100 ppm	100 ppm	20 ppm
Uranium (as U)	7440-61-1					
Soluble compounds			0.05	0.05 mg/m³	Ca 0.05 mg/m³, See Appendix A	0.2 mg/m³ (ST) 0.6 mg/m³
Insoluble compounds			0.25	0.2 mg/m³ (ST) 0.6 mg/m³	Ca 0.2 mg/m³ (ST) 0.6 mg/m³ See Appendix A	0.2 mg/m³ (ST) 0.6 mg/m³
Vanadium	1314-62-1					0.05 mg/m³ (IHL) Vanadium pentoxide as V

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV®[h]
		ppm[d]	mg/m³[e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Respirable dust (as V_2O_5)			(C) 0.5	0.05 mg/m³, vanadium pentoxide	(C) 0.05 mg V/m³ [15-min], except Vanadium metal and Vanadium carbide	
Fume (as V_2O_5)			(C) 0.1	0.05 mg/m³	(C) 0.05 mg V/m³ [15-min]	
Vegetable oil mist				Vegetable oil mists (except castor, cashew nut or similar irritant oils) See PNOR		See *TLV® book* Appendix G
Total dust			15	10 mg/m³	10 mg/m³	
Respirable fraction			5	5 mg/m³	5 mg/m³	
Vinyl benzene; see Styrene						
Vinyl chloride; see 1910.1017	75-01-4			1 ppm See Section 5210	Ca See Appendix A	1 ppm
Vinyl cyanide; see Acrylonitrile						
Vinyl toluene	25013-15-4	100	480	50 ppm	100 ppm	50 ppm (ST) 100 ppm
Warfarin	81-81-2		0.1	0.1 mg/m³	0.1 mg/m³	0.01 mg/m³ (IHL)
Xylenes (o-, m-, p-isomers)	1330-20-7	100	435	100 ppm (ST) 150 ppm (C) 300 ppm	100 ppm (ST) 150 ppm	100 ppm (ST) 150 ppm
Xylidine	1300-73-8	5	25	0.5 ppm	2 ppm	0.5 ppm (IFV)
Yttrium	7440-65-5		1	1 mg/m³	1 mg/m³	1 mg/m³
Zinc chloride fume	7646-85-7		1	1 mg/m³ (ST) 2 mg/m³	1 mg/m³ (ST) 2 mg/m³	1 mg/m³ (ST) 2 mg/m³
Zinc oxide fume	1314-13-2		5	5 mg/m³ (ST) 10 mg/m³	5 mg/m³ (ST) 10 mg/m³	2 mg/m³ (resp.) (ST) 10 mg/m³ (resp)
Zinc oxide	1314-13-2			See PNOR		
Total dust			15	10 mg/m³	5 mg/m³ (C) 15 mg/m³	
Respirable fraction			5	5 mg/m³		2 mg/m³ (ST) 10 mg/m³
Zinc stearate	557-05-1					See *TLV® Documentation on Stearates*

Substance	CAS No.[c]	Regulatory Limits			Recommended Limits	
		OSHA PEL[b]		Cal/OSHA PEL[f] *(as of 4/4/2018)*	NIOSH REL[g] *(as of 7/7/16)*	ACGIH® 2018 TLV® [h]
		ppm [d]	mg/m³ [e]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Total dust			15	10 mg/m³	10 mg/m³	10 mg/m³ (IHL)
Respirable fraction			5		5 mg/m³	3 mg/m³(resp.)
Zirconium compounds (as Zr)	7440-67-7		5	5 mg/m³ (ST) 10 mg/m³	5 mg/m³ (ST) 10 mg/m³	5 mg/m³ (ST) 10 mg/m³

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Annotated Z-1 Table Footnotes, Abbreviations, References

(a) The unshaded area on this page lists PELs from OSHA Table Z-1 in 29 CFR 1910.1000. The shaded area of this page lists other occupational exposure limits (OELs) from Cal/OSHA, NIOSH, and ACGIH®.

(b) Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELS) from 29 CFR 1910.1000 Z-1 Table [58 FR 35340, June 30, 1993; 58 FR 40191, July 27, 1993, as amended at 61 FR 56831, Nov. 4, 1996; 62 FR 1600, Jan 10,1997; 62 FR 42018, Aug. 4,1997; 71 FR 10373, Feb. 28, 2006; 71 FR 16673, Apr. 3, 2006; 71 FR 36008, June 23, 2006.]. [OSHA entries for respirable crystalline silica from 81 FR 16285, March 25, 2016; OSHA entries for beryllium and beryllium compounds from 82 FR 2470, January 9, 2017]. PELs are 8-hour time weighted averages (TWAs) unless otherwise indicated. OSHA enforces these limits under section 5(a)(2) of the OSH Act. In addition to the values listed in this table, the Z tables in 29 CFR 1910.1000 list skin absorption designations.

(c) The CAS number is for information only. Enforcement is based on the substance name. For an entry covering more than one metal compound measured as the metal, the CAS number for the metal is given - not CAS numbers for the individual compounds.

(d) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees C and 760 torr.

(e) Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

(f) California Division of Occupational Safety and Health (Cal/OSHA) Permissible Exposure Limits (PELs) from Table AC-1 last viewed April 4, 2018, viewable at http://www.dir.ca.gov/title8/5155table_ac1.html. Cal/OSHA enforces its PELs in workplaces under its jurisdiction. Cal/OSHA has established occupational exposure limits for compounds not included in the OSHA Z Tables. Please see Cal/OSHA Table AC-1 for additional limits, the most current limits, and other designations such as skin absorption. The Cal/OSHA AC-1 table and regulations should be consulted for explanations.

(g) National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limits (RELs) from the NIOSH Pocket Guide to Chemical Hazards (https://www.cdc.gov/niosh/npg) (Web site last updated May 18, 2016). RELs are for up to 10-hour time weighted averages (TWAs) during a 40-hour work week unless otherwise indicated. NIOSH has established occupational exposure limits for compounds not included in the OSHA Z Tables. Please see the NIOSH Pocket Guide for additional limits, skin absorption and other designations, and explanations.

(h) ACGIH® Threshold Limit Values (TLVs®) (ACGIH® 2018). TLVs® are listed in the order of 8-hour time weighted averages (TWAs), STELs (ST), and Ceilings (C), if available. ACGIH® has established TLVs® for compounds not included in the OSHA Z Tables. Please see ACGIH® *Documentation* for additional limits, skin absorption and other designations, and explanations. The 2018 *TLV® and BEI® Book and Documentation of the Threshold Limit Values on Chemical Substances, 7th Edition* are available through the ACGIH® website at http://www.acgih.org. The TLVs® and BEIs® are copyrighted by ACGIH® and are not publicly available. Permission must be requested from ACGIH® to reproduce the TLVs® and BEIs®. Click here for permission request form.

(i) In 29 CFR 1000, all inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.

(j) The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except in some circumstances the distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures; for the excepted subsegments, the benzene limits in Table Z-2 apply. See 1910.1028 for specific circumstances.

