October 30, 2023

Town of Millis Conservation Commission
900 Main Street
Millis, MA 02054

RE: Notice of Intent
Well #3 Water Treatment Plant PFAS Upgrades
Birch Street, Millis

Dear Commission Members:

The Town of Millis Department of Public Works (DPW) is proposing to demolish existing water infrastructure and construct a new treatment / PFAS plant and associated infrastructure to Well #3 of Birch Street in Millis, MA. The Town of Millis well is currently offline due to the elevated PFAS levels, and requires additional treatment before it can be brought back online. The size and number of the filtration units will require a significant footprint. Adding on to the current building is not feasible, so DPW is proposing to construct a new building on the site.

A Wetland Resource Area protected under the Wetland Protection Act (WPA) (310 CMR 10.0) is located within 100 feet of the proposed limit of work. In accordance with the requirements of the WPA, please find enclosed copies of the Notice of Intent and reduced plan copies (11”x17”) of the project site plans for your review.

Federal Emergency Management Agency (FEMA) floodplain mapping for the Town of Millis shows the limits of work within the 100-year floodplain; however proposed activities within this area propose to maintain or lower existing ground surface elevation.

We respectfully request the Commission to schedule a public hearing for the Conservation Commission meeting on November 13, 2023. Please contact the DPW or myself at the below number if you have any questions regarding this project. Thank you for your consideration on this matter.

Respectfully yours,

Tyler Bernier
Kleinfelder

cc: James McKay, Millis Department of Public Works

KLEINFELDER
Bright People. Right Solutions.

Table of Contents

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

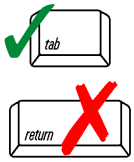
Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Millis
City/Town

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

Village Street (a. Street Address) | Millis (b. City/Town) | 02054 (c. Zip Code)

Latitude and Longitude: 42.1690 (d. Latitude) | -71.3400 (e. Longitude)

Map 28 (f. Assessors Map/Plat Number) | 41 (g. Parcel /Lot Number)

2. Applicant:

Jim (a. First Name) | McKay (b. Last Name)

Town of Millis (c. Organization)

900 Main St (d. Street Address)

Millis (e. City/Town) | MA (f. State) | 02054 (g. Zip Code)

508-376-7040 (h. Phone Number) | (i. Fax Number) | (j. Email Address)

3. Property owner (required if different from applicant): ☐ Check if more than one owner

(a. First Name) | (b. Last Name)

(c. Organization)

(d. Street Address)

(e. City/Town) | (f. State) | (g. Zip Code)

(h. Phone Number) | (i. Fax Number) | (j. Email address)

4. Representative (if any):

Gregory (a. First Name) | Avenia (b. Last Name)

Kleinfelder (c. Company)

1 Beacon Street (d. Street Address)

Boston (e. City/Town) | MA (f. State) | 02108 (g. Zip Code)

617 497 7800 (h. Phone Number) | (i. Fax Number) | GAvenia@kleinfelder.com (j. Email address)

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

$0 (a. Total Fee Paid) | (b. State Fee Paid) | (c. City/Town Fee Paid)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Millis
City/Town

A. General Information (continued)

6. General Project Description:

Implementation of PFAS groundwater treatment facility

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☒ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☐ Transportation
9. ☐ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☐ Yes ☒ No

If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

a. County

b. Certificate # (if registered land)

Deed not found, plan 377 of 1973

c. Book

d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. ☐ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. ☒ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Millis
City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Bank	1. linear feet	2. linear feet
b. ☐ Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☐ Land Under Waterbodies and Waterways	1. square feet 3. cubic yards dredged	2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☒ Bordering Land Subject to Flooding	1661 1. square feet 0 3. cubic feet of flood storage lost	N/A 2. square feet 4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced
f. ☐ Riverfront Area	1. Name of Waterway (if available) - **specify coastal or inland**	

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☐ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: _____ square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet _____ b. square feet within 100 ft. _____ c. square feet between 100 ft. and 200 ft. _____

5. Has an alternatives analysis been done and is it attached to this NOI? ☐ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☐ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f**. above.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Millis
City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above 1. cubic yards dredged	
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ Restoration/Enhancement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

5. ☐ Project Involves Stream Crossings

a. number of new stream crossings

b. number of replacement stream crossings

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 3 – Notice of Intent
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Millis
City/Town

C. Other Applicable Standards and Requirements

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

   a. ☐ Yes ☒ No

   If yes, include proof of mailing or hand delivery of NOI to:

   Natural Heritage and Endangered Species Program
   Division of Fisheries and Wildlife
   1 Rabbit Hill Road
   Westborough, MA 01581

   GIS viewer checked 9/28/23

   If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

   c. Submit Supplemental Information for Endangered Species Review*

      1. ☐ Percentage/acreage of property to be altered:

         (a) within wetland Resource Area _____ percentage/acreage

         (b) outside Resource Area _____ percentage/acreage

      2. ☐ Assessor's Map or right-of-way plan of site

2. ☒ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

   (a) ☒ Project description (including description of impacts outside of wetland resource area & buffer zone)

   (b) ☒ Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 3 – Notice of Intent
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Millis
City/Town

C. Other Applicable Standards and Requirements (cont'd)

(c) ☐ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # b. Date submitted to NHESP

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☒ Not applicable – project is in inland resource area only b. ☐ Yes ☒ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Cohasset to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

c. ☐ Is this an aquaculture project? d. ☐ Yes ☒ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Millis

City/Town

C. Other Applicable Standards and Requirements (cont'd)

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

   a. ☐ Yes ☒ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

   b. ACEC

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

   a. ☐ Yes ☒ No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

   a. ☒ Yes ☐ No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

   a. ☒ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

      1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)

      2. ☐ A portion of the site constitutes redevelopment

      3. ☐ Proprietary BMPs are included in the Stormwater Management System.

   b. ☐ No. Check why the project is exempt:

      1. ☐ Single-family house

      2. ☐ Emergency road repair

      3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☒ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☒ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Millis
City/Town

D. Additional Information (cont'd)

3. ☒ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

Millis, Massachusetts Well 3 Water Treatment Facility
a. Plan Title

Kleinfelder
b. Prepared By

Gregory Avenia, P.E.
c. Signed and Stamped by

10/27/2023
d. Final Revision Date

1"=20'
e. Scale

f. Additional Plan or Document Title

g. Date

5. ☐ If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. ☐ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. ☒ Attach NOI Wetland Fee Transmittal Form

9. ☒ Attach Stormwater Report, if needed.

E. Fees

1. ☒ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Millis
City/Town

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

1. Signature of Applicant	2. Date: 10/30/2023
3. Signature of Property Owner (if different)	4. Date
5. Signature of Representative (if any): Gregory Avenia, PE (Kleinfelder)	6. Date: 10/30/2023

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:
If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

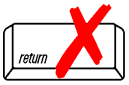
The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A. Applicant Information

1. Location of Project:

Village St	Millis
a. Street Address	b. City/Town
c. Check number	d. Fee amount

2. Applicant Mailing Address:

Jim	McKay	
a. First Name	b. Last Name	
Town of Millis		
c. Organization		
900 Main Street		
d. Mailing Address		
Millis	MA	02054
e. City/Town	f. State	g. Zip Code
508-376-7040		
h. Phone Number	i. Fax Number	j. Email Address

3. Property Owner (if different):

a. First Name	b. Last Name	
c. Organization		
d. Mailing Address		
e. City/Town	f. State	g. Zip Code
h. Phone Number	i. Fax Number	j. Email Address

B. Fees

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
No fee, Town Project	1	0	0

Step 5/Total Project Fee:

Step 6/Fee Payments:

Total Project Fee:	$0 (a. Total Fee from Step 5)
State share of filing Fee:	$0 (b. 1/2 Total Fee **less $**12.50)
City/Town share of filling Fee:	$0 (c. 1/2 Total Fee **plus** $12.50)

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

Village Street Property Map

Millis, MA

1 inch = 300 Feet

0 300 600 900

October 27, 2023

CAI Technologies
Precision Mapping. Geospatial Solutions.

www.cai-tech.com

Water-poly	Right of Way	Property Hook	Private Road
Wet Areas	Utility	Right of Way	Property Line
WaterLines	PropNotPar	Wetland	Public Road

Village Street USGS Map

Millis, MA

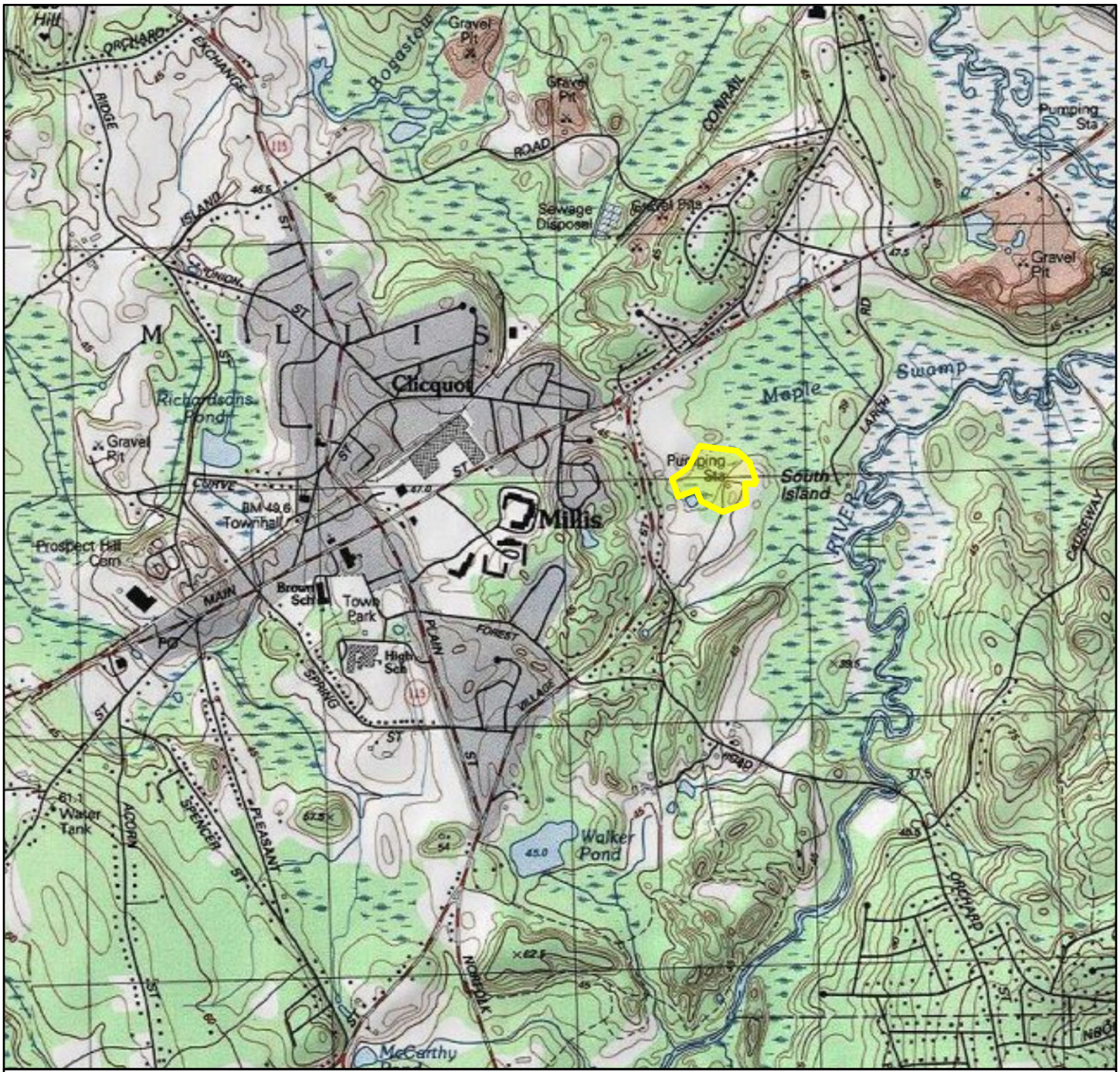
1 inch = 2000 Feet

0 2000 4000 6000

October 27, 2023

CAI Technologies
Precision Mapping. Geospatial Solutions.

www.cai-tech.com



Data shown on this map is provided for planning and informational purposes only. The municipality and CAI Technologies are not responsible for any use for other purposes or misuse or misrepresentation of this map.

Village Street Aerial Map

Millis, MA

1 inch = 300 Feet

0 300 600 900

October 27, 2023

CAI Technologies
Precision Mapping. Geospatial Solutions.

www.cai-tech.com

Village Street NHESP Map

Millis, MA

1 inch = 300 Feet

0 300 600 900

October 27, 2023

CAI Technologies
Precision Mapping. Geospatial Solutions.

www.cai-tech.com

Water-poly	Right of Way	Property Hook	Private Road
Wet Areas	Utility	Right of Way	Property Line
WaterLines	PropNotPar	Wetland	Public Road

Village Street Flood Map

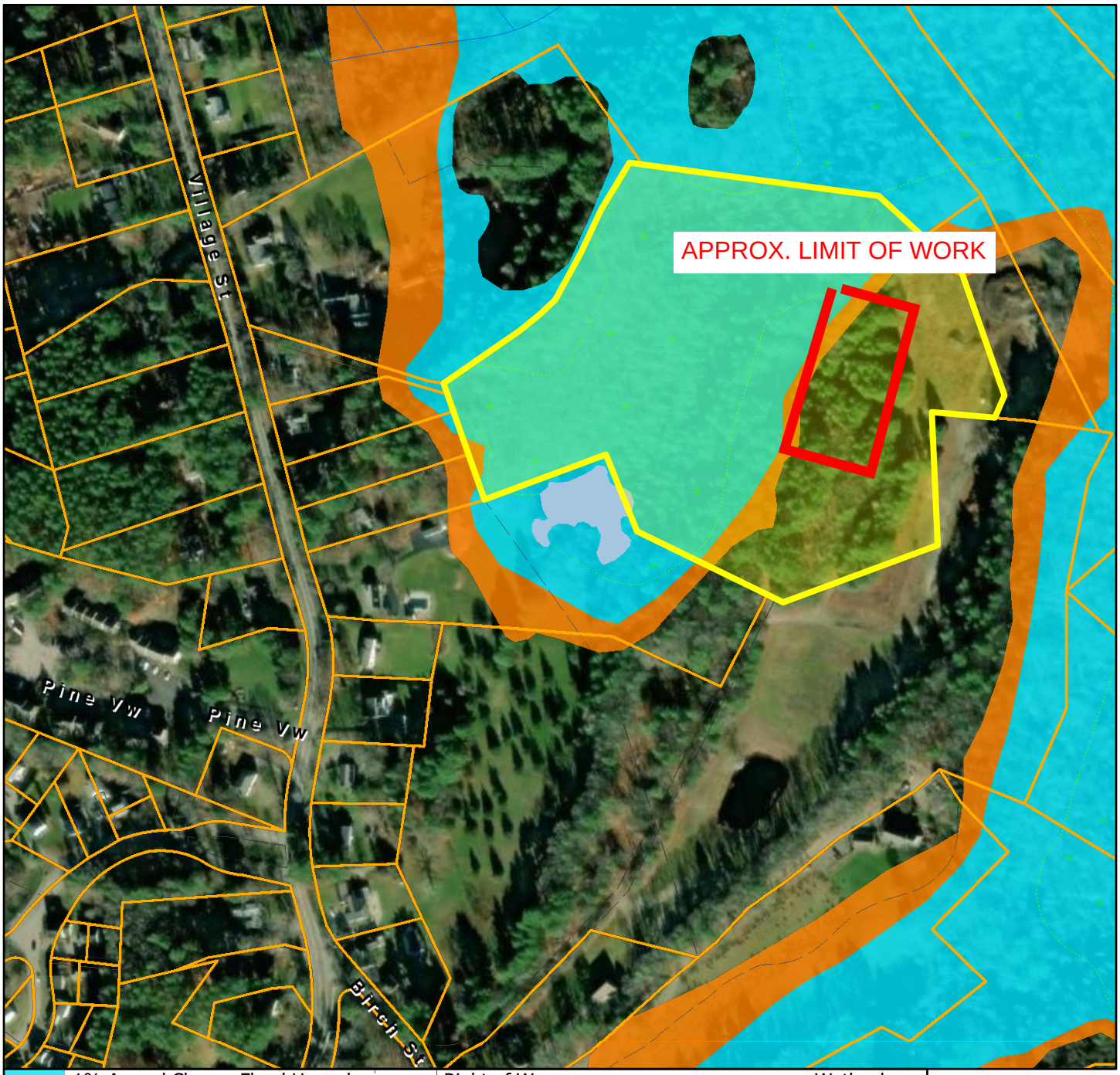
Millis, MA

1 inch = 300 Feet

0 300 600 900

October 27, 2023

CAI Technologies
Precision Mapping. Geospatial Solutions.
www.cai-tech.com



1% Annual Chance Flood Hazard
0.2% Annual Chance Flood Hazard
Water-poly
Wet Areas
WaterLines
Right of Way
Utility
PropNotPar
Property Hook
Right of Way
Wetland
Private Road
Property Line
Public Road

KLEINFELDER
Bright People. Right Solutions.

ATTACHMENT A

NOI Narrative

Attachment A – Notice of Intent Narrative

This Notice of Intent (NOI) is filed pursuant to the Massachusetts Wetlands Protection Act (WPA) (MGL Chapter 131, Section 40) and its implementing regulations (310 CMR 10.00). This narrative presents wetland resource areas associated with the Project area, a description of the proposed work, proposed mitigation measures, and how the Project meets the performance standards of the WPA regulations. Refer to the accompanying Project plans included as Attachment D for a plan layout and details of the Project components.

Introduction

The Town of Millis (Millis) operates a water system with six overburden groundwater wells and four treatment plants, serving approximately 8,600 residential customers. The Massachusetts Department of Environmental Protection (MassDEP) recently adopted a drinking water standard limiting six per- and poly-fluoroalkyl substances (PFAS) levels to no more than 20 nanograms per liter (ng/L), and as part of the new drinking water regulations, all public water systems are required to sample for PFAS levels.

Since the discovery of PFAS in Millis' water supply, the Town has worked to improve water quality through the design and construction of the PFAS treatment upgrades at the D'Angelis Water Treatment Facility (WTF). However, the remaining Wells 3 through 6 also have PFAS detections for compounds subject to regulations from Massachusetts Department of Environmental Protection (DEP) and some of which may also be subject to the proposed regulations by United States Environmental Protection Agency (EPA). While the new D'Angelis WTF will be capable of meeting average daily demands on its own, the Town must install additional PFAS treatment to meet peak demands.

The Town of Millis Department of Public Works (DPW) has conducted pilot testing and a thorough site investigation to obtain the most effective treatment for removing PFAS from drinking water with the least environmental impact. The DPW proposes to construct a new building housing granular activated carbon (GAC) filters, chemical feed equipment, and associated infrastructure at the existing Well 3 site for treatment of public drinking water.

Portions of the land near the Project area contain Bordering Vegetated Wetlands (BVW), a resource area subject to the jurisdiction of the WPA. Proposed work for the Project will occur only in the 100-foot Buffer Zone of the BVW. The Project meets or exceeds all performance standards for Buffer Zone under the WPA. Portions of the Project area are also shown on the Flood Insurance Rate Map (FIRM) as located within Zone AE (100-year floodplain, regulated as Bordering Land Subject to Flooding [BLSF]). However, within the Project area, base flood elevation (BFE) is mapped as 123 feet NAVD88 and recently the DPW obtained survey information collect by a Professional Land Surveyor (PLS) registered in the Commonwealth of Massachusetts that shows a small portion of the limit of disturbance for this Project is located within BFE and/or inside of regulated floodplain areas. More information on the position of the project footprint relative to Zone AE is provided below.

Site Description

The Project area is located on one parcel of land off Birch Street in Millis, Massachusetts. The Project area currently contains wooded land and existing water system infrastructure. Wooded area borders the site to the south, the gravel driveway and wetland to the west, existing Well 3 infrastructure to the north, and a grassed field to the east past a loop in the gravel driveway. Refer to Figure 1 for a Tax Parcel map of the Project area, and Figures 2 and 3 for a USGS map and aerial map of the Project area.

According to the most recently available data provided by the Massachusetts Natural Heritage and Endangered Species Program (NHESP), no Priority Habitats for Rare Species or Estimated Habitats for Rare Wildlife have been mapped in the vicinity of the Project area. No certified or potential vernal pools have been mapped in the Project area (Figure 4). The Project Area is not located within or near an Area of

Critical Environmental Concern (ACEC). According to the Massachusetts Department of Environmental Protection (DEP), the Project area is not located within an Outstanding Resource Water area, but it designated as a Zone I and Zone II Wellhead Protection Area. According to the Natural Resources Conservation Service (NRCS) soil survey, soils in the Project area are mapped as Swansea and Hinkley.

Wetland Resource Areas

Wetland Resource areas in or near the Project Area were identified and delineated by environmental scientists from Basbanes Wetland Consulting on July 19, 2023, in accordance with methods developed by the DEP and U.S. Army Corps of Engineers. Resource areas are shown on the accompanying Project plans and wetland data forms are included in Attachment C. One BVW was delineated in the Project Area, as was Land Subject to Flooding. BVW is defined under the WPA Regulations (310 CMR 10.00) as: "freshwater wetlands that border on creeks, rivers, streams, ponds, and lakes." The boundary of a BVW is determined by the presence of 50 percent or more of wetland indicator plants and saturated or inundated conditions. Bordering Land Subject to Flooding is defined under the WPA Regulations (310 CMR 10.00) as: "an area which floods from a rise in a bordering waterway or water body. Such areas are likely to be significant to flood control and storm damage prevention."

The delineated wetland is located west of the Project Area. Dominant vegetation within the wetland includes beech, maple, oak, pine, buckthorn, highbush and lowbush blueberry, Canada mayflower, fern cinnamon, fern wood, partridgeberry, sphagnum moss, starflower, and poison ivy. The wetland was delineated with flags 1A through 23A (See Project plans). The wetland is regulated as BVW under the WPA.

A 100-foot Buffer Zone extends horizontally outward from the BVW boundary described above, as defined in 310 CMR 10.02(2)(b). The Buffer Zone is not considered a resource area under the WPA, but areas within the Buffer Zone are under the jurisdiction of the issuing authority. Millis has an additional wetlands protection bylaw preventing structures within the inner 50-foot Buffer Zone from the edge of a wetland resource. Within the Project area, the Buffer Zone of the wetland contains and existing gravel drive, paved parking, existing infrastructure, and proposed utilities.

The FIRM for the area indicates a portion of the Project is within as within Zone AE, regulated as BLSF, with an elevation of 123 feet NAVD88. A civil survey conducted within the Project area in September 2022 and July 2023 shows that all Project impacts occur outside of this area, except for demolition activities associated with the existing chemical feed building that proposed to maintain or lower existing grades. Proposed demolition activities are encompass 1,661 square feet of Bordering Land Subject to Flooding. The project is subject to regulation under the WPA.

Proposed Activities

The project includes installation of four (4) 10,000 lb. GAC filters at the Well 3 site, which will require additional building footprint to accommodate the infrastructure. The DPW proposes to construct a new building on the site, adjacent to existing Well 3 infrastructure. A small existing chemical treatment building on the parcel will be demolished and the new building housing the PFAS treatment system and chemicals will be built nearby, on land outside the 100-year floodplain. The existing gravel access road leading to the new building will be reconstructed to provide safe access for vehicles and maintenance personnel. The proposed building footprint is located outside the 100-foot Buffer Zone of a BVW, however portions of construction activities are located within the Millis 100-foot and 50-foot Buffer Zones.

Activities Within Buffer Zone

Project work within the Buffer Zone will include demolition of an existing water infrastructure building, as well as reconstruction of existing gravel driveway areas, installation of new paved driveways, and installation of a new building with associated parking and utilities. All work will take place outside of the

BVW, but demolition of the chemical feed building, restoration of the gravel access drive, and installing pavement, will be within the 100-foot Buffer Zone as shown on the attached plans in Attachment D. Within the area of disturbance associated with the demolition of the chemical feed building, approximately 2,140 square feet of wetland buffer restoration is proposed in a previously developed location.

Sedimentation barriers will be placed around the perimeter of the work area to prevent migration of excavated material from entering the BVW.

Mitigation

The new building has been sited to reduce impacts to wetland resources to the greatest extent practicable by locating it outside of the buffer zone and restoring 2,140 square feet of buffer zone that was previously developed. An erosion and sedimentation control program will be implemented to minimize temporary impacts to wetland resource areas during the construction phase of the project. The program incorporates Best Management Practices (BMPs) specified in guidelines developed by the DEP and the U.S. Environmental Protection Agency (EPA).

Proper implementation of the erosion and sedimentation control program will:

› Minimize exposed soil areas through sequencing and temporary stabilization;

› Place structures to manage stormwater runoff and erosion; and

› Establish a permanent vegetative cover or other forms of stabilization as soon as practicable.

Non-Structural Practices

Non-structural practices to be used during construction include temporary stabilization, temporary seeding, permanent seeding, pavement sweeping, and dust control. These practices will be initiated as soon as practicable in appropriate areas within the Project Area.

Temporary Stabilization

Any areas of exposed soil or stockpiles that will remain inactive for more than 14 days will be surrounded by erosion control devices and covered with polyurethane sheeting.

Temporary Seeding

If conditions allow, a temporary vegetative cover will be established on areas of exposed soils (including stockpiles) that remain unstabilized for a period of more than 60 days. The seeded surfaces will be covered with a layer of straw mulch or bonded fiber matrix as described above. The seed mix shall include a blend of rapid germinating grasses that are indigenous to eastern Massachusetts.

Permanent Seeding

Upon completion of final grading, any areas not covered by pavement, other forms of stabilization, or other methods of landscaping will be seeded with a native seed mix. The mix will be applied at a rate specified by the manufacturer and will be covered with mulch or bonded fiber matrix as described above.

Pavement Sweeping

The interior roads (once paved) and the portion of the street that fronts the Project Area shall be swept as needed during construction. The sweeping program will remove sediment and other contaminants directly from paved surfaces before their release into stormwater runoff. Pavement sweeping has been demonstrated to be an effective initial treatment for reducing pollutant loading into stormwater. A street sweeper shall be kept at the site or at a nearby location to facilitate this practice. Once construction has been completed, sweeping at the Project Area will occur as required under the Operation and Maintenance Plan.

Dust Control

The erosion and sediment control program includes provisions to minimize the generation of dust during dry and windy conditions. When necessary, larger areas of exposed soil will be wetted to prevent wind borne transport of fine-grained sediment. Enough water shall be applied to wet the upper 0.5 inches of soil. The water will be applied as a fine spray to prevent erosion. A water truck will be kept on the property (or at a nearby location) to facilitate this practice.

Structural Practices

Structural erosion and sedimentation controls to be used on the Project Area include barriers, catch basin inlet protection, and dewatering filters.

Erosion Control Barriers

Prior to any ground disturbance, an approved erosion control barrier will be installed at the downgradient limit of work. As construction progresses, additional barriers will be installed around the base of stockpiles and other erosion prone areas. The barriers will be entrenched into the substrate to prevent underflow.

If sediment has accumulated to a depth which impairs proper functioning of the barrier, it will be removed by hand or by machinery operating upslope of the barriers. This material will be either reused in the Project Area or disposed of at a suitable offsite location. Any damaged sections of the barrier will be repaired or replaced immediately upon discovery.

Dewatering Filters

If necessary, sediment laden water that collects in trenches or excavated areas will be pumped into straw bale basins or filter bags. The basins will consist of a ring of staked straw bales overlain by non-woven geotextile filter fabric and crushed stone. Discharge water will be pumped into the basin and allowed to drain through the fabric onto relatively flat stabilized surfaces. Dewatering filter bags may be used in place of straw bale basins. The bags will be placed on relatively flat terrain, free of brush and stumps, to avoid ruptures and punctures. A maximum of one six-inch discharge hose will be allowed per filter bag. To help prevent punctures, geotextile fabric will be placed beneath the filter bag when used in wooded locations. Unattended filter bags will be encircled with a straw bale and silt fence barrier.

All dewatering structures will be placed as far away from wetland resources as possible. Filter bags used during construction will be bundled and removed for proper disposal.

Stormwater Management

Runoff generated from impervious surfaces will be collected and managed in accordance with the DEP Stormwater policies in significant improvement to existing conditions. The proposed Project will improve existing conditions within the Project Area by constructing a stormwater management system that includes measures to provide groundwater recharge, attenuate peak flows and provide water quality treatment. Full details on the system (including supporting calculations) are included in the accompanying Stormwater Management Report (Attachment E).

Compliance with the 10 stormwater management standards cited in Section 310 CMR 10.05(6)(k) of the WPA Regulations is evaluated in the Regulatory Compliance section of the Stormwater Management Report.

Regulatory Compliance

As demonstrated below, the Project work fully complies with and exceeds applicable performance standards contained in the WPA for work in the 100-foot Buffer Zone to BVW and the Bordering Land Subject to Flooding. Compliance with each of the applicable performance standards is described in more detail below.

The Buffer Zone is not a resource area and, therefore, work within a Buffer Zone is not governed by specific regulatory performance standards. In general, work within a Buffer Zone is permissible when said work

has been designed, or can be conditioned, such that there will be no impact on the downgradient wetland resource area(s) being buffered. As stated in 310 CMR 10.53(1) of the WPA Regulations:

For work in Buffer Zone subject to review under 310 CMR 10.02(2)(b)3., the Issuing Authority shall impose conditions to protect the interests of the Act identified for the adjacent Resource Area… The issuing authority may consider the characteristics of the Buffer Zone, such as the presence of steep slopes, that may increase the potential for adverse impacts on Resource Areas. Conditions may include limitations on the scope and location of work in the Buffer Zone as necessary to avoid alteration of Resource Areas. The Issuing Authority may require erosion and sedimentation controls during construction, a clear limit of work, and the preservation of natural vegetation adjacent to the Resource Area and/or other measures commensurate with the scope and location of work with the Buffer Zone to protect the interests of the Act.

The Project has been designed to address these considerations. Measures have been incorporated into the Project design to ensure that work will be done in a manner that prevents impacts to downgradient wetland resources. A clear limit of work will be identified, and erosion and sedimentation control areas will be installed in the Project Area. Temporary disturbance in vegetated areas of Buffer Zone will be restored in place and seeded with a native seed mix.

The Applicant respectfully requests that the Millis Conservation Commission find these measures adequately protective of the interests identified in the WPA and issue an Order of Conditions approving the work described in this NOI and shown on the accompanying plans.

KLEINFELDER
Bright People. Right Solutions.

ATTACHMENT B

Abutter Information

Parcel 0028-0046 Abutter's List

Millis, MA

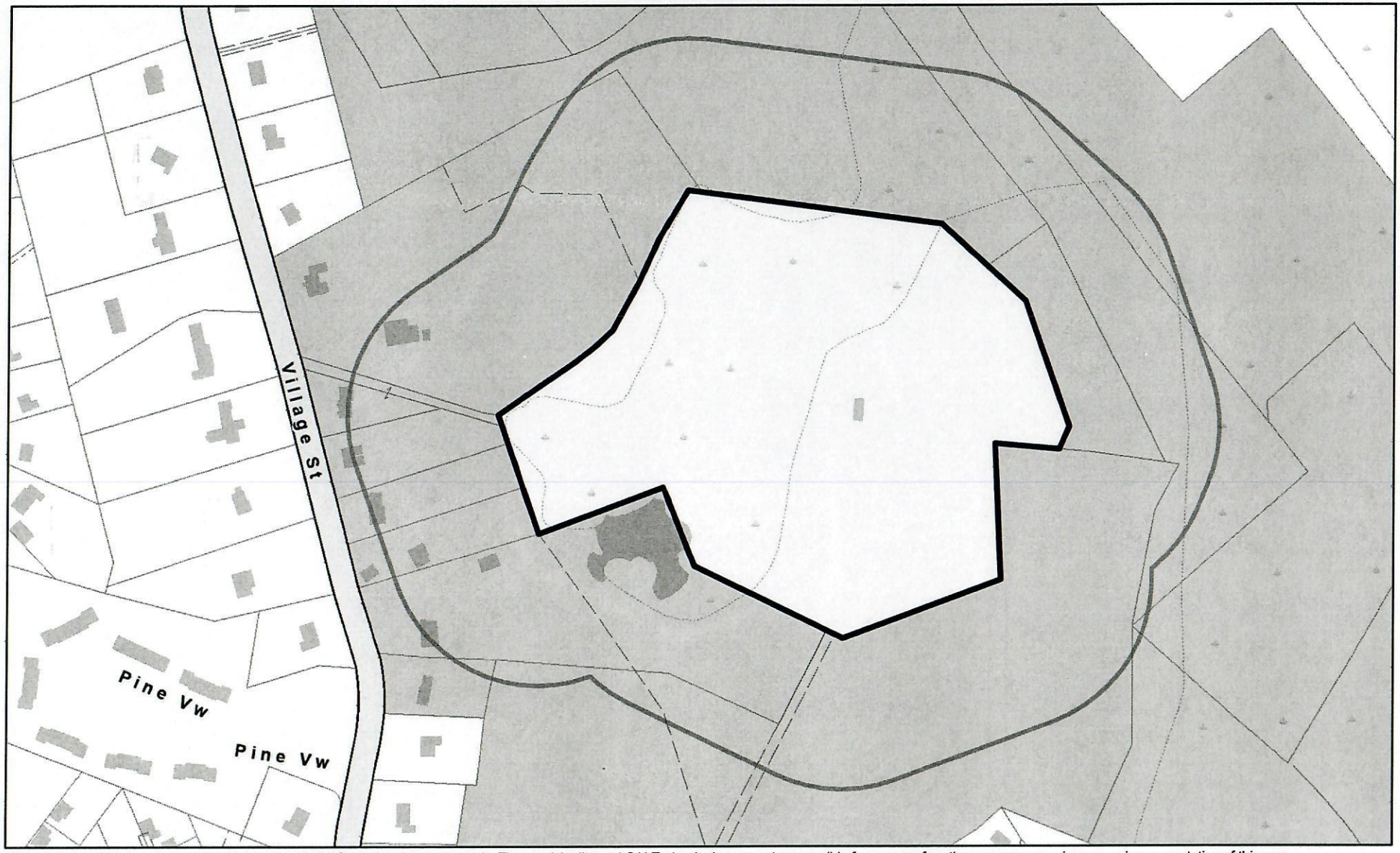
October 13, 2023

1 inch = 275 Feet

0 275 550 825

CAI Technologies
Precision Mapping Geospatial Solutions

www.cai-tech.com



300 foot Abutters List Report

Millis, MA
October 13, 2023

CERTIFIED COPY by the TOWN OF MILLIS

Assessors Office Liz Rand 10/13/23

Subject Property:

Parcel Number: 0028-0046-0000
CAMA Number: 0028-0046-0000
Property Address: VILLAGE ST

Mailing Address: TOWN OF MILLIS
900 MAIN ST
MILLIS, MA 02054

Abutters:

Parcel Number: 0025-0088-0000
CAMA Number: 0025-0088-0000
Property Address: MAIN ST TRACT 417

Mailing Address: U S ARMY CORPS OF ENGINEERS
REAL ESTATE DIVISION
518 HARTFORD AVE E
UXBRIDGE, MA 01569

Parcel Number: 0027-0052-0000
CAMA Number: 0027-0052-000B
Property Address: 30 LARCH RD

Mailing Address: FIN FUR & FEATHER CLUB INC
P O BOX 272
MILLIS, MA 02054

Parcel Number: 0028-0014-0000
CAMA Number: 0028-0014-0000
Property Address: 34 VILLAGE ST

Mailing Address: LYDIA GEORGE CHRIS TSINIDIS
34 VILLAGE ST
MILLIS, MA 02054

Parcel Number: 0028-0015-0000
CAMA Number: 0028-0015-0000
Property Address: 30 VILLAGE ST

Mailing Address: KERRI A BARRETT THOMAS J BARRETT SR.
30 VILLAGE ST
MILLIS, MA 02054

Parcel Number: 0028-0015-0000
CAMA Number: 0028-0015-000H
Property Address: 30 VILLAGE ST

Mailing Address: KERRI A BARRETT THOMAS J BARRETT SR.
30 VILLAGE ST
MILLIS, MA 02054

Parcel Number: 0028-0016-0000
CAMA Number: 0028-0016-0000
Property Address: 36 VILLAGE ST

Mailing Address: HAMPTON LYNDA L & SCOTT D
36 VILLAGE ST
MILLIS, MA 02054

Parcel Number: 0028-0019-0000
CAMA Number: 0028-0019-0000
Property Address: 40 VILLAGE ST

Mailing Address: NGUYEN BICH-VAN
40 VILLAGE ST
MILLIS, MA 02054

Parcel Number: 0028-0020-0000
CAMA Number: 0028-0020-0000
Property Address: 42 VILLAGE ST

Mailing Address: ANTHONY DELGROSSO LATOYA THOMPSON
42 VILLAGE ST
MILLIS, MA 02054

Parcel Number: 0025-0088-0000
CAMA Number: 0028-0021-0000
Property Address: MAIN ST TRACT 417

Mailing Address: U S ARMY CORPS OF ENGINEERS
REAL ESTATE DIVISION
518 HARTFORD AVE E
UXBRIDGE, MA 01569

Parcel Number: 0028-0022-0000
CAMA Number: 0028-0022-0000
Property Address: MAIN ST TRACT 412

Mailing Address: U S ARMY CORPS OF ENGINEERS
REAL ESTATE DIVISION
518 HARTFORD AVE E
UXBRIDGE, MA 01569

300 foot Abutters List Report

Millis, MA
October 13, 2023

Parcel Number:	0028-0023-0000	Mailing Address:	U S ARMY CORPS OF ENGINEERS REAL ESTATE DIVISION 518 HARTFORD AVE E UXBRIDGE, MA 01569
CAMA Number:	0028-0023-0000		
Property Address:	VILLAGE ST TR 428		
Parcel Number:	0028-0024-0000	Mailing Address:	U S ARMY CORPS OF ENGINEERS REAL ESTATE DIVISION 518 HARTFORD AVE E UXBRIDGE, MA 01569
CAMA Number:	0028-0024-0000		
Property Address:	MAIN ST TRACT 412		
Parcel Number:	0028-0025-0000	Mailing Address:	Contact Town For Info ,
CAMA Number:	0028-0025-0000		
Property Address:	44 VILLAGE ST		
Parcel Number:	0028-0039-0000	Mailing Address:	WHELAN KENNETH J 27 BIRCH ST MILLIS, MA 02054
CAMA Number:	0028-0039-0000		
Property Address:	BIRCH ST		
Parcel Number:	0028-0041-0000	Mailing Address:	WHELAN BRENDA J TRUSTEE WHELAN BRENDA J REALTY TRUST 68 VILLAGE ST MILLIS, MA 02054
CAMA Number:	0028-0041-0000		
Property Address:	68 VILLAGE ST		
Parcel Number:	0028-0047-0000	Mailing Address:	MOGAN JOHN J JR & MARCIA A C/O MOGAN JOHN J JR 46 VILLAGE ST MILLIS, MA 02054
CAMA Number:	0028-0047-0000		
Property Address:	46 VILLAGE ST		

KLEINFELDER
Bright People. Right Solutions.

ATTACHMENT C
Wetland Data Forms

BASBANES WETLAND CONSULTING
39 Hardy St.
Dunstable, MA 01827

Delineation Report
21167-1A Millis Well 3
Village St, Millis, MA

July 20 2023

The following is a report on the delineation of the wetland resource areas at the Millis Well 3 off Village St, Millis, MA. The delineation was done on July 19 2923. The jurisdictional wetland resource area present on site may include: 310 CMR 10.55 Bordering Vegetated Wetland and 310 CMR 10.57 Land Subject to Flooding.