(k) See Table Z-2 for the exposure limits for any operations or sectors where the exposure limits in 1910.1026 are stayed or are otherwise not in effect.

(l) This 8-hour TWA applies to respirable dust as measured by a vertical elutriator cotton dust sampler or equivalent instrument. The time-weighted average applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning and willowing) and garnetting. See also 1910.1043 for cotton dust limits applicable to other sectors.

(m)See Table Z-3 for the exposure limit for any operations or sectors where the exposure limit in § 1910.1053 is stayed or is otherwise not in effect.

(n)For butyl acetate all isomers [105-46-4; 110-19-0; 123-86-4; 540-88-5]: TWA = 50 ppm; STEL = 150 ppm.

(o) See Table Z–2 for the exposure limits for any operations or sectors where the exposure limits in § 1910.1024 are stayed or otherwise not in effect.

(p) For propyl acetate isomers (108-21-4; 109-60-4): TWA = 100 ppm; STEL = 150 ppm.

Abbreviations

C = Ceiling limit
Ca = Potential occupational carcinogens
CAS No. = Chemical Abstract Service Number
D = Simple asphyxiant
EX = Explosion hazard: the substance is a flammable asphyxiant or excursions about the TLV® could approach 10% of the lower explosive limit
f/cm^3 = fibers/cubic centimeter
f/cc = fibers/cubic centimeter
hr = hour
IHL = Inhalable
IFV = Inhalable Fraction and Vapor
m^3 = cubic meters
min = Minute
mg/m^3 = milligrams/meter cubed
PAH = Polycyclic aromatic hydrocarbons
PNOR = Particulates not otherwise regulated
ppm = parts per million
resp. = respirable
ST = Short Term Exposure Limit
Thor. = Thoracic fraction
TLV® = Threshold Limit Value
TWA – Time weighted average
V = Vapor and aerosol

References

ACGIH® 2018 Threshold Limit Values for Chemical Substances in the Work Environment. Adopted by ACGIH® with Intended Changes. See http://www.acgih.org/.

California Division of Occupational Safety and Health (Cal/OSHA) Table AC-1, Permissible Exposure Limits (PELs), in California Code of Regulations (CCR) Title 8 Section 5155, last viewed April 4, 2018. Viewable at http://www.dir.ca.gov/title8/5155table_ac1.html.

National Institute for Occupational Safety and Health (NIOSH) (2016) NIOSH Pocket Guide to Chemical Hazards. Department of Health and Human Services. Centers for Disease Control and Prevention. National Institute for Occupational Safety and Health (NIOSH). Web site last updated on May 18, 2016. Available at https://www.cdc.gov/niosh/npg

Occupational Safety and Health Administration (OSHA) (2017) Air Contaminants. 29 CFR 1910.1000 [82 FR 2735, January 9, 2017]. Web site accessed on April 4, 2018. Available at https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9991

Note: This table only includes occupational exposure limits (OELs) for substances listed in the OSHA Z-2 Table. OELs for hundreds of additional substances have been adopted by Cal/OSHA, NIOSH, and ACGIH. These organizations periodically make revisions to their OELs and so they should be consulted directly for their most current values and substances, as well as special notations such as for skin absorption. The TLVs® and BEIs® are copyrighted by ACGIH® and are not publicly available. However, they can be purchased in their entirety on the ACGIH® website at http://www.acgih.org/store/. Permission must be requested from ACGIH® to reproduce the TLVs® and BEIs®. Click here for permission request form.

Annotated OSHA Z-2 Table[a]

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Regulatory Limits						Recommended Limits	
	OSHA PELs[b]				Cal/OSHA PEL[c] *(as of 4/4/18)*	NIOSH REL[d] *(as of 7/7/16)*	ACGIH® 2018 TLV®[e]
Substance	8-hour Time Weighted Average (TWA)	Acceptable Ceiling Concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift: Concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift: Maximum Duration	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Benzene[f] (Z37.40-1969)	10 ppm	25 ppm	50 ppm	10 min	See Annotated Table Z-1		
Beryllium and beryllium compounds[i] (Z37.29-1970)	2 µg/m^3	5 µg/m^3	25 µg/m^3	30 min	0.2 µg/m^3 (ST) 2 µg/m^3 (C) 25 µg/m^3	Ca (C) 0.5 µg/m^3, See Appendix A	0.05 µg/m^3 (IHL)
Cadmium fume[g] (Z37.5-1970)	0.1 mg/m^3	0.3 mg/m^3			See Annotated Table Z-1		
Cadmium dust[g] (Z37.5-1970)	0.2 mg/m^3	0.6 mg/m3			See Annotated Table Z-1		
Carbon disulfide (Z37.3-1968)	20 ppm	30 ppm	100 ppm	30 min	1 ppm (ST) 12 ppm (C) 30 ppm	1 ppm (ST) 10 ppm	1 ppm
Carbon tetrachloride (Z37.17-1967)	10 ppm	25 ppm	200 ppm	5 min in any 3 hr	2 ppm (ST) 10 ppm (C) 200 ppm	Ca (ST) 2 ppm [60-min] See Appendix A	5 ppm (ST) 10 ppm
Chromic acid and chromates[h] (Z37-7-1971)		1 mg/10m^3			See Chromium (VI) compounds in Annotated Table Z-1		

Regulatory Limits						Recommended Limits	
OSHA PELs[b]					Cal/OSHA PEL[c] *(as of 4/4/18)*	NIOSH REL[d] *(as of 7/7/16)*	ACGIH® 2018 TLV®[e]
			Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift				
Substance	**8-hour Time Weighted Average (TWA)**	**Acceptable Ceiling Concentration**	**Concentration**	**Maximum Duration**	**8-hour TWA (ST) STEL (C) Ceiling**	**Up to 10-hour TWA (ST) STEL (C) Ceiling**	**8-hour TWA (ST) STEL (C) Ceiling**
Ethylene dibromide (Z37.31-1970)	20 ppm	30 ppm	50 ppm	5 min	(C) 0.13 ppm, See Section 5219	Ca 0.045 ppm (C) 0.13 ppm [15-min] See Appendix A	See *TLV® Documentation* on Ethylene dibromide
Ethylene dichloride (Z37.21-1969)	50 ppm	100 ppm	200 ppm	5 min in any 3 hr	1 ppm (ST) 2 ppm (C) 200 ppm	Ca 1 ppm (ST) 2 ppm See Appendix A See Appendix C Chloroethanes	10 ppm
Fluoride as dust (Z37.28-1969)	2.5 mg/m³				2.5 mg/m³	2.5 mg/m³	2.5 mg/m³ as F
Formaldehyde See 1910.1048					See Annotated Table Z-1		
Hydrogen fluoride (Z37.28-1969)	3 ppm				0.4 ppm as F (ST) 1 ppm as F	3 ppm (C) 6 ppm [15-min]	0.5 ppm as F (C) 2 ppm as F
Hydrogen sulfide (Z37.2-1966)		20 ppm	50 ppm	10 min once only if no other measurable exposure occurs.	10 ppm (ST) 15 ppm (C) 50 ppm	(C) 10 ppm [10-min]	1 ppm (ST) 5 ppm
Mercury (Z37.8-1971)		0.1 mg/m³			0.025 mg/m³ for metallic and inorganic	0.05 mg/m³	0.025 mg/m³ (elemental and inorganic)
Methyl chloride (Z37.18-1969)	100 ppm	200 ppm	300 ppm	5 min in any 3 hr	50 ppm (ST) 100 ppm (C) 300 ppm	Ca See Appendix A	50 ppm (ST) 100 ppm
Methylene Chloride See 1910.1052					25 ppm (ST) 125 ppm See Section 5202	Ca See Appendix A	50 ppm
Organo (alkyl) mercury (Z37.30-1969)	0.01 mg/m³	0.04 mg/m³			0.01 mg/m³ (ST) 0.03 mg/m³ (C) 0.04 mg/m³	0.01 mg/m³ (ST) 0.03 mg/m³	0.01 mg/m³ (ST) 0.03 mg/m³
Styrene (Z37.15-1969)	100 ppm	200 ppm	600 ppm	5 min in any 3 hr	50 ppm (ST) 100 ppm (C) 500 ppm	50 ppm (ST) 100 ppm	20 ppm (ST) 40 ppm
Tetrachloroethylene	100 ppm	200 ppm	300 ppm	5 min in any 3 hr			

Regulatory Limits						Recommended Limits	
	OSHA PELs[b]				Cal/OSHA PEL[c] *(as of 4/4/18)*	NIOSH REL[d] *(as of 7/7/16)*	ACGIH® 2018 TLV®[e]
Substance	8-hour Time Weighted Average (TWA)	Acceptable Ceiling Concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift: Concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift: Maximum Duration	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
					25 ppm (ST) 100 ppm (C) 300 ppm	Ca See Appendix A	25 ppm (ST) 100 ppm
Toluene (Z37.12-1967)	200 ppm	300 ppm	500 ppm	10 min	10 ppm (ST) 150 ppm (C) 500 ppm	100 ppm (ST) 150 ppm	20 ppm
Trichloroethylene (Z37.19-1967)	100 ppm	200 ppm	300 ppm	5 min in any 2 hr	25 ppm (ST) 100 ppm (C) 300 ppm	Ca See Appendix A See Appendix C	10 ppm (ST) 25 ppm

Annotated Z-2 Table Footnotes, Abbreviations, References

(a) The unshaded area on this page Lists PELs from OSHA Table Z-2 in 29 CFR 1910.1000. The shaded area of this page lists other occupational exposure limits (OELs) from Cal/OSHA, NIOSH, and ACGIH®.

(b) Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELS) from 29 CFR 1910.1000 Z-2 Table; [62 FR 42018, August 4, 1997] as amended [71 FR 36009, June 23, 2006]. OSHA entries for beryllium and beryllium compounds from 82 FR 2470, January 9, 2017]. PELs are 8-hour time weighted averages (TWAs) unless otherwise indicated. OSHA enforces these limits under section 5(a)(2) of the OSH Act. In addition to the values listed in this table, the Z tables in 29 CFR 1910.1000 list skin absorption designations.

(c) California Division of Occupational Safety and Health (Cal/OSHA) Permissible Exposure Limits (PELs) from Table AC-1 last viewed April 4, 2018, viewable at http://www.dir.ca.gov/title8/5155table_ac1.html. Cal/OSHA enforces its PELs in workplaces under its jurisdiction. Cal/OSHA has established occupational exposure limits for compounds not included in the OSHA Z Tables. Please see Cal/OSHA Table AC-1 for additional limits, the most current limits, and other designations such as skin absorption. The Cal/OSHA AC-1 table and regulations should be consulted for explanations.

(d) National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limits (RELs) from the NIOSH Pocket Guide to Chemical Hazards (http://www.cdc.gov/niosh/npg) (NIOSH Web site last updated May 18, 2016). RELs are for up to 10-hour time weighted averages (TWAs) during a 40-hour work week unless otherwise indicated. NIOSH has established occupational exposure limits for compounds not included in the OSHA Z Tables. Please see the NIOSH Pocket Guide for additional limits, skin absorption and other designations, and explanations.

(e) ACGIH® Threshold Limit Values (TLV®s) (ACGIH® 2018). TLV®s are listed in the order of 8-hour time weighted averages (TWAs), STELs (ST), and Ceilings (C), if available. ACGIH® has established TLVs® for compounds not included in the OSHA Z Tables. Please see ACGIH® *Documentation* for additional limits, skin absorption and other designations, and explanations. The 2018 *TLV® and BEI® Book and Documentation of the Threshold Limit Values on Chemical Substances, 7th Edition* are available through the ACGIH® website at http://www.acgih.org. The TLVs® and BEIs® are copyrighted by ACGIH® and are not publicly available. Permission must be requested from ACGIH® to reproduce the TLVs® and BEIs®. Click here for permission request form.

(f) This standard applies to the industry segments exempt from the 1 ppm 8-hour TWA and 5 ppm STEL of the benzene standard at 1910.1028.

(g) This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect.

(h) This standard applies to any operations or sectors for which the exposure limit in the Chromium (VI) standard, Sec. 1910.1026, is stayed or is otherwise not in effect.

(i) This standard applies to any operations or sectors for which the exposure limits in the beryllium standard, § 1910.1024, are stayed or is otherwise not in effect.

Abbreviations

C = Ceiling limit
Ca = Potential occupational carcinogens
CAS No. = Chemical Abstract Service Number

hr = hour
m^3 = cubic meters
mg/m^3= millilgram per cubic meter
min = minutes
ppm = parts per million
IHL = Inhalable
ST = Short Term Exposure Limit
TWA = Time Weighted Average
$\mu g/m^3$ = microgram per cubic meter

References

ACGIH® 2018 Threshold Limit Values for Chemical Substances in the Work Environment. Adopted by ACGIH® with Intended Changes. See http://www.acgih.org/.

California Division of Occupational Safety and Health (Cal/OSHA) Table AC-1, Permissible Exposure Limits (PELs), in California Code of Regulations (CCR) Title 8 Section 5155, last viewed April 4, 2018. Viewable at http://www.dir.ca.gov/title8/5155table_ac1.html.

National Institute for Occupational Safety and Health (NIOSH) (2016) NIOSH Pocket Guide to Chemical Hazards. Department of Health and Human Services. Centers for Disease Control and Prevention. National Institute for Occupational Safety and Health (NIOSH). Web site last updated on May 18, 2016. Available at https://www.cdc.gov/niosh/npg.

Occupational Safety and Health Administration (OSHA) (2017) Air Contaminants. 29 CFR 1910.1000 [82 FR 2735, January 9, 2017]. Web site accessed on April 4, 2018. Available at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9991.