Delineation Method
A wetland delineation is done by visual survey of topography, evidence of hydrology, and identification of plant species. A determination is made for each plant species as to their indicator status as referenced in the "National List of Plant Species that Occur in Wetlands", published by the Fish and Wildlife Service. The boundary of the wetland is then determined to be where 50% or more of the vegetation community consists of wetland indicator species with a status of FAC or wetter. Where there is a dominance of wetland plants species, evidence of hydrology is looked for, i.e. water stained leaves, drainage patterns, morphological adaptations, and hydric soils. Typically, hydric soils are determined by digging or augering a pit 20" deep and observing the horizons for color and features. Determinations are made referencing "Field Indicators for Identifying Hydric Soils in New England" and color matched to the Munsell Soil Color Charts.

Flagging Series
The wetland resource area is delineated by the flagging series 1A-23A. The wetland delineated is a bordering vegetated wetland that is part of an extensive wetland system associated with the Charles River. The Charles River is well over 1500 l.f. from the subject property. The wetland boundary is fairly well defined though the area is relatively flat. The transition of wetland plants of hydric to upland plants as well as non-hydric soils to hydric soils is narrow.

Vegetation
The vegetation along the delineated area consists of the following dominant species:

Beech, *Fagus grand folia*	FACU
Maple, Red *Acer rubrum*	FAC
Maple, Sugar *Acer saccharum*	FACU
Oak, Red *Quercus rubra*	FACU
Pine, White *Pinus strobus*	FACU
Buckthorn, European *Rhamnus frangula*	FAC
Highbush Blueberry *Vaccinium corymbosum*	FACW
Lowbush Blueberry *Vaccinium angustifolium*	FACU
Canada Mayflower *Maianthemum canadense*	FACU
Fern Cinnamon *Osmunda cinnamomea*	FACW
Fern Wood *Dryopteris spinulosa*	
Partridgeberry *Mitchella repens*	FACU
Sphagnum moss *Sphagnum spp.*	OBL
Starflower *Trientalis borealis*	FAC
Poison Ivy *Toxicodendron radicans*	FAC

Soils
As referenced to the NRCS Soil Survey, the soils on the subject property are Swansea in the wetland and Hinckley in the upland area. Swansea soils consist of nearly level, deep (5+ ft.), very poorly drained organic soils in depressions and low flat areas of uplands and glacial outwash plains and terraces. Hinckley soils consist of deep, excessively drained soils on terraces, outwash plains, deltas, kames and eskers.

The typical soil profiles observed were:

SP upland	
O	<1"
A	0" – 8" 10YR 2/2
B	8"-18" 10YR 4/4

SP hydric	
O	<1"
A	0" – 10" 10YR 2/1
B	10"-18" 10YR 4/2 redox

Indicators of hydrology
Along with the presence of hydric soil conditions other indicators of hydrology were observed. Those indicators include: water-stained leaves, areas void of vegetation, sphagnum moss.

Rare Species
Under MESA and 310 CMR 10:59 Estimated Habitats of Rare Wildlife, any work proposed, regardless of wetlands, within an Estimated or Priority habitat shall be reviewed by the NHESP as well as the Conservation Commission. The site is not located within an Estimated or Priority Habitat

Vernal Pools
There are no certified vernal pools on the property per the most recently NHESP map.

FEMA
As referenced to the FEMA flood data maps, a portion of the site is located within a regulatory flood zone AE.

If you have any questions please do not hesitate to contact me. Thank you.

Sincerely,

Leah D. Basbanes

Leah D. Basbanes, M.A.
Wetland Consultant/Biologist

The wetland resource areas were delineated/reviewed in the keeping with the Massachusetts Wetland Protection Act and were done so to the best of our abilities. Considering all the variables (seasonal growth form of vegetation, soils conditions, topography, weather, etc.) involved in such an effort, please be advised that despite the best effort, no wetland delineation is considered definitive until verified and approved by the final issuing authority.

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: 21167-1A Millis Well 3 City/Town: Millis Sampling Date: July 19 2023

Applicant/Owner: Town of Millis Sampling Point or Zone: non wet SP1

Investigator(s): Leah Basbanes Latitude / Longitude: 42.16812, -71.34051

Soil Map Unit Name: Hinckley NWI or DEP Classification: WS1

Are climatic/hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks)

Are Vegetation [ ], Soil [ ] , or Hydrology [ ] significantly disturbed? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ] , or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [ ] No [✓]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soils criterion met?	Yes [ ] No [✓]	
Wetlands hydrology present?	Yes [ ] No [✓]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:		
Surface Water Present?	Yes [ ] No [✓]	Depth (inches)_____
Water Table Present?	Yes [ ] No [✓]	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes [ ] No [✓]	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[ ] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[ ] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red Oak	Quercus rubra	FACU	30.0	Yes	No
2. White Pine	Pinus strobus	FACU	30.0	Yes	No
3. Red Maple	Acer rubrum	FAC	20.0	Yes	Yes
4. sugar maple	Acer saccharum	FACU	10.0	No	No
5.					
6.					
7.					
8.					
9.					

90.0 = Total Cover

Shrub/Sapling Stratum Plot size 15'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. European Buckthorn	Rhamnus frangula	FAC	40.0	Yes	Yes
2. Lowbush Blueberry	Vaccinium angustifolia	FACU	30.0	Yes	No
3.					
4.					
5.					
6.					
7.					
8.					
9.					

70.0 = Total Cover

Herb Stratum Plot size 5'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Starflower	Trientalis borealis	FAC	10.0	No	No
2. Partridgeberry	Mitchella repens	FACU	20.0	Yes	No
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

30.0 = Total Cover

VEGETATION – continued.

Woody Vine Stratum Plot size _____

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
			0.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW? Yes ☐ No ☑

Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants	Do wetland indicator plants make up ≥ 50% of dominant plant species?
	6	2	Yes ☐ No ☑

Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
	Prevalence Index	B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐

Wetland vegetation criterion met? Yes ☐ No ☑

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point non wet SP1

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-6	10yr 2/2							
6-8	10yr 3/3						sandy loam	
8-18	10yr 4/4							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: 21167-1A Millis Well 3 City/Town: Millis Sampling Date: July 19 2023

Applicant/Owner: Town of Millis Sampling Point or Zone: wet SP2

Investigator(s): Leah Basbanes Latitude / Longitude: 42.16809, -71.34063

Soil Map Unit Name: Swansea NWI or DEP Classification: WS1

Are climatic/hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks)

Are Vegetation [ ], Soil [ ] , or Hydrology [ ] significantly disturbed? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ] , or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [✓] No [ ]	**Is the Sampled Area within a Wetland?** **Yes [✓] No [ ]**
Hydric Soils criterion met?	Yes [✓] No [ ]	
Wetlands hydrology present?	Yes [✓] No [ ]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)_____
Water Table Present?	Yes [ ]	No [✓]	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes [✓]	No [ ]	Depth (inches) 10.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[✓] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[✓] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[✓] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red Oak	Quercus rubra	FACU	25.0	Yes	No
2. White Pine	Pinus strobus	FACU	25.0	Yes	No
3. Red Maple	Acer rubrum	FAC	25.0	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

75.0 = Total Cover

Shrub/Sapling Stratum Plot size 15'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. European Buckthorn	Rhamnus frangula	FAC	20.0	Yes	Yes
2. Higbush Blueberry	Vaccinium corymbosum	FACW	30.0	Yes	Yes
3. Red Maple	Acer rubrum	FAC	10.0	No	No
4.					
5.					
6.					
7.					
8.					
9.					

60.0 = Total Cover

Herb Stratum Plot size 5'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Cinnamon Fern	Osmunda cinnamomea	FACW	40.0	Yes	Yes
2. Starflower	Trientalis borealis	FAC	10.0	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

50.0 = Total Cover

VEGETATION – continued.

Woody Vine Stratum Plot size _____

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
			0.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW? Yes ☐ No ☑

Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants	Do wetland indicator plants make up ≥ 50% of dominant plant species?
	7	5	Yes ☑ No ☐

Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
	Prevalence Index	B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐

Wetland vegetation criterion met? Yes ☑ No ☐

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point wet SP2

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-8	10yr 2/1							
8-18	10yr 4/2						sandy loam	redox present

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☑ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ☑ **No** ☐

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: 21167-1A Millis Well 3 City/Town: Millis Sampling Date: July 19 2023

Applicant/Owner: Town of Millis Sampling Point or Zone: wet SP5

Investigator(s): Leah Basbanes Latitude / Longitude: 42.16917, -7134025

Soil Map Unit Name: Swansea NWI or DEP Classification: WS1

Are climatic/hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] significantly disturbed? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [✓] No [ ]	**Is the Sampled Area within a Wetland?** **Yes [✓] No [ ]**
Hydric Soils criterion met?	Yes [✓] No [ ]	
Wetlands hydrology present?	Yes [✓] No [ ]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches) _____
Water Table Present?	Yes [ ]	No [✓]	Depth (inches) _____
Saturation Present (including capillary fringe)?	Yes [✓]	No [ ]	Depth (inches) 9.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[✓] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[✓] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[✓] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red Oak	Quercus rubra	FACU	20.0	Yes	No
2. White Pine	Pinus strobus	FACU	20.0	Yes	No
3. Red Maple	Acer rubrum	FAC	40.0	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

80.0 = Total Cover

Shrub/Sapling Stratum Plot size 15'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. European Buckthorn	Rhamnus frangula	FAC	40.0	Yes	Yes
2. Higbush Blueberry	Vaccinium corymbosum	FACW	30.0	Yes	Yes
3. Red Maple	Acer rubrum	FAC	10.0	No	No
4.					
5.					
6.					
7.					
8.					
9.					

80.0 = Total Cover

Herb Stratum Plot size 5'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Cinnamon Fern	Osmunda cinnamomea	FACW	40.0	Yes	Yes
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

40.0 = Total Cover

VEGETATION – continued.

Woody Vine Stratum Plot size _____

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Poison Ivy	Toxicodendron radicans	FAC	30.0	Yes	Yes
2.					
3.					
4.					
		30.0 = Total Cover			

Rapid Test: Do all dominant species have an indicator status of OBL or FACW? Yes ☐ No ☑

Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants	Do wetland indicator plants make up ≥ 50% of dominant plant species?
	7	5	Yes ☑ No ☐

Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
	Prevalence Index	B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐

Wetland vegetation criterion met? Yes ☑ No ☐

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point wet SP5

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-8	10yr 2/1							
8-18	10yr 5/2						sandy loam	redox present

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☑ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ☑ **No** ☐

KLEINFELDER
Bright People. Right Solutions.

ATTACHMENT D

Project Plans

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

PERMIT REVIEW SET

OCTOBER 2023

SELECT BOARD

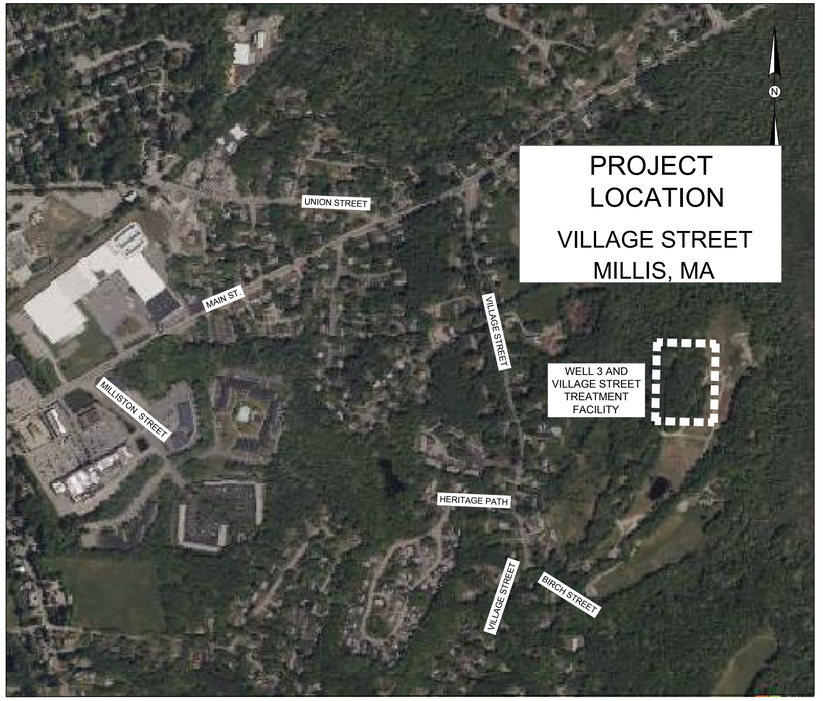
CRAIG SCHULTZE	CHAIR
ELLEN ROSENFELD	VICE CHAIR
ERIN UNDERHILL	CLERK

DEPARTMENT OF PUBLIC WORKS

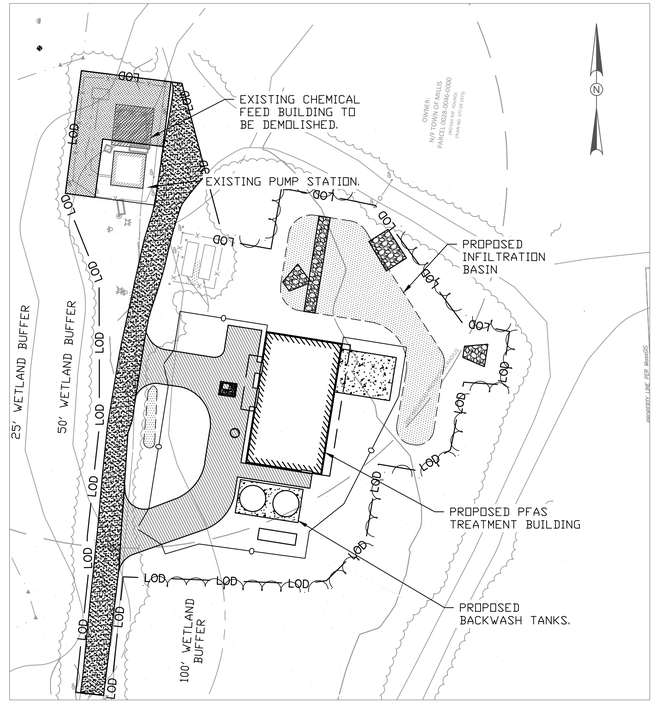
JAMES F. McKAY	DIRECTOR

WATER AND SEWER DEPARTMENT

RON McKENNEY	SUPERINTENDENT



LOCUS PLAN
SCALE: 1" =500'



SITE PLAN
SCALE: 1" = 40'

KLEINFELDER
Bright People. Right Solutions.

COMMONWEALTH OF MASSACHUSETTS
GREGORY AVENIA
CIVIL
No. 51461
REGISTERED PROFESSIONAL ENGINEER

10/27/2023

NOT FOR CONSTRUCTION

SHEET NUMBER	DRAWING TITLE
COVER	COVER
G-001	GENERAL NOTES AND LEGEND
C-101	EXISTING CONDITIONS PLAN
C-102	SITE PREPARATION PLAN
C-103	OVERALL SITE PLAN
C-104	GRADING PLAN
C-105	UTILITIES PLAN
C-501	CIVIL DETAILS SHEET- 1
C-502	CIVIL DETAILS SHEET- 2
M-001	PROCESS FLOW DIAGRAM
M-002	PROCESS EQUIPMENT SCHEDULES
M-003	PROCESS FLOOR PLAN
M-004	PROCESS SECTION
M-005	PUMP AND EXISTING BUILDING MODIFICATIONS
M-006	CHEMICAL FEED SYSTEM LAYOUT
M-007	SODIUM HYPOCHLITE CHEMICAL FEED SCHEMATIC
M-008	SODIUM HYDROXIDE CHEMICAL FEED SCHEMATIC
M-009	SODIUM FLUORIDE CHEMICAL FEED & CHLORINE ANALYZER SCHEMATICS
M-010	SURGE PROTECTION VAULT
M-011	BACKWASH TANK
M-501	PROCESS DETAILS SHEET 1 OF 2
M-502	PROCESS DETAILS SHEET 2 OF 2
A-1	GENERAL NOTES, LEGENDS & ABBREVIATIONS
A-2	CODE SUMMARY & LIFE SAFETY PLAN
A-10	ARCH PLANS
A-20	ARCH ELEVATIONS AND SECTIONS
A-30	SCHEDULES AND DETAILS
S-101	GENERAL NOTES SHEET 1 OF 2
S-102	GENERAL NOTES SHEET 2 OF 2
S-201	TYPICAL DETAIL SHEET 1 OF 2
S-202	TYPICAL DETAIL SHEET 2 OF 2
S-301	FOUNDATION
S-401	SECTIONS
E-001	ELECTRICAL LEGEND AND GENERAL NOTES
E-002	ELECTRICAL GENERAL NOTES
E-003	ELECTRICAL TREATMENT BUILDING ONE LINE DIAGRAM
E-004	ELECTRICAL WELL STATION #3 ONE LINE DIAGRAMS
E-101	ELECTRICAL SITE PLAN
E-102	ELECTRICAL LOWER LEVEL FLOOR POWER PLAN
E-102	ELECTRICAL UPPER LEVEL FLOOR POWER PLAN
E-201	ELECTRICAL LIGHTING FLOOR PLAN
E-202	ELECTRICAL LIGHTING UPPER LEVEL PLAN
E-301	ELECTRICAL LOW VOLTAGE FLOOR PLAN
E-400	ELECTRICAL DIAGRAMS I
E-401	ELECTRICAL DIAGRAMS II
E-402	ELECTRICAL SCHEDULES
E-403	ELECTRICAL SITE DETAILS
E-404	ELECTRICAL DETAILS
FP-001	FIRE PROTECTION LEGEND AND GENERAL NOTES
FP-101	FIRE PROTECTION FLOOR PLAN
FP-200	FIRE PROTECTION DETAILS
H-001	HVAC LEGEND AND GENERAL NOTES
H-101	HVAC FLOOR PLAN
H-200	HVAC SCHEDULES AND DETAILS
P-001	PLUMBING LEGEND AND GENERAL NOTES
P-002	PLUMBING SITE PLAN
P-100	PLUMBING UNDERGROUND FLOOR PLAN
P-101	PLUMBING FLOOR PLAN
P-200	PLUMBING DETAILS

EXISTING LEGEND

- 129 — MINOR CONTOUR
- 130 — MAJOR CONTOUR
- × 129.9 — SPOT ELEVATION
- DSW — DIGSAFE WATER LINE
- W — RECORD WATER LINE
- A/R — ABANDONED/REMOVED WATER LINE
- HYDRANT
- WATER GATE
- W — WATER WELL
- SP — STANDPIPE
- E — ELECTRIC LINE
- OHW — OVERHEAD WIRES
- UTILITY POLE
- GUY WIRE
- TRANSFORMER
- E — ELECTRIC MANHOLE
- DSG — DIGSAFE GAS LINES
- G — RECORD GAS LINES
- GM — GAS METER
- WETLAND LIMIT
- WETLAND FLAG
- WETLAND BUFFER
- SP — SOIL PLOT
- X — CHAINLINK FENCE
- TREELINE
- D — DRAIN LINE
- D — DRAIN MANHOLE
- S — SEWER LINE
- S — SEWER MANHOLE
- CLF — CHAIN LINK FENCE
- CP — CONCRETE PAD
- DI — DUCTILE IRON
- EOP — EDGE OF PAVEMENT

PROPOSED LEGEND

- PROPOSED TREELINE
- LOD — LIMIT OF DISTURBANCE
- CHAIN LINK FENCE
- G — GAS LINE
- S — SEWER LINE
- D — DRAIN LINE
- 8" BW — BACKWASH LINE
- 8" RW — RAW WATER LINE
- W — WATER LINE
- EROSION CONTROL
- VEHICULAR ACCESS GATE
- 133 — PROPOSED 1-FT CONTOUR
- PROPOSED WATER GATE
- AREA OF WETLAND RESTORATION
- MODIFIED ROCKFILL
- CONCRETE PAD
- EXTENT OF ASPHALT PAVING
- PROPOSED BUILDING
- EXTENT OF STORMWATER FEATURE
- EXTENT OF MATERIAL DEMOLITION
- EXTENT OF TREE CLEARING AND GRUBBING

GENERAL NOTES:

1. PRIOR TO BIDDING THE PROJECT, THE CONTRACTOR IS ENCOURAGED VISIT THE SITE TO VERIFY EXISTING CONDITIONS.
2. BASE MAP INFORMATION FOUND ON SHEETS C-101, C-102, C-103, C-104, AND C-105 WAS PREPARED BY BRENNAN CONSULTING, INC. ON SEPTEMBER 1, 2022, SEPTEMBER 6, 2022, AND JULY 25, 2023. THE COORDINATES OF THE SURVEY ARE IN FEET AND ARE BASED UPON THE NORTH AMERICAN DATUM OF 1983 MASSACHUSETTS STATE PLANE (NAD '83 MASSACHUSETTS STATE PLANE, MAINLAND ZONE). THE ELEVATIONS OF THE SURVEYS ARE IN FEET AND REFER TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAD '88).
3. FOR TEMPORARY BENCH MARKS, SEE SHEET C-101:

   TBM BREN-1: BENCH TIE SPIKE SET IN UTILITY POLE AT WELL BUILDING. ELEVATION = 124.79'
   TBM BREN-2: X-CUT ON HYDRANT BONNET NUT. ELEVATION = 125.29'

4. THE PROPERTY LINES SHOWN HERE WERE COMPILED FROM MASSGIS ONLINE DATABASE, ARE APPROXIMATE ONLY, AND ARE SHOWN FOR GRAPHICAL PURPOSES ONLY.
5. THE WETLANDS DEPICTED HEREON WERE DELINEATED ON JULY 19, 2023.
6. THE CONTRACTOR SHALL CALL THE DIG-SAFE CENTER AT 1-888-344-7233 A MINIMUM OF 72 HOURS PRIOR TO ANY EXCAVATION TO LOCATE UNDERGROUND UTILITIES IN THE FIELD AND NOTIFY UTILITIES OF CONSTRUCTION.
7. INFORMATION SHOWN ON THE DRAWINGS RELATING TO MATERIALS, CONDITIONS AND/OR LOCATIONS OF EXISTING STRUCTURES AND UTILITIES HAS BEEN COMPILED FROM AVAILABLE INFORMATION INCLUDING FIELD SURVEY, AERIAL PHOTOGRAPHY, RECORD MAPS AND DRAWINGS, AND UTILITY RECORD DRAWINGS AND IS NOT GUARANTEED CORRECT OR COMPLETE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXISTING CONDITIONS AND DIMENSIONS INCLUDING THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO BEGINNING CONSTRUCTION. LOCATIONS AND DEPTHS OF CRITICAL UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR IN THE FIELD BY TEST PITS AS APPROVED BY THE ENGINEER. ANY DAMAGE TO UTILITIES CAUSED BY THE CONTRACTOR SHALL BE THE CONTRACTOR'S RESPONSIBILITY, AND COSTS FOR THE REPAIR OR REPLACEMENT OF SUCH DAMAGED UTILITIES SHALL BE BORNE BY THE CONTRACTOR.
8. ACCORDING TO FEMA FIRM (FLOOD INSURANCE RATE MAP) COMMUNITY PANEL 250244; REVISION DATED 7/17/2012, THE APPROXIMATE FLOODPLAIN ELEVATION ON THE SITE IS 123 FEET.
9. THE PROPOSED PROJECT REQUIRE NOTICE OF INTENT APPROVAL BY THE TOWN OF MILLIS CONSERVATION COMMISSION. ALL CONSTRUCTION ACTIVITIES SHALL BE COMPLETED IN ACCORDANCE WITH THAT PERMIT.

SOIL EROSION AND SEDIMENT CONTROL NOTES

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

WORK OF GENERAL CONTRACTOR:

1. THE GENERAL CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS REQUIRED TO COMPLETE THE VILLAGE STREET WTP PFAS UPGRADES, COMPLETE AND READY FOR OPERATION AS INDICATED ON THE DRAWINGS AND SPECIFICATIONS, INCLUDING ALL CONTRACT DOCUMENTS.
2. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF SUBCONTRACTORS' WORK WITH EACH OTHER AND WITH THE WORK OF THE GENERAL CONTRACTOR.
3. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE OVERALL CONSTRUCTION SEQUENCE AND NOTE THAT THE EXTREME IMPORTANCE OF THIS PROJECT. THE VILLAGE STREET WTP WILL BE OFFLINE DURING THE DURATION OF CONSTRUCTION.
4. THE GENERAL CONTRACTOR SHALL NOT STORE EQUIPMENT OR STOCKPILE MATERIAL WITHIN 50' WETLAND BUFFER ZONES.
5. THE GENERAL CONTRACTOR SHALL PROVIDE ADEQUATE EROSION CONTROL DURING CONSTRUCTION. SEE SPECIFICATION SECTION 01568 AND NOTES ON THIS PAGE.
6. SOME PIPE/EQUIPMENT CONNECTIONS MAY REQUIRE TRANSITION FITTING OR OTHER FITTINGS NOT SHOWN ON DRAWINGS, THE CONTRACTOR SHALL PROVIDE ADEQUATE FITTING TO MAKE COMPLETE CONNECTION.
7. WHERE BURIED DUCTILE IRON PIPE LEAVES/ENTERS A BUILDING OR STRUCTURE, THE GENERAL CONTRACTOR SHALL PROVIDE MULTIPLE MECHANICAL JOINT BELLS.
8. PROPOSED FIELD MODIFICATION, REVISIONS AND ADDITIONS TO THE DESIGN DRAWINGS MUST BE APPROVED BY THE ENGINEER, IN WRITING, BEFORE WORK BEGINS. ANY REQUEST TO DEVIATE FROM THE ENGINEER'S SPECIFIED DETAILS ON THE DESIGN DRAWINGS BY THE CONTRACTOR MUST BE SUBMITTED IN WRITING TO THE ENGINEER FOR APPROVAL.
9. GENERAL CONTRACTOR AND SUBCONTRACTORS MUST PROVIDE ALL MATERIAL, LABOR, EQUIPMENT, CONSUMABLES, AND ALL OTHER ITEMS REQUIRED TO COMPLETE THE WORK AS SPECIFIED ON THE DESIGN DRAWINGS, PROJECT SPECIFICATIONS, AND AS NECESSARY TO COMPLETE THE WORK.
10. GENERAL CONTRACTOR AND SUBCONTRACTORS SHALL VISIT THE PROJECT SITE AND OBSERVE CONDITIONS FOR THE PROPOSED CONSTRUCTION. ANY DISCREPANCY BETWEEN THE DESIGN DRAWINGS AND ACTUAL SITE CONDITIONS MUST BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ENGINEER, IN WRITING, FOR RESOLUTION PRIOR TO COMMENCEMENT OF THE WORK.
11. THE CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS, ELEVATIONS AND DIMENSIONS PRIOR TO FABRICATING NEW WORK THAT WILL BE CONNECTED TO EXISTING CONSTRUCTION.
12. ALL ITEMS OF CONSTRUCTION MUST BE IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS APPLICABLE TO THE PROJECT.
13. THE CONTRACTOR IS RESPONSIBLE FOR SEGREGATING WORK AREAS FROM THE GENERAL PUBLIC USING TEMPORARY FENCES, SIGNS, CONES, CAUTION TAPE, ETC.
14. THE CONTRACTOR'S BASE BID FOR THIS PROJECT MUST INCLUDE ALL LABOR, MOBILIZATION, PERMITTING, MATERIALS, TEMPORARY PROTECTION, ETC. NO ADDITIONAL COSTS WILL BE SUBMITTED TO THE ENGINEER IN ORDER TO COMPLETE THE INTENT OF THE WORK AS INDICATED ON THE DESIGN DRAWINGS.
15. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING WATER AND ELECTRICITY REQUIRED TO PERFORM THE WORK. SUBMIT PROPOSED MEANS AND METHODS TO THE ENGINEER FOR REVIEW.
16. ALL DIMENSIONS AND QUANTITIES MUST BE DETERMINED OR VERIFIED BY THE CONTRACTOR. QUANTITIES TO BE CARRIED UNDER THE BASE BID WORK HAVE BEEN INDICATED ON THE CONTRACT DRAWINGS. THE CONTRACT DRAWINGS HAVE BEEN COMPILED FROM VARIOUS SOURCES AND MAY NOT REFLECT THE ACTUAL CONDITION AT THE MOMENT OF CONSTRUCTION. THE CONTRACTOR IS CAUTIONED TO TAKE ALL PRECAUTIONS AND MAKE ALL INVESTIGATIONS NECESSARY TO INSTALL THE PROPOSED WORK.
17. ITS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR AND THE SUBCONTRACTOR TO REVIEW ALL DRAWINGS, PROJECT MANUAL, AGENDA ETC. IN ORDER TO ASSURE THE COORDINATION OF ALL WORK AFFECTING EACH TRADE. FAILURE TO REVIEW AND COORDINATE ALL CONTRACTOR DOCUMENTS BY THE GENERAL WITH ALL THE SUBCONTRACTORS FOR APPLICABLE ITEMS OF THE WORK SHALL NOT RELIEVE THE RESPONSIBILITY PARTY FROM PERFORMING ALL WORK SO REQUIRED AS PART OF THE CONTRACT.
18. ITS IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR AND THE SUBCONTRACTOR FOLLOWING THE REVIEW OF ALL THE DRAWINGS, PROJECT MANUAL, ADDENDA, ETC. TO INFORM THE ENGINEER OF ANY DISCREPANCIES IN THE DOCUMENTS AND TO OBTAIN CLARIFICATION ON ALL ITEMS AFFECTING CONSTRUCTION COST PRIOR TO THE SUBMISSION OF THE BID.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

Signed By: #

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

GENERAL NOTES AND LEGEND

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	TB
DRAWN BY	MR
CHECKED BY	TB
APPROVED BY	ABB

G-001

SHEET 2 of 59

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\G-LEGEND.dwg LAYOUT: 22x34horiz PLOTTED: 10/29/2023 9:44 PM BY: mckenna roberts

MASSACHUSETTS COORDINATE SYSTEM
NAD 83, MAINLAND ZONE

OWNER:
N/F TOWN OF MILLIS
PARCEL 0028-0046-0000
(NO DEED REF. FOUND)
(PLAN NO. 377 OF 1973)

Now or Formerly
DOMENIC J. TIBERI etux
PARCEL 0028-0025-0000
(Book 33903 Page 340)
(Plan No. 519 of 1989, Lot 1)

Now or Formerly
BRENDA J. WHELAN REALTY TRUST
PARCEL 0028-0041-0000
(Book 11874 Page 403)
(Plan No. 142 of 1997, Lot 3)

PROPERTY LINE PER MassGIS

24' WIDE EASEMENT FOR ROAD (APPROX. LOC.) (PLAN No. 377 OF 1973)

100.00'

25.00'

50.00'

WETLAND LINE

25' BUFFER ZONE

50' BUFFER ZONE

100' BUFFER ZONE

TREELINE (TYP.)

EXIST. GRAVEL ROAD

MILLIS VILLAGE STREET

WELL 3 BUILDING

EXIST. CONC. BUILDING

EXIST. CONC. BUILDING

CHEMICAL FEED BUILDING

CONCRETE PAD

CONCRETE PADS

PROPANE

PROPANE

TBM: BREN–1
ELEVATION = 124.79

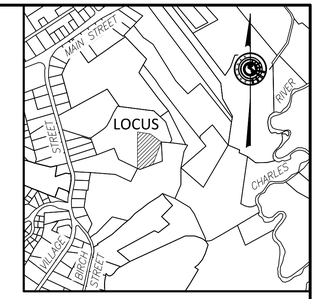
TBM: BREN–2
ELEVATION = 125.29

WF–1A WF–2A WF–3A WF–4A WF–5A WF–6A WF–7A WF–8A WF–9A WF–10A WF–11A WF–12A WF–A13 WF–A14 WF–A15 WF–A16 WF–A17 WF–A18 WF–A19 WF–A20 WF–A21 WF–A22 WF–A23

SP–1 SP–2 SP–3 SP–4 SP–5 SP–6

UP#8 UP#9 UP#10

GATE



OWNER OF RECORD:

TOWN OF MILLIS
NO DEED REFERENCE FOUND
PLAN No. 377 OF 1973
PARCEL 0028–0046–0000
BIRCH STREET

OWNER:
N/F TOWN OF MILLIS
PARCEL 0028-0046-0000
(NO DEED REF. FOUND)
(PLAN NO. 377 OF 1973)

LEGEND

W	WATER MANHOLE
	HYDRANT
	WATER SHUT OFF/WATER GATE
	GUY WIRE
	UTILITY POLE
	BOLLARD
EM	ELECTRIC METER
GP	GATE POST
CLF	CHAIN LINK FENCE W/BARBED WIRE
CONC	CONCRETE
ENT	ENTRANCE
GEN	GENERATOR
G	GAS
OHW	OVERHEAD WIRES
W	WATER
12" C.I.	PIPE SIZE AND MATERIAL
C.I.	CAST IRON
D.I.	DUCTILE IRON
HDPE	HIGH-DENSITY POLYETHYLENE
X	METAL FENCE
	METAL GATE
	TREELINE
DSE	DIGSAFE ELECTRIC
DSG	DIGSAFE GAS
DSW	DIGSAFE WATER
	WETLANDS
	SOIL PROBES
WF–1	WETLAND FLAG

SCALE: 1"=20'

20' 0 10' 20' 40' 80'

NOTES:

1. THE TOPOGRAPHY, SITE DETAIL, AND SURFACE IMPROVEMENTS DEPICTED HEREON WERE OBTAINED FROM AN ON–THE–GROUND INSTRUMENT SURVEY CONDUCTED BY BRENNAN CONSULTING, INC ON SEPTEMBER 1, 2022, SEPTEMBER 6, 2022 AND JULY 20, 2023.
2. PROPERTY AND EASEMENT LINES SHOWN HEREON ARE PER MassGIS AND SHOULD NOT BE USED AS A DETERMINATION OF BOUNDARY.
3. THE HORIZONTAL DATUM IS BASED ON THE MASSACHUSETTS COORDINATE SYSTEM, NAD83, MAINLAND ZONE AS DERIVED FROM GPS OBSERVATIONS.
4. THE VERTICAL DATUM IS BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AS DERIVED FROM GPS OBSERVATIONS.
5. BENCH MARK INFORMATION:

   TBM: BREN–1: BENCH TIE SPIKE SET IN UTILITY POLE AT WELL BUILDING AS SHOWN HEREON.
   ELEVATION = 124.79

   TBM: BREN–2: X–CUT ON HYDRANT BONNET NUT AS SHOWN HEREON.
   ELEVATION = 125.29

5. CONTOUR INTERVAL EQUALS ONE (1) FOOT.
6. UTILITIES SHOWN HEREON ARE BASED UPON OBSERVED ABOVE GROUND EVIDENCE. BURIED UTILITY LINES SHOWN HEREON ARE BASED UPON MARKS ON THE GROUND AND RECORD PLANS PROVIDED BY THE TOWN OF MILLIS.
7. WETLANDS SHOWN HEREON WERE DELINEATED BY LEAH BASBANES ON JULY 19, 2023.

I HEREBY CERTIFY THAT THIS PLAN IS BASED ON AN ACTUAL FIELD SURVEY.

PAJE BROWN OWENS
No. 57494
REGISTERED PROFESSIONAL LAND SURVEYOR
COMMONWEALTH OF MASSACHUSETTS

PROFESSIONAL LAND SURVEYOR

07/25/2023
DATE

REVISIONS

NO.	DATE	DESCRIPTION	BY	CHK'D
1	7/24/23	ADDED WETLAND DELINEATION	CLR	PBO

EXISTING CONDITIONS PLAN
MILLIS VILLAGE STREET TREATMENT FACILITY / WELL 3
MILLIS, MASSACHUSETTS
(NORFOLK COUNTY)

PREPARED FOR
KLEINFELDER

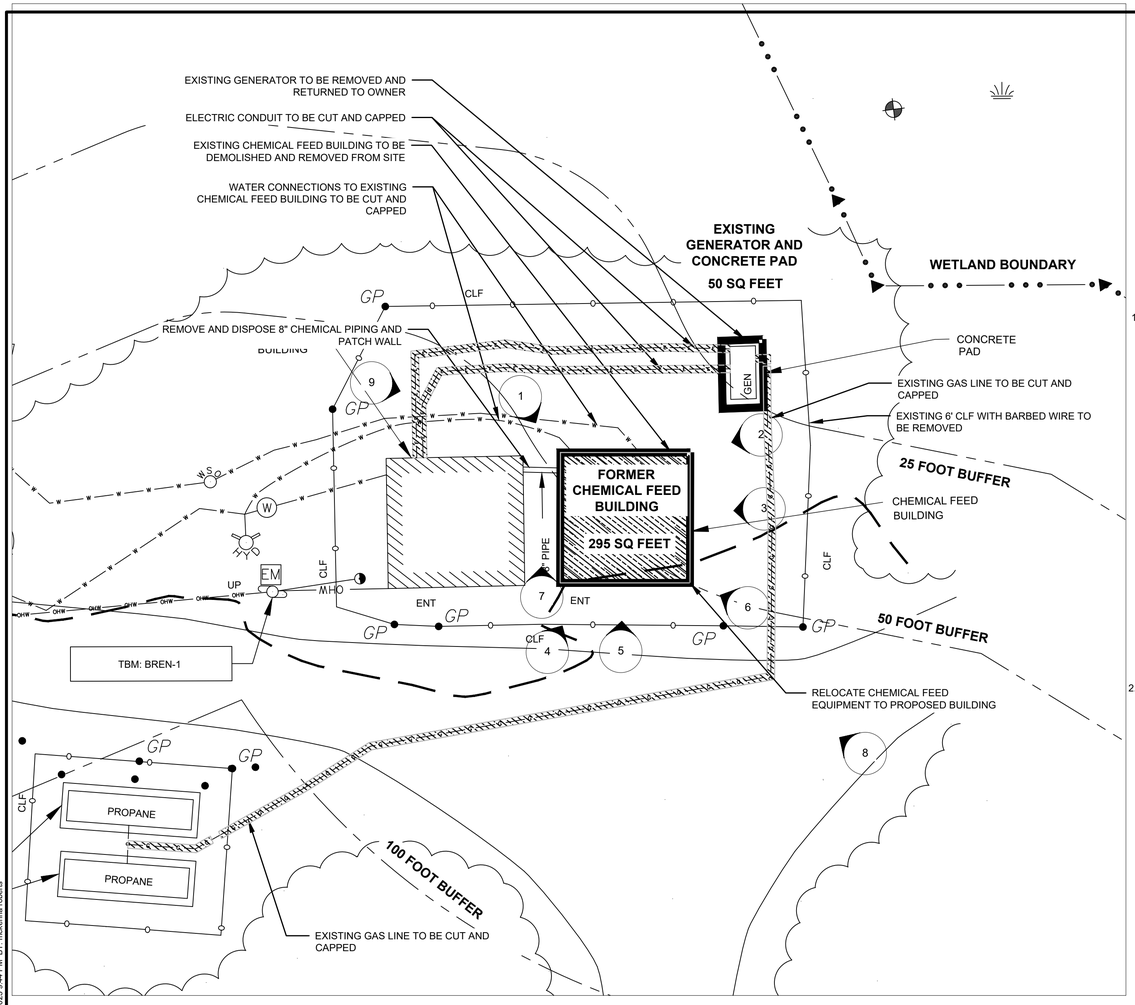
SCALE: 1" =20'

DATE: SEPTEMBER 14, 2022

Brennan·Consulting
ENGINEERING TRANSPORTATION SURVEYING
24 RAY AVENUE, BURLINGTON, MA
PHONE: (781) 273-3434 WWW.BRENNANCONSULTS.COM

FIELD CHIEF: JT	APPROVED: CE	PM: PBO	SHEET NO. 1 OF 1
RESEARCH: PBO	COMP: PBO	CADD: PBO	JOB NO. 21169–1

P:\21169-1A Well 3 Wetland Survey, Millis – Kleinfelder\Survey\Dwg\Plans_Worksheets\21169-1A.dwg



1. SOUTHWEST CORNER OF CHEMICAL FEED BUILDING FACING NORTHEAST

2. NORTH SIDE OF BUILDING FACING SOUTHEAST

3. NORTH SIDE OF BUILDING FACING SOUTH

4. SOUTHEAST CORNER OF BUILDING FACING NORTHWEST.

5. EAST SIDE OF BUILDING FACING WEST.

6. NORTHEAST CORNER OF BUILDING FACING SOUTHWEST.

7. EAST SIDE OF PIPING BETWEEN CHEMICAL FEED BUILDING AND WELL PUMP HOUSE FACING WEST

8. NORTHEAST CORNER OF FACILITY OUTSIDE OF FENCE FACING SOUTHWEST

9. WESTERN SIDE OF FACILITY FACING NORTH EAST

NOTES

1) CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL DEMOLISHED BUILDINGS MATERIALS, INCLUDING CONCRETE SLAB AND FOUNDATION. FOR DETAILS REGARDING DEMOLITION OF EXISTING BUILDINGS SEE SPECIFICATION SECTIONS 02050 AND 02221.