UNITED STATES
DEPARTMENT OF LABOR

Occupational Safety and Health Administration
200 Constitution Ave NW
Washington, DC 20210
800-321-6742 (OSHA)
TTY
www.OSHA.gov

Note: This table only includes occupational exposure limits (OELs) for substances listed in the OSHA Z-3 Table. OELs for hundreds of additional substances have been adopted by Cal/OSHA, NIOSH, and ACGIH. These organizations periodically make revisions to their OELs and so they should be consulted directly for their most current values and substances, as well as special notations such as for skin absorption. The TLVs® and BEIs® are copyrighted by ACGIH® and are not publicly available. However, they can be purchased in their entirety on the ACGIH® website at http://www.acgih.org/store/. Permission must be requested from ACGIH® to reproduce the TLVs® and BEIs®. Click here for permission request form.

Annotated TABLE Z-3 Mineral Dusts[a]

***Go to list of all footnotes**

Regulatory Limits				**Recommended Limits**	
OSHA PEL[b]			**Cal/OSHA PEL[c] 8-hour TWA** *(as of 4/4/2018)*	**NIOSH REL[d] Up to 10-hour TWA** *(as of 7/7/16)*	**ACGIH® 2018 TLV®[e] 8-hour TWA**
Substance	**mppcf[f][g]**	**mg/m³**	**mg/m³**	**mg/m³**	**mg/m³**
Silica: Crystalline					
Quartz (Respirable)[i]	$\frac{250^{(h)}}{(\%SiO_2+5)}$	$\frac{10\ mg/m^{3(k)}}{(\%SiO_2+2)}$	See Annotated Z-1	See Annotated Z-1	See Annotated Z-1
Quartz (Total Dust)		$\frac{30\ mg/m^3}{(\%SiO_2+2)}$	0.3		
Cristobalite[j]	Use ½ the value calculated from the count or mass formulae for quartz.		See Annotated Z-1	See Annotated Z-1	See Annotated Z-1
Tridymite[j]	Use ½ the value calculated from the formulae for quartz.		See Annotated Z-1	See Annotated Z-1	See Annotated Z-1
Amorphous, including natural diatomaceous earth	20	$\frac{80\ mg/m^3}{(\%SiO_2)}$	6 (total) 3 (resp.)	6	See *TLV® book* Appendix G

Regulatory Limits				Recommended Limits	
OSHA PEL[b]			Cal/OSHA PEL[c] 8-hour TWA *(as of 4/4/2018)*	NIOSH REL[d] Up to 10-hour TWA *(as of 7/7/16)*	ACGIH® 2018 TLV®[e] 8-hour TWA
Substance	**mppcf[f] [g]**	**mg/m³**	**mg/m³**	**mg/m³**	**mg/m³**
Silicates (less than 1% crystalline silica):					
Mica	20		3 (resp.)	3 (resp.)	3 (resp.)
Soapstone	20		6 (total) 3 (resp.)	6 (total) 3 (resp.)	See Talc
Talc (not containing asbestos)	20[i]		2 (resp.)	2 (resp.)	2 (resp., < 1% crystalline silica)
Talc (containing asbestos)	Use asbestos limit		See Section 5208	Use asbestos limit Ca 0.1 f/cm³	Use asbestos TLV®
Tremolite, asbestiform	See 29 CFR 1910.1001			See Appendix A See Appendix C	
Portland cement	50		See PNOR	10 (total) 5 (resp.)	1 (resp., < 1% crystalliine silica and no asbestos)
Graphite (Natural)	15		2.5 (resp.)	2.5 (resp.)	2 (resp., natural, all forms except fibers)
Coal Dust:				1 See Appendix C	0.9 (resp.) bituminous or lignite; 0.4 (resp.) anthracite (Note coal dust should also be monitored for crystalline silica and if present, see *TLV® book* Appendix E for mixtures)
Respirable fraction less than 5% SiO_2		2.4 mg/m³ [k]	0.9 (bituminous)		
Respirable fraction greater than 5% SiO_2		$\frac{10}{(\%SiO_2+2)}$ mg/m³[k]	0.1 (bituminous)		
Inert or Nuisance Dust: [j]					See *TLV® Book* Appendix B
Respirable fraction	15	5 mg/m³	5 (See PNOR)	See Appendix D	
Total Dust	50	15 mg/m³	10 (See PNOR)	See Appendix D	

Annotated Z-3 Table Footnotes, Abbreviations, References

(a) The unshaded area on this page Lists PELs from OSHA Table Z-3 in 29 CFR 1910.1000. The shaded area of this page lists other occupational exposure limits (OELs) from Cal/OSHA, NIOSH, and ACGIH®.

(b) Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELS) from 29 CFR 1910.1000. Z-3 Table; [58 FR 35340, June 30, 1993; 58 FR 40191, July 27, 1993, as amended at 61 FR 56831, Nov. 4, 1996; 62 FR 1600, Jan. 10, 1997; 62 FR 42018, Aug. 4,1997]. [OSHA entries for respirable crystalline silica from 81 FR 16285, March 25, 2016] PELs are 8-hour time weighted averages (TWAs) unless otherwise indicated. OSHA enforces these limits under section 5(a)(2) of the OSH Act.

(c) California Division of Occupational Safety and Health (Cal/OSHA) Permissible Exposure Limits (PELs) from Table AC-1 last viewed April 4, 2018, viewable at http://www.dir.ca.gov/title8/5155table_ac1.html. Cal/OSHA enforces its PELs in workplaces under its jurisdiction. Cal/OSHA has established occupational exposure limits for compounds not included in the OSHA Z Tables. Please see Cal/OSHA Table AC-1 for additional limits, the most current limits, and other designations such as skin absorption. The Cal/OSHA AC-1 table and regulations should be consulted for explanations.

(d) National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limits (RELs) from the NIOSH Pocket Guide to Chemical Hazards (http://www.cdc.gov/niosh/npg) (Web site last updated May 18, 2016). RELs are for up to 10-hour time weighted averages (TWAs) during a 40-hour work week unless otherwise indicated. NIOSH has established occupational exposure limits for compounds not included in the OSHA Z Tables. Please see the NIOSH Pocket Guide for additional limits, skin absorption and other designations, and explanations.

(e) ACGIH® Threshold Limit Values (TLVs®) (ACGIH® 2018). TLVs® are listed in the order of 8-hour time weighted averages (TWAs), STELs (ST), and Ceilings (C), if available. ACGIH® has established TLVs® for compounds not included in the OSHA Z Tables. Please see ACGIH® *Documentation* for additional limits, skin absorption and other designations, and explanations. The 2018 *TLV® and BEI® Book and Documentation of the Threshold Limit Values on Chemical Substances, 7th Edition* are available through the ACGIH® website at http://www.acgih.org. The TLVs® and BEIs® are copyrighted by ACGIH® and are not publicly available. Permission must be requested from ACGIH® to reproduce the TLVs® and BEIs®. Click here for permission request form.

(f) Millions of particles per cubic foot of air, based on impinger samples counted by light-field techniques.

(g) Conversion factors - mppcf X 35.3 = million particles per cubic meter = particles per c.c.

(h) The percentage of crystalline silica in the formula is the amount determined from airborne samples, except in those instances in which other methods have been shown to be applicable.

(i) Containing less than 1% quartz; if 1% quartz or more, use quartz limit.