2) CONTRACTOR TO DECOMMISSION EXISTING ELECTRICAL AND WATER SERVICES AS SHOWN ON SHEET C-102 PRIOR TO BUILDING DEMOLITION.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

COMMONWEALTH OF MASSACHUSETTS
GREGORY AVENIA
CIVIL
No. 51461
REGISTERED PROFESSIONAL ENGINEER

10/27/2023

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 10 20

SCALE: 1" = 10' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

DEMOLITION PLAN

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

INCORPORATED FEB 23 1885 MILLIS, MASS.

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

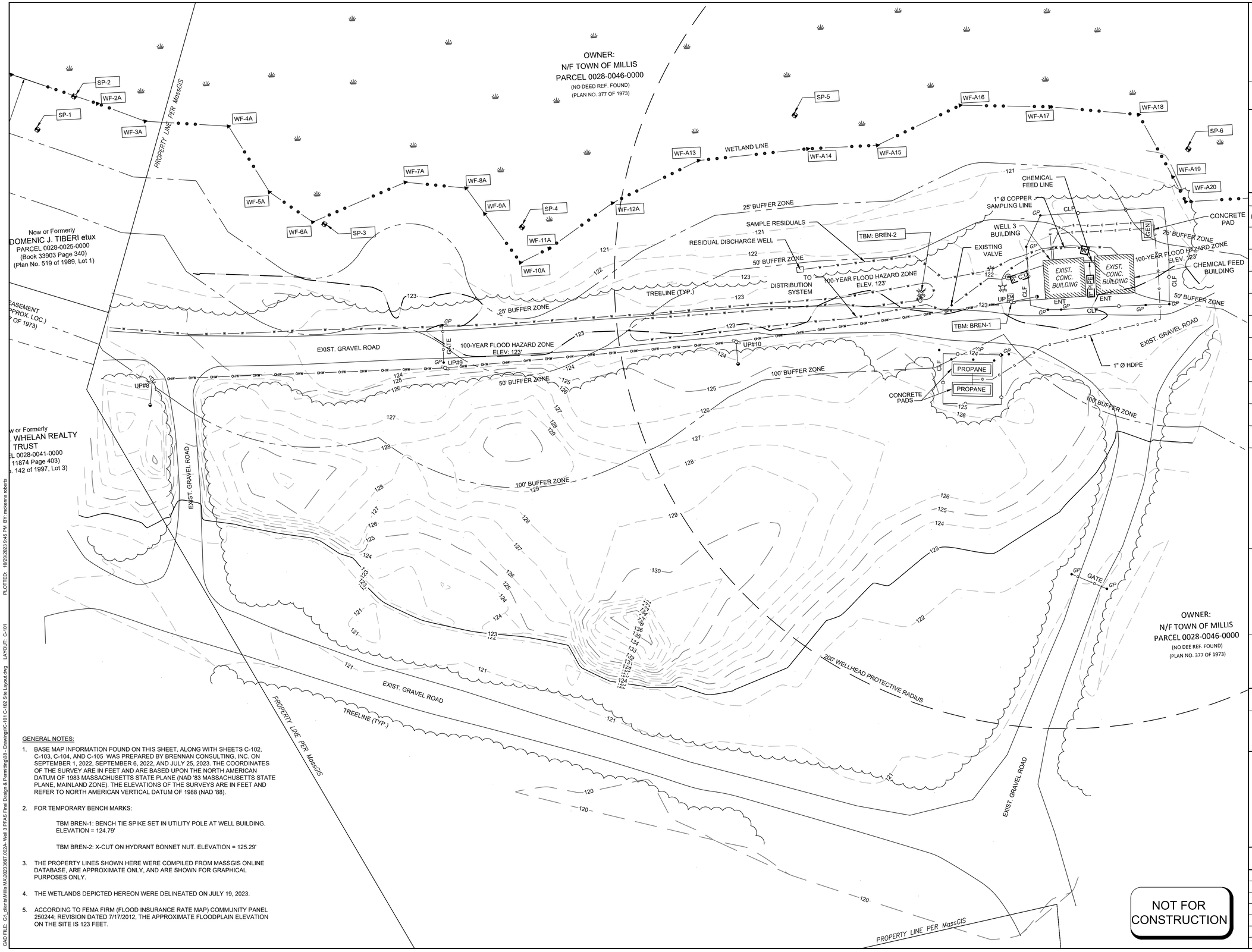
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	MPS
DRAWN BY	MPS
CHECKED BY	GAA
APPROVED BY	GAA

D-001

SHEET 3 of 59

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\D-001.dwg LAYOUT: D-1
PLOTTED: 10/26/2023 9:44 PM BY: mckenna robetts



GENERAL NOTES:

1. BASE MAP INFORMATION FOUND ON THIS SHEET, ALONG WITH SHEETS C-102, C-103, C-104, AND C-105 WAS PREPARED BY BRENNAN CONSULTING, INC. ON SEPTEMBER 1, 2022, SEPTEMBER 6, 2022, AND JULY 25, 2023. THE COORDINATES OF THE SURVEY ARE IN FEET AND ARE BASED UPON THE NORTH AMERICAN DATUM OF 1983 MASSACHUSETTS STATE PLANE (NAD '83 MASSACHUSETTS STATE PLANE, MAINLAND ZONE). THE ELEVATIONS OF THE SURVEYS ARE IN FEET AND REFER TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAD '88).
2. FOR TEMPORARY BENCH MARKS:

   TBM BREN-1: BENCH TIE SPIKE SET IN UTILITY POLE AT WELL BUILDING. ELEVATION = 124.79'

   TBM BREN-2: X-CUT ON HYDRANT BONNET NUT. ELEVATION = 125.29'
3. THE PROPERTY LINES SHOWN HERE WERE COMPILED FROM MASSGIS ONLINE DATABASE, ARE APPROXIMATE ONLY, AND ARE SHOWN FOR GRAPHICAL PURPOSES ONLY.
4. THE WETLANDS DEPICTED HEREON WERE DELINEATED ON JULY 19, 2023.
5. ACCORDING TO FEMA FIRM (FLOOD INSURANCE RATE MAP) COMMUNITY PANEL 250244; REVISION DATED 7/17/2012, THE APPROXIMATE FLOODPLAIN ELEVATION ON THE SITE IS 123 FEET.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

COMMONWEALTH OF MASSACHUSETTS
GREGORY AVENIA
CIVIL
No. 51461
REGISTERED PROFESSIONAL ENGINEER

Signed By: ---- 10/27/2023 # 12345

REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 20 40

SCALE: 1" = 20' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

EXISTING CONDITIONS PLAN

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

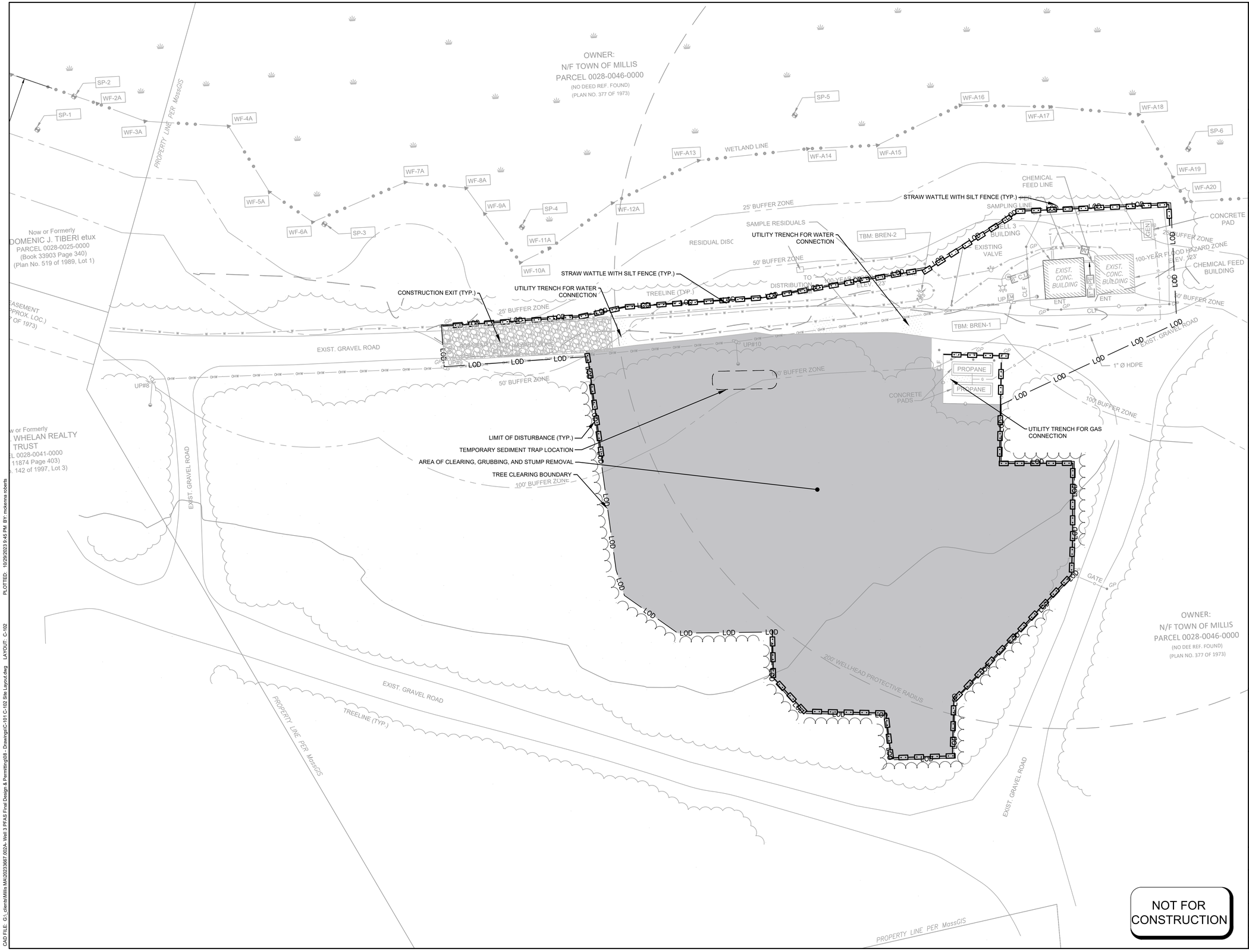
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	DRAFT
DESIGNED BY	MPS
DRAWN BY	MPS
CHECKED BY	GAA
APPROVED BY	GAA

C-101

SHEET 3 of 59

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\C-101 C-102 Site Layout.dwg LAYOUT: C-101 PLOTTED: 10/29/2023 9:45 PM BY: mckenna roberts



KLEINFELDER
Bright People. Right Solutions.

One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

COMMONWEALTH OF MASSACHUSETTS
GREGORY AVENIA
CIVIL
No. 51481
REGISTERED PROFESSIONAL ENGINEER

Signed By: ---- 10/27/2023 # 12345

REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 20 40

SCALE: 1" = 20' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

SITE PREPARATION PLAN

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

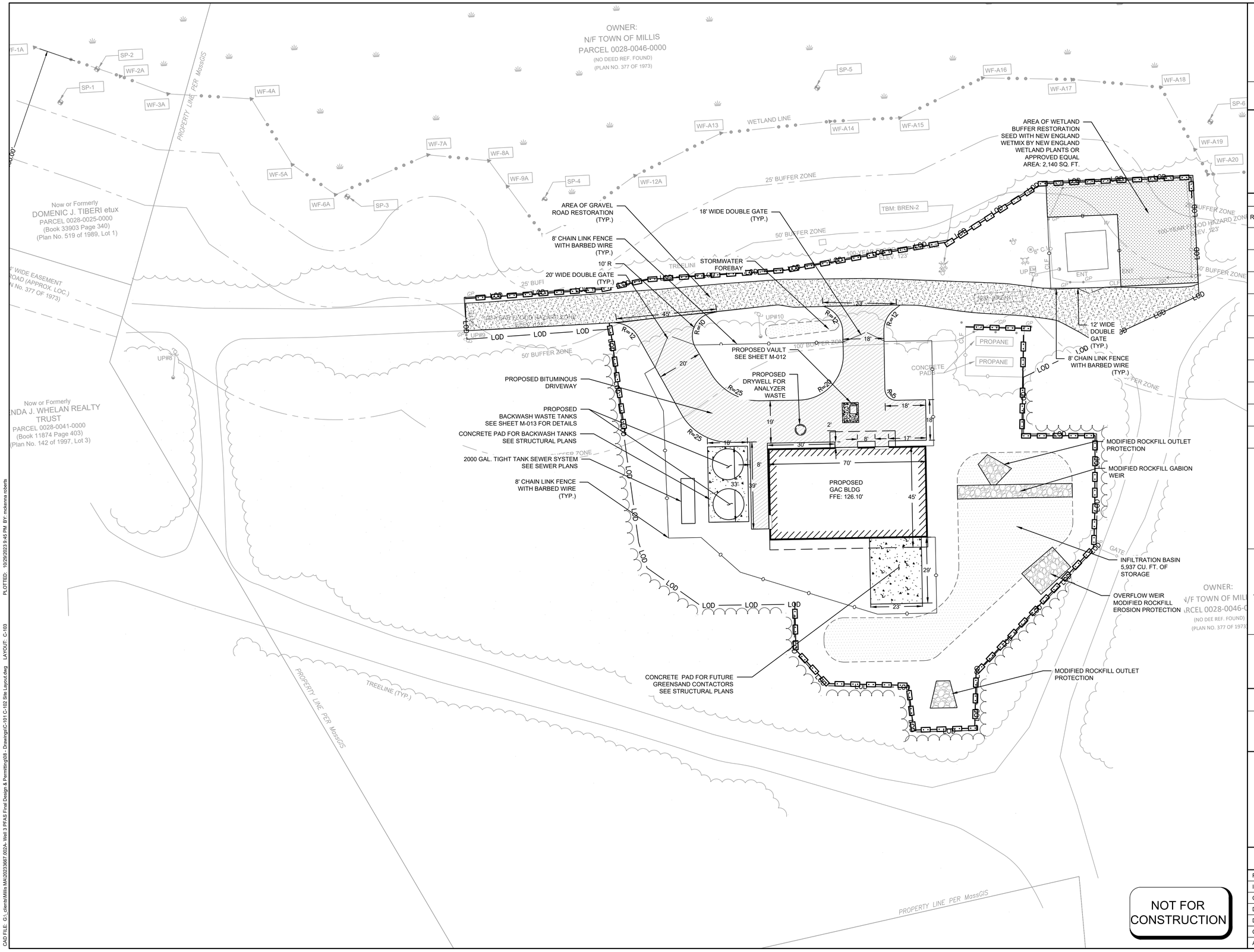
PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	DRAFT
DESIGNED BY	MPS
DRAWN BY	MPS
CHECKED BY	GAA
APPROVED BY	GAA

C-102

SHEET 4 of 59

NOT FOR CONSTRUCTION

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\C-101 C-102 Site Layout.dwg LAYOUT: C-102 PLOTTED: 10/28/2023 9:45 PM BY: mckenna roberts



KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

COMMONWEALTH OF MASSACHUSETTS
GREGORY AVENIA
CIVIL
No. 51461
REGISTERED PROFESSIONAL ENGINEER

Signed By: ----- 10/27/2023 # 12345

REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 20 40

SCALE: 1" = 20' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

OVERALL SITE PLAN

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

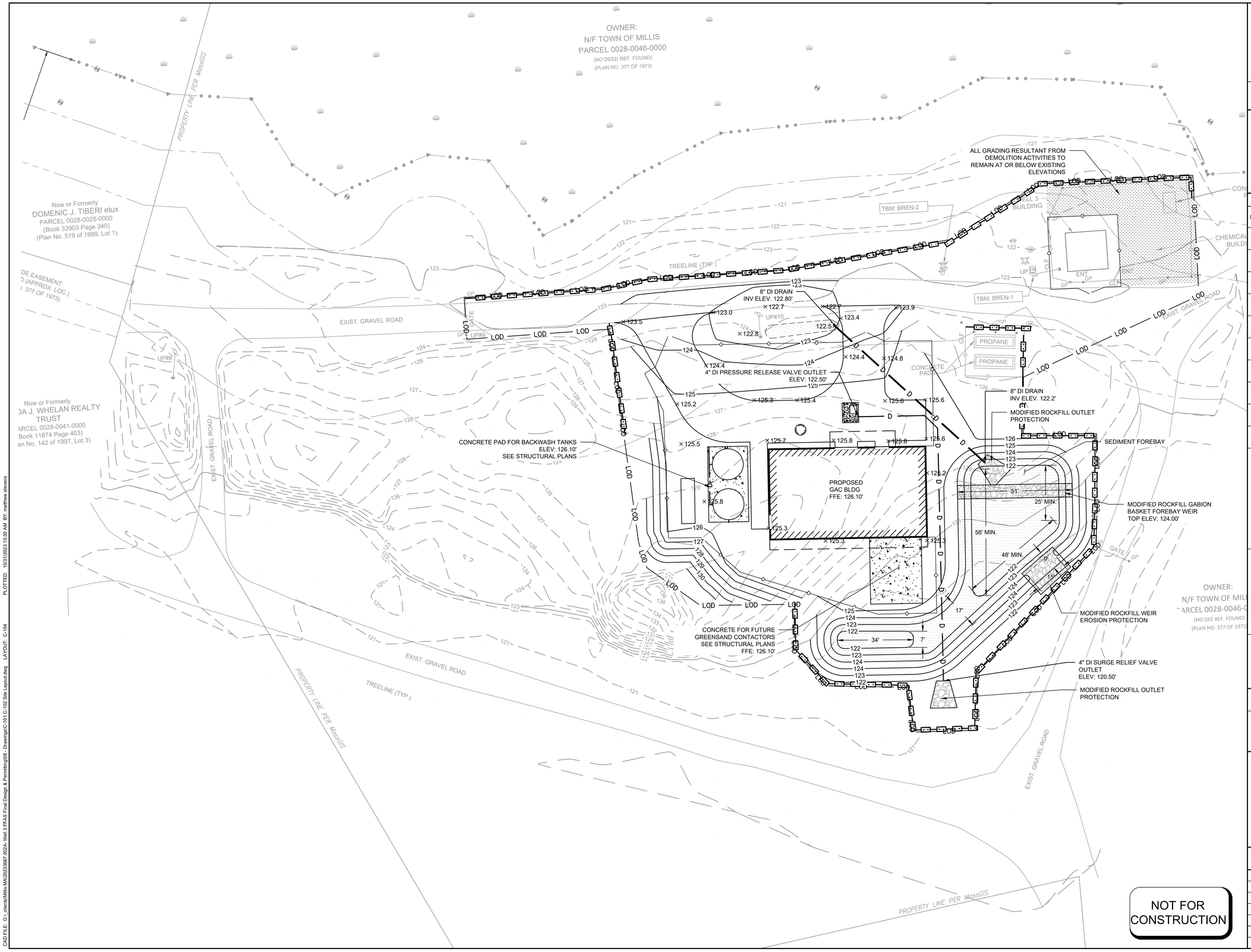
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	DRAFT
DESIGNED BY	MPS
DRAWN BY	MPS
CHECKED BY	GAA
APPROVED BY	GAA

C-103

SHEET 5 of 59

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08- Drawings\C-101 C-102 Site Layout.dwg LAYOUT: C-103 PLOTTED: 10/29/2023 9:45 PM BY: mckenna roberts



NOT FOR CONSTRUCTION

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\C-101 C-102 Site Layout.dwg LAYOUT: C-104 PLOTTED: 10/31/2023 10:39 AM BY: matthew stevens

KLEINFELDER
Bright People. Right Solutions.

One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

COMMONWEALTH OF MASSACHUSETTS
GREGORY AVENIA
CIVIL
No. 51461
REGISTERED PROFESSIONAL ENGINEER

Signed By: ---- 10/27/2023 # 12345

REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 20 40

SCALE: 1" = 20' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

GRADING PLAN

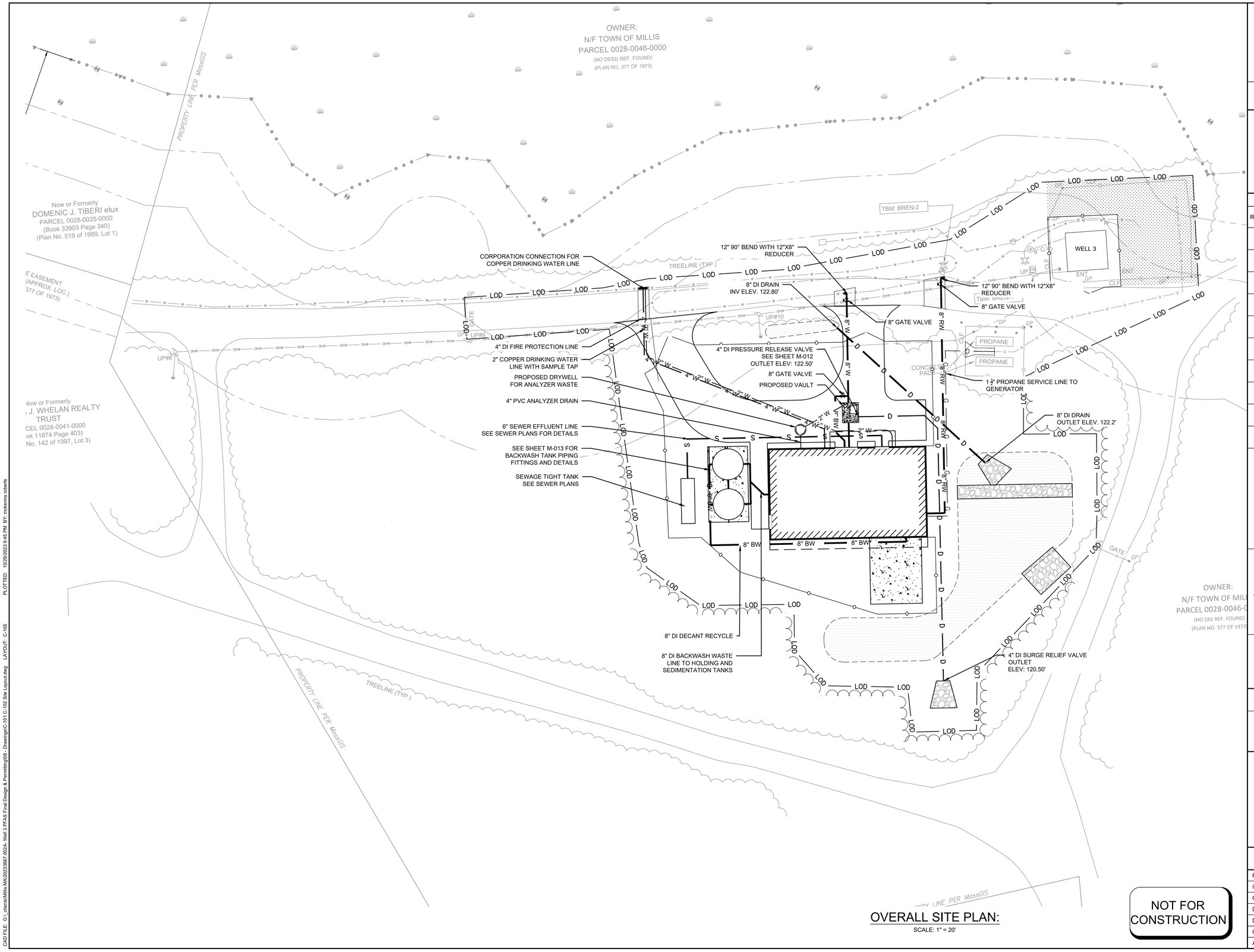
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

INCORPORATED FEB. 24 1885 TOWN SEAL MILLIS, MASS.

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO. 20233667.002A	
ISSUE DATE OCT. 2023	
CURRENT REVISION DRAFT	
DESIGNED BY MPS	C-104
DRAWN BY MPS	
CHECKED BY GAA	
APPROVED BY GAA	SHEET 6 of 59



OVERALL SITE PLAN:

SCALE: 1" = 20'

NOT FOR CONSTRUCTION

CAD FILE: G:\...clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08- Drawings\C-101 C-102 Site Layout.dwg LAYOUT: C-105 PLOTTED: 10/29/2023 9:45 PM BY: mckenna roberts

KLEINFELDER
Bright People. Right Solutions.

One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

COMMONWEALTH OF MASSACHUSETTS
GREGORY AVENIA
CIVIL
No. 51481
REGISTERED PROFESSIONAL ENGINEER

Signed By: ---- 10/27/2023 # 12345

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 20 40

SCALE: 1" = 20' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

UTILITIES PLAN

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

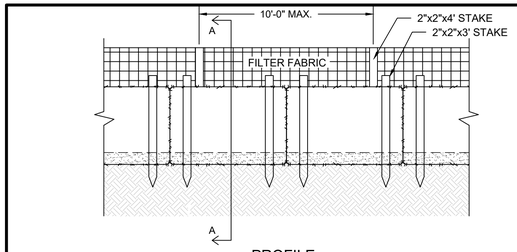
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

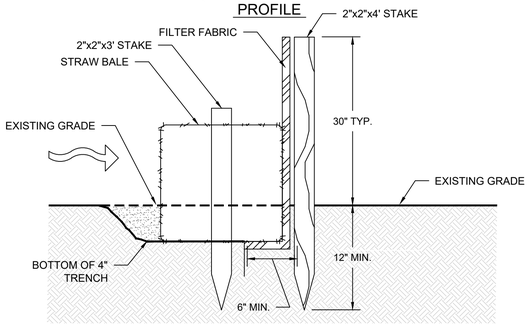
PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	DRAFT
DESIGNED BY	MPS
DRAWN BY	MPS
CHECKED BY	GAA
APPROVED BY	GAA

C-105

SHEET 7 of 59



PROFILE



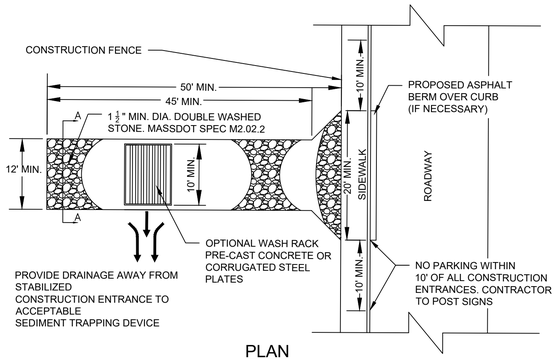
SECTION A-A

NOTES:

1. FABRIC TO BE UV RESISTANT POLYPROPYLENE WITH A MINIMUM WEIGHT OF 2.5 OZ./S.Y.
2. FABRIC TO BE ATTACHED TO STAKES WITH STAPLES.
3. USE SLIT FENCE AND STRAW BALES WHERE INDICATED OR AS DIRECTED BY ENGINEER.
4. WHERE STRAW BALES ARE USED, TRENCH A MINIMUM OF 4" INTO EXISTING GRADE.
5. A MINIMUM OF (2) WOODEN OR METAL STAKES PER STRAW BALE. DRIVE STAKES A MINIMUM OF 12" INTO GROUND.

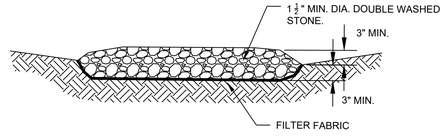
SILT FENCE WITH STRAW BALES DETAIL

SCALE: N.T.S.



PLAN

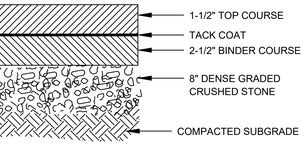
NOT TO SCALE



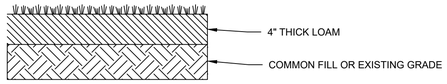
SECTION A-A

STABILIZED VEHICLE CONSTRUCTION EXIT

SCALE: N.T.S.

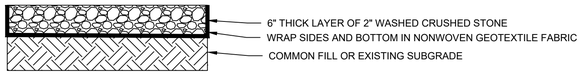


BITUMINOUS CONCRETE PAVEMENT ROAD SURFACE



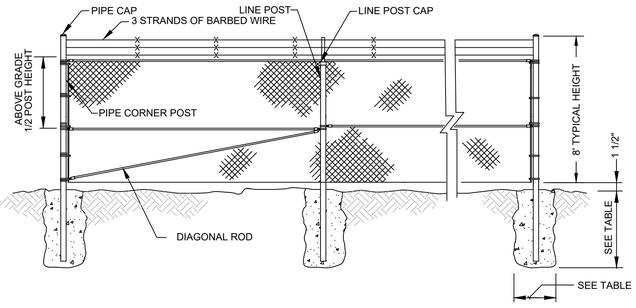
TYPICAL LOAM AND SEED SECTION

N.T.S.



TYPICAL GRAVEL ROAD RESTORATION SECTION

N.T.S.



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

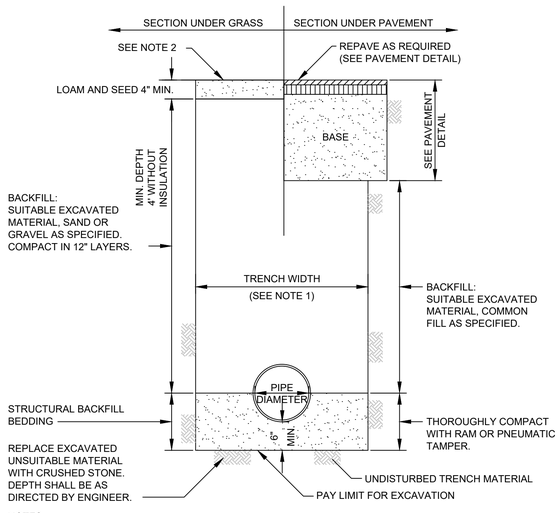
*MIN. HOLE DIAMETER IN SOFT OR LOOSE SOIL SHALL BE 18"

NOTES:

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

CHAIN LINK FENCE

SCALE: N.T.S.

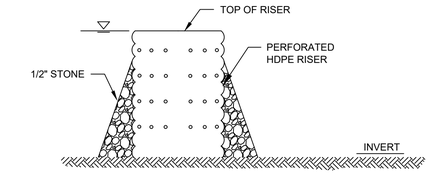


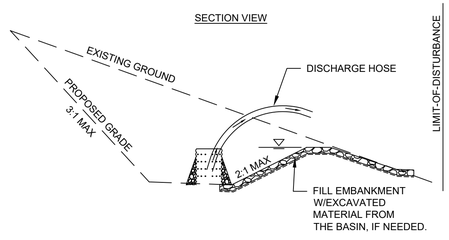
NOTES:

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

TYPICAL UTILITY TRENCH

SCALE: N.T.S.





LONGITUDINAL SECTION

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

TEMPORARY SEDIMENT TRAP (TYP.)

SCALE: N.T.S.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

COMMONWEALTH OF MASSACHUSETTS
GREGORY AVENIA
CIVIL
No. 51461
REGISTERED PROFESSIONAL ENGINEER
10/27/2023

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

CIVIL DETAILS - 1

VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES DESIGN

INCORPORATED FEB 23 1885 MILLIS, MASS

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

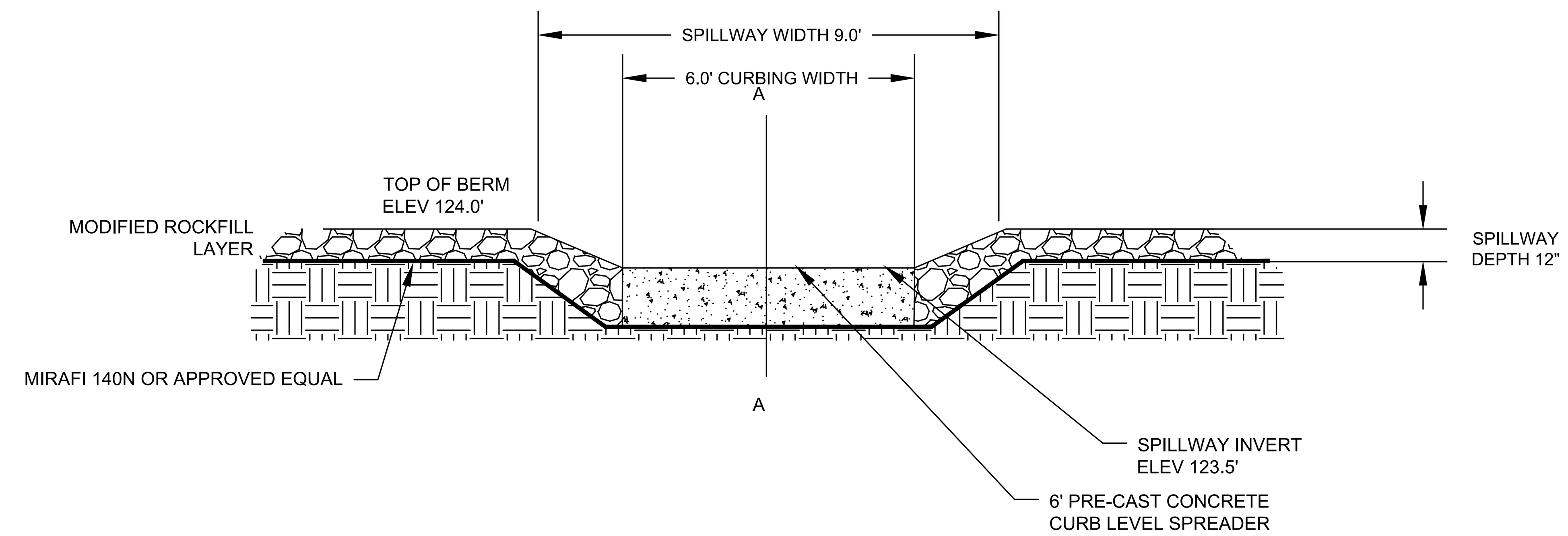
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	DRAFT
DESIGNED BY	MPS
DRAWN BY	MPS
CHECKED BY	GAA
APPROVED BY	GAA

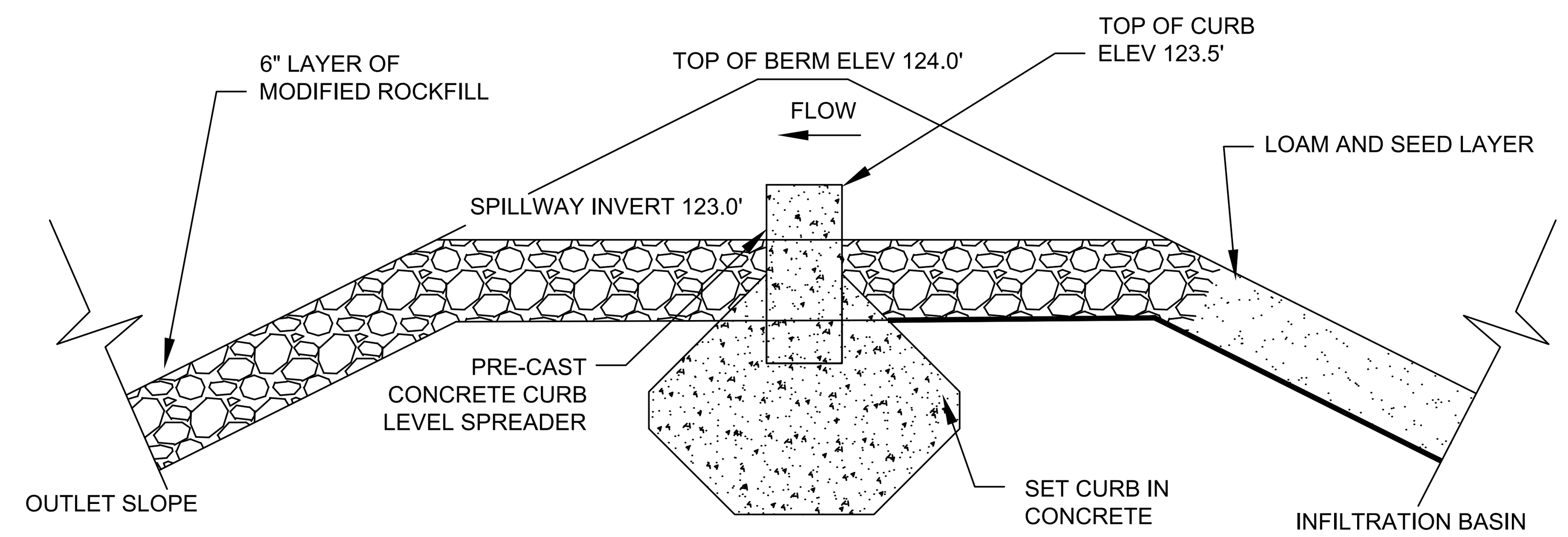
C-501

SHEET 8 of 62

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08- Drawings\C-501.dwg LAYOUT: C-501 PLOTTED: 10/29/2023 9:45 PM BY: mckenna roberts



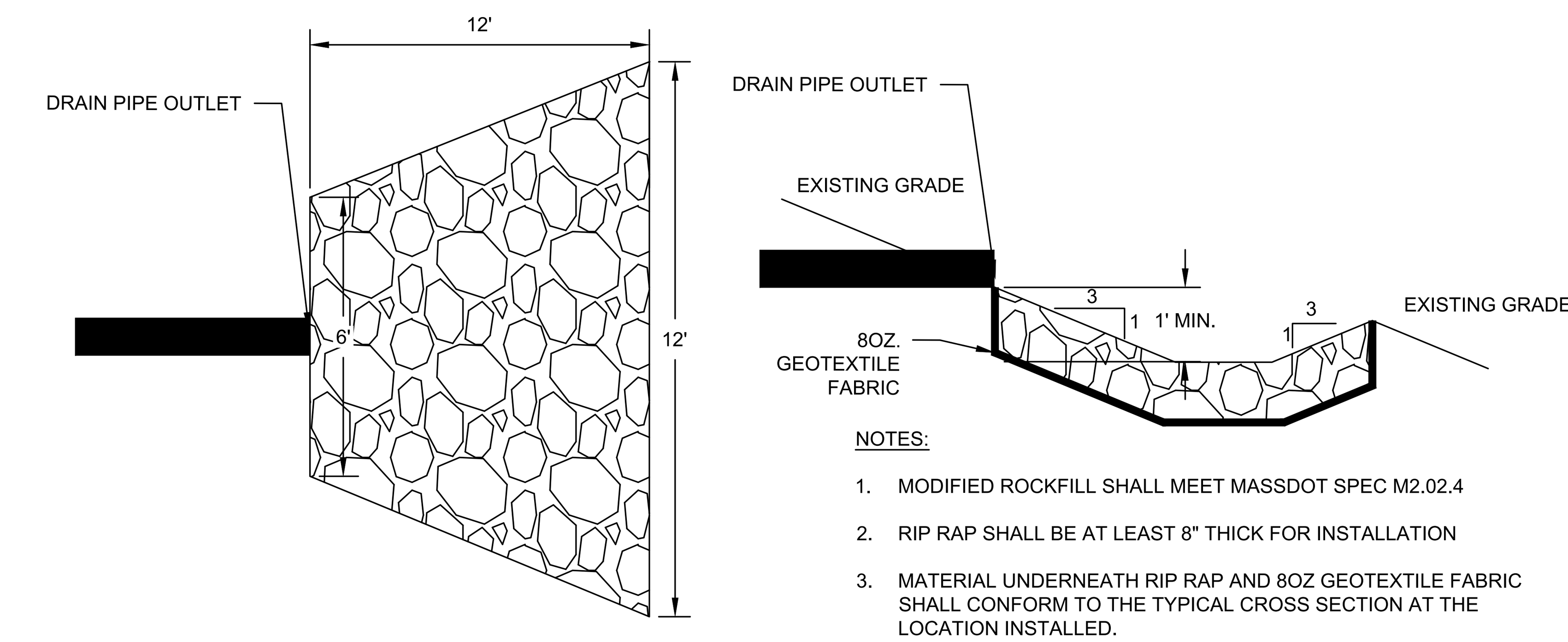
FRONT VIEW



SECTION VIEW

PRECAST CONCRETE CURB OUTLET WEIR

N.T.S.

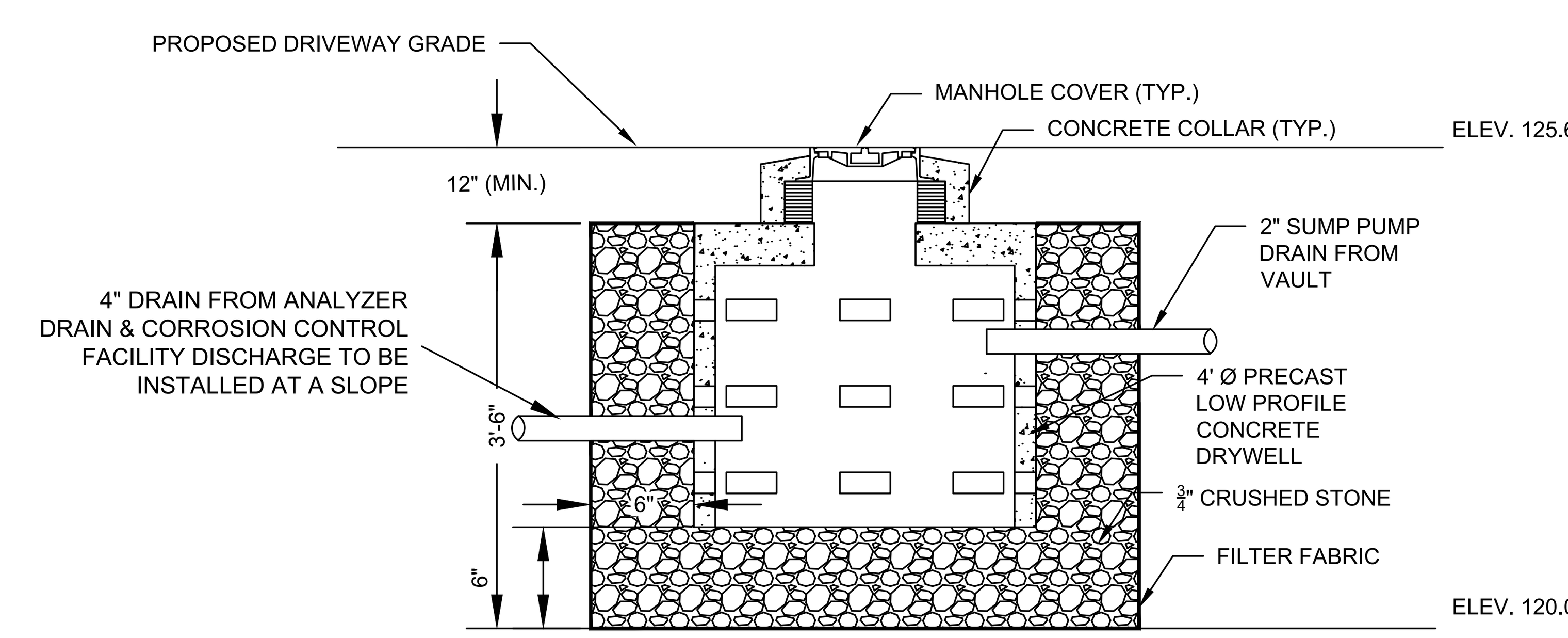


NOTES:

1. MODIFIED ROCKFILL SHALL MEET MASSDOT SPEC M2.02.4
2. RIP RAP SHALL BE AT LEAST 8" THICK FOR INSTALLATION
3. MATERIAL UNDERNEATH RIP RAP AND 8OZ GEOTEXTILE FABRIC SHALL CONFORM TO THE TYPICAL CROSS SECTION AT THE LOCATION INSTALLED.

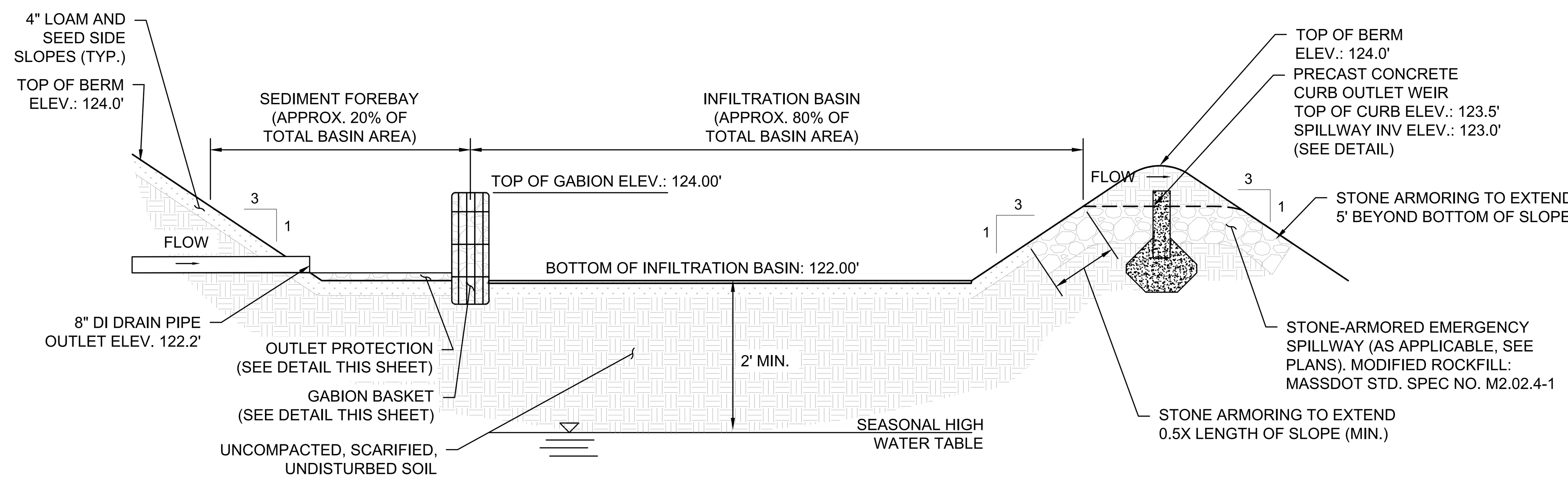
MODIFIED ROCKFILL OUTLET PROTECTION

N.T.S.



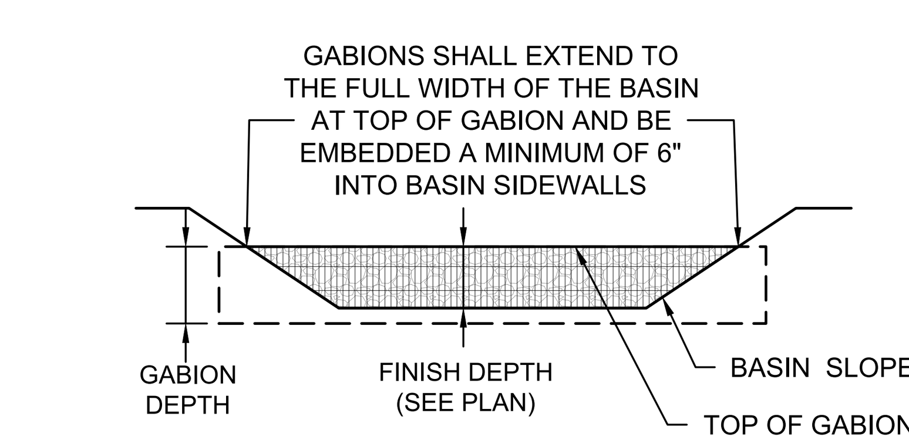
PRECAST DRYWELL

N.T.S.

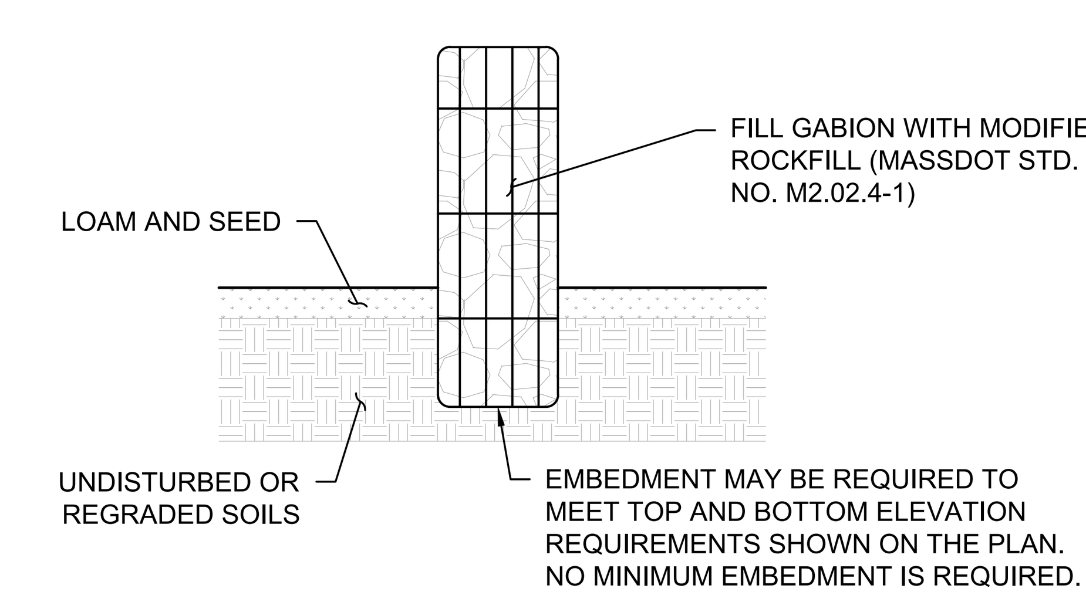


INFILTRATION BASIN SECTION

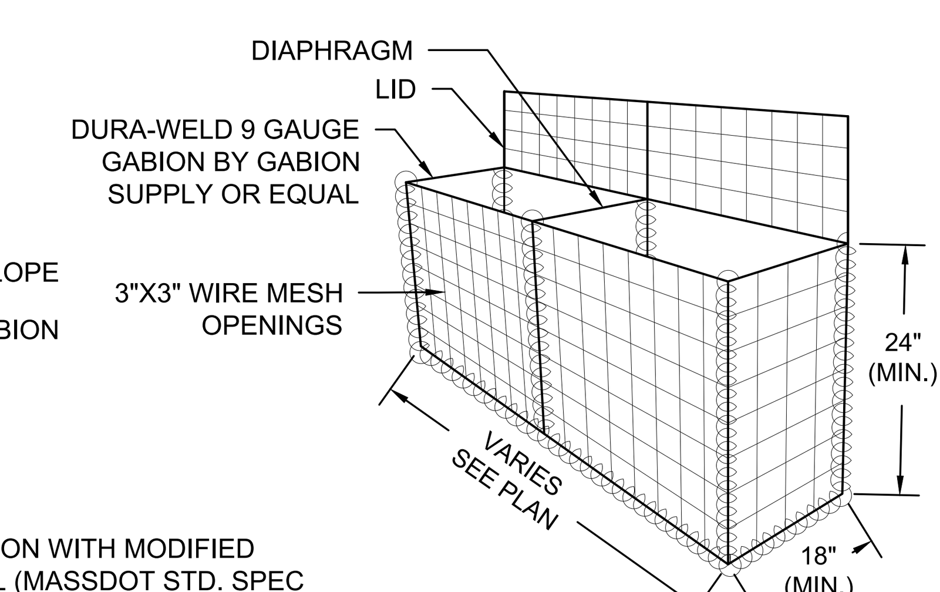
N.T.S.



GABION PROFILE
(ACROSS WIDTH OF BASIN)



GABION CROSS SECTION



NOTE:
1. GABIONS TO BE ASSEMBLED PER MANF.

GABION BASKET

GABION BASKET

N.T.S.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

COMMONWEALTH OF MASSACHUSETTS
GREGORY AVENIA
CIVIL
No. 51461
REGISTERED PROFESSIONAL ENGINEER
10/27/2023

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

CIVIL DETAILS - 2

VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES DESIGN

INCORPORATED FEB 24 1885 · MILLIS, MASS.

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	DRAFT
DESIGNED BY	MPS
DRAWN BY	MPS
CHECKED BY	GAA
APPROVED BY	GAA

C-502

SHEET 9 of 62

PFAS TREATMENT FACILITY

PUMP STATION

VFD-100

WP-100

PG-100

ARV-100

CV-100

FIT-100

GV-100 N.I.C.

T-100

ST-001

WELL 3

ST-002

BFV-020 N.C.

8" PROCESS INFLUENT

6"

BFV-010 N.O.

PG-010

BAG FILTER 010

PG-011

BFV-011 N.O.

6"

ARV-101

GAC UNIT 101

ST-102

ST-103

MEDIA FILL

MEDIA DRAIN

4"

2"

DRAIN

PG-101

ST-101

PIT-101

BFV-105 N.C.

BFV-101 N.O.

BFV-109 N.C.

BFV-111 N.O.

BFV-103 N.C.

BFV-107 N.C.

FIT-101

PG-104

ST-104

BFV-106 N.C.

BFV-102 N.C.

BFV-110 N.O.

BFV-112 N.C.

BFV-104 N.O.

BFV-108 N.C.

N.O. BFV-027

N.O. BFV-025

N.O. BFV-023

BFV-021 N.O.

BFV-022 N.O.

N.O. BFV-026

N.O. BFV-024

BFV-028 N.O.

FIT-201

ARV-111

GAC UNIT 111

ST-112

ST-113

MEDIA FILL

MEDIA DRAIN

4"

2"

DRAIN

PG-111

ST-111

PIT-111

PG-114

ST-114

8" BACKWASH INFLUENT

8" PROCESS EFFLUENT

8" BACKWASH EFFLUENT

4" BACKWASH RECYCLE

BFV-501 N.C.

FIT-500

CV-501

DISTRIBUTION SUPPLY - BACKWASH INFLUENT

ST-300

NAOCL TREATMENT SEE SHEET M-007

NAF TREATMENT SEE SHEET M-009

NAOH TREATMENT SEE SHEET M-008

PRV-301

BFV-301

4" DI PIPE

CV-301

BFV-302

TO DISTRIBUTION SYSTEM ENTRY POINT

SURGE PROTECTION VAULT

BFV-408 N.C.

FIT-400

CV-401

PG-400

RP-400

RECYCLE PUMP

ST-400

FIT-300

ARV-201

GAC UNIT 201

ST-202

ST-203

MEDIA FILL

MEDIA DRAIN

DRAIN

PG-201

ST-201

PIT-201

BFV-219 N.C.

BFV-213 N.O.

BFV-221 N.C.

BFV-223 N.O.

BFV-215 N.C.

BFV-217 N.C.

BFV-220 N.C.

BFV-214 N.C.

BFV-222 N.O.

BFV-224 N.C.

BFV-216 N.O.

BFV-218 N.C.

PG-204

ST-204

ST-214

PG-214

ARV-211

GAC UNIT 211

ST-212

ST-213

MEDIA FILL

MEDIA DRAIN

DRAIN

PG-211

ST-211

PIT-211

BACKWASH TANK PADS

N.O. GV-401

N.O. BFV-404

N.O. GV-402

N.O. BFV-403

LT-401

LT-402

BACKWASH WASTE TANK 401

BACKWASH WASTE TANK 402

N.C. BFV-407

BFV-405 N.C.

BFV-406 N.C.

DRAIN

LEGEND

- GATE VALVE
- CHEMICAL METERING PUMP
- RUPTURE DISK
- CHECK VALVE
- FLOWMETER
- BUTTERFLY VALVE
- PUMP
- AIR RELEASE VALVE
- FIELD MOUNTED INSTRUMENT
- SAMPLE VALVE
- SUBMERSIBLE PUMP
- BALL/ISOLATION VALVE
- FLANGED CONNECTION
- FLEXIBLE COUPLING
- PRESSURE RELIEF VALVE

ABBREVIATIONS

BFV	AUTOMATED BUTTERFLY VALVE	PG	PRESSURE GAUGE
BFV	BUTTERFLY VALVE	PIT	PRESSURE INDICATING TRANSMITTERS
BWP	BACKWASH PUMP	ST	SAMPLE TAP
CV	CHECK VALVE	VFD	VARIABLE FREQUENCY DRIVE
FIT	FLOW INDICATING TRANSMITTER	WP	WELL PUMP
GV	GATE VALVE		
N.C.	NORMALLY CLOSED		
N.O.	NORMALLY OPEN		

NOT FOR CONSTRUCTION

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\M-001, M-002 -recover.dwg LAYOUT: M-001 - PFD PLOTTED: 10/28/2023 9:46 PM BY: mckenna roberts

KLEINFELDER
Bright People. Right Solutions.

One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

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

NOT TO SCALE

ORIGINAL DRAWING SIZE IS 22 x 34

PROCESS FLOW DIAGRAM

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	AB/TB
DRAWN BY	MR
CHECKED BY	TB
APPROVED BY	ABB

M-001

SHEET 10 of 59

VALVE SCHEDULE

TAG	SIZE	DESCRIPTION	TYPE	SERVICE	ACTUATOR
BFV-010	6"	BAG FILTER 010 INFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-011	6"	BAG FILTER 010 EFFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-020	8"	BAG FILTER BYPASS	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-021	8"	GAC 101/111 PROCESS INFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-022	8"	GAC 201/211 PROCESS INFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-023	8"	GAC 101/111 PROCESS EFFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-024	8"	GAC 201/211 PROCESS EFFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-025	8"	GAC 101/111 BACKWASH INFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-026	8"	GAC 201/211 BACKWASH INFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-027	8"	GAC 101/111 BACKWASH EFFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-028	8"	GAC 201/211 BACKWASH EFFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-301	4"	SURGE PROTECTION ISOLATION VALVE	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-302	8"	DISTRIBUTION SYSTEM CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-403	4"	BACKWASH TANK 401 EFFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-404	4"	BACKWASH TANK 402 EFFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-405	4"	BACKWASH TANK 401 DRAIN	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-406	4"	BACKWASH TANK 402 DRAIN	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-407	4"	BACKWASH TANK CONNECTION	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-408	4"	RECYCLE CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
BFV-101	6"	GAC 101 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-102	6"	GAC 111 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-103	6"	GAC 101 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-104	6"	GAC 111 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-105	6"	GAC 101 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-106	6"	GAC 111 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-107	6"	GAC 101 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-108	6"	GAC 111 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-109	6"	GAC 101 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-110	6"	GAC 111 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-111	6"	GAC 101 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-112	6"	GAC 111 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-213	6"	GAC 201 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-214	6"	GAC 211 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-215	6"	GAC 201 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-216	6"	GAC 211 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-217	6"	GAC 201 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-218	6"	GAC 211 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-219	6"	GAC 201 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-220	6"	GAC 211 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-221	6"	GAC 201 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-222	6"	GAC 211 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-223	6"	GAC 201 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-224	6"	GAC 211 CONTROL VALVE	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
BFV-501	8"	DISTRIBUTION SUPPLY BACKWASH INFLUENT CONTR	BUTTERFLY VALVE	OPEN/CLOSE	ELECTRIC
ARV-100	1"	WELL 3 AIR/VACUUM RELEASE VALVE	AIR/VACUUM RELEASE VALVE	AIR/VAC RELEASE	---
ARV-101	2"	GAC-101 AIR/VACUUM RELEASE VALVE	AIR/VACUUM RELEASE VALVE	AIR/VAC RELEASE	---
ARV-111	2"	GAC-111 AIR/VACUUM RELEASE VALVE	AIR/VACUUM RELEASE VALVE	AIR/VAC RELEASE	---
ARV-201	2"	GAC-201 AIR/VACUUM RELEASE VALVE	AIR/VACUUM RELEASE VALVE	AIR/VAC RELEASE	---
ARV-211	2"	GAC-211 AIR/VACUUM RELEASE VALVE	AIR/VACUUM RELEASE VALVE	AIR/VAC RELEASE	---
CV-100	6"	WELL 3 CHECK VALVE	DOUBLE DOOR CHECK VALVE	CHECK	---
CV-301	8"	SWING CHECK VALVE	DOUBLE DOOR CHECK VALVE	CHECK	---
CV-401	4"	BACKWASH WASTE PUMP CHECK VALVE	DOUBLE DOOR CHECK VALVE	CHECK	---
CV-501	8"	BACKWASH WASTE PUMP CHECK VALVE	DOUBLE DOOR CHECK VALVE	CHECK	---
PRV-301	4"	SURGE PROTECTION	PRESSURE RELEASE VALVE	PRESSURE RELEASE	---
GV-100	12"	WELL ISOLATION VALVE - NOT IN CONTRACT	GATE VALVE	OPEN/CLOSE	MANUAL
GV-401	4"	BACKWASH TANK 401 INFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL
GV-402	4"	BACKWASH TANK 402 INFLUENT	BUTTERFLY VALVE	OPEN/CLOSE	MANUAL

SAMPLE TAP SCHEDULE

SAMPLE TAP	DIAMETER	DESCRIPTION	TYPE	SERVICE	ACTUATO
ST-001	1"	WELL 3 RAW WATER SAMPLE TAP	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-002	1"	COMBINED INFLUENT SAMPLE TAP	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-101	1/4"	SAMPLE TAP GAC 101 INFLUENT	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-102	1/4"	SAMPLE TAP GAC 101 INTERMEDIATE COLUMN TAP	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-103	1/4"	SAMPLE TAP GAC 101 INTERMEDIATE COLUMN TAP	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-104	1/4"	SAMPLE TAP GAC 101 EFFLUENT	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-111	1/4"	SAMPLE TAP GAC 111 INFLUENT	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-112	1/4"	SAMPLE TAP GAC 111 INTERMEDIATE COLUMN TAP	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-113	1/4"	SAMPLE TAP GAC 111 INTERMEDIATE COLUMN TAP	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-114	1/4"	SAMPLE TAP GAC 111 EFFLUENT	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-201	1/4"	SAMPLE TAP GAC 201 INFLUENT	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-202	1/4"	SAMPLE TAP GAC 201 INTERMEDIATE COLUMN TAP	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-203	1/4"	SAMPLE TAP GAC 201 INTERMEDIATE COLUMN TAP	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-204	1/4"	SAMPLE TAP GAC 201 EFFLUENT	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-211	1/4"	SAMPLE TAP GAC 211 INFLUENT	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-212	1/4"	SAMPLE TAP GAC 211 INTERMEDIATE COLUMN TAP	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-213	1/4"	SAMPLE TAP GAC 211 INTERMEDIATE COLUMN TAP	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-214	1/4"	SAMPLE TAP GAC 211 EFFLUENT	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-300	1"	PRE-CHEMICAL FEED SAMPLE TAP	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL
ST-400	1"	RECYCLE SUPPLY SAMPLE TAP	SMOOTH NOSE SAMPLE TAP	OPEN/CLOSE	MANUAL

PUMP SCHEDULE

TAG	PUMP NAME	LOCATION	QUANTITY	TYPE
WP-100	WELL 3 MOTOR/PUMP	WELL 3	1	VERTICAL TURBINE
RP-400	BACKWASH PUMP	GAC BUILDING	1	HORIZONTAL END SUCTION
TP-600	NaOCL TRANSFER PUMP	GAC BUILDING	1	MAGNETIC DRIVE
TP-610	NaOH TRANSFER PUMP	GAC BUILDING	1	MAGNETIC DRIVE
CP-601	NaOCL METERING PUMP 1	GAC BUILDING	1	PERISTALTIC
CP-602	NaOCL METERING PUMP 2	GAC BUILDING	1	PERISTALTIC
CP-611	NaOH METERING PUMP 1	GAC BUILDING	1	PERISTALTIC
CP-612	NaOH METERING PUMP 2	GAC BUILDING	1	PERISTALTIC
CP-621	FLUORINE METERING PUMP 1	GAC BUILDING	1	DIAPHRAGM
CP-622	FLUORINE METERING PUMP 2	GAC BUILDING	1	DIAPHRAGM

INSTRUMENTATION SCHEDULE

TAG	SIZE	SERVICE
FIT-100	8"	WELL 3 FLOW METER
FIT-101	6"	GAC 101/111 INFLUENT FLOWMETER
FIT-201	6"	GAC 201/211 INFLUENT FLOWMETER
FIT-300	6"	BACKWASH FLOWMETER
FIT-400	4"	RECYCLE FLOWMETER
FIT-500	6"	DISTRIBUTION SUPPLY BACKWASH INFLUENT FLOWMETER
FIT-620		FLUORINE FLOW METER
LT-100	---	WELL 3 LEVEL TRANSMITTER
LT-401	---	BACKWASH WASTE TANK 401 LEVEL TRANSMITTER
LT-402	---	BACKWASH WASTE TANK 402 LEVEL TRANSMITTER
LIT-603	---	NaOCL BULK TANK LEVEL INDICATING TRANSMITTER
LIT-604	---	NaOCL DAY TANK LEVEL INDICATING TRANSMITTER
LIT-613	---	NaOH BULK TANK LEVEL INDICATING TRANSMITTER
LIT-614	---	NaOH DAY TANK LEVEL INDICATING TRANSMITTER
PG-010	1"	INLET FOR BAG FILTER 010
PG-011	1"	OUTLET FOR BAG FILTER 010
PG-100	1"	WELL 3 PRESSURE GAUGE
PG-101	1/4"	GAC 101 INFLUENT PRESSURE GAUGE
PG-104	1/4"	GAC 101 EFFLUENT PRESSURE GAUGE
PIT-101	1/4"	GAC 101 DIFFERENTIAL PRESSURE TRANSDUCER
PG-111	1/4"	GAC 111 INFLUENT PRESSURE GAUGE
PG-114	1/4"	GAC 111 EFFLUENT PRESSURE GAUGE
PIT-111	1/4"	GAC 111 DIFFERENTIAL PRESSURE TRANSDUCER
PG-201	1/4"	GAC 201 INFLUENT PRESSURE GAUGE
PG-204	1/4"	GAC 201 EFFLUENT PRESSURE GAUGE
PIT-201	1/4"	GAC 201 DIFFERENTIAL PRESSURE TRANSDUCER
PG-211	1/4"	GAC 211 INFLUENT PRESSURE GAUGE
PG-214	1/4"	GAC 211 EFFLUENT PRESSURE GAUGE
PIT-211	1"	GAC 211 DIFFERENTIAL PRESSURE TRANSDUCER
PG-400	1/4"	RECYCLE SUPPLY PRESSURE GAUGE
PG-600	1/4"	NaOCL PRESSURE GAUGE
PG-610	1/4"	NaOH PRESSURE GAUGE

VALVE OPERATION SCHEDULE

	Train 1												Train 2												BW Supply
	ABV-101	ABV-102	ABV-103	ABV-104	ABV-105	ABV-106	ABV-107	ABV-108	ABV-109	ABV-110	ABV-111	ABV-112	ABV-213	ABV-214	ABV-215	ABV-216	ABV-217	ABV-218	ABV-219	ABV-220	ABV-221	ABV-222	ABV-223	ABV-224	ABV-051
Series Flow 101 to 111 & 201 to 211	Open	Closed	Closed	Open	Closed	Closed	Closed	Closed	Closed	Open	Open	Closed	Open	Closed	Closed	Open	Closed	Closed	Closed	Closed	Closed	Open	Open	Closed	Closed
Series Flow 111 to 101 & 211 to 201	Closed	Open	Open	Closed	Closed	Closed	Closed	Closed	Open	Closed	Closed	Open	Closed	Open	Open	Closed	Closed	Closed	Closed	closed	Open	Closed	Closed	Open	Closed
Backwash 101	Closed	Closed	Closed	Closed	Open	Closed	Open	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open
Backwash 111	Closed	Closed	Closed	Closed	Closed	Open	Closed	Open	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open
Filter To Waste 101	Open	Closed	Closed	Closed	Closed	Open	Closed	Closed	Closed	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Filter to Waste 111	Closed	Open	Closed	Closed	Open	Closed	Closed	Closed	Open	Closed	Closed	Open	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Backwash 201	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed	Open	Closed	Closed	Closed	Closed	Closed	Open
Backwash 211	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed	Open	Closed	Closed	Closed	Closed	Open
Filter To Waste 201	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed	Open	Open	Closed	Closed
Filter to Waste 211	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed	Closed	Closed	Closed	Open	Closed	Open	Closed	Closed	Open	Closed

NOTE: BFVs 010, 011, 012, 013, 022, 023 SHALL REMAIN OPEN AND BFVs 020, 030 SHALL REMAIN CLOSED UNDER NORMAL OPERATIONS

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

PROCESS EQUIPMENT SCHEDULE

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

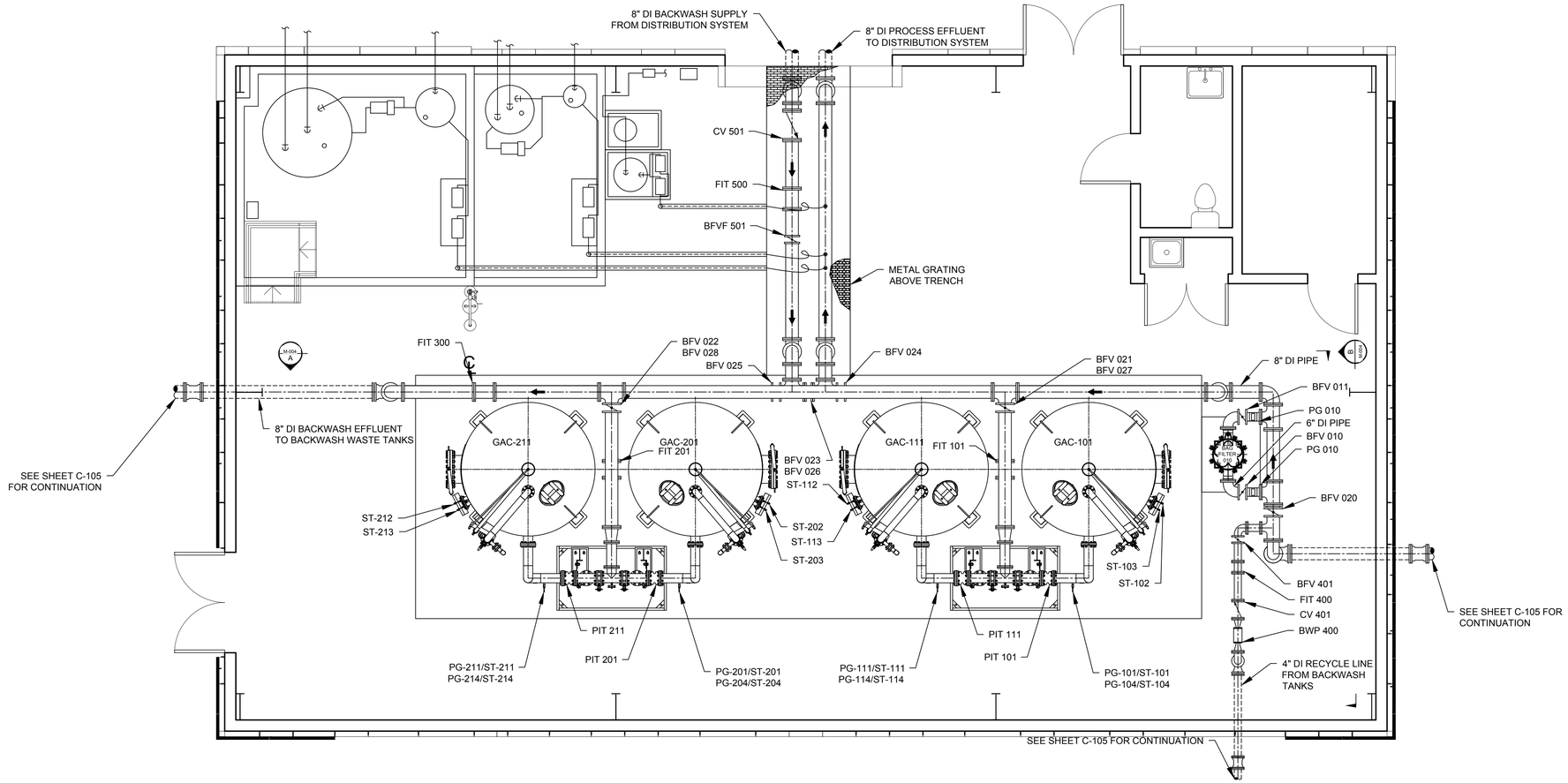
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	ABB
DRAWN BY	MR
CHECKED BY	TB
APPROVED BY	ABB

M-002

SHEET 11 of 59



PLAN

SCALE: 1" = 4'

NOTES:
1. CONTRACTOR SHALL INSTALL PIPE SUPPORTS IN ACCORDANCE WITH SPECIFICATION SECTION 15056.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

Signed By: #

REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

N

0 4 8 12

SCALE: 1" = 4' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

PROCESS FLOOR PLAN

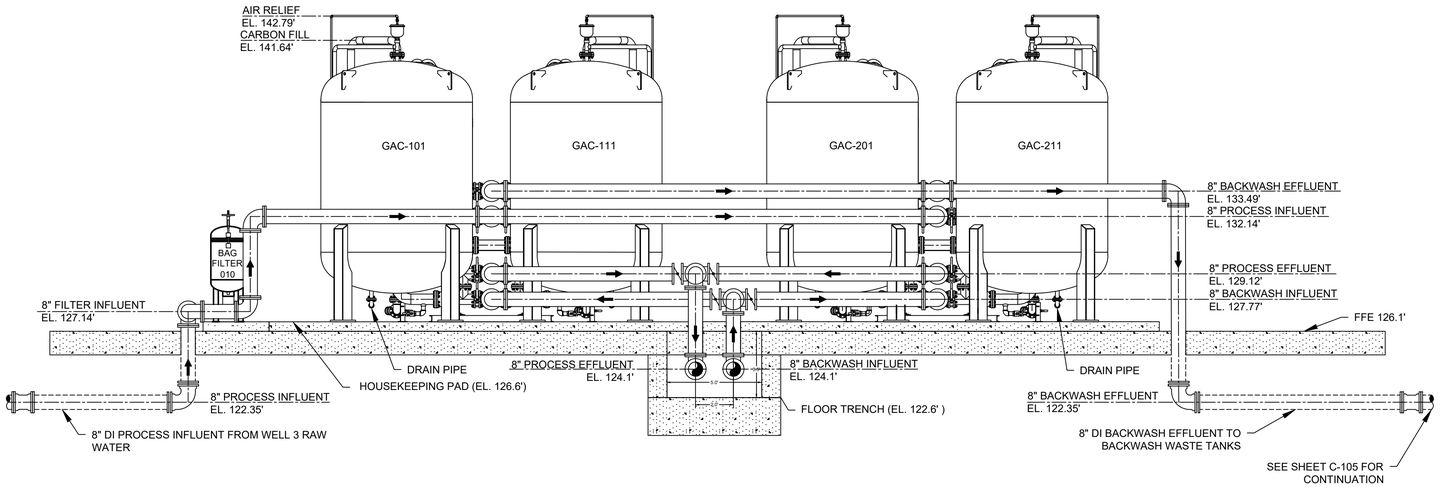
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

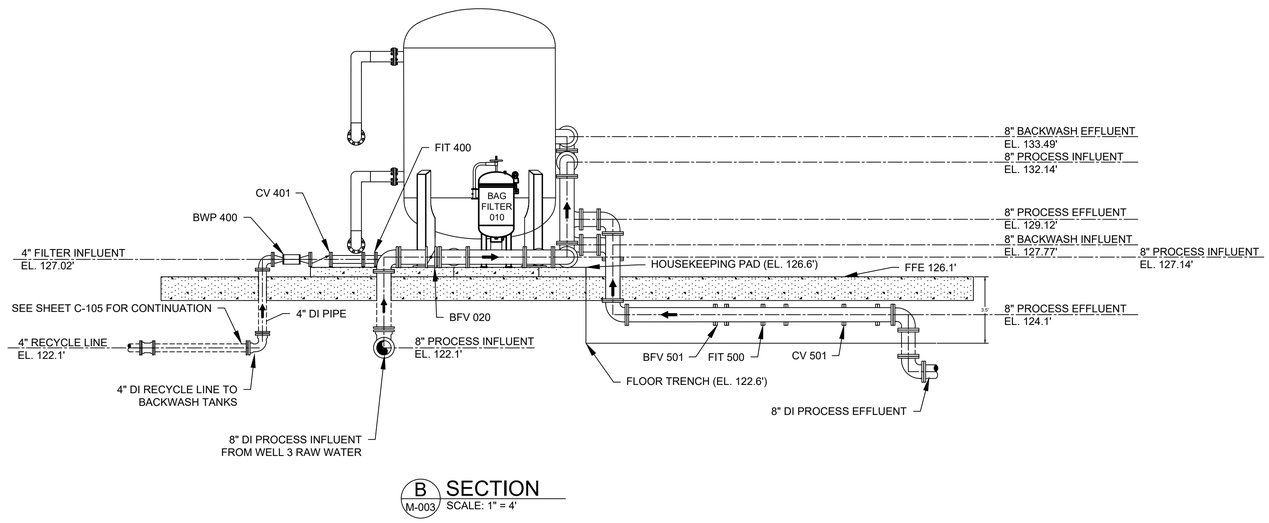
PERMIT REVIEW SET

PROJECT NO. 20233667.002A	
ISSUE DATE OCT. 2023	
CURRENT REVISION -	M-003
DESIGNED BY TB	
DRAWN BY PF	
CHECKED BY TB	
APPROVED BY TB	SHEET 12 of 59