(j) All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the Particulates Not Otherwise Regulated (PNOR) limit in Table Z-1.

(k) Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

Aerodynamic diameter (unit density sphere)	Percent passing selector
2	90
2.5	75
3.5	50
5	25
10	0

The measurements under this note refer to the use of an AEC (now NRC) instrument. The respirable fraction of coal dust is determined with an MRE; the figure corresponding to that of 2.4 mg/m^3 in the table for coal dust is 4.5 mg/m^3.

(l) This standard applies to any operations or sectors for which the respirable crystalline silica standard, 1910.1053, is stayed or is otherwise not in effect.

Abbreviations

Ca = Potential occupational carcinogens
f/cm^3 = fibers/cubic centimeter
mg/m^3 = milligrams/meter cubed
PNOR = particulates not otherwise regulated
resp. = respirable
TLV® = Threshold Limit Value
TWA = Time weighted average

References

ACGIH® 2018 Threshold Limit Values for Chemical Substances in the Work Environment. Adopted by ACGIH® with Intended Changes. See http://www.acgih.org/.

California Division of Occupational Safety and Health (Cal/OSHA) Table AC-1, Permissible Exposure Limits (PELs), in California Code of Regulations (CCR) Title 8 Section 5155, last viewed April 4, 2018. Viewable at http://www.dir.ca.gov/title8/5155table_ac1.html.

National Institute for Occupational Safety and Health (NIOSH) (2016) NIOSH Pocket Guide to Chemical Hazards. Department of Health and Human Services. Centers for Disease Control and Prevention. National Institute for Occupational Safety and Health (NIOSH). Web site last updated on May 18, 2016. Available at http://www.cdc.gov/niosh/npg

Occupational Safety and Health Administration (OSHA) (2017) Air Contaminants. 29 CFR 1910.1000 [82 FR 2735, January 9, 2017]. Web site accessed on April 4, 2018. Available at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9991.

Appendix D – Safety Data Sheets

Methanol
Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 07/03/2013 Revision date: 11/15/2013 Supersedes: 10/02/2013 Version: 1.2

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form	:	Substance
Substance name	:	Methanol
CAS No	:	67-56-1
Product code	:	VT430
Formula	:	CH4O
Synonyms	:	acetone alcohol / alcohol C1 / alcohol, methyl / carbinol / colonial spirits / columbian spirits / green wood spirits / manhattan spirits / methyl alcohol / methyl hydrate / methyl hydroxide / methylen / methylol / monohydroxymethane / pyroligneous spirit / pyroxylic spirit / wood alcohol / wood naphtha

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	:	Solvent

1.3. Details of the supplier of the safety data sheet

Val Tech Diagnostics, A Division of LabChem Inc
Jackson's Pointe Commerce Park Building 1000
1010 Jackson's Pointe Court
Zelienople, PA 16063
T 412-826-5230
F 724-473-0647

1.4. Emergency telephone number

Emergency number	:	CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

GHS-US classification

Flam. Liq. 2	H225
Acute Tox. 3 (Oral)	H301
Acute Tox. 3 (Dermal)	H311
Acute Tox. 3 (Inhalation)	H331
STOT SE 1	H370

2.2. Label elements

GHS-US labelling

Hazard pictograms (GHS-US) :

GHS02 GHS06 GHS08

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :
H225 - Highly flammable liquid and vapour
H301+H311+H331 - Toxic if swallowed, in contact with skin or if inhaled
H370 - Causes damage to organs (liver, kidneys, central nervous system, optic nerve) (Dermal, oral)

Precautionary statements (GHS-US) :
P210 - Keep away from heat, sparks, open flames, hot surfaces. - No smoking
P233 - Keep container tightly closed
P240 - Ground/bond container and receiving equipment
P241 - Use explosion-proof electrical, ventilating, lighting equipment
P242 - Use only non-sparking tools
P243 - Take precautionary measures against static discharge
P260 - Do not breathe mist, vapours, spray
P264 - Wash exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves, protective clothing, eye protection, face protection

P301 + P310 - IF SWALLOWED: immediately call a POISON CENTER or doctor/physician
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304 + P340 - IF INHALED: remove victim to fresh air and keep at rest in a position comfortable for breathing
P330 - If swallowed, rinse mouth
P363 - Wash contaminated clothing before reuse
P370 + P378 - In case of fire: Use carbon dioxide (CO_2), powder, alcohol-resistant foam for extinction
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P235 - Keep cool
P405 - Store locked up
P501 - Dispose of contents/container to comply with local, state and federal regulations

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS-US)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent
Name : Methanol
CAS No : 67-56-1
EC no : 200-659-6
EC index no : 603-001-00-X

Name	Product identifier	%	GHS-US classification
Methanol (Main constituent)	(CAS No) 67-56-1	100	Flam. Liq. 2, H225 Acute Tox. 3 (Oral), H301 Acute Tox. 3 (Dermal), H311 Acute Tox. 3 (Inhalation), H331 STOT SE 1, H370

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Never give alcohol to drink.

First-aid measures after inhalation : Remove the victim into fresh air. Immediately consult a doctor/medical service.

First-aid measures after skin contact : Wash immediately with lots of water. Soap may be used. Do not apply (chemical) neutralizing agents. Remove clothing before washing. Consult a doctor/medical service.

First-aid measures after eye contact : Rinse with water. Take victim to an ophthalmologist if irritation persists.

First-aid measures after ingestion : Rinse mouth with water. Give nothing to drink. Do not induce vomiting. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Ingestion of large quantities: immediately to hospital. Take the container/vomit to the doctor/hospital. Doctor: administration of chemical antidote. Doctor: gastric lavage.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : Slight irritation. EXPOSURE TO HIGH CONCENTRATIONS: Coughing. Symptoms similar to those listed under ingestion.

Symptoms/injuries after skin contact : Symptoms similar to those listed under ingestion. Slight irritation.

Symptoms/injuries after eye contact : Redness of the eye tissue. Lacrimation.

Symptoms/injuries after ingestion	:	Nausea. Vomiting. AFTER ABSORPTION OF HIGH QUANTITIES: FOLLOWING SYMPTOMS MAY APPEAR LATER: Change in the haemogramme/blood composition. Headache. Feeling of weakness. Abdominal pain. Muscular pain. Central nervous system depression. Dizziness. Mental confusion. Drunkenness. Coordination disorders. Disturbed motor response. Disturbances of consciousness. Visual disturbances. Blindness. Respiratory difficulties. Cramps/uncontrolled muscular contractions.
Chronic symptoms	:	ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Dry skin. Skin rash/inflammation. Headache. Disturbed tactile sensibility. Visual disturbances. Sleeplessness. Gastrointestinal complaints. Cardiac and blood circulation effects.

4.3. Indication of any immediate medical attention and special treatment needed

Hospitalize at once. Until victim can be cared for by specialized staff:

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	:	Preferably: alcohol resistant foam. Water spray. BC powder. Carbon dioxide.
Unsuitable extinguishing media	:	Solid water jet ineffective as extinguishing medium.