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\M-005 - Interior Piping.dwg LAYOUT: M-003 PLOTTED: 10/30/2023 3:00 PM BY: mckenna roberts



A M-003 SECTION
SCALE: 1" = 4'



B M-003 SECTION
SCALE: 1" = 4'

NOTES:
1. CONTRACTOR SHALL INSTALL PIPE SUPPORTS IN ACCORDANCE WITH SPECIFICATION SECTION 15056.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

Signed By: #

REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4 8 12

SCALE: 1" = 4' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

PROCESS SECTION

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

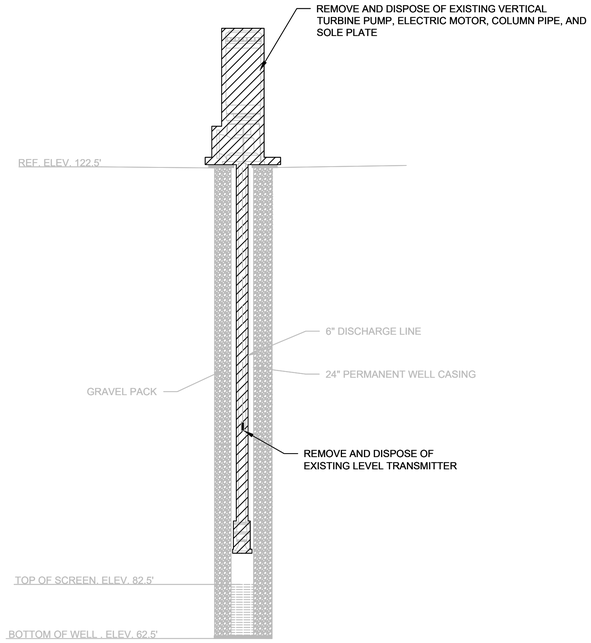
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	TB
DRAWN BY	PF
CHECKED BY	TB
APPROVED BY	----

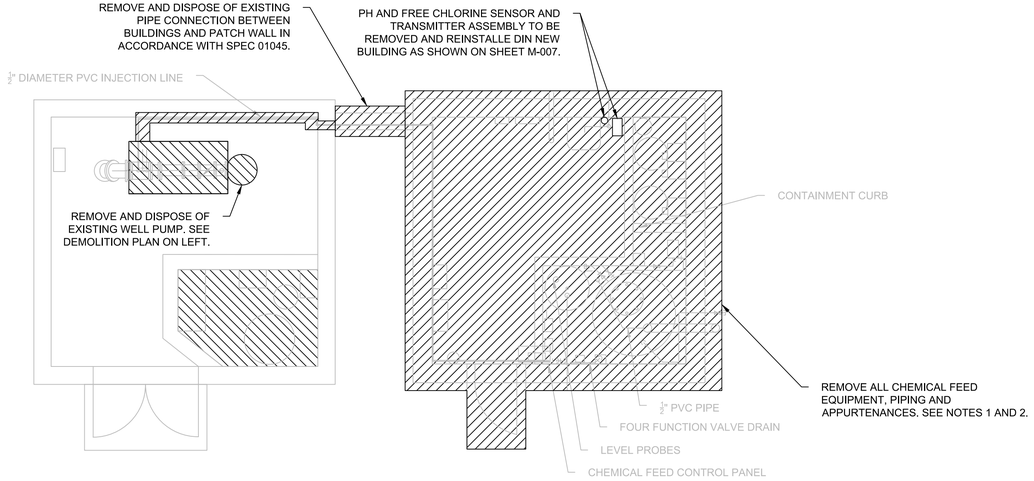
M-004

SHEET 13 of 59

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08- Drawings\M-00\5- Interior Piping.dwg LAYOUT: M-004 PLOTTED: 10/30/2023 2:37 PM BY: portia freeman

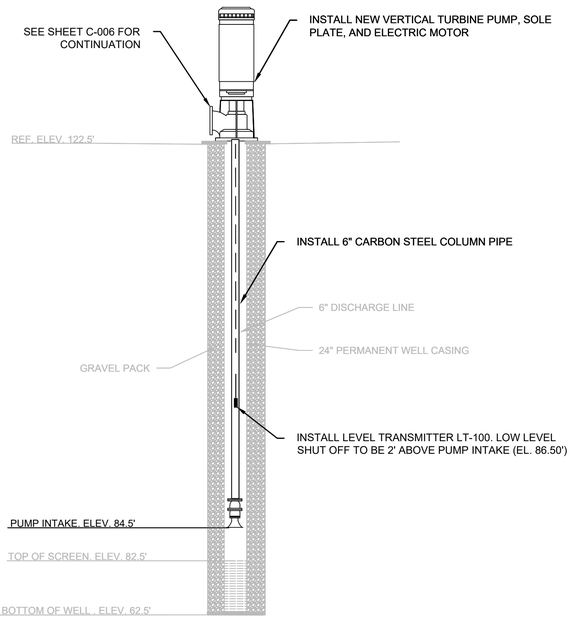


WELL 3 DEMOLITION PLAN
SCALE: NTS

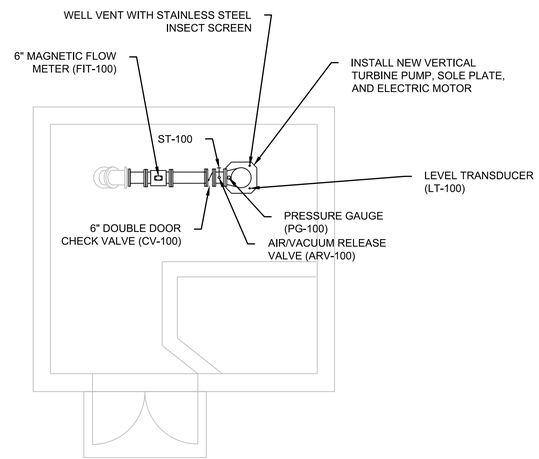


DEMOLITION PLAN
SCALE: 1" = 4'

NOTES
1. EXISTING CHEMICAL FEED ITEMS TO BE REMOVED AND DISPOSED OF INCLUDED BUT ARE NOT LIMITED TO LEVEL PROBES, A CHEMICAL FEED CONTROL PANEL, A FOUR FUNCTION VALVE DRAIN, PVC PIPING, A FLOW METER, A CHECK VALVE, A SAMPLE TAP, COPPER PIPING, CHEMICAL INJECTION NOZZLES, TUBING, APPURTENANCES, CONTROL PANELS, A 320 GAL SODIUM HYPOCHLORITE BULK TANK, A 15 GAL SODIUM HYPOCHLORITE DAY TANK, A 300 GAL PE SODIUM HYDROXIDE DAY TANK, AN EXISTING 1000 GAL FRP SODIUM HYDROXIDE BULK TANK, A 32 GAL PE SODIUM FLUORIDE STORAGE CONTAINER, AND A 20 GAL SODIUM FLUORIDE SATURATOR.
2. ALL CHEMICAL FEED PUMPS AND CHEMICAL TRANSFER PUMPS SHALL BE REMOVED AND RETURNED TO OWNER.
3. CONTRACTOR SHALL FIELD VERIFY EXISTING EQUIPMENT.



WELL 3 MODIFICATION PLAN
SCALE: NTS



MODIFICAITON PLAN
SCALE: SCALE: 1" = 4'

NOTES
1) CLEAN, REDEVELOP, AND INSPECT WELLS PRIOR TO INSTALLING PUMPS. REFER TO SPECIFICATION SECTION 02673.
2) DISINFECT WELL SCREEN AND APPURTENANCES PRIOR TO PUMP INSTALLATION. REFER TO SPECIFICATION SECTION 02673.
3) PAINTING FSB TO COAT ALL PIPES IN ACCORDANCE WITH SPECIFICATION SECTION 09960.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

Signed By: #

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4 8 12

SCALE: 1" = 4' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

PUMP AND EXISTING BUILDING MODIFICATIONS

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

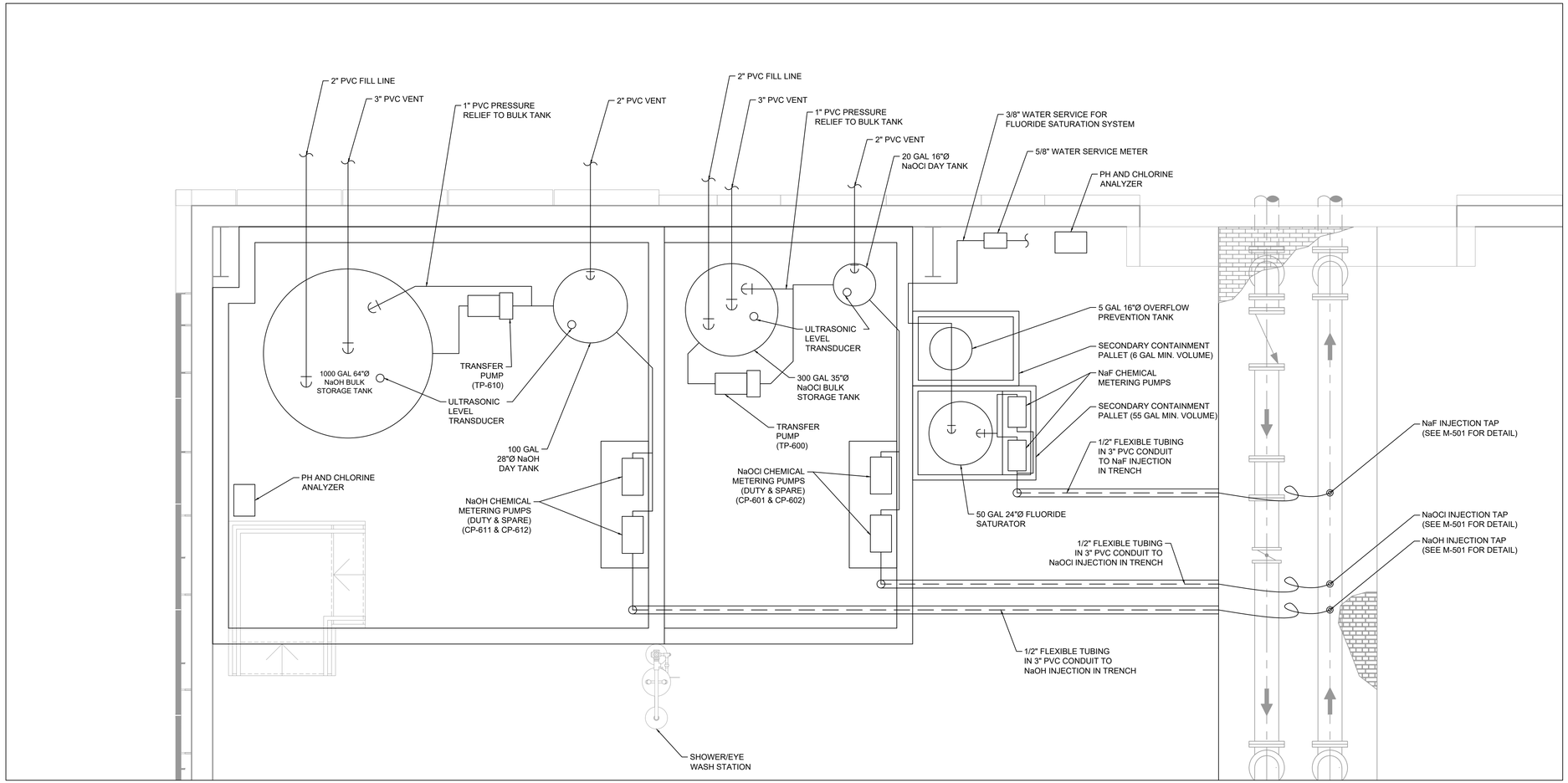
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	TB
DRAWN BY	MR
CHECKED BY	TB
APPROVED BY	ABB

M-005

SHEET 14 of 59

CAD FILE G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\03 - Drawings\M-005, M-006 - Pump Station And Chem Feed Modifications.dwg LAYOUT: M-005 PLOTTED: 10/29/2023 9:49 PM BY: mckenna roberts



CHEMICAL FEED SYSTEM LAYOUT

SCALE: 1" = 2'

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 2 4 6

SCALE: 1" = 2' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

CHEMICAL FEED SYSTEM LAYOUT

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

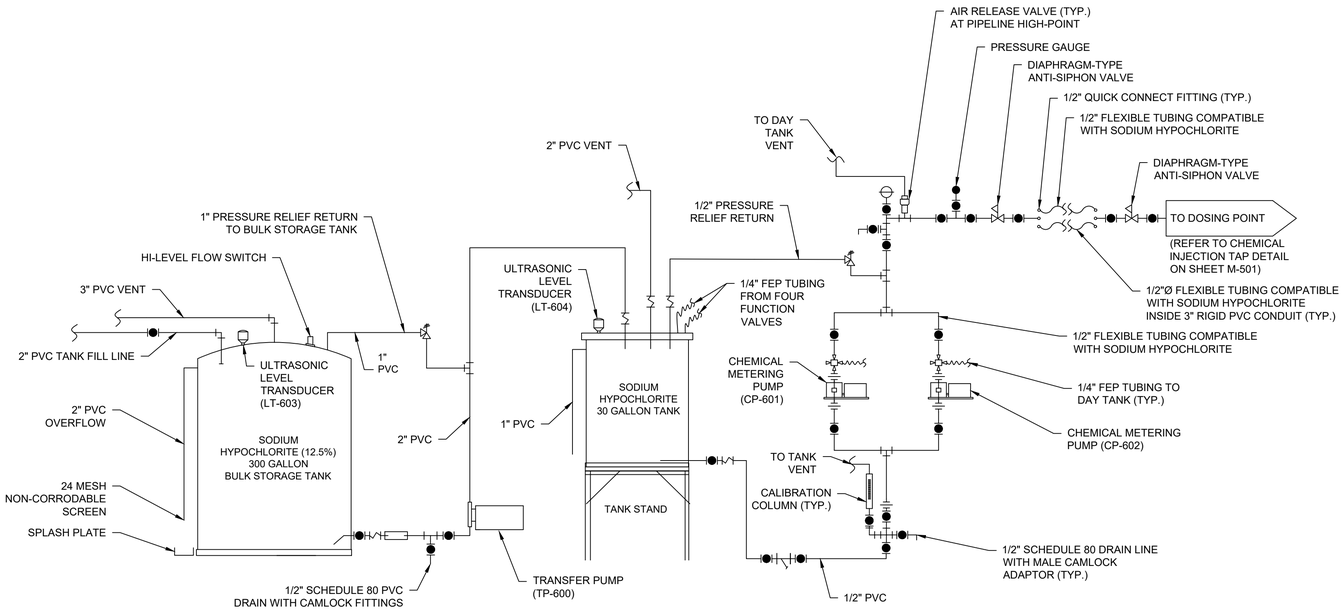
PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	AB/GAA
DRAWN BY	MPS
CHECKED BY	TB
APPROVED BY	TB

M-006

SHEET 15 of 59

CHEMICAL PROCESS SCHEMATIC LEGEND

- FOUR FUNCTION VALVE
- BACKPRESSURE VALVE
- PRESSURE RELIEF VALVE
- ULTRASONIC LEVEL TRANSDUCER
- EXPANSION JOINT
- FLEXIBLE CONNECTION
- STRAINER
- PULSATION DAMPENER
- PRESSURE GAUGE
- AIR RELEASE VALVE
- BALL VALVE
- FOOTVALVE
- ANTI-SIPHON VALVE
- SOLENOID VALVE
- CHECK VALVE
- UNION

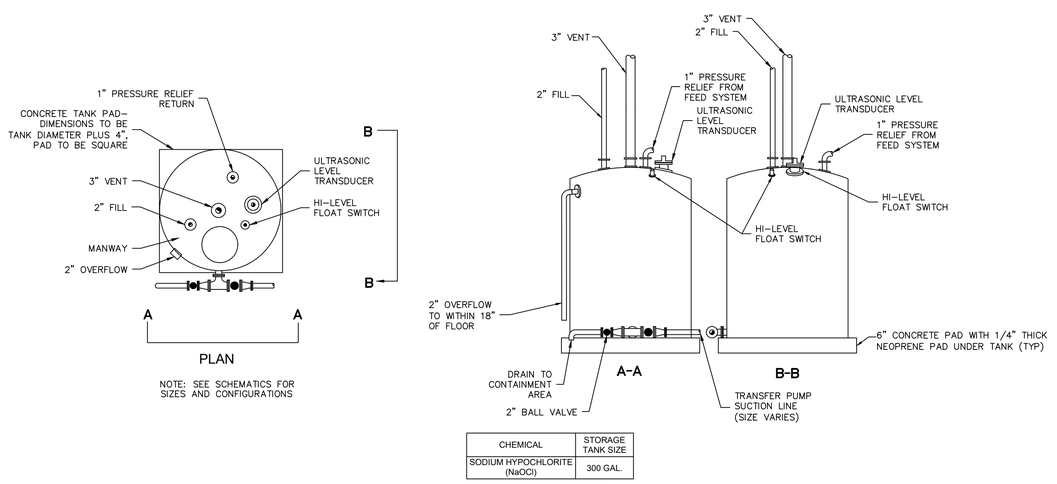


SODIUM HYPOCHLORITE CHEMICAL FEED SCHEMATIC

SCALE: NTS

NOTES:

1. FLOODED SUCTION REQUIRED.
2. VENT GAS PRIOR TO METERING PUMPS.
3. SLOPE SUCTION LINE DOWN FROM TANK TO METERING PUMP SO GAS CANNOT ENTER PUMP HEAD.
4. ALL BALL VALVES USED FOR SODIUM HYPOCHLORITE SHALL BE 1/4 TURN TRUE UNION VENTED BALL VALVES.
5. BACKPRESSURE VALVES SHALL BE INSTALLED IN SERIES PER MASSDEP GUIDELINES FOR SODIUM HYPOCHLORITE.
6. CAMLOCK FITTINGS SHALL BE FRP.
7. ALL FITTINGS AND ACCESSORIES SHALL BE TRUE UNION.
8. ¾" FLEXIBLE TUBING SHALL EXTEND AT LEAST 2' FROM START AND END OF 3" RIGID PVC CHEMICAL CONDUIT.
9. CHEMICAL METERING PUMPS SHALL INCLUDE AN INTERLOCK SYSTEM THAT IS HARD WIRED OR USE A TWIST TYPE PLUG AND RECEPTACLE WITH PILOT LIGHT "ON OR ENERGIZED" INDICATOR TO HELP PREVENT OVERFEEDS.
10. MOUNTING PANELS FOR ALL CHEMICAL FEED EQUIPMENT, INCLUDING BUT LIMITED TO PUMPS, PIPING, CALIBRATION COLUMN, SHALL BE CHEMICALLY COMPATIBLE WITH SODIUM HYPOCHLORITE.
11. SODIUM HYPOCHLORITE CHEMICAL FEED SYSTEM SHALL BE INSTALLED ACCORDING TO THE REQUIREMENTS PROVIDED IN THE MASSDEP CHEMICAL FEED SYSTEM CHECKLIST AND/OR ALL MASSDEP GUIDELINES AND REGULATIONS.
12. CONTRACTOR TO SUPPLY INITIAL 300 GALLON FILL OF SODIUM HYPOCHLORITE (12.5%) BUNK TANK PRIOR TO START-UP AND COMMISSIONING.



CHEMICAL	STORAGE TANK SIZE
SODIUM HYPOCHLORITE (NaOCl)	300 GAL.

NOTE: FOR NaOCl TANK ONLY

SODIUM HYPOCHLORITE BULK CHEMICAL STORAGE TANK DETAIL

SCALE: N.T.S.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

SODIUM HYPOCHLORITE CHEMICAL FEED SCHEMATIC

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

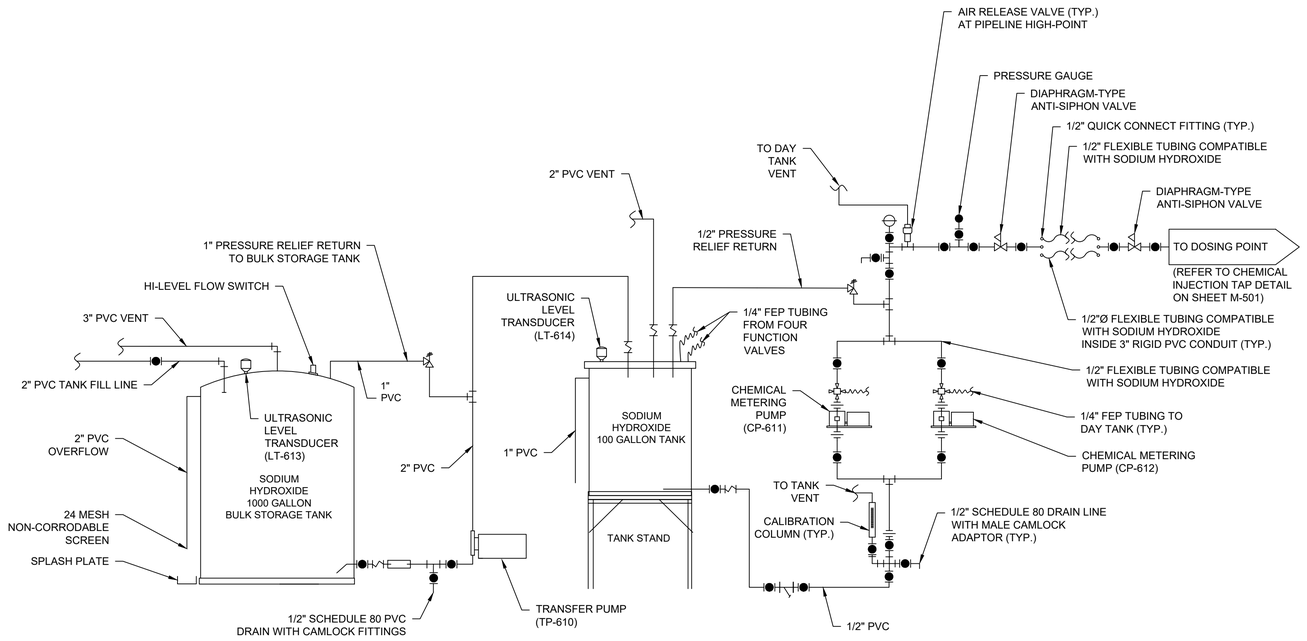
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	AB/GAA
DRAWN BY	MPS
CHECKED BY	TB
APPROVED BY	TB

M-007

SHEET 16 of 59

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\M-00X - Chem Feed_recover.dwg LAYOUT: M-009 - NaOCl PLOTTED: 10/29/2023 9:50 PM BY: mckenna roberts

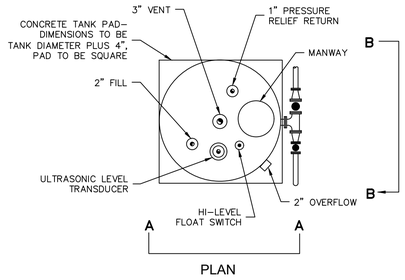


SODIUM HYDROXIDE CHEMICAL FEED SCHEMATIC

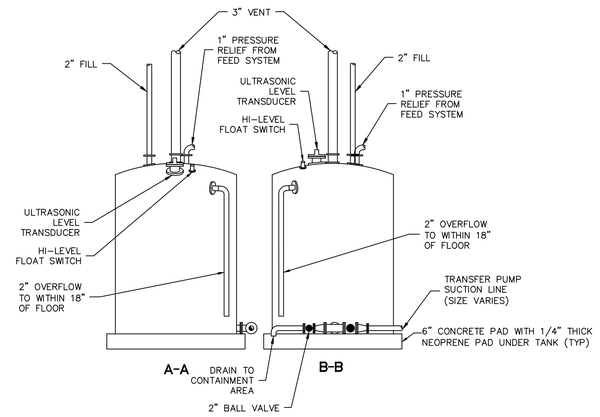
SCALE: NTS

NOTES:

1. FLOODED SUCTION REQUIRED.
2. VENT GAS PRIOR TO METERING PUMPS.
3. ELEVATION OF BOTTOM OF DAY TANKS SHOULD MATCH THE ELEVATION OF METERING PUMPS.
4. BACKPRESSURE VALVES SHALL BE INSTALLED IN SERIES PER MASSDEP GUIDELINES FOR SODIUM HYDROXIDE.
5. CAMLOCK FITTINGS SHALL BE FRP.
6. ALL FITTINGS AND ACCESSORIES SHALL BE TRUE UNION.
7. ¾" FLEXIBLE TUBING SHALL EXTEND AT LEAST 2' FROM START AND END OF 3" RIGID PVC CHEMICAL CONDUIT.
9. CHEMICAL METERING PUMPS SHALL INCLUDE AN INTERLOCK SYSTEM THAT IS HARD WIRED OR USE A TWIST TYPE PLUG AND RECEPTACLE WITH PILOT LIGHT "ON OR ENERGIZED" INDICATOR TO HELP PREVENT OVERFEEDS.
10. MOUNTING PANELS FOR ALL CHEMICAL FEED EQUIPMENT, INCLUDING BUT LIMITED TO PUMPS, PIPING, CALIBRATION COLUMN, SHALL BE CHEMICALLY COMPATIBLE WITH SODIUM HYDROXIDE.
11. SODIUM HYDROXIDE CHEMICAL FEED SYSTEM SHALL BE INSTALLED ACCORDING TO THE REQUIREMENTS PROVIDED IN THE MASSDEP CHEMICAL FEED SYSTEM CHECKLIST AND/OR ALL MASSDEP GUIDELINES AND REGULATIONS.
12. CONTRACTOR TO SUPPLY INITIAL 1000 GALLON FILL OF SODIUM HYDROXIDE BUNK TANK PRIOR TO START-UP AND COMMISSIONING.



NOTE: SEE SCHEMATICS FOR SIZES AND CONFIGURATIONS



CHEMICAL	STORAGE TANK SIZE
SODIUM HYDROXIDE (NaOH)	1000 GAL.

NOTE: FOR NaOH TANK ONLY

SODIUM HYDROXIDE BULK CHEMICAL STORAGE TANK DETAIL

SCALE: N.T.S.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

SODIUM HYDROXIDE CHEMICAL FEED SCHEMATIC

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

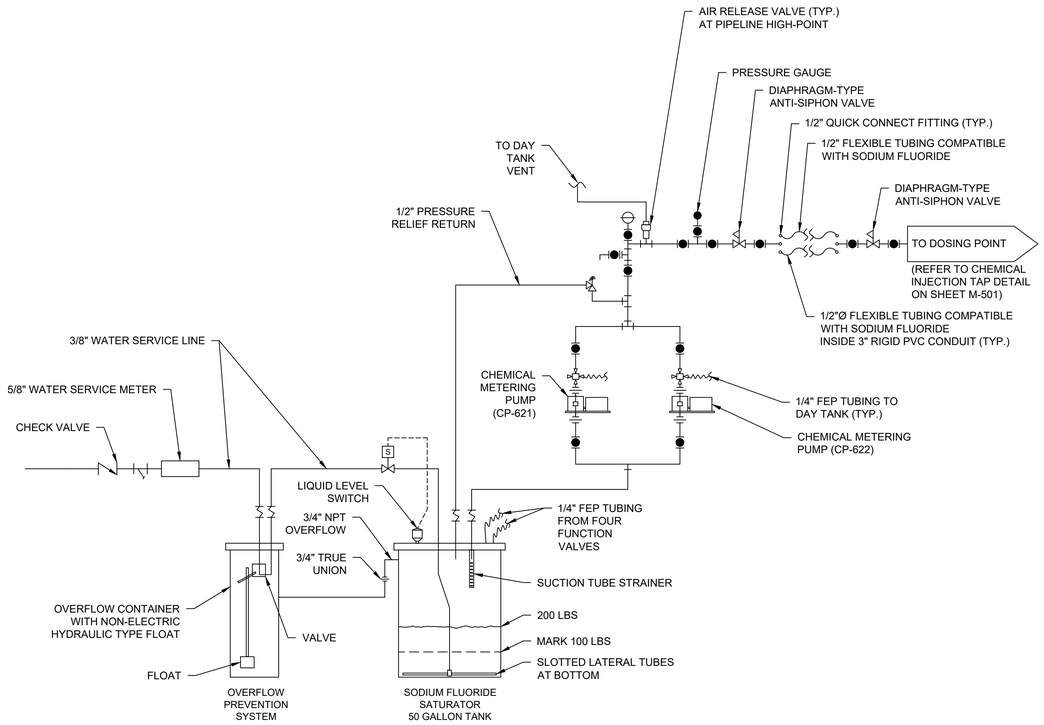
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	AB/GAA
DRAWN BY	MPS
CHECKED BY	TB
APPROVED BY	TB

M-008

SHEET 17 of 59

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\M-00X - Chem Feed_recover.dwg LAYOUT: M-010 - NaOH PLOTTED: 10/29/2023 9:50 PM BY: mckenna roberts

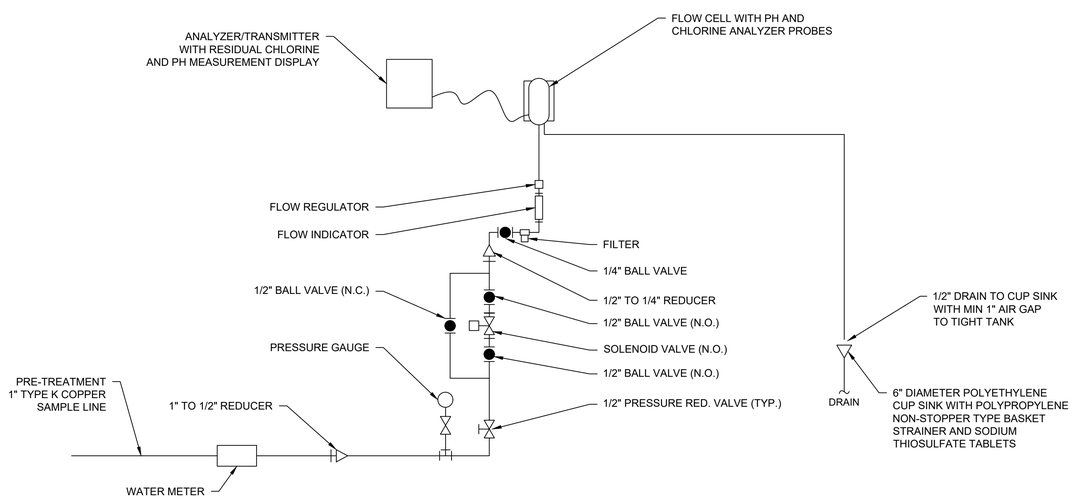


SODIUM FLUORIDE CHEMICAL FEED SCHEMATIC

SCALE: NTS

NOTES:

1. COMPLETE FLUORIDE SYSTEM SHALL BE PROVIDED BY A SINGLE MANUFACTURER.
2. FLUORIDE SUCTION LINE SHALL BE AS SHORT AS POSSIBLE AND SLOPED UPWARD.
3. CHEMICAL METERING PUMP SHALL BE MOUNTED ABOVE THE SATURATOR UNIT.
4. CAMLOCK FITTINGS SHALL BE FRP.
5. ALL FITTINGS AND ACCESSORIES SHALL BE TRUE UNION.
6. ¾" FLEXIBLE TUBING SHALL EXTEND AT LEAST 2' FROM START AND END OF 6" RIGID PVC CHEMICAL CONTAINMENT.
7. CONTRACTOR SHALL PROVIDE SPARE PARTS AVAILABLE FOR ALL FEEDERS, INCLUDING BUT NOT LIMITED TO ANTI-SIPHON VALVES, BELTS, TUBING, CORPORATION COCK, AND INJECTION NOZZLE. DUTY & SPARE CHEMICAL FEED LINES SHALL BE CONTAINED TOGETHER IN THE SAME CONTAINMENT PIPE TO EACH APPLICATION POINT.
8. MOUNTING PANELS FOR ALL CHEMICAL FEED EQUIPMENT, INCLUDING BUT LIMITED TO PUMPS, PIPING, CALIBRATION COLUMN, SHALL BE CHEMICALLY COMPATIBLE WITH SODIUM FLUORIDE.
9. SODIUM FLUORIDE CHEMICAL FEED SYSTEM SHALL BE INSTALLED ACCORDING TO THE REQUIREMENTS PROVIDED IN THE MASSDEP CHEMICAL FEED SYSTEM CHECKLIST AND/OR ALL MASSDEP GUIDELINES AND REGULATIONS.
12. CONTRACTOR TO SUPPLY INITIAL FILL OF SODIUM FLUORIDE SATURATOR CHEMICALS FOR OPERATION PRIOR TO START-UP AND COMMISSIONING.



RESIDUAL CHLORINE/PH ANALYZERS

SCALE: N.T.S.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

SODIUM FLUORIDE CHEMICAL FEED AND CHLORINE ANALYZER SCHEMATICS

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

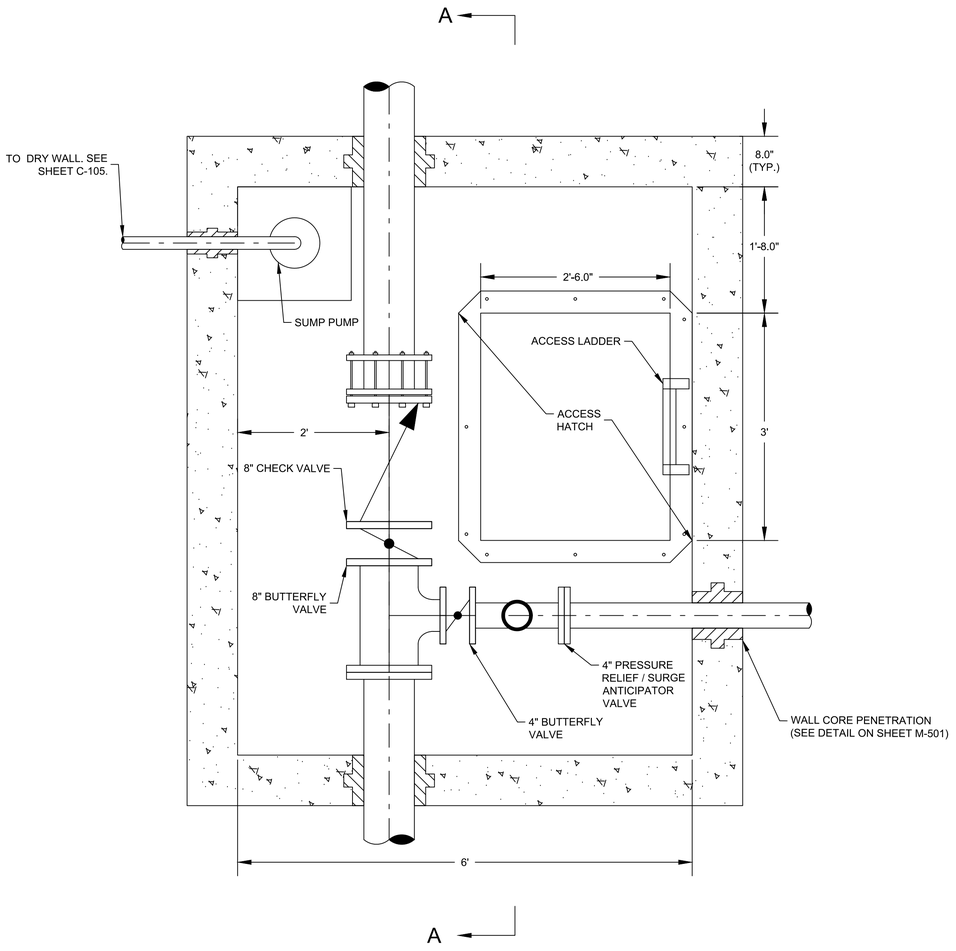
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	AB/GAA
DRAWN BY	MPS
CHECKED BY	TB
APPROVED BY	TB

M-009

SHEET 18 of 59

CAD FILE: G:\...clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\M-00X - Chem Feed_recover.dwg LAYOUT: M-011 - NaF & Chlorine Analyzer PLOTTED: 10/29/2023 9:50 PM BY: mckenna roberts

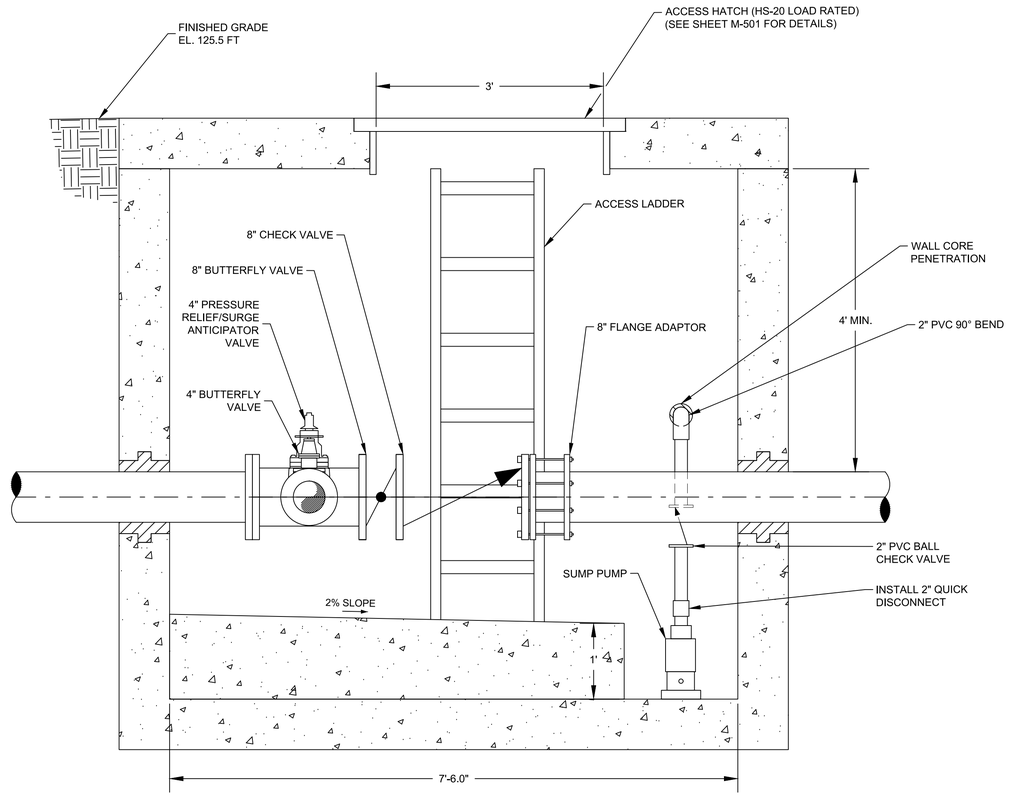


SURGE PROTECTION VAULT PLAN

SCALE: 1" = 1'

NOTES:

1. CONTRACTOR TO PROVIDE ADJUSTABLE SUPPORTS IN VAULT.



SECTION A: SURGE PROTECTION VAULT PLAN

SCALE: 1" = 1'

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 ####### ####### #######

SCALE: 1" = #######' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

SURGE PROTECTION VAULT

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

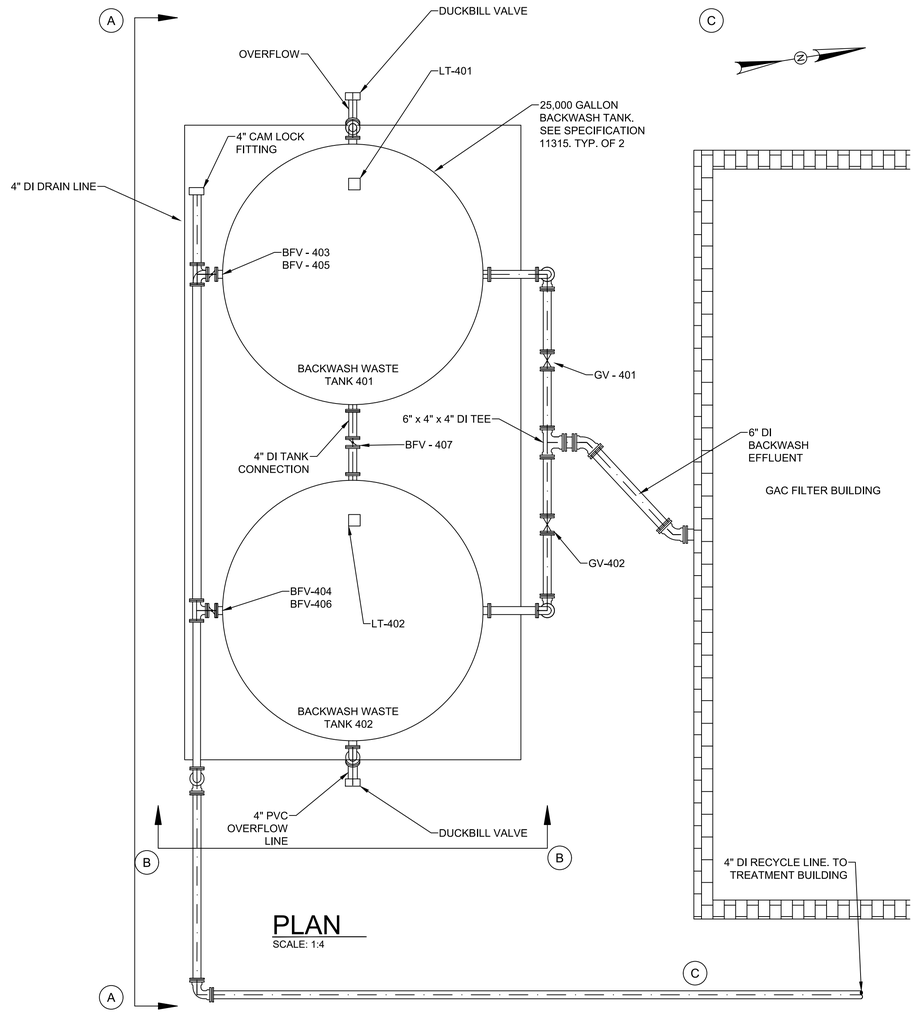
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	MD
DRAWN BY	MD
CHECKED BY	TB
APPROVED BY	TB

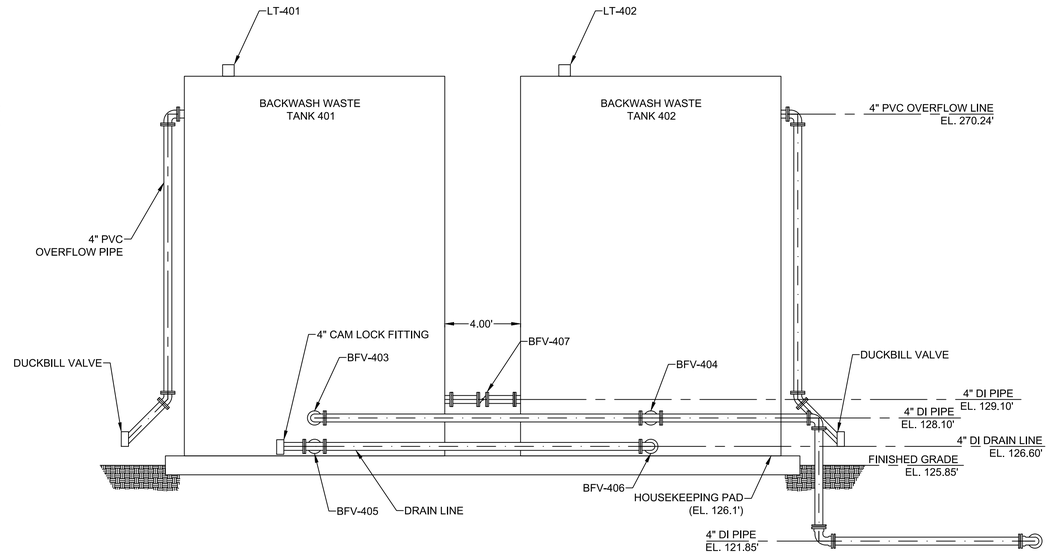
M-010

SHEET 19 of 59

CAD FILE: G:\...clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\M-012 - Surge Vault.dwg LAYOUT: M-012 - Vault PLOTTED: 10/29/2023 9:50 PM BY: mckenna roberts

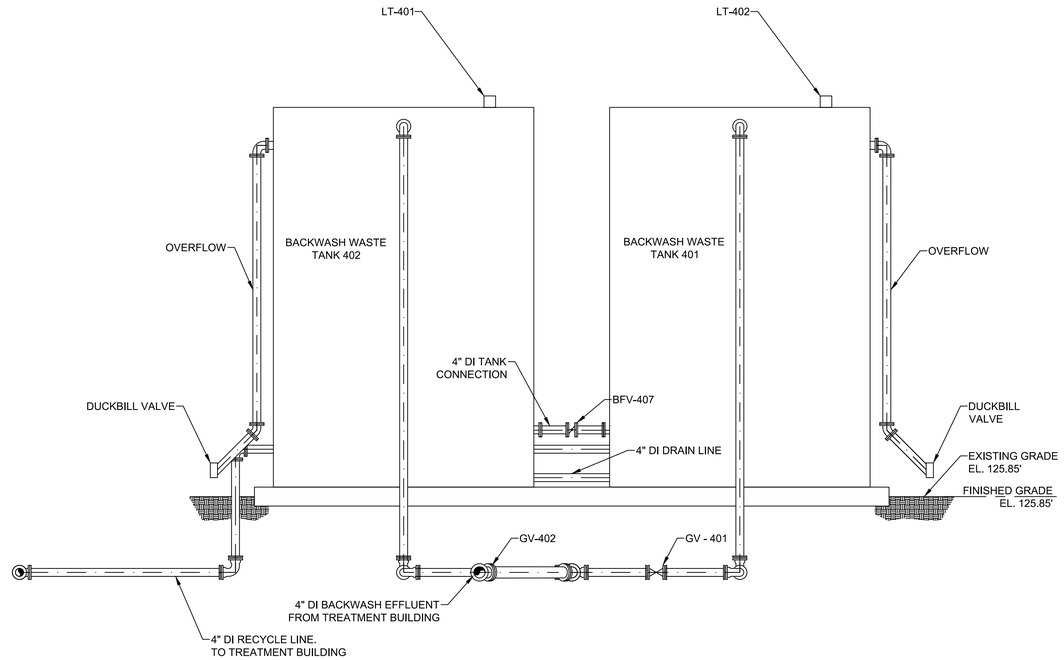


PLAN
SCALE: 1:4



A SECTION
M-011 SCALE: 1" = 4'

B SECTION
M-011 SCALE: 1" = 4'



C SECTION
M-011 SCALE: 1" = 4'

NOTES:
1. CONTRACTOR SHALL FURNISH PIPE SUPPORTS IN ACCORDANCE WITH SPECIFICATION SECTION 02615.
2. CONTRACTOR SHALL COAT PIPES IN ACCORDANCE WITH SPECIFICATION SECTION 09960.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4 8 12

SCALE: 1" = 4' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

BACKWASH TANK

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

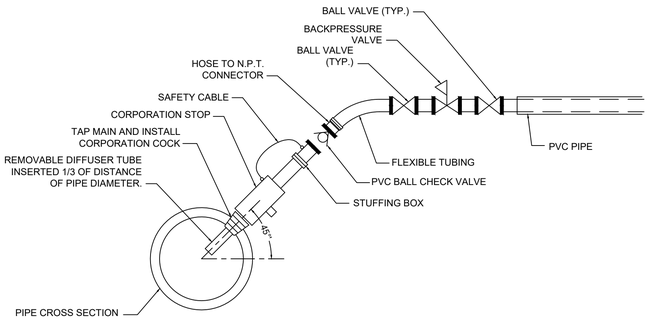
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	ABB
DRAWN BY	MR
CHECKED BY	TB
APPROVED BY	ABB

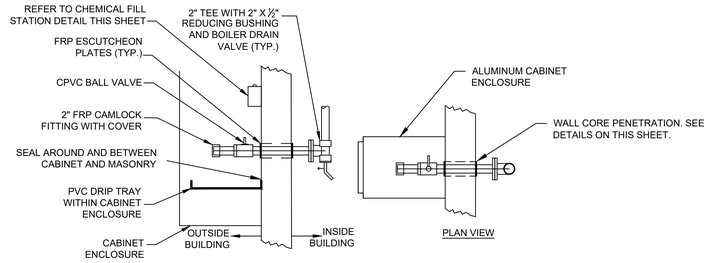
M-011

SHEET 20 of 59



CHEMICAL INJECTION TAP DETAIL

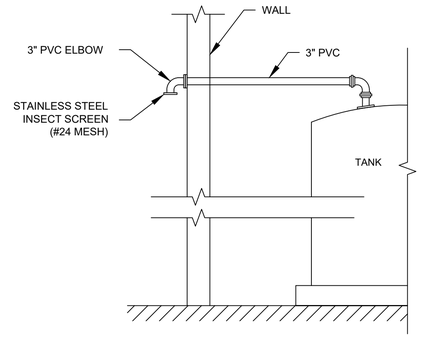
SCALE: N.T.S.



NOTES:
1. ONLY ONE FILL LINE SHALL BE INSTALLED FOR SODIUM HYPOCHLORITE AND SODIUM HYDROXIDE EACH.

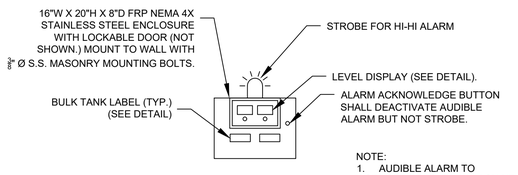
CHEMICAL FILL LINE DETAILS

SCALE: N.T.S.



CHEMICAL TANK VENT

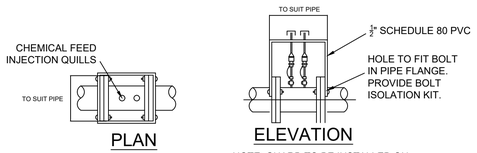
SCALE: N.T.S.



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

CHEMICAL FILL STATION DETAIL

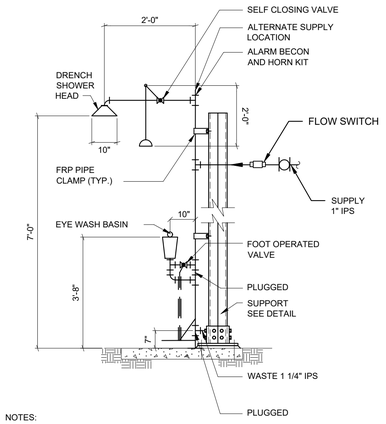
SCALE: N.T.S.



NOTE: GUARD TO BE INSTALLED ON PIPES WITHIN 5' OF FINISHED FLOOR

CHEMICAL INJECTION GUARD DETAIL

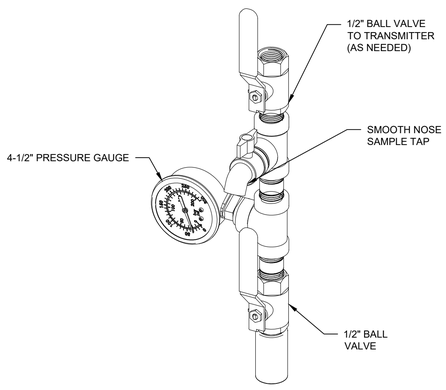
SCALE: N.T.S.



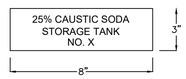
NOTES:
1. FLOOR DRAINS NOT TO BE INSTALLED IN CHEMICAL CONTAINMENT AREAS.

EMERGENCY SHOWER AND EYE WASH

SCALE: N.T.S.



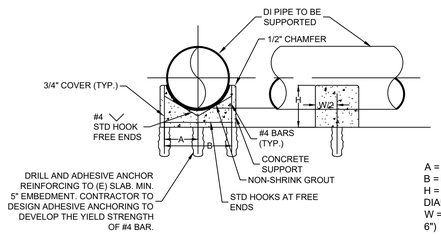
PRESSURE/SAMPLE TAP DETAIL
N.T.S.



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

BULK TANK LABEL DETAIL

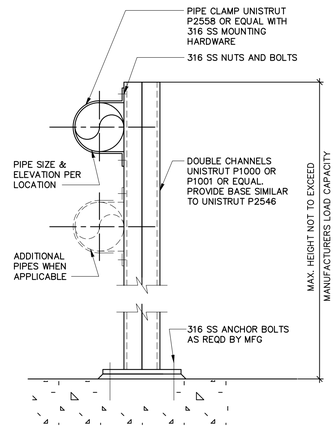
SCALE: N.T.S.



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

CONCRETE PIPE SUPPORT DETAIL

SCALE: N.T.S.



METALLIC SUPPORT

SCALE: N.T.S.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Click Here to Select Office Address

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

PROCESS DETAILS SHEET 1 OF 2

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

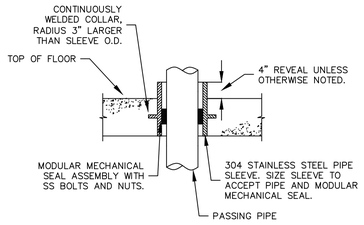
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	AB/GAA
DRAWN BY	MPS
CHECKED BY	TB
APPROVED BY	TB

M-501

SHEET 21 of 59

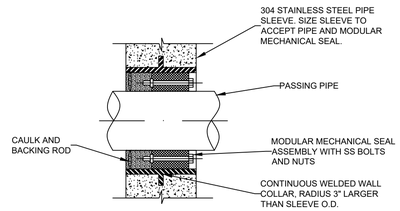
CAD FILE: G:\...clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\M-00X - Chem Feed_recover.dwg LAYOUT: M-501 - Details 1 PLOTTED: 10/29/2023 9:51 PM BY: mckenna roberts



NOTE: COAT FLOOR SLEEVE WITH SPECIFIED PAINT SYSTEM BEFORE CONCRETER PLACEMENT.

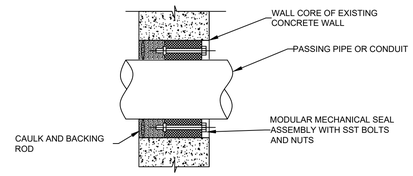
FLOOR SLEEVE DETAIL

SCALE: N.T.S.



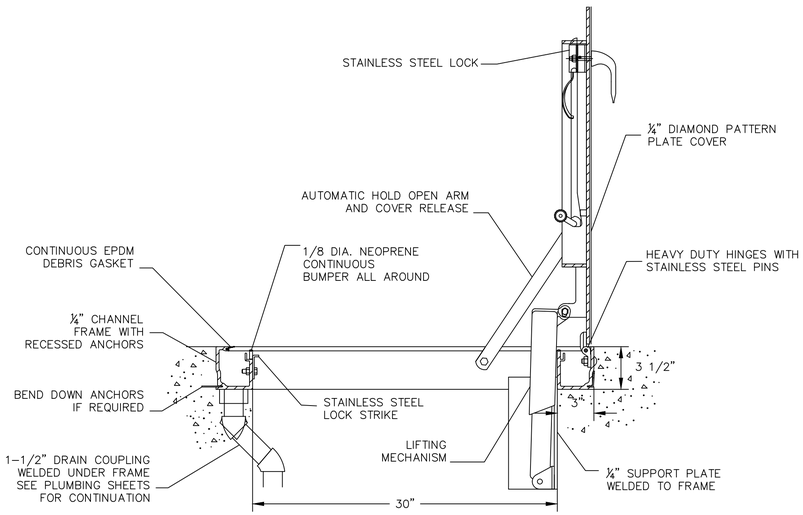
WALL SLEEVE PENETRATION SEAL DETAIL

SCALE: N.T.S.



WALL CORE PENETRATION SEAL DETAIL

SCALE: N.T.S.



NOTES:
REFER TO SPECIFICATION SECTION 03420 FOR ADDITIONAL ACCESS HATCH REQUIREMENTS.

SINGLE GRATE ACCESS HATCH

SCALE: N.T.S.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

PROCESS DETAILS SHEET 2 OF 2

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	OCT. 2023
CURRENT REVISION	-
DESIGNED BY	AB/GAA
DRAWN BY	MD
CHECKED BY	TB
APPROVED BY	TB

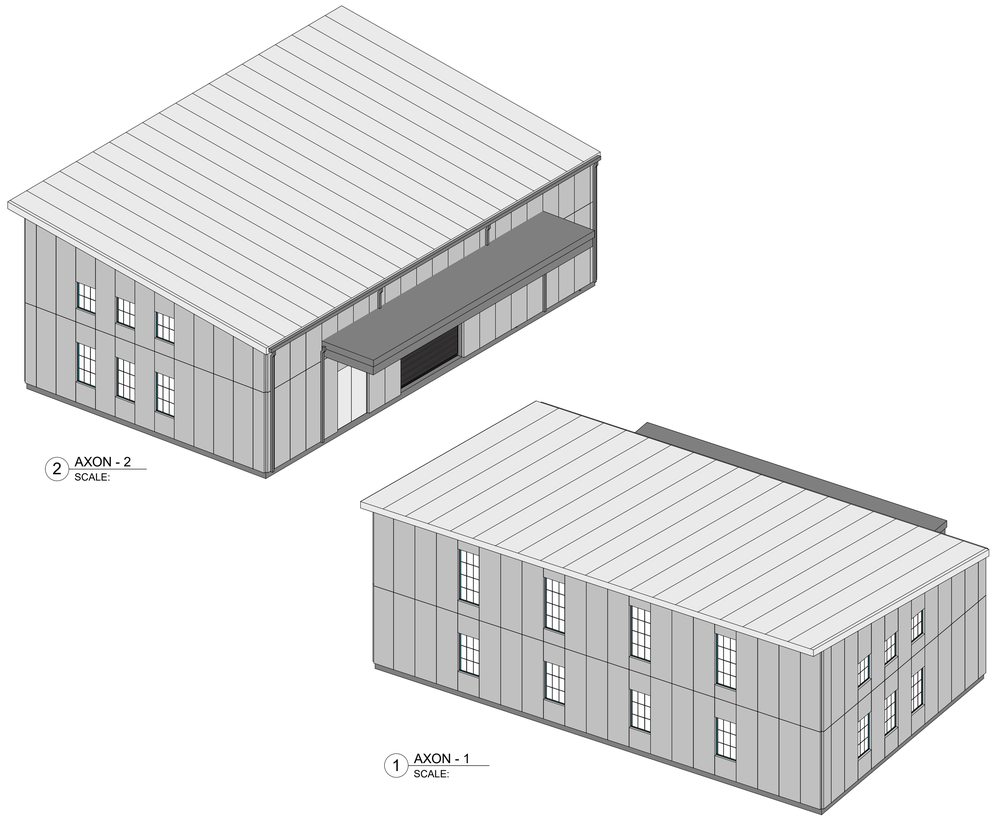
M-502

SHEET 22 of 59

CAD FILE: G:_clients\Millis MA\20233667.002A - Well 3 PFAS Final Design & Permitting\08 - Drawings\M-502 - M Details.dwg LAYOUT: M-502 - Details 2 PLOTTED: 10/29/2023 9:51 PM BY: mckenna roberts

PLOTTED: 9/26/2023 8:52:23 AM

PROJECT PREVIEW & DESCRIPTION



2 AXON - 2
SCALE:

1 AXON - 1
SCALE:

GENERAL NOTES

1. ALL WORK TO BE NEW U.O.N.
2. ALL WORK SHALL COMPLY WITH FEDERAL, STATE, AND LOCAL BUILDING REGULATIONS.
3. ANY CONFLICTS BETWEEN SITE CONDITIONS AND DRAWINGS SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE OWNER AND ARCHITECT/DESIGNER.
4. ALL DOORS TO BE A MINIMUM OF 4" FROM NEAREST PERPENDICULAR PARTITION, U.O.N.
5. TEMPERED GLASS TO BE USED IN ALL LOCATIONS AS REQUIRED BY MASSACHUSETTS STATE BUILDING CODE - CMR 780.
6. REVIEW LAYOUTS FOR PARTITIONS IN FIELD WITH THE OWNER AND ARCHITECT/DESIGNER PRIOR TO START OF CONSTRUCTION.
7. PROVIDE FIRE EXTINGUISHERS IN QUANTITIES AND LOCATIONS ON DWGS (MIN 1/6000 SQ-FT & 75' MAX TRAVEL DISTANCE). REVIEW FINAL LOCATIONS WITH THE ARCHITECT/DESIGNER PRIOR TO START OF CONSTRUCTION.
8. COORDINATE BLOCKING REQUIREMENTS AND LOCATIONS WITH ELEVATIONS AND DETAILS. ALL WOOD BLOCKING TO BE FIRE RETARDANT TREATED.
9. ALIGN CENTERLINES OF ALL WALL-MOUNTED FIRE EXTINGUISHERS AND MEP/FP DEVICES ON WALLS IN THE SAME LOCATION.
10. DISCLAIMER: MANUFACTURERS REFERENCES ARE INTENDED TO ESTABLISH COLOR AND FINISH ONLY AND ARE NOT INTENDED TO LIMIT SELECTIONS FROM OTHER MANUFACTURERS. WHEN ALTERNATE SELECTIONS ARE SUBMITTED, SUBMITTAL SHALL INCLUDE MATERIALS LISTED FOR COMPARISON.
11. DIMENSIONS:
    - A. ALL DIMENSIONS ARE TO FINISHED FACE OF WALL U.O.N.
    - B. DRAWINGS ARE NOT TO BE SCALED; VERIFY ANY MISSING OR CONFLICTING WRITTEN DIMENSIONS WITH THE ARCHITECT/ DESIGNER PRIOR TO CONSTRUCTION.
    - C. NOTIFY ARCHITECT OF CONDITIONS WHERE CLEAR OR CRITICAL DIMENSIONS ARE DESIGNATED BUT CANNOT BE MET OR WHERE CORRIDOR/AISLE WIDTH CANNOT MEET THE MINIMUM REQUIREMENTS (3'-8" U.O.N.)
    - D. MAINTAIN FINISH FLOOR BASE ELEVATION THROUGHOUT THE CONTRACT AREA SUCH THAT ALL DIMENSIONS INDICATED AS ABOVE FINISH FLOOR ARE AT THE SAME ELEVATION.

SYMBOLS LEGEND

- 0 — COLUMN GRID LINE
- ℄ — CENTER LINE
- 1 / A101 — DETAIL MARKER
- 101 — DOOR TAG
- SIM, 1 / A101 — SECTION MARKER
- Room name, 101 — ROOM IDENTIFICATION
- 1t — WALL TAG

MATERIALS LEGEND

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

ABBREVIATIONS

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

KLEINFELDER
Bright People. Right Solutions.

One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

NOT FOR CONSTRUCTION

SCALE AS NOTED

ORIGINAL DRAWING SIZE IS 22 x 34

GENERAL NOTES, LEGENDS & ABBREVIATIONS

VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES PRELIMINARY DESIGN

TOWN OF MILLIS
DPW ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT 2023
CURRENT REVISION	
DESIGNED BY	KL, PM
DRAWN BY	PM
CHECKED BY	DS
APPROVED BY	DS

A-1

PRELIMINARY CODE SUMMARY

GAC BUILDING
(NEW CONSTRUCTION)

OVERALL GROSS BUILDING AREA	OVERALL BUILDING VOLUME
2,944 GSF	85,230 CF

SECTION NO.	DESCRIPTION	
2015 INTERNATIONAL BUILDING CODE (780 CMR 9TH EDITION)		
CHAPTER 1	FIRE PREVENTION M.G.L. c. 148 26G - CERTAIN NON RESIDENTIAL STRUCTURES THAT EXCEED 7,500 S.F.	COMPLIES - DOES NOT EXCEED 7,500 S.F.
CHAPTER 3	USE AND OCCUPANCY SECTION 302 CLASSIFICATION	H-3 - PRESENCE OF SODIUM HYPOCHLORITE, SODIUM HYDROXIDE, SODIUM FLOURIDE, - SODIUM HYDROXIDE BEING UNSTABLE (REACTIVE) MATERIAL.
CHAPTER 4		AUTOMATIC FIRE DETECTION SYSTEM EMERGENCY ALARMS
CHAPTER 5	CONSTRUCTION TYPE: II-B NOT-SPRINKLERED (NS) TABLE 504.3 - ALLOWABLE BUILDING HEIGHT IN FEET ABOVE GROUND PLANE 55 FT ACTUAL BUILDING HEIGHT IN FEET ABOVE GROUND PLANE 34.5 FT TABLE 504.4 - ALLOWABLE NUMBER OF STORIES ABOVE GROUND PLANE 2 ACTUAL NUMBER OF STORIES ABOVE GROUND PLANE 1 TABLE 506.2 - ALLOWABLE AREA FACTOR IN SQ FT 15,500 SF ACTUAL ALLOWABLE AREA FACTOR 2,944 SF	TYPE II-B
CHAPTER 6	TABLE 601 - FIRE RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HRS) CONSTRUCTION TYPE II-B: PRIMARY STRUCTURALLY FRAME BEARING WALLS 0 HRS EXTERIOR INTERIOR 0 HRS NON-BEARING WALLS AND PARTITIONS 0 HRS EXTERIOR INTERIOR 0 HRS FLOOR CONSTRUCTION AND SECONDARY MEMBERS 0 HRS ROOF CONSTRUCTION AND SECONDARY MEMBERS 0 HRS	TYPE II-B
CHAPTER 9	F 903.2.5.1 GENERAL AN AUTOMATIC SPRINKLER SYSTEM SHALL BE INSTALLED IN GROUP H OCCUPANCIES	AUTOMATIC SPRINKLER SYSTEM
CHAPTER 10	TABLE 1004.1.2 INDUSTRIAL AREAS = 100 GROSS OCCUPANT LOAD FACTOR 1004.1.1 CUMULATIVE OCCUPANT LOAD GAC FLOOR 2944/100 = 29.4 (~30) TOTAL CALCULATED LOAD = 30 ACTUAL OCCUPANT LOAD TABLE 1006.2.1 SPACES WITH ONE EXIT - F OCCUPANCY = MAX 49 OCCUPANTS, 75 FT TRAVEL DISTANCE GAC FLOOR.....75 FT TABLE 106.3.1 MIN. NUMBER OF EXITS PER STORY WITH 1 - 500 OCCUPANTS = 1 EXIT	

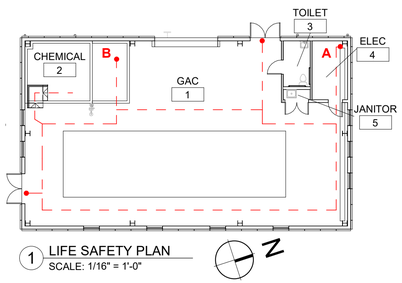
2018 INTERNATIONAL ENERGY CONSERVATION CODE (2020 MEC)			
CHAPTER 4			COMPLIANCE FOR NEW CONSTRUCTION
COMMERCIAL ENERGY EFFICIENCY	TABLE C402.1.3 METAL BUILDING ROOFS WALLS ABOVE GRADE WALLS BELOW GRADE FLOORS (MASS) FLOORS (UNHEATED SLAB) OPAQUE DOORS (NON-SWINGING)	 R-30 CI R-13 + R-13 CI R-7.5 CI R-10 CI R-10 (24" BELOW) R-4.75	
	TABLE C402.1.4 OPAQUE DOORS (SWINGING) GARAGE DOOR <14% GLAZING	 U-0.37 U-0.31	
	C402.3 ROOFTOP SOLAR READINESS		
521 CMR ARCHITECTURAL ACCESS BOARD			
CHAPTER 2	PURPOSE PUBLIC BUILDINGS		

CHEMICAL STORED ON SITE:

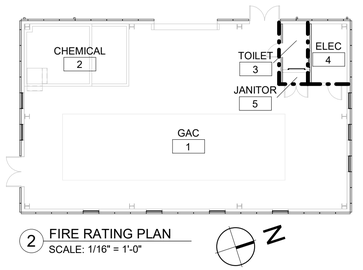
	BULK/DAY	VOLUME (GAL)	DIAMETER (IN)	HEIGHT (IN)
SODIUM HYPOCHLORITE	BULK	300	35	78
SODIUM HYPOCHLORITE	DAY	20	16	28
SODIUM HYPOCHLORITE	BULK	1000	64	80
SODIUM HYPOCHLORITE	DAY	100	28	43
SODIUM HYPOCHLORITE	SATURATOR - LARGE	50	18	53
SODIUM HYPOCHLORITE	SATURATOR - SMALL	5	11	13

APPLICABLE CODES STANDARDS AND REGULATIONS

BUILDING	2021 INTERNATIONAL BUILDING CODE (IBC) 780 CMR - MASSACHUSETTS STATE BUILDING CODE 9TH EDITION, WHICH IS AN AMENDED VERSION OF THE 2015 IBC
FIRE PROTECTION	527 CMR - BOARD OF FIRE PREVENTION REGULATIONS, WHICH IS AN AMMENDED VERSION OF NFPA 1 (FIRE CODE) 2015
PLUMBING	248 CMR - BOARD OF STATE EXAMINERS OF PLUMBERS AND GAS FITTERS
ELECTRICAL	527 CMR 12.00 MASSACHUSSETS ELECTRICAL CODE, WHICH IS AN AMENDED VERSION OF THE 2020 EDITION OF NFPA 70, NATIONAL ELECTRICAL CODE
MECHANICAL	2015 INTERNATIONAL MECHANICAL CODE (IMC) 271 CMR SHALL APPLY TO ALL SHEET METAL WORK
ENERGY	780 CMR 13.00 - ENERGY EFFICIENCY, WHICH AMENDS THE 2018 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
ACCESSIBLITY	521 CMR - ARCHITECTURAL ACCESS BOARD (AAB) RULES & REGULATIONS
OTHER	VARIOUS NATIONAL FIRE PROTECTION AGENCY (NFPA) CODES AND STANDARDS AS REFERENCED BY THE CODES LISTED ABOVE



1 LIFE SAFETY PLAN
SCALE: 1/16" = 1'-0"



2 FIRE RATING PLAN
SCALE: 1/16" = 1'-0"

LEGEND

1 HOUR FIRE RATED PARTITION.

PLOTTED: 9/26/2023 8:52:23 AM

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

NOT FOR CONSTRUCTION

NOT TO SCALE

ORIGINAL DRAWING SIZE IS 22 x 34

CODE SUMMARY & LIFE SAFETY PLAN

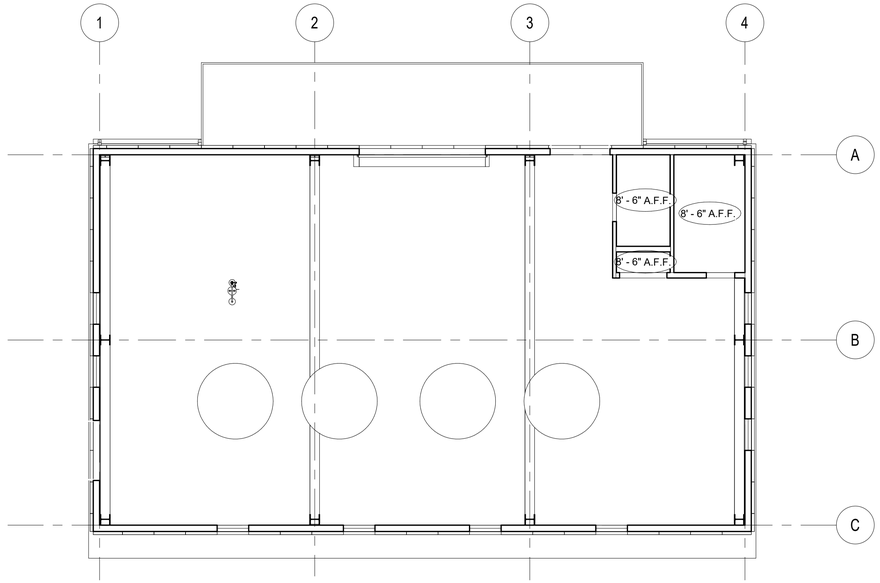
VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES PRELIMINARY DESIGN

TOWN OF MILLIS
DPW ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

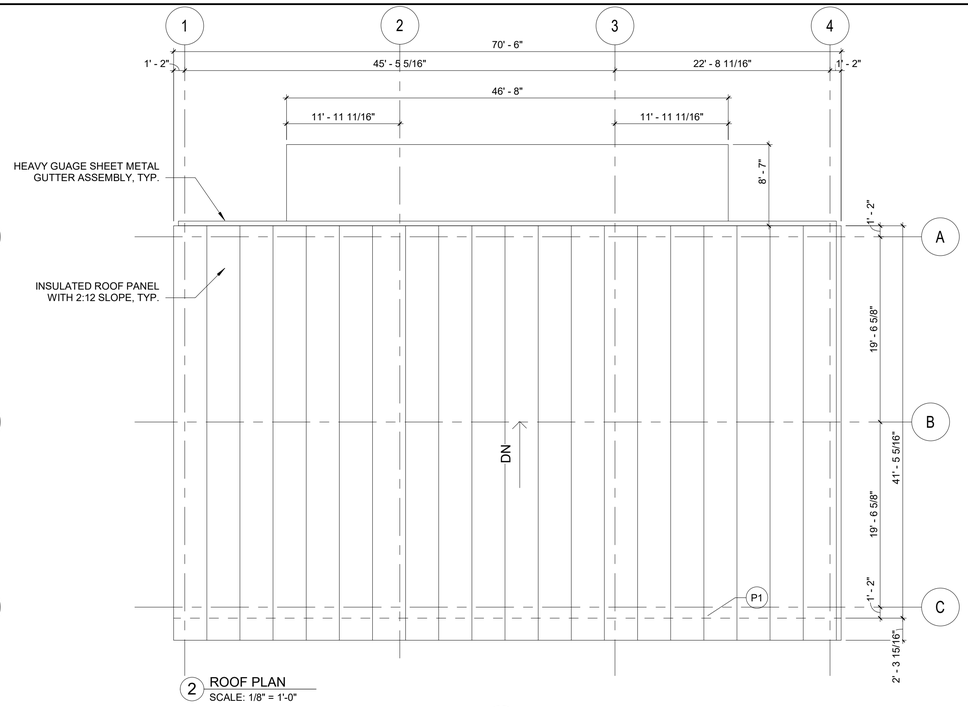
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT 2023
CURRENT REVISION	
DESIGNED BY	KL, PM
DRAWN BY	PM
CHECKED BY	DS
APPROVED BY	DS

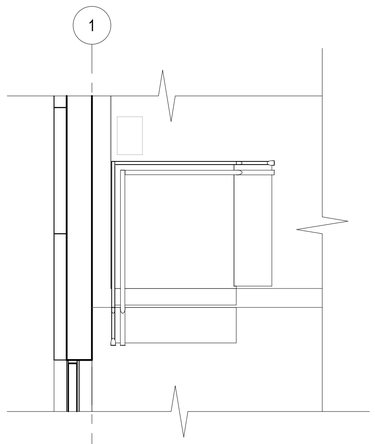
A-2



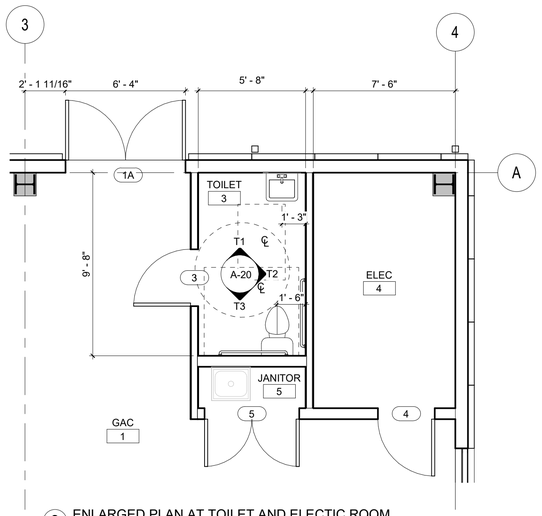
5 REFLECTED CEILING PLAN
SCALE: 1/8" = 1'-0"



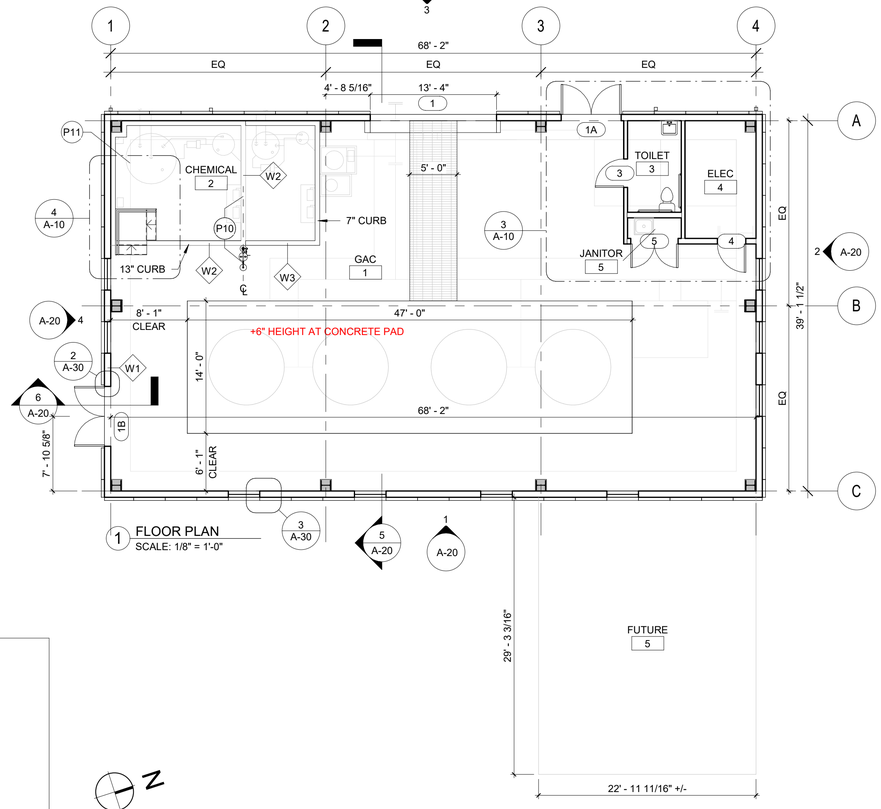
2 ROOF PLAN
SCALE: 1/8" = 1'-0"



4 ENLARGED PLAN - STAIRS
SCALE: 1/2" = 1'-0"



3 ENLARGED PLAN AT TOILET AND ELECTIC ROOM
SCALE: 1/4" = 1'-0"



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

PLAN KEYNOTES

P1	OUTER FACE OF EXTERIOR WALL BELOW.
P10	ALIGN.
P11	EQUIPMENT LAYOUT IS APPROXIMATE. SEE MECHANICAL. TYP.