5.2. Special hazards arising from the substance or mixture

Fire hazard	:	DIRECT FIRE HAZARD. Highly flammable. Gas/vapour flammable with air within explosion limits. INDIRECT FIRE HAZARD. May be ignited by sparks.
Explosion hazard	:	DIRECT EXPLOSION HAZARD. Gas/vapour explosive with air within explosion limits. INDIRECT EXPLOSION HAZARD. may be ignited by sparks. Reactions with explosion hazards: see "Reactivity Hazard".
Reactivity	:	On heating: release of toxic/corrosive/combustible gases/vapours (formaldehyde). Upon combustion: CO and CO2 are formed. Violent to explosive reaction with (some) metal powders and with (strong) oxidizers. Violent exothermic reaction with (some) acids and with (some) halogens compounds.

5.3. Advice for firefighters

Firefighting instructions	:	Cool tanks/drums with water spray/remove them into safety. Do not move the load if exposed to heat. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
Protection during firefighting	:	Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	:	Gas-tight suit.
Emergency procedures	:	Keep upwind. Mark the danger area. Consider evacuation. Close doors and windows of adjacent premises. Stop engines and no smoking. No naked flames or sparks. Spark- and explosionproof appliances and lighting equipment. Keep containers closed. Wash contaminated clothes.

6.1.2. For emergency responders

Protective equipment	:	Equip cleanup crew with proper protection.
Emergency procedures	:	Stop leak if safe to do so. Ventilate area.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment	:	Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Try to reduce evaporation. Measure the concentration of the explosive gas-air mixture. Dilute combustible/toxic gases/vapours with water spray. Take account of toxic/corrosive precipitation water. Provide equipment/receptacles with earthing. Do not use compressed air for pumping over spills.
Methods for cleaning up	:	Take up liquid spill into a non combustible material e.g.: sand, earth, vermiculite slaked lime or soda ash. Scoop absorbed substance into closing containers. See "Material-handling" for suitable container materials. Carefully collect the spill/leftovers. Damaged/cooled tanks must be emptied. Do not use compressed air for pumping over spills. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Handle uncleaned empty containers as full ones. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Do not use compressed air for pumping over. Use spark-/explosionproof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks. Observe strict hygiene. Keep container tightly closed. Measure the concentration in the air regularly. Work under local exhaust/ventilation.

Hygiene measures : Do not eat, drink or smoke when using this product. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Incompatible products : Strong oxidizers. Strong bases. Strong acids. Acid anhydrides. Acid chlorides.

Incompatible materials : Direct sunlight. Heat sources. Sources of ignition.

Heat and ignition sources : KEEP SUBSTANCE AWAY FROM: heat sources. ignition sources.

Prohibitions on mixed storage : KEEP SUBSTANCE AWAY FROM: combustible materials. oxidizing agents. (strong) acids. (strong) bases. halogens. amines. water/moisture.

Storage area : Store at room temperature. Keep out of direct sunlight. Store in a dry area. Keep container in a well-ventilated place. Fireproof storeroom. Keep locked up. Provide for a tub to collect spills. Provide the tank with earthing. Unauthorized persons are not admitted. Aboveground. Meet the legal requirements.

Special rules on packaging : SPECIAL REQUIREMENTS: closing. dry. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.

Packaging materials : SUITABLE MATERIAL: steel. stainless steel. iron. glass. MATERIAL TO AVOID: lead. aluminium. zinc. polyethylene. PVC.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Methanol (67-56-1)		
USA ACGIH	ACGIH TWA (ppm)	200 ppm
USA ACGIH	ACGIH STEL (ppm)	200 ppm
USA OSHA	OSHA PEL (TWA) (mg/m³)	260 mg/m³
USA OSHA	OSHA PEL (TWA) (ppm)	200 ppm

8.2. Exposure controls

Appropriate engineering controls : Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Keep concentrations well below lower explosion limits.

Personal protective equipment : Safety glasses. Protective clothing. Gloves. Full protective flameproof clothing. Face shield.

Materials for protective clothing : GIVE EXCELLENT RESISTANCE: No data available. GIVE GOOD RESISTANCE: polyethylene/ethylenevinylalcohol. styrene-butadiene rubber. viton. GIVE LESS RESISTANCE: chloroprene rubber. chlorinated polyethylene. natural rubber. nitrile rubber/PVC. GIVE POOR RESISTANCE: leather. neoprene. nitrile rubber. polyethylene. PVA. PVC. polyurethane.

Hand protection : Gloves.

Eye protection : Combined eye and respiratory protection. Safety glasses.

Skin and body protection : Head/neck protection. Protective clothing.

Respiratory protection : Gas mask with filter type AX at conc. in air > exposure limit. Wear gas mask with filter type A if conc. in air > exposure limit. High vapour/gas concentration: self-contained respirator.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid

Appearance	:	Liquid.
Molecular mass	:	32.04 g/mol
Colour	:	Colourless.
Odour	:	Characteristic odour. Mild odour. Pleasant odour. Alcohol odour. Commercial/unpurified substance: Irritating/pungent odour.
Odour threshold	:	2000 - 8800 ppm 2620 - 11528 mg/m³
pH	:	No data available
Relative evaporation rate (butylacetate=1)	:	4.1
Relative evaporation rate (ether=1)	:	6.3
Melting point	:	-98 °C
Freezing point	:	No data available
Boiling point	:	65 °C
Flash point	:	11 °C
Critical temperature	:	240 °C
Self ignition temperature	:	455 °C
Decomposition temperature	:	No data available
Flammability (solid, gas)	:	No data available
Vapour pressure	:	128 hPa
Vapour pressure at 50 °C	:	552 hPa
Critical pressure	:	79547 hPa
Relative vapour density at 20 °C	:	1.1
Relative density	:	0.79
Relative density of saturated gas/air mixture	:	1.0
Density	:	792 kg/m³
Solubility	:	Soluble in water. Soluble in ethanol. Soluble in ether. Soluble in acetone. Soluble in chloroform. Water: Complete Ethanol: Complete Ether: Complete Acetone: Complete
Log Pow	:	-0.77 (Experimental value; Other,Experimental value; Other)
Log Kow	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	0.6 mPa.s (20 °C)
Explosive properties	:	No data available
Oxidising properties	:	No data available
Explosive limits	:	5.5 - 36.5 vol %

9.2. Other information

Minimum ignition energy	:	0.14 mJ
Saturation concentration	:	166 g/m³
VOC content	:	100 %
Other properties	:	Clear. Hygroscopic. Volatile. Substance has neutral reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

On heating: release of toxic/corrosive/combustible gases/vapours (formaldehyde). Upon combustion: CO and CO2 are formed. Violent to explosive reaction with (some) metal powders and with (strong) oxidizers. Violent exothermic reaction with (some) acids and with (some) halogens compounds.

10.2. Chemical stability

Hygroscopic.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Direct sunlight. High temperature. Incompatible materials. Open flame. Sparks. Overheating.

10.5. Incompatible materials

Strong oxidizers. Strong bases. Strong acids. Peroxides. Acid anhydrides. Acid chlorides.