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

NOT FOR CONSTRUCTION

8' 4' 0' 8' 16'
SCALE : 1/8" = 1'-0"
ORIGINAL DRAWING SIZE IS 22 x 34

ARCH PLANS

VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES PRELIMINARY DESIGN

TOWN OF MILLIS
DPW ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

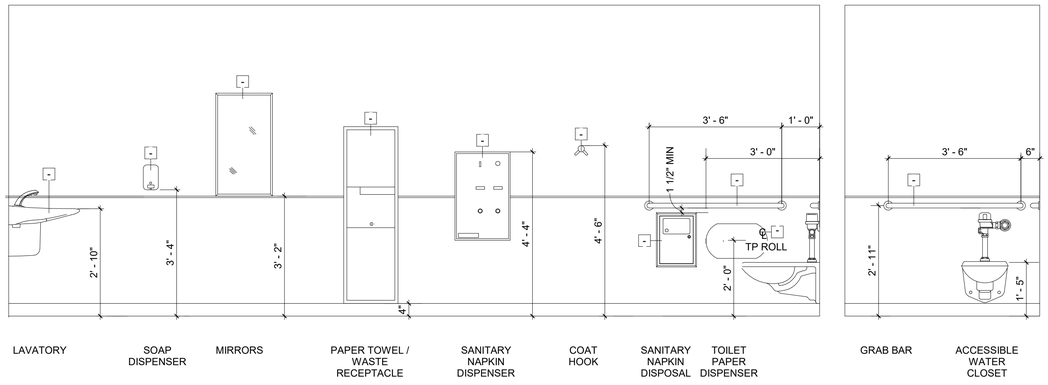
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT 2023
CURRENT REVISION	
DESIGNED BY	KL, PM
DRAWN BY	PM
CHECKED BY	DS
APPROVED BY	DS

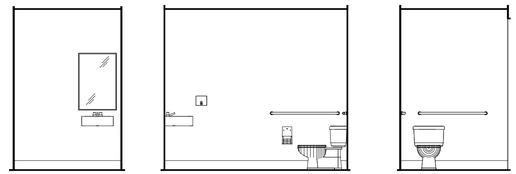
A-10

SHEET 25 of 59

PLOTTED: 9/28/2023 8:52:24 AM



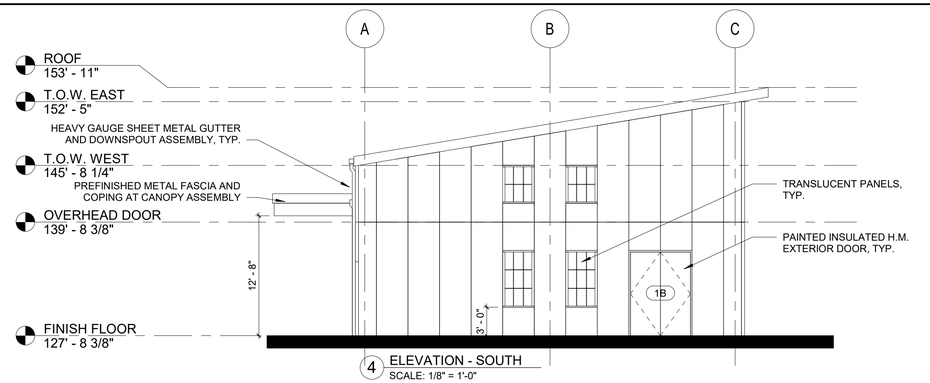
7 FIXTURE MOUNTING HEIGHT TYP
SCALE: 1/2" = 1'-0"



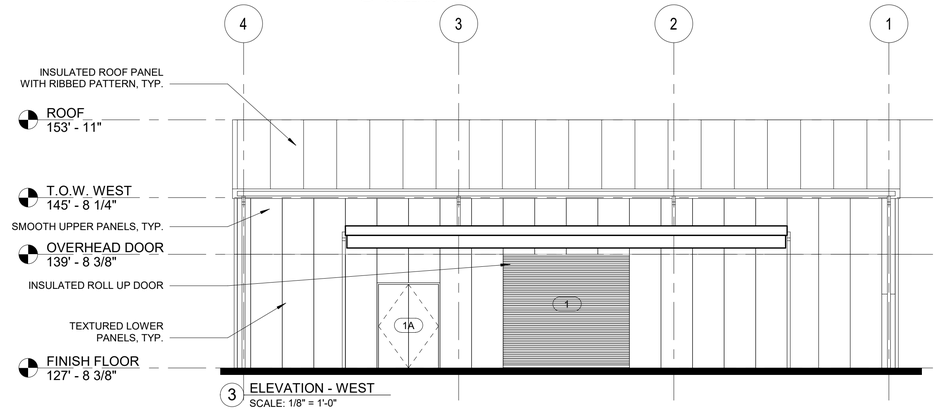
T1 TOILET - 1
SCALE: 1/4" = 1'-0"

T2 TOILET - 2
SCALE: 1/4" = 1'-0"

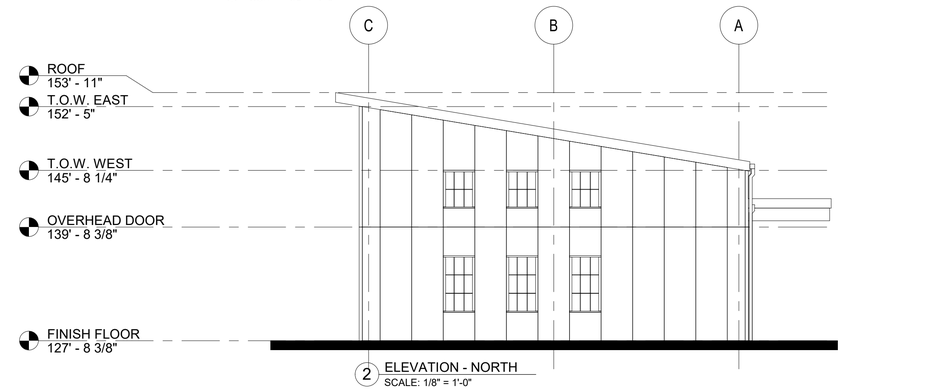
T3 TOILET - 3
SCALE: 1/4" = 1'-0"



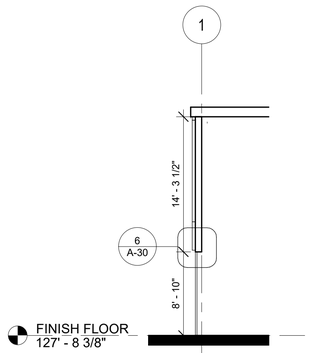
4 ELEVATION - SOUTH
SCALE: 1/8" = 1'-0"



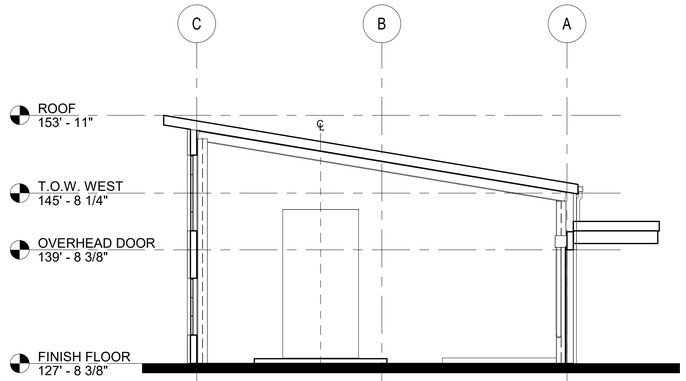
3 ELEVATION - WEST
SCALE: 1/8" = 1'-0"



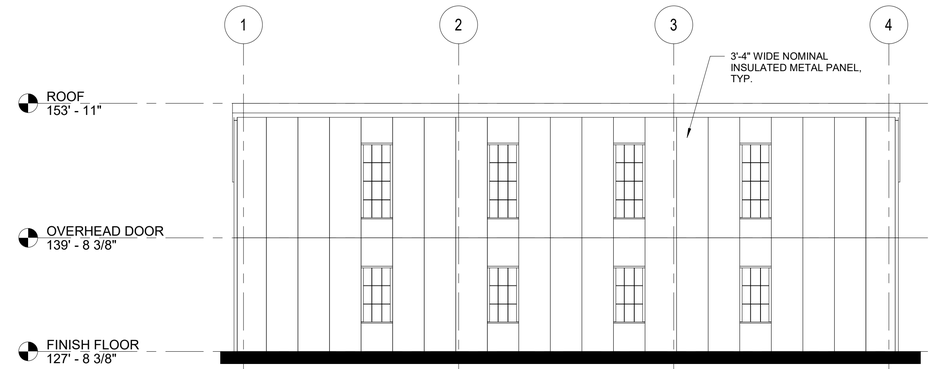
2 ELEVATION - NORTH
SCALE: 1/8" = 1'-0"



6 WALL SECTION AT DOOR
SCALE: 1/8" = 1'-0"



5 BUILDING SECTION 1
SCALE: 1/8" = 1'-0"



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

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

NOT FOR CONSTRUCTION

8' 4' 0' 8' 16'
SCALE : 1/8" = 1'-0"
ORIGINAL DRAWING SIZE IS 22 x 34

ARCH ELEVATIONS AND SECTIONS

VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES PRELIMINARY DESIGN

TOWN OF MILLIS
DPW ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

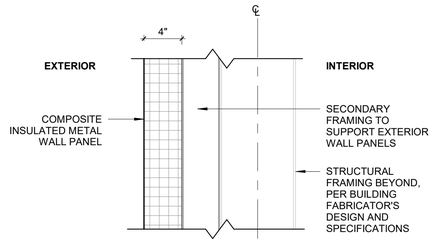
PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT 2023
CURRENT REVISION	
DESIGNED BY	KL, PM
DRAWN BY	PM
CHECKED BY	DS
APPROVED BY	DS

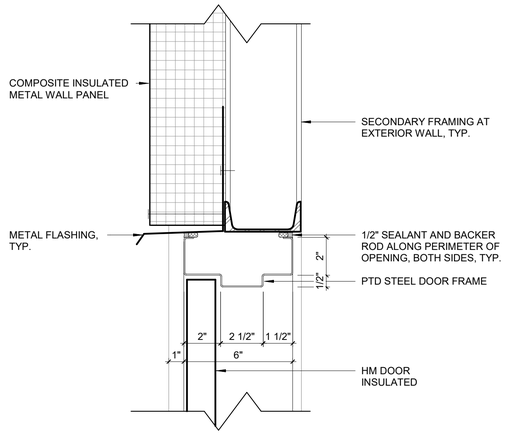
A-20

SHEET 26 of 59

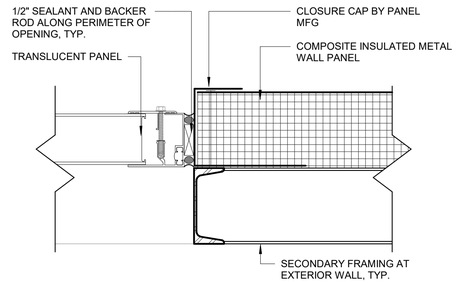
PLOTTED: 9/26/2023 8:52:25 AM



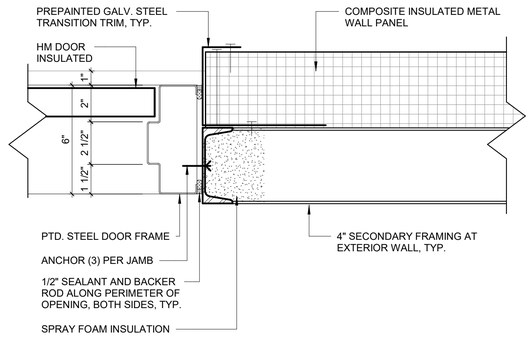
8 WALL TYPE 1 - EXTERIOR WALL
SCALE: 1 1/2" = 1'-0"



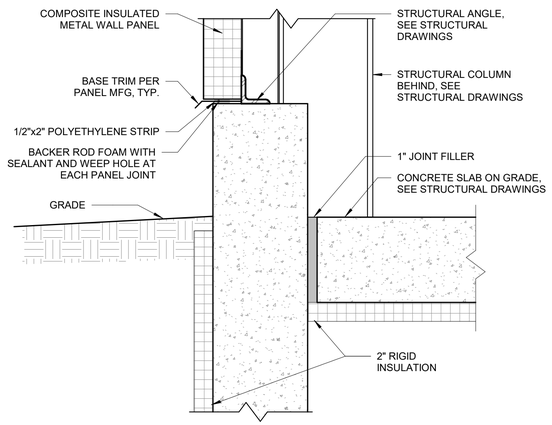
6 DOOR HEAD DETAIL
SCALE: 3" = 1'-0"



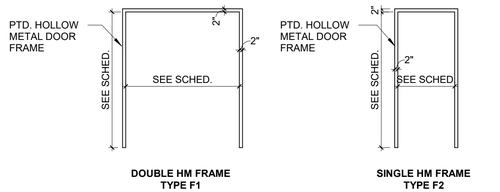
3 TRANSLUCENT PANEL JAMB DETAIL
SCALE: 3" = 1'-0"



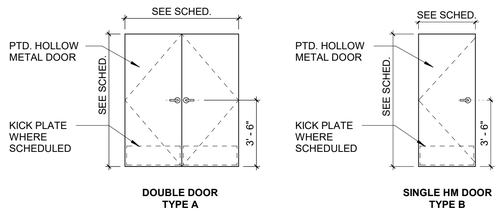
2 DOOR JAMB DETAIL (HIGH WALL)
SCALE: 3" = 1'-0"



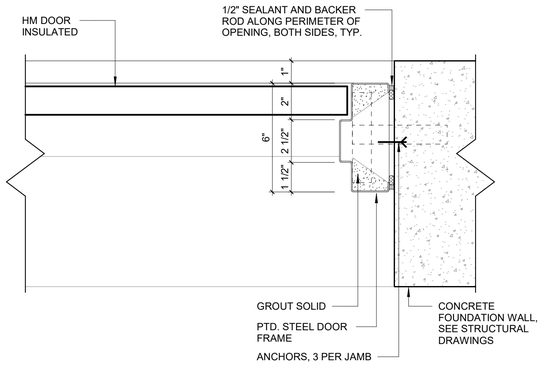
7 EXTERIOR DETAIL
SCALE: 1 1/2" = 1'-0"



5 FRAME TYPES
SCALE: 1/4" = 1'-0"



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



1 DOOR JAMB DETAIL (LOW WALL)
SCALE: 3" = 1'-0"

PLOTTED: 9/28/2023 8:52:25 AM

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

NOT FOR CONSTRUCTION

ORIGINAL DRAWING SIZE IS 22 x 34

SCHEDULES AND DETAILS

VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES PRELIMINARY DESIGN

TOWN OF MILLIS
DPW ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT 2023
CURRENT REVISION	
DESIGNED BY	KL, PM
DRAWN BY	PM
CHECKED BY	DS
APPROVED BY	DS

A-30

A. GENERAL NOTES

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

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

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

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

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

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

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

8. STRUCTURAL REQUIREMENTS TO SECURE FIXED EQUIPMENT, INCLUDING BUT NOT LIMITED TO ROOF TOP UNITS, EQUIPMENT AND EMBEDMENTS, ARE INCIDENTAL TO THE REQUIREMENTS OF A SPECIFIC EQUIPMENT MANUFACTURER. ALL WORK MUST CONFORM TO APPROVED EQUIPMENT MANUFACTURER'S SHOP DRAWINGS AND INSTALLATION INSTRUCTIONS. THE CONTRACTOR MUST SUBMIT TO THE ENGINEER FOR REVIEW AND APPROVAL ANY REQUIRED MODIFICATIONS TO ACCOMMODATE APPROVED EQUIPMENT. SUCH MODIFICATIONS MUST BE MADE AT NO COST TO THE OWNER.

B. PROTECTION OF EXISTING STRUCTURES NOTES

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

C. DESIGN CRITERIA NOTES

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

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

3. LIVE LOAD:

INTERIOR SLABS	250 PSF
LIGHT STORAGE	125 PSF
HEAVY STORAGE	250 PSF
FLOOR PLATES AND GRADING	100 PSF

4. ROOF LIVE LOAD:
MAINTENANCE: 20PSF

5. SNOW LOAD:

GROUND SNOW	P_g = 40 PSF
FLAT-ROOF SNOW	P_f = 35 PSF
EXPOSURE FACTOR	C_e = 1.0
THERMAL FACTOR	C_t = 1.0
IMPORTANCE FACTOR	I_s = 1.0
SLOPE FACTOR	C_s = 1.0
DRIFT SURCHARGE	P_d = 42 PSF
DRIFT WIDTH	W = 8.8 FT

6. WIND LOAD:

RISK CATEGORY	II
ULTIMATE WIND SPEED	V_{ULT} = 139 MPA
NOMINAL WIND SPEED	V_{asd} = 108 MPH
EXPOSURE CATEGORY	C
DIRECTIONALITY FACTOR	K_d = 0.85
GUST EFFECT FACTOR	G = 0.85
TOPOGRAPHIC FACTOR	K_{zt} = 1.0
INTERNAL PRESSURE COEFFICIENT	GC_{pi} = 0.55

7. SEISMIC LOAD:

RISK CATEGORY	II
IMPORTANCE FACTOR	I_e = 1.0
SITE CLASSIFICATION	E
SEISMIC DESIGN CATEGORY	C
RESPONSE MODIFICATION FACTOR	R = 3
DESIGN SPECTRAL RESPONSES	S_s = 0.189 S_1 = 0.065 S_{DS} = 0.314 S_{D1} = 0.152
SEISMIC FORCE RESISTING SYSTEM	SYSTEM NOT SPECIFICALLY DETAILED FOR SEISMIC RESISTANCE
SEISMIC FORCE RESISTING SYSTEM	CS = 0.104
ANALYSIS PROCEDURE	EQUIVALENT LATERAL FORCE

8. GEOTECHNICAL:
GEOTECHNICAL INVESTIGATION ON GOING.

REFERENCED SOIL PROPERTIES FROM GEOTECHNICAL REPORT ARE AS FOLLOWS:

APPROXIMATE GROUND WATER ELEVATION BELOW GRADE	
SOIL BEARING CAPACITY (ALLOWABLE)	4,000 PSF
COEFFICIENT OF FRICTION	0.45
SUBGRADE MODULUS	250 PCI

9. FLOOD:

DESIGN CLASS	
LOWEST FLOOR ELEVATION	
DRY FLOODPROOFED ELEVATION	

10. RAIN:
INTENSITY ..... i = 2.71 INCHES PER HR

D. BUILDING ERECTION NOTES

1. THE CONTRACTOR SHALL PROVIDE, FURNISH, AND ERECT BUILDING INCLUDING ALL STRUCTURAL SUPPORTS (PRIMARY AND SECONDARY), ROOFING AND SIDING MATERIALS, DOORS, AND DOOR OPERATIONG EQUIPMENT.

E. CAST-IN-PLACE CONCRETE NOTES

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

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

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

4. NO ALUMINUM EMBEDMENT IN THE CONCRETE IS PERMITTED.

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

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

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

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

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

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

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

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

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

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

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

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

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

17. AIR-ENTRAIN ALL CONCRETE.

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

19. ALL CONCRETE MUST BE NOMINAL WEIGHT AND HAVE THE FOLLOWING MINIMUM STRENGTH UNLESS NOTED OTHERWISE:
a. LEAN CONCRETE FOR FILL_1000 PSI @ 28 DAYS
b. SPREAD FOOTING AND FOUNDATION WALLS_5000 PSI @ 28 DAYS
c. SLAB-ON-GRADE_5000 PSI @ 28 DAYS
d. HOUSEKEEPING PADS_5000 PSI @ 28 DAYS
e. LIQUID CONTAINMENT STRUCTURES_5000 PSI @ 28 DAYS

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

F. POST-INSTALLED ANCHORS

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

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

G. CAST-IN-PLACE ANCHOR BOLTS & EMBEDMENTS

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

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

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

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

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

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

NOT FOR CONSTRUCTION

REVISIONS

REV	DESCRIPTION	DSN	CHK	DATE
		DWN	APP	

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

GENERAL NOTES SHEET 1 OF 2

VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES PRELIMANARY DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	
DESIGNED BY	DF
DRAWN BY	JFC
CHECKED BY	KM
APPROVED BY	DF

S-101

SHEET 28 of 59

STRUCTURAL ABBREVIATIONS

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

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

NOT FOR CONSTRUCTION

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

GENERAL NOTES SHEET 2 OF 2

VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES PRELIMANARY DESIGN

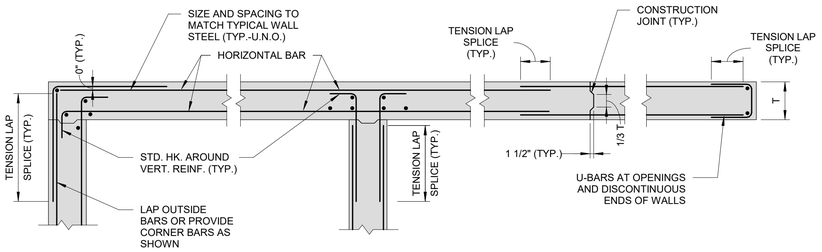
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	
DESIGNED BY	DF
DRAWN BY	JFC
CHECKED BY	KM
APPROVED BY	DF

S-102

SHEET 29 of 59

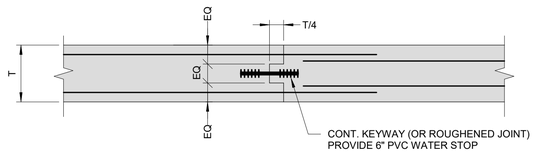


AT CORNERS AT INTERSECTIONS AT END

NOTE: ALL SPLICES TO BE CLASS "B" UNLESS NOTED OTHERWISE.

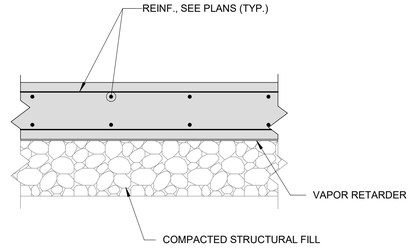
TYPICAL FOUNDATION WALL CONSTRUCTION JOINT AND HORIZONTAL REINFORCING DETAILS

SCALE: N.T.S.



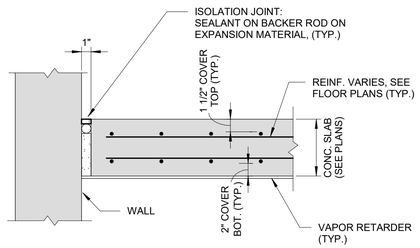
TYPICAL CAST-IN-PLACE WALL AND SLAB FOOTING CONSTRUCTION JOINT DETAIL

SCALE: N.T.S.



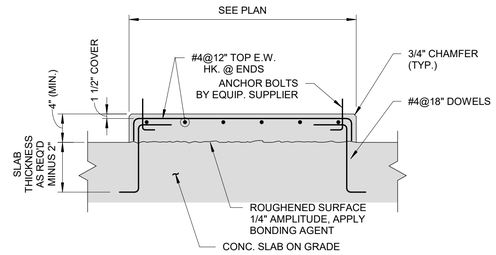
TYPICAL SLAB-ON-GRADE DETAIL (U.N.O.)

SCALE: N.T.S.



TYPICAL SLAB-ON-GRADE EXPANSION JOINT DETAIL

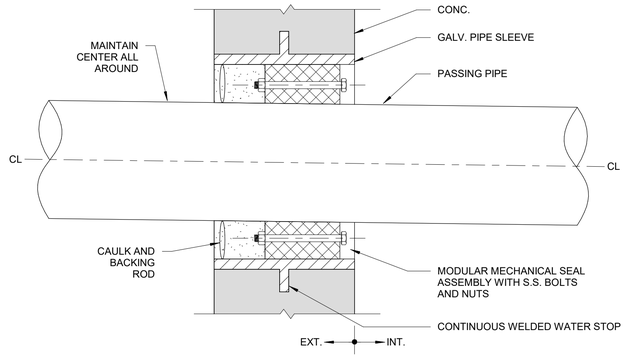
SCALE: N.T.S..



NOTE: SEE MECH., ELEC., PLUMBING AND ARCH. DWGS. FOR LOCATIONS.

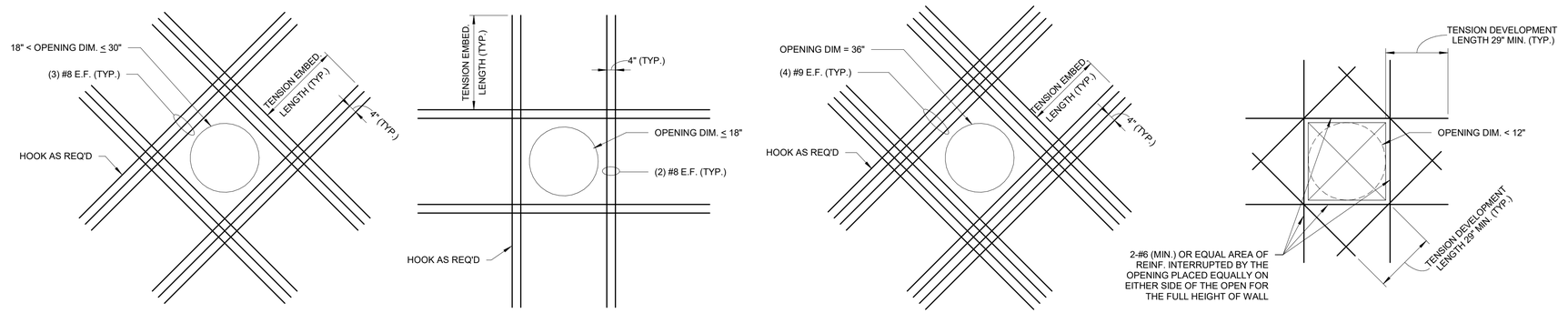
TYPICAL INTERIOR CONCRETE PAD DETAIL

SCALE: N.T.S.



TYPICAL WALL PIPE PENETRATION SEAL DETAIL

SCALE: N.T.S.



TYPICAL FOUNDATION WALL OPENING DETAIL

SCALE: N.T.S.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

NOT FOR CONSTRUCTION

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

TYPICAL DETAIL SHEET 1 OF 2

VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES PRELIMANARY DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	
DESIGNED BY	DF
DRAWN BY	JFC
CHECKED BY	KM
APPROVED BY	DF

S-201

SHEET 30 of 59

TENSION LAP SPLICE LENGTHS - GRADE 60 UNCOATED BARS

BAR SIZE DESIGNATION	LAP CLASS	f'c = 3,000 psi or GREATER, NORMAL WEIGHT CONCRETE											
		f'c = 3,000 psi				f'c = 4,000 psi				f'c = 5,000 psi			
		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS	
		CASE 1	CASE 2	CASE 1	CASE 2	CASE 1	CASE 2	CASE 1	CASE 2	CASE 1	CASE 2	CASE 1	CASE 2
#3	A	22	32	17	25	19	28	15	22	17	25	13	19
	B	28	42	22	32	24	36	19	28	22	33	17	25
#4	A	29	43	22	33	25	37	19	29	22	33	17	26
	B	37	56	29	43	32	48	25	37	29	43	22	33
#5	A	36	54	28	41	31	47	24	36	28	42	22	32
	B	47	70	36	54	40	60	31	47	36	54	28	42
#6	A	43	64	33	50	37	56	29	43	33	50	26	38
	B	56	84	43	64	48	72	37	56	43	65	33	50
#7	A	63	94	48	72	54	81	42	63	49	73	37	56
	B	81	122	63	94	70	106	54	81	63	94	49	73
#8	A	72	107	55	82	62	93	48	72	55	83	43	64
	B	93	139	72	107	80	121	62	93	72	108	55	83
#9	A	81	121	62	93	70	105	54	81	63	94	48	72
	B	105	157	81	121	91	136	70	105	81	122	63	94
#10	A	91	136	70	105	79	118	61	91	70	105	54	81
	B	118	177	91	136	102	153	79	118	91	137	70	105
#11	A	101	151	78	116	87	131	67	101	78	117	60	90
	B	131	196	101	151	113	170	87	131	101	152	78	117
#14	N/A	121	181	93	139	105	157	81	121	94	140	72	108
#18	N/A	161	241	124	186	139	209	107	161	125	187	96	144

NOTES:

1. TABULATED VALUES ARE BASED ON GRADE 60 REINFORCING BARS AND NORMAL WEIGHT CONCRETE.
2. TENSION DEVELOPMENT LENGTHS AND TENSION LAP SPLICE LENGTHS ARE BASED ON ACI 318-14, SECTION 12.2.2 AND 12.15, RESPECTIVELY. TABULATED VALUES FOR BEAMS OR COLUMNS ARE BASED ON TRANSVERSE REINFORCEMENT AND CONCRETE COVER MEETING MINIMUM CODE REQUIREMENTS. LENGTHS ARE IN INCHES.
3. CASES 1 AND 2, WHICH DEPEND ON THE TYPE OF STRUCTURAL ELEMENT, CONCRETE COVER, AND THE CENTER-TO-CENTER SPACING OF THE BARS, ARE DEFINED AS:

BEAMS or COLUMNS	CASE 1	COVER AT LEAST $1d_b$ AND CTR.-CTR. SPACING AT LEAST $2d_b$
	CASE 2	COVER LESS THAN $1d_b$ AND CTR.-CTR. SPACING LESS THAN $2d_b$
ALL OTHERS	CASE 1	COVER AT LEAST $1d_b$ AND CTR.-CTR. SPACING AT LEAST $3d_b$
	CASE 2	COVER LESS THAN $1d_b$ AND CTR.-CTR. SPACING LESS THAN $3d_b$

4. LAP CLASS A VALUES ARE THE REQUIRED TENSION DEVELOPMENT LENGTHS, L_d ; LAP SPLICE LENGTHS ARE MULTIPLES OF TENSION DEVELOPMENT LENGTHS; CLASS A - $1.0L_d$ AND CLASS B = $1.3L_d$ (ACE 318-02, SECTION 12.15.1).
5. LAP SPLICES OF #14 or #18 BARS ARE NOT PERMITTED. THE TABULATED VALUES FOR THOSE BAR SIZES ARE THE TENSION DEVELOPMENT LENGTHS.
6. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12 INCHES OF CONCRETE CAST BELOW THE BARS.
7. FOR LIGHTWEIGHT AGGREGATE CONCRETE, MULTIPLY THE TABULATED VALUES BY 1.3; or WHEN f_{ct} IS SPECIFIED, THE FACTOR IS 6.7 $\sqrt{f'_c}/f_{ct} \geq 1.0$.
8. FOR EPOXY-COATED BARS, MULTIPLY THE TABULATED VALUES BY ONE OF THE FOLLOWING FACTORS:

CONCRETE COVER AND SPACING	TOP BARS	OTHER BARS
COVER < $3d_b$ or CTR.-CTR. SPACING > $7d_b$	1.7 / 1.3 - 1.31	1.50
COVER $\leq$ $3d_b$ or CTR.-CTR. SPACING $\leq$ $7d_b$	1.20	1.20

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

NOT FOR CONSTRUCTION

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

TYPICAL DETAIL SHEET 2 OF 2

VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES PRELIMANARY DESIGN

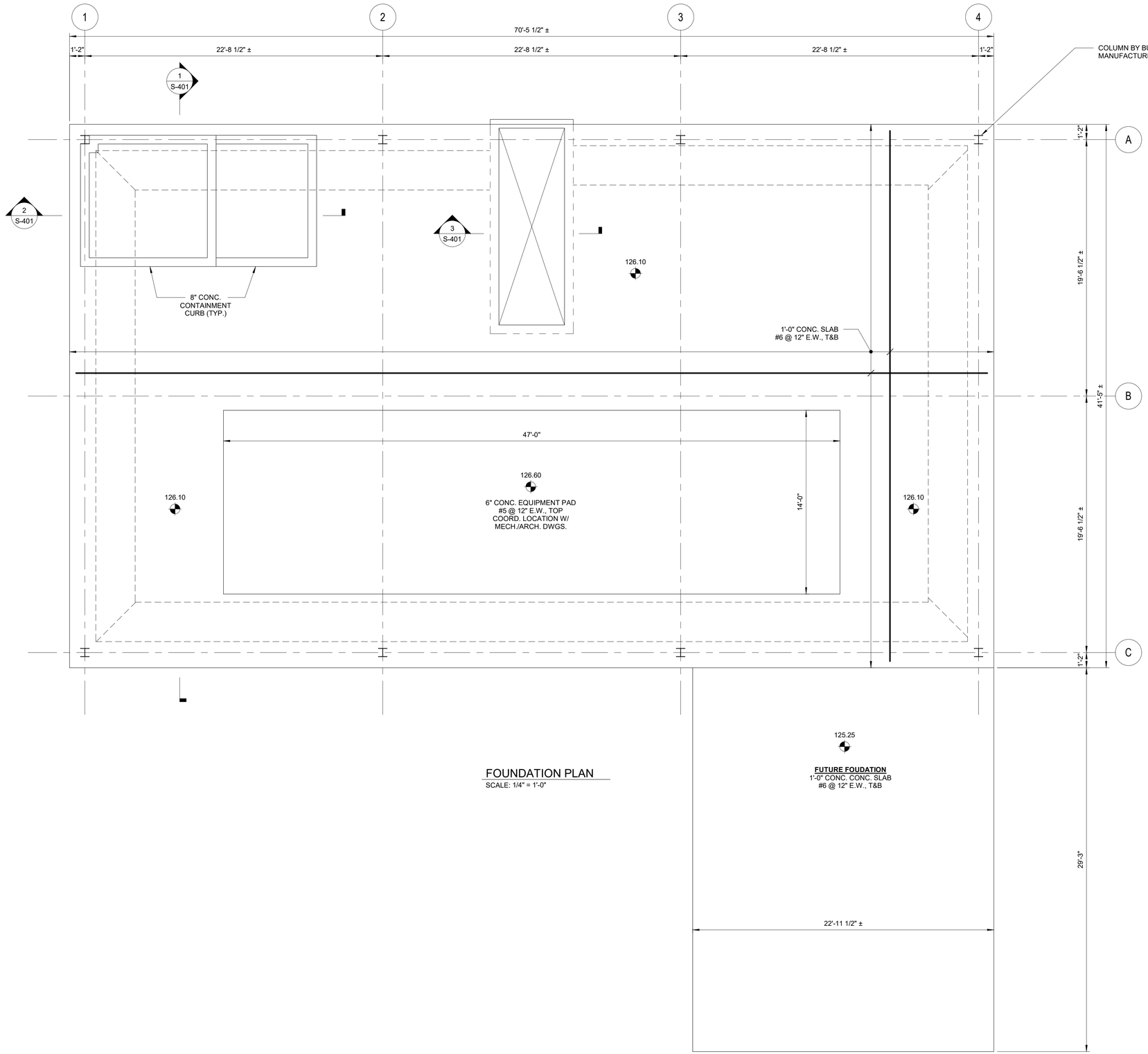
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	
DESIGNED BY	DF
DRAWN BY	JFC
CHECKED BY	KM
APPROVED BY	DF

S-202

SHEET 31 of 59



FOUNDATION PLAN

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

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

NOT FOR CONSTRUCTION

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

FOUNDATION

VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES PRELIMANARY DESIGN

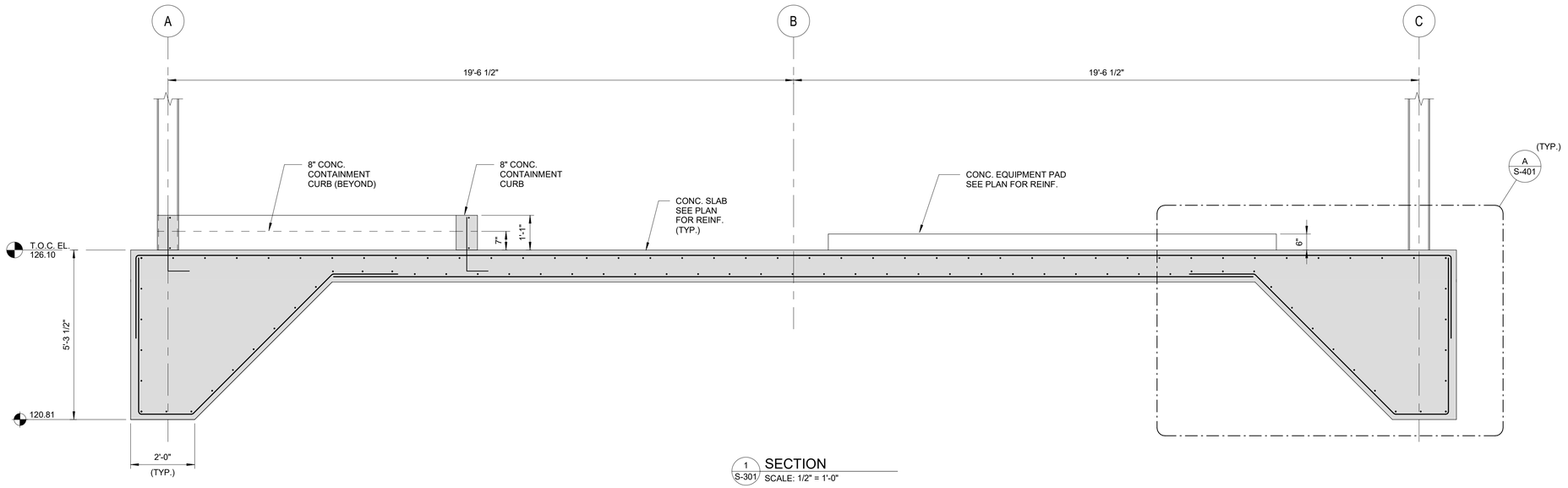
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

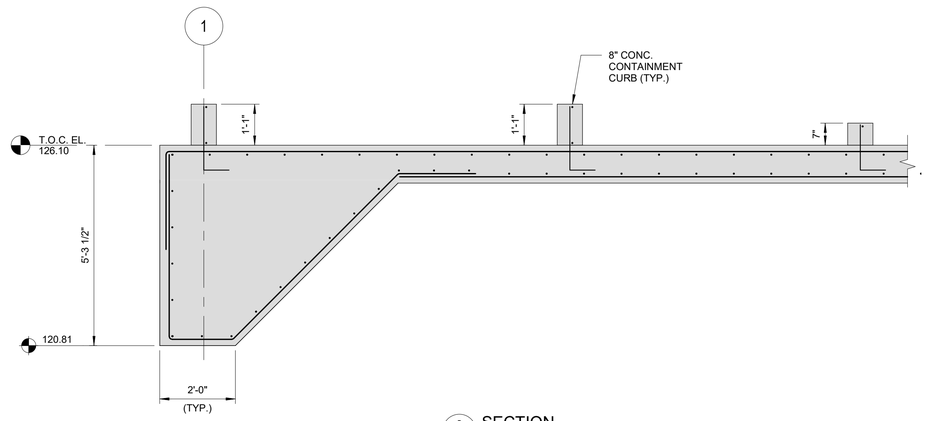
PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	
DESIGNED BY	DF
DRAWN BY	JFC
CHECKED BY	KM
APPROVED BY	DF