10.6. Hazardous decomposition products

Carbon dioxide. Carbon monoxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Toxic if swallowed. Toxic in contact with skin. Toxic if inhaled.

Methanol (\f)67-56-1	
LD50 oral rat	> 5000 mg/kg (1187-2769 mg/kg bodyweight; Rat; Rat)
LD50 dermal rabbit	15800 mg/kg (Rabbit)
LC50 inhalation rat (mg/l)	85 mg/l/4h (Rat)
LC50 inhalation rat (ppm)	64000 ppm/4h (Rat)

Skin corrosion/irritation : Not classified

Serious eye damage/irritation : Not classified

Respiratory or skin sensitisation : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : Causes damage to organs (liver, kidneys, central nervous system, optic nerve) (Dermal, oral).

Specific target organ toxicity (repeated exposure) : Not classified

Aspiration hazard : Not classified

Symptoms/injuries after inhalation : Slight irritation. EXPOSURE TO HIGH CONCENTRATIONS: Coughing. Symptoms similar to those listed under ingestion.

Symptoms/injuries after skin contact : Symptoms similar to those listed under ingestion. Slight irritation.

Symptoms/injuries after eye contact : Redness of the eye tissue. Lacrimation.

Symptoms/injuries after ingestion : Nausea. Vomiting. AFTER ABSORPTION OF HIGH QUANTITIES: FOLLOWING SYMPTOMS MAY APPEAR LATER: Change in the haemogramme/blood composition. Headache. Feeling of weakness. Abdominal pain. Muscular pain. Central nervous system depression. Dizziness. Mental confusion. Drunkenness. Coordination disorders. Disturbed motor response. Disturbances of consciousness. Visual disturbances. Blindness. Respiratory difficulties. Cramps/uncontrolled muscular contractions.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Dry skin. Skin rash/inflammation. Headache. Disturbed tactile sensibility. Visual disturbances. Sleeplessness. Gastrointestinal complaints. Cardiac and blood circulation effects.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Classification concerning the environment: not applicable.

Ecology - air : TA-Luft Klasse 5.2.5/I.

Ecology - water : Not harmful to fishes (LC50(96h) >1000 mg/l). Not harmful to invertebrates (Daphnia) (EC50 (48h) > 1000 mg/l). Not harmful to algae (EC50 (72h) >1000 mg/l). Slightly harmful to bacteria (EC50: 100 - 1000 mg/l). Inhibition of activated sludge.

Methanol (67-56-1)	
LC50 fishes 1	15400 mg/l (96 h; Lepomis macrochirus; Lethal)
EC50 Daphnia 1	> 10000 mg/l (48 h; Daphnia magna; Lethal)
LC50 fish 2	10800 mg/l 96 h; Salmo gairdneri (Oncorhynchus mykiss)
EC50 Daphnia 2	24500 mg/l (48 h; Daphnia magna)
Threshold limit other aquatic organisms 1	6600 mg/l (16 h; Pseudomonas putida)
Threshold limit algae 1	530 mg/l (192 h; Microcystis aeruginosa)
Threshold limit algae 2	8000 mg/l (168 h; Scenedesmus quadricauda)

12.2. Persistence and degradability

Methanol (67-56-1)	
Persistence and degradability	Readily biodegradable in water. Biodegradable in the soil.
Biochemical oxygen demand (BOD)	0.6 - 1.12 g O^2/g substance
Chemical oxygen demand (COD)	1.42 g O^2/g substance
ThOD	1.5 g O^2/g substance
BOD (% of ThOD)	0.8 % ThOD

12.3. Bioaccumulative potential

Methanol (67-56-1)	
BCF fish 1	< 10 (Leuciscus idus)
Log Pow	-0.77 (Experimental value; Other,Experimental value; Other)
Bioaccumulative potential	Low potential for bioaccumulation (BCF < 500).

12.4. Mobility in soil

Methanol (67-56-1)	
Surface tension	0.023 N/m (20 °C)

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle by distillation. Incinerate under surveillance with energy recovery. Do not discharge into drains or the environment. Obtain the consent of pollution control authorities before discharging to wastewater treatment plants.

Additional information : LWCA (the Netherlands): KGA category 06. Hazardous waste according to Directive 2008/98/EC.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN1230 Methanol, 3, II

UN-No.(DOT) : 1230

DOT NA no. : UN1230

DOT Proper Shipping Name : Methanol

Department of Transportation (DOT) Hazard Classes : 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120

Hazard labels (DOT) : 3 - Flammable liquid

DOT Symbols : D - Proper shipping name for domestic use only, or to and from Canada

Packing group (DOT) : II - Medium Danger

DOT Special Provisions (49 CFR 172.102)	:	IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized. T7 - 4 178.274(d)(2) Normal..... 178.275(d)(3) TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: (image) Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and a is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: (image) Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively.
DOT Packaging Exceptions (49 CFR 173.xxx)	:	150
DOT Packaging Non Bulk (49 CFR 173.xxx)	:	202
DOT Packaging Bulk (49 CFR 173.xxx)	:	242
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	1 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	60 L
DOT Vessel Stowage Location	:	B - (i) The material may be stowed ‘‘on deck’’ or ‘‘under deck’’ on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) ‘‘On deck only’’ on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded.
DOT Vessel Stowage Other	:	40 - Stow ‘‘clear of living quarters’’

Additional information

Other information	:	No supplementary information available.
State during transport (ADR-RID)	:	as liquid.

ADR

Transport document description	:	UN 1230 Methanol, 3 (6.1), II, (D/E)
Packing group (ADR)	:	II
Class (ADR)	:	3 - Flammable liquid
Hazard identification number (Kemler No.)	:	336
Classification code (ADR)	:	FT1
Danger labels (ADR)	:	3 - Flammable liquids 6.1 - Toxic substances

Orange plates :

Tunnel restriction code : D/E

Transport by sea

UN-No. (IMDG)	:	1230
Class (IMDG)	:	3 - Flammable liquids
Subsidiary risk (IMDG)	:	6.1
EmS-No. (1)	:	F-E
MFAG-No	:	19
EmS-No. (2)	:	S-D

Air transport

UN-No.(IATA)	:	1230
Class (IATA)	:	3 - Flammable Liquids

Packing group (IATA) : II - Medium Danger
Subsidiary risk (IATA) : 6.1

SECTION 15: Regulatory information

15.1. US Federal regulations

Methanol (67-56-1)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings)	
RQ (Reportable quantity, section 304 of EPA's List of Lists) :	5000 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Fire hazard

15.2. International regulations

CANADA

Methanol (67-56-1)	
Listed on the Canadian DSL (Domestic Sustances List) inventory.	
WHMIS Classification	Class B Division 2 - Flammable Liquid Class D Division 2 Subdivision A - Very toxic material causing other toxic effects Class D Division 2 Subdivision B - Toxic material causing other toxic effects

EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Flam. Liq. 2	H225
Acute Tox. 3 (Inhalation)	H331
Acute Tox. 3 (Dermal)	H311
Acute Tox. 3 (Oral)	H301
STOT SE 1	H370
STOT SE 1	H370
STOT SE 1	H370

Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC or 1999/45/EC

F; R11
T; R23/24/25
T; R39/23/24/25

Full text of R-phrases: see section 16

15.2.2. National regulations

Methanol (67-56-1)
Listed on the Canadian Ingredient Disclosure List

15.3. US State regulations

Methanol(67-56-1)	
U.S. - California - Proposition 65 - Developmental Toxicity	Yes
No significance risk level (NSRL)	23000 µg/day

SECTION 16: Other information

Full text of H-phrases: see section 16:

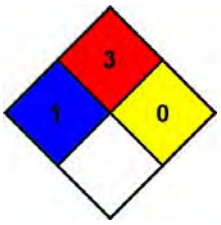
Acute Tox. 3 (Dermal)	Acute toxicity (dermal), Category 3
Acute Tox. 3 (Inhalation)	Acute toxicity (inhal.), Category 3

Acute Tox. 3 (Oral)	Acute toxicity (oral), Category 3
Flam. Liq. 2	Flammable liquids, Category 2
STOT SE 1	Specific target organ toxicity — single exposure, Category 1
H225	Highly flammable liquid and vapour
H301	Toxic if swallowed
H311	Toxic in contact with skin
H331	Toxic if inhaled
H370	Causes damage to organs

NFPA health hazard : 1 - Exposure could cause irritation but only minor residual injury even if no treatment is given.

NFPA fire hazard : 3 - Liquids and solids that can be ignited under almost all ambient conditions.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health : 2 Moderate Hazard - Temporary or minor injury may occur

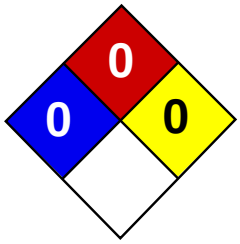
Flammability : 3 Serious Hazard

Physical : 0 Minimal Hazard

Personal Protection : H

SDS US ValTech

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.



Health	0
Fire	0
Reactivity	0
Personal Protection	A

Material Safety Data Sheet
Water, Deionized MSDS

Section 1: Chemical Product and Company Identification

Product Name: Water, Deionized

Catalog Codes: SLW1015

CAS#: 7732-18-5

RTECS: ZC0110000

TSCA: TSCA 8(b) inventory: Water

CI#: Not available.

Synonym: Dihydrogen oxide

Chemical Name: Water

Chemical Formula: H2O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Water	7732-18-5	100

Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification

Potential Acute Health Effects:
Non-corrosive for skin. Non-irritant for skin. Non-sensitizer for skin. Non-permeator by skin. Non-irritating to the eyes. Non-hazardous in case of ingestion. Non-hazardous in case of inhalation. Non-irritant for lungs. Non-sensitizer for lungs. Non-corrosive to the eyes. Non-corrosive for lungs.

Potential Chronic Health Effects:
Non-corrosive for skin. Non-irritant for skin. Non-sensitizer for skin. Non-permeator by skin. Non-irritating to the eyes. Non-hazardous in case of ingestion. Non-hazardous in case of inhalation. Non-irritant for lungs. Non-sensitizer for lungs. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available.

Section 4: First Aid Measures

Eye Contact: Not applicable.

Skin Contact: Not applicable.

Serious Skin Contact: Not available.

Inhalation: Not applicable.

Serious Inhalation: Not available.

Ingestion: Not Applicable

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances: Not Applicable

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Section 7: Handling and Storage

Precautions: No specific safety phrase has been found applicable for this product.

Storage: Not applicable.

Section 8: Exposure Controls/Personal Protection

Engineering Controls: Not Applicable

Personal Protection: Safety glasses. Lab coat.

Personal Protection in Case of a Large Spill: Not Applicable

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Odorless.

Taste: Not available.

Molecular Weight: 18.02 g/mole

Color: Colorless.

pH (1% soln/water): 7 [Neutral.]

Boiling Point: 100°C (212°F)

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: 1 (Water = 1)

Vapor Pressure: 2.3 kPa (@ 20°C)

Vapor Density: 0.62 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not applicable

Solubility: Not Applicable

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact.

Toxicity to Animals:
LD50: [Rat] - Route: oral; Dose: > 90 ml/kg LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Non-corrosive for skin. Non-irritant for skin. Non-sensitizer for skin. Non-permeator by skin. Non-hazardous in case of ingestion. Non-hazardous in case of inhalation. Non-irritant for lungs. Non-sensitizer for lungs. Non-corrosive to the eyes. Non-corrosive for lungs.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Water

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
This product is not classified according to the EU regulations. Not applicable.

HMIS (U.S.A.):

Health Hazard: 0

Fire Hazard: 0

Reactivity: 0

Personal Protection: a

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Not applicable. Lab coat. Not applicable. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:33 PM

Last Updated: 05/21/2013 12:00 PM

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MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	**ALCONOX®**
CHEMICAL FAMILY NAME:	Detergent.
PRODUCT USE:	Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER:	Not Applicable
U.N. DANGEROUS GOODS CLASS:	Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME:	Alconox, Inc.
ADDRESS:	30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE:	**TOLL-FREE in USA/Canada** 800-255-3924
	International calls 813-248-0585
BUSINESS PHONE:	914-948-4040
DATE OF PREPARATION:	May 2011
DATE OF LAST REVISION:	February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS

EUROPEAN and (GHS) Hazard Symbols

Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1
EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 207-638-8 Index# 011-005-00-2
EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):

Eye Irritant Category 2A

Hazard Statement(s):

H319: Causes serious eye irritation

Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray
P264: Wash hands thoroughly after handling
P271: Use only in well ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):

[Xi] Irritant

Risk Phrases:
R20: Harmful by inhalation
R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:
S8: Keep container dry
S22: Do not breath dust
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS: ACUTE: Eye, respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing dificulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

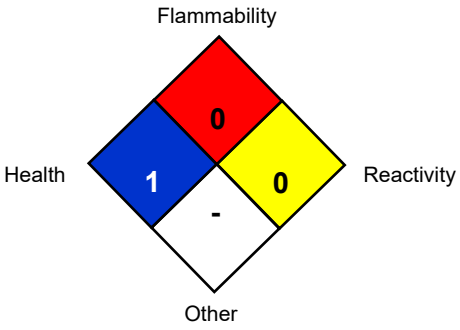
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT: Not Flammable
AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA
FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is non-flammable and has no known explosion hazards.
Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m³	5 mg/m³	5 mg/m³
Sodium Carbonate	497-19-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE & ODOR:	White granular powder with little or no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	Not Applicable.
FREEZING POINT (C°):	Not Applicable.
pH:	9.5 (1% aqueous solution)
SPECIFIC GRAVITY 20°C: (WATER =1)	0.85 – 1.1
SOLUBILITY IN WATER (%)	>10% w/w
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable
DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.
IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.
SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No Data available at this time.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.
PROPER SHIPPING NAME: Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable
UN IDENTIFICATION NUMBER: Not Applicable
PACKING GROUP: Not Applicable.
DOT LABEL(S) REQUIRED: Not Applicable
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable
MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-inplace. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.