S-301

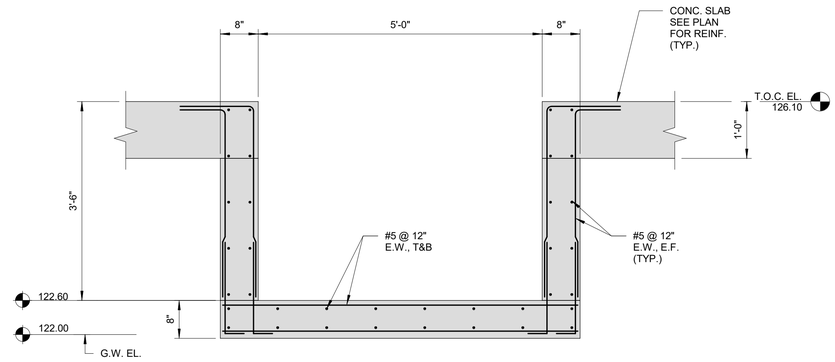
SHEET 32 of 59



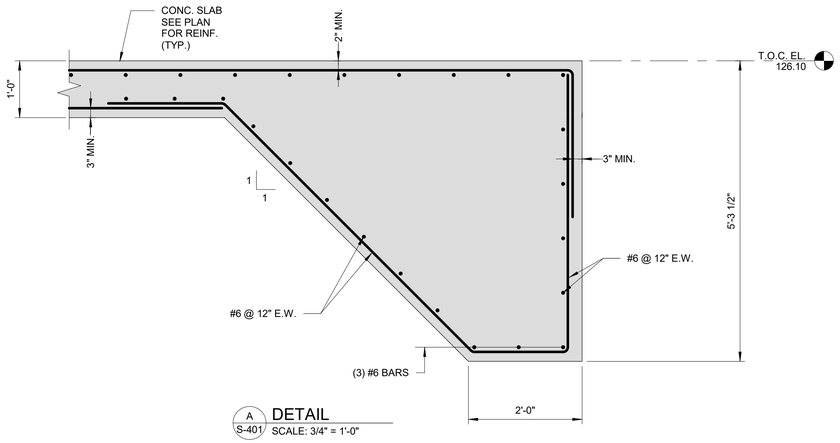
1 S-301 SECTION
SCALE: 1/2" = 1'-0"



2 S-301 SECTION
SCALE: 1/2" = 1'-0"



3 S-301 SECTION
SCALE: 3/4" = 1'-0"



A S-401 DETAIL
SCALE: 3/4" = 1'-0"

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

NOT FOR CONSTRUCTION

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

SECTIONS

VILLAGE STREET MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY
PFAS UPGRADES PRELIMANARY DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	
DESIGNED BY	DF
DRAWN BY	JFC
CHECKED BY	KM
APPROVED BY	DF

S-401

SHEET 33 of 59

ELECTRICAL SYMBOLS

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

ELECTRICAL SYMBOLS

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

FIRE ALARM / SECURITY SYSTEM SYMBOLS

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

TELE/DATA & CCTV SYMBOLS

1T 2D	WALL MOUNTED DATA OUTLET, 2D INDICATES (2) CAT6 TERMINAL DATA CONNECTORS, 1T INDICATES (1) CAT6 TERMINAL TELEPHONE CONNECTOR
CCTV	CLOSED CIRCUIT TELEVISION CAMERA – PROVIDED BY DIV. 13
DVRS	DIGITAL VIDEO RECORDING SERVER – PROVIDED BY DIV. 13
POES	POWER OVER ETHERNET SWITCH – PROVIDED BY DIV. 13

CHEMICAL ALARM SYSTEM SYMBOLS

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

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL LEGEND AND GENERAL NOTES

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	MC
DRAWN BY	RLB
CHECKED BY	MC
APPROVED BY	ABB

E-001

SHEET 34 of 59

GENERAL NOTES

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

DEMOLITION NOTES

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

ABBREVIATIONS

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

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL GENERAL NOTES

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

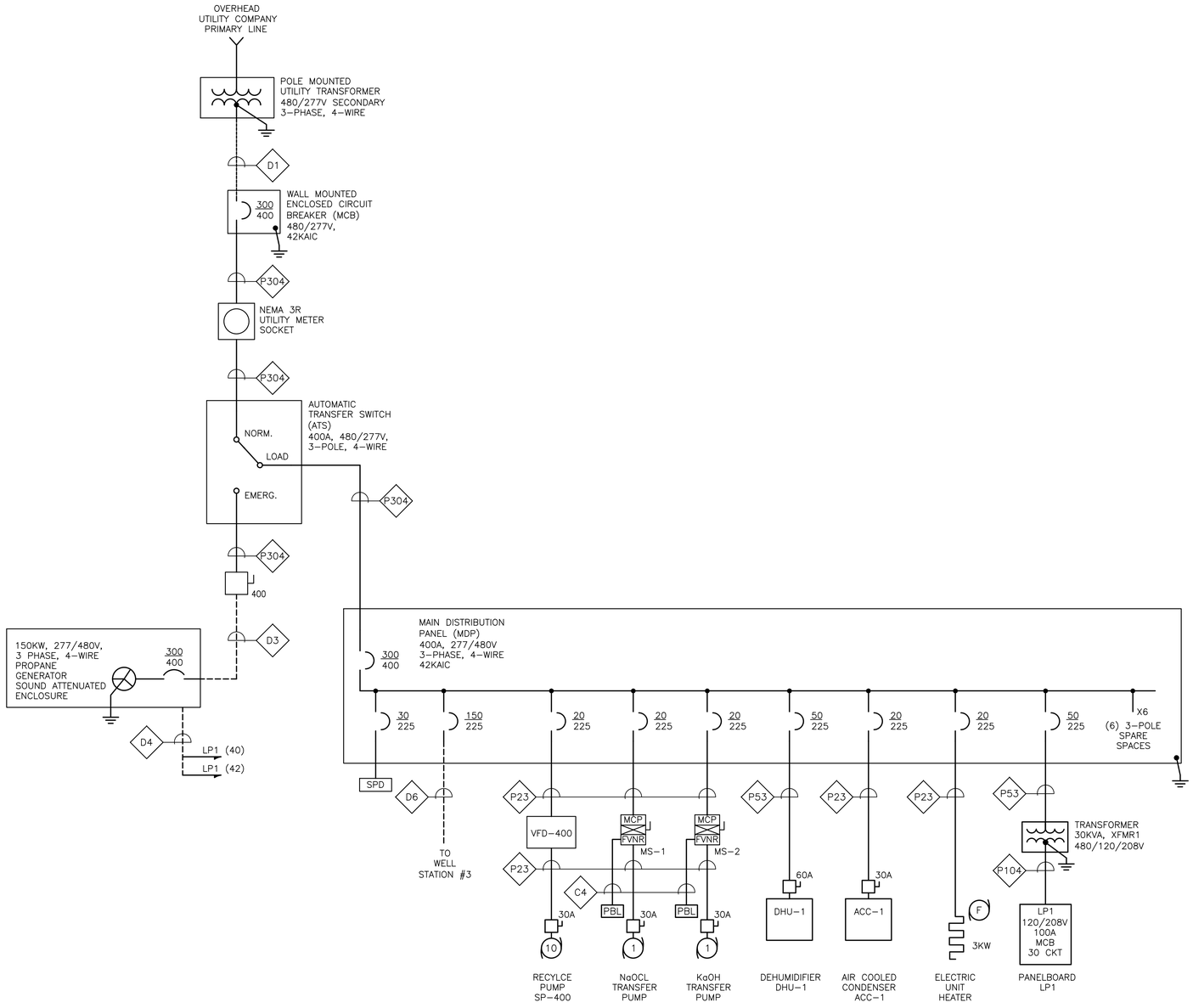
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	MC
DRAWN BY	RLB
CHECKED BY	MC
APPROVED BY	ABB

E-002

SHEET 35 of 59



TREATMENT BUILDING ONE LINE DIAGRAM

NOT TO SCALE

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SVR ENGINEERING, INC.
Mechanical/Electrical Engineers
150 Grossman Drive, Suite 309
Braintree, Massachusetts 02184
617 221-9220
web: www.sar.com

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL
TREATMENT BUILDING ONE LINE DIAGRAM

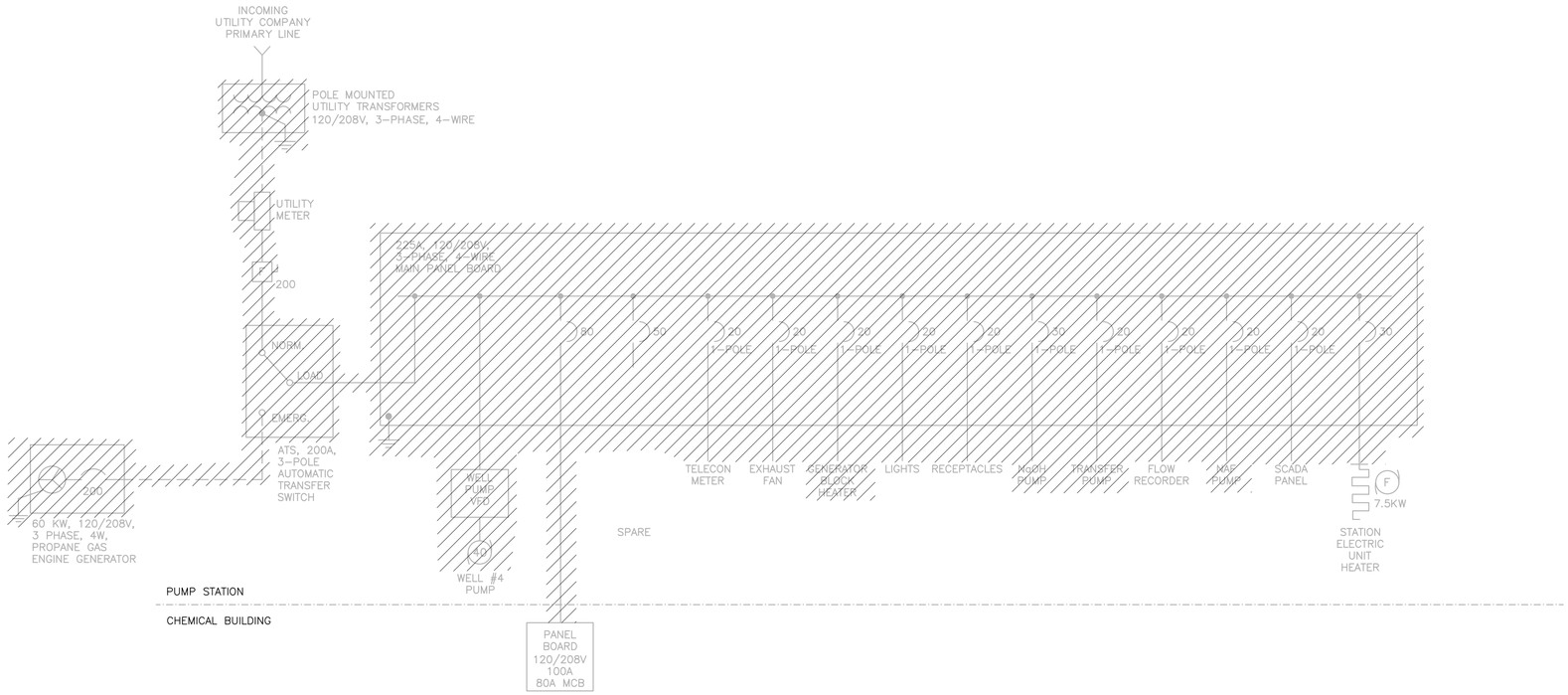
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

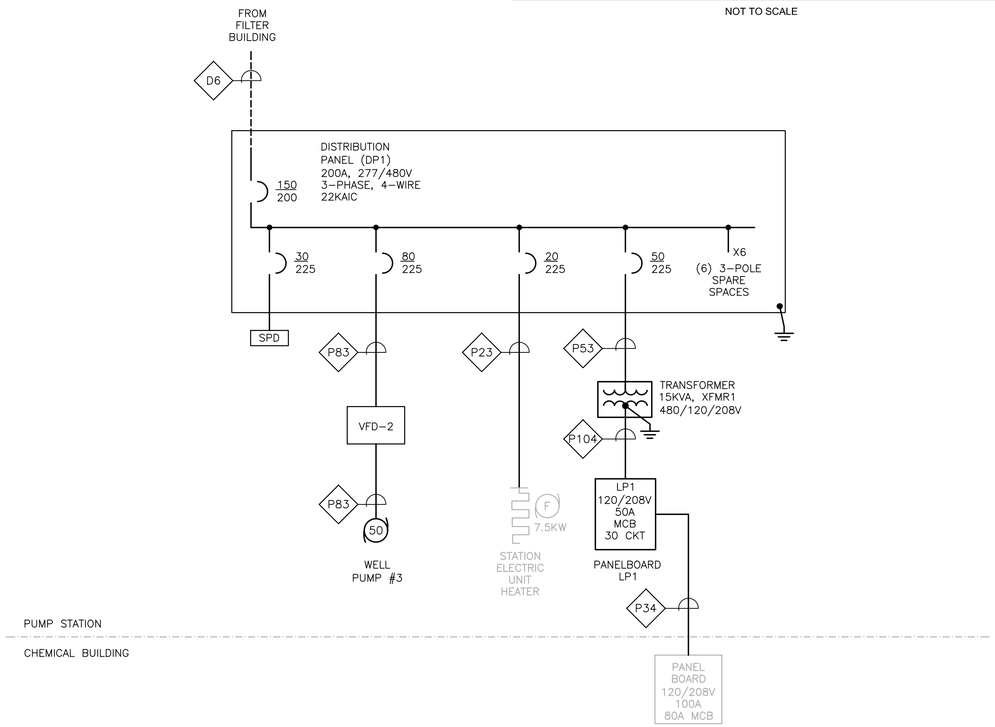
PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	MC
DRAWN BY	RLB
CHECKED BY	MC
APPROVED BY	ABB

E-003



WELL STATION #3 DEMOLITION ONE LINE DIAGRAM

NOT TO SCALE



WELL STATION #3 ONE LINE DIAGRAM

NOT TO SCALE

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL
WELL STATION #3 ONE LINE DIAGRAMS

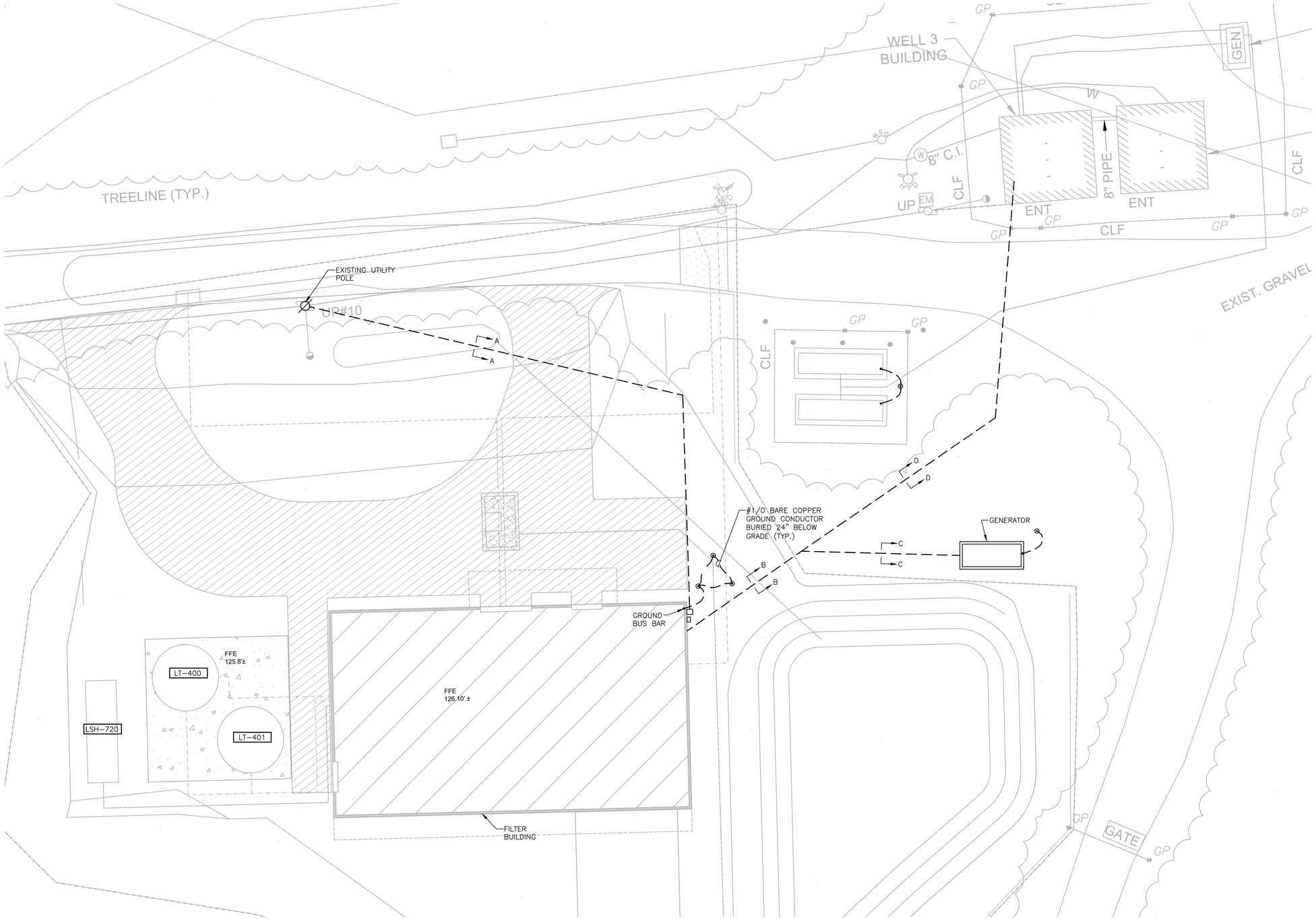
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO. 20233667.002A	
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	MC
DRAWN BY	RLB
CHECKED BY	MC
APPROVED BY	ABB

E-004



SITE PLAN:

SCALE: 1" = 10'

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

Signed By: ---- # 12345

REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL SITE PLAN

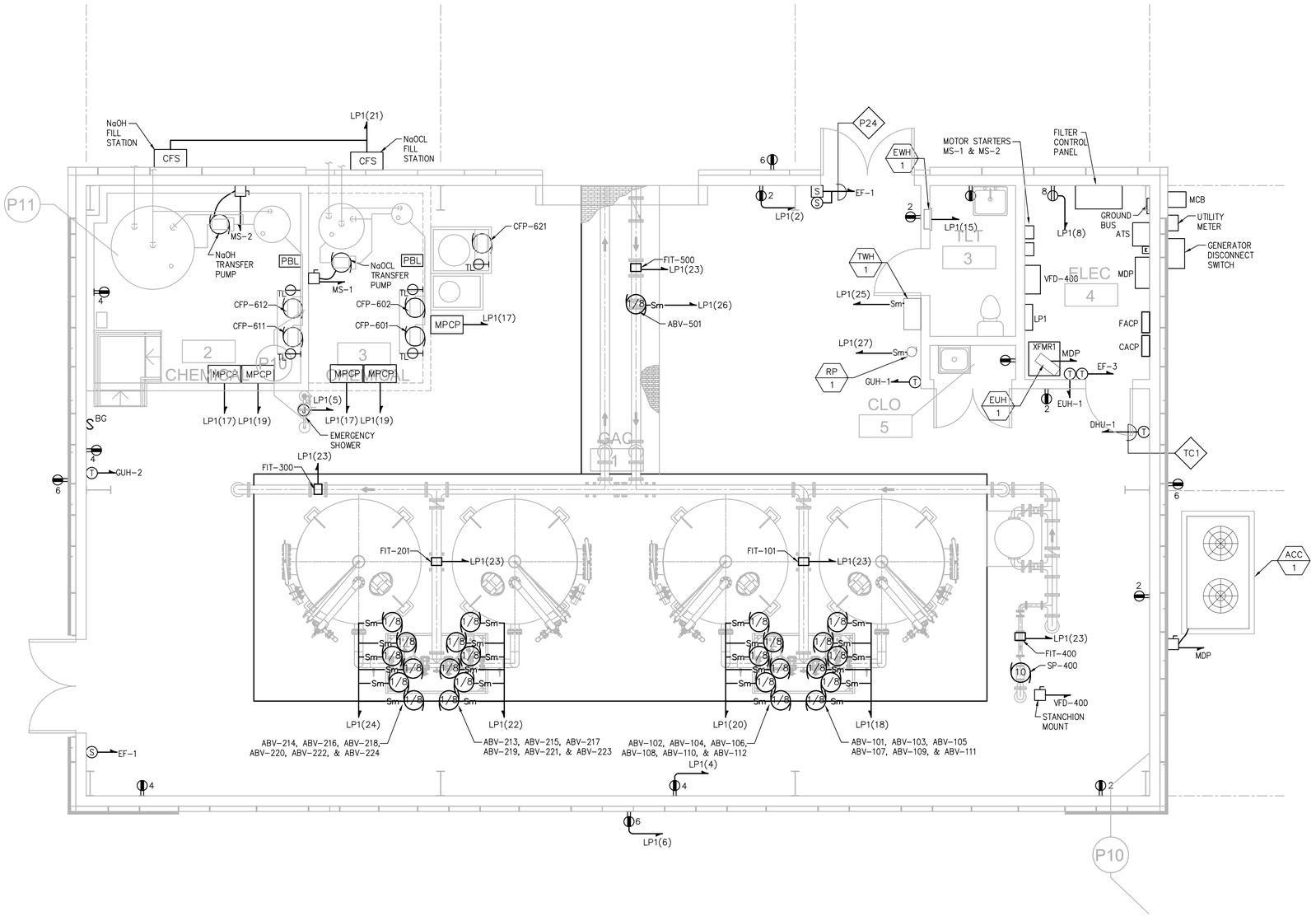
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	MC
DRAWN BY	RLB
CHECKED BY	MC
APPROVED BY	ABB

E-005



NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4' 8'

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL
LOWER LEVEL FLOOR POWER PLAN

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

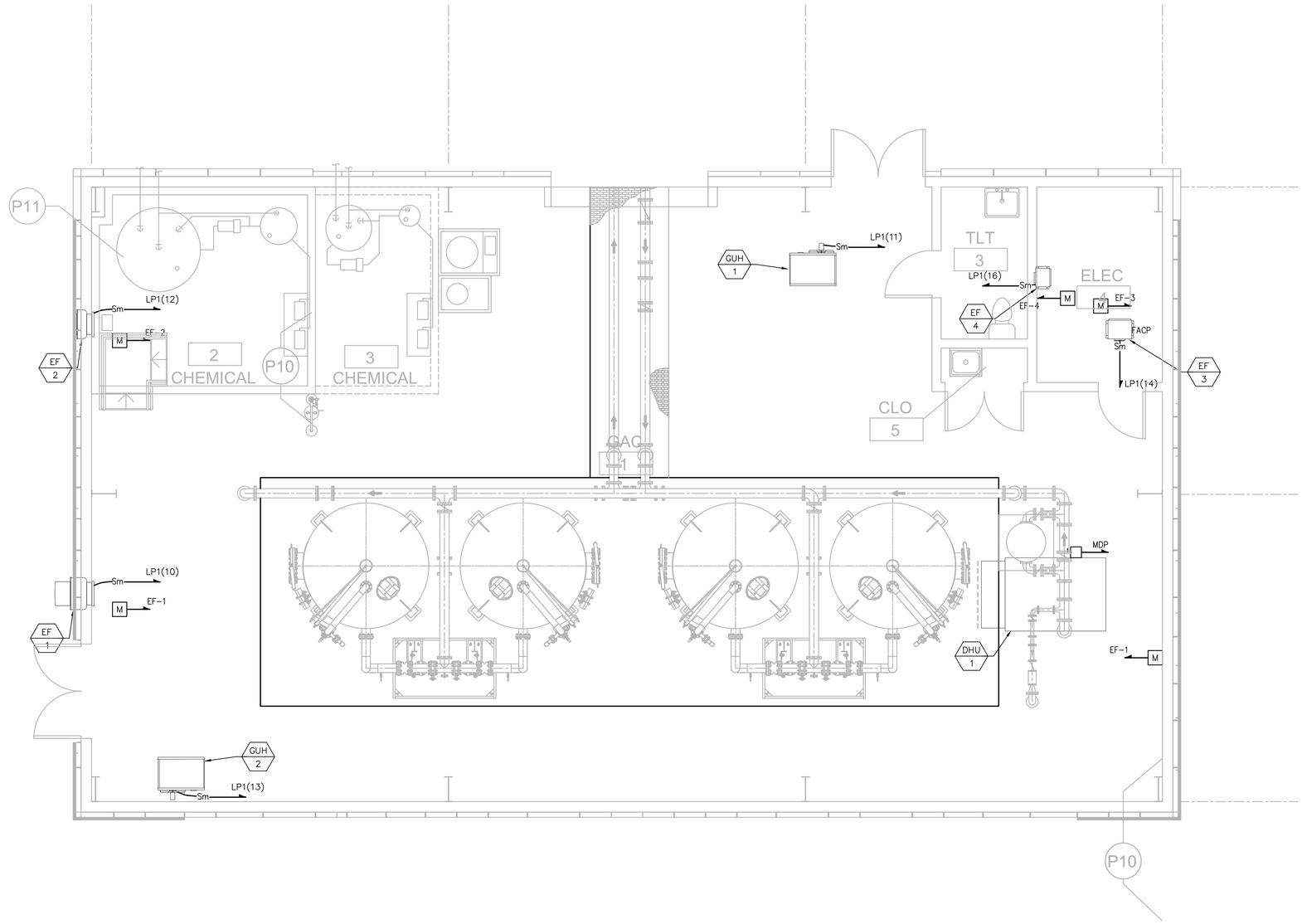
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	MC
DRAWN BY	RLB
CHECKED BY	MC
APPROVED BY	ABB

E-101

SHEET 39 of 59



NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4' 8'

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL
UPPER LEVEL FLOOR POWER PLAN

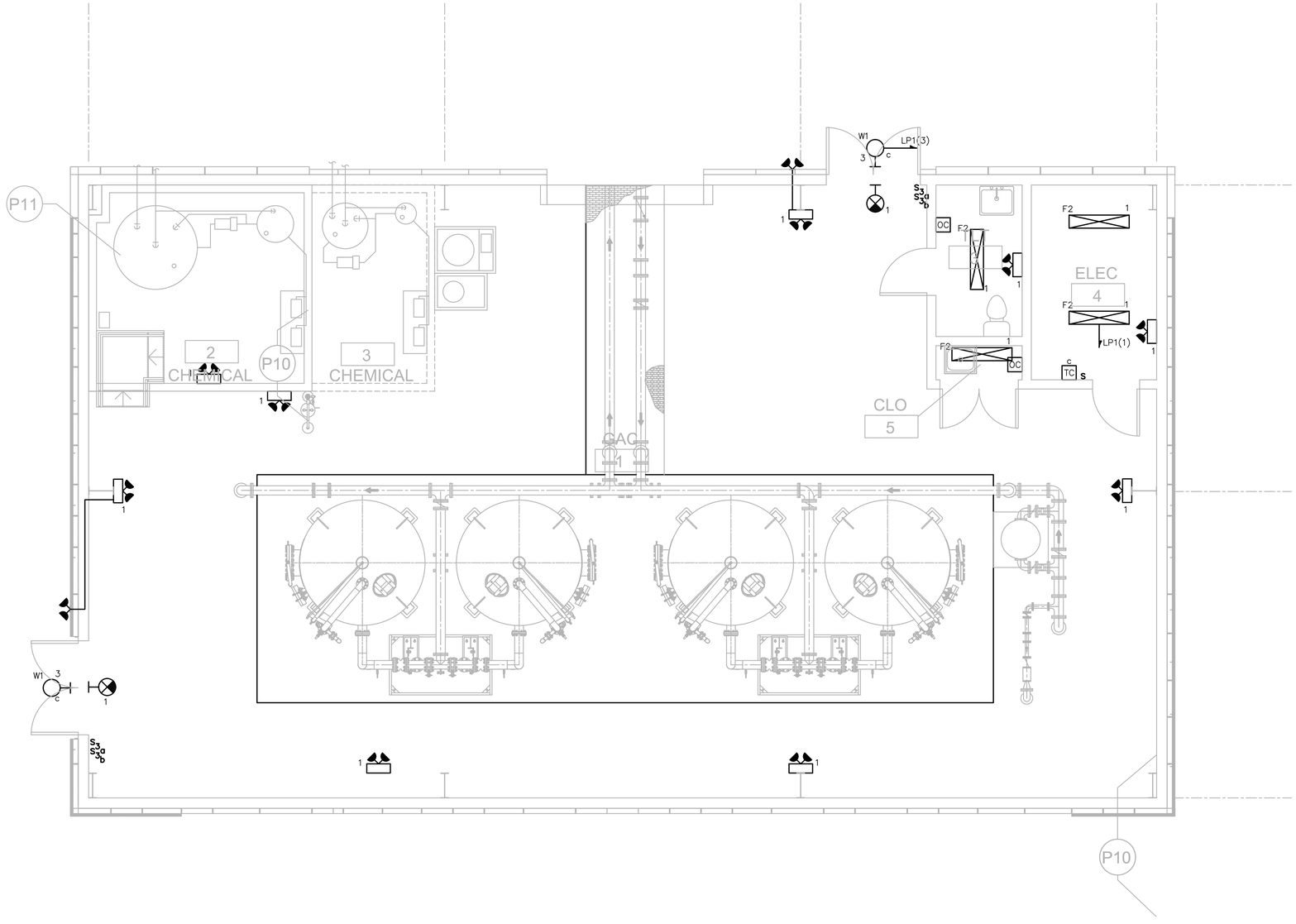
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO. 20233667.002A	
ISSUE DATE SEPT. 2023	
CURRENT REVISION -	
DESIGNED BY MC	
DRAWN BY RLB	
CHECKED BY MC	
APPROVED BY ABB	

E-102



NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4' 8'

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL
LIGHTING FLOOR PLAN

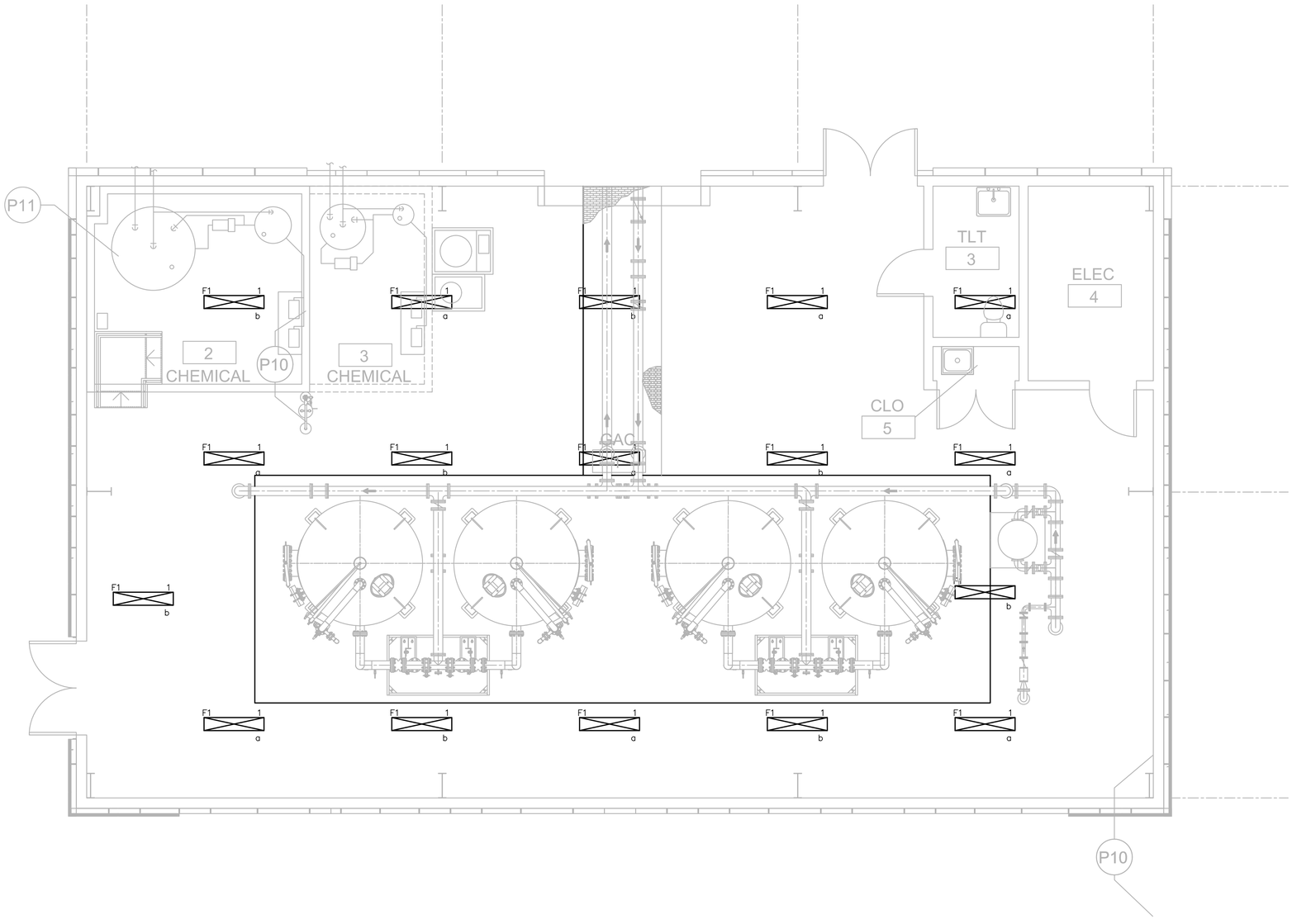
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	MC
DRAWN BY	RLB
CHECKED BY	MC
APPROVED BY	ABB

E-201



NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4' 8'

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL
LIGHTING UPPER LEVEL PLAN

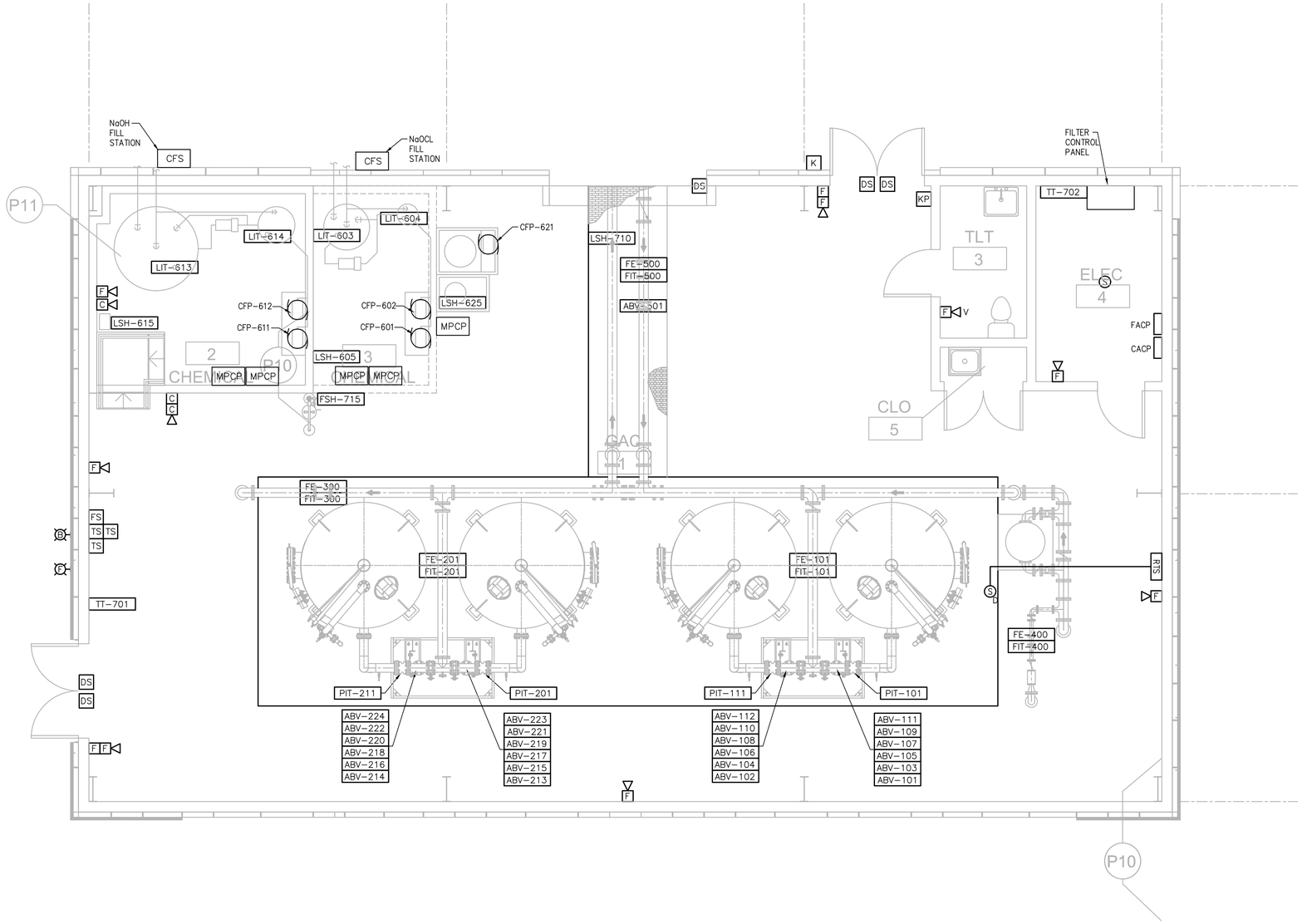
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	MC
DRAWN BY	RLB
CHECKED BY	MC
APPROVED BY	ABB

E-201



NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4' 8'

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL
LOW VOLTAGE FLOOR PLAN

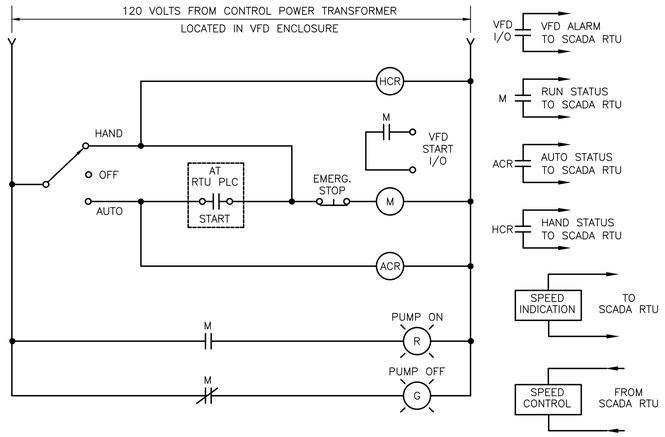
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

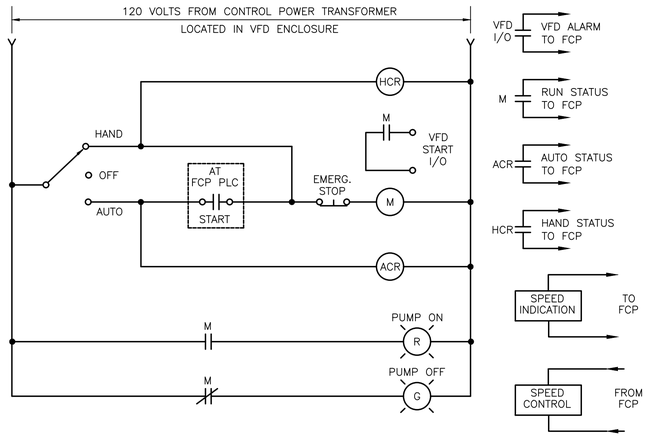
PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	MC
DRAWN BY	RLB
CHECKED BY	MC
APPROVED BY	ABB

E-301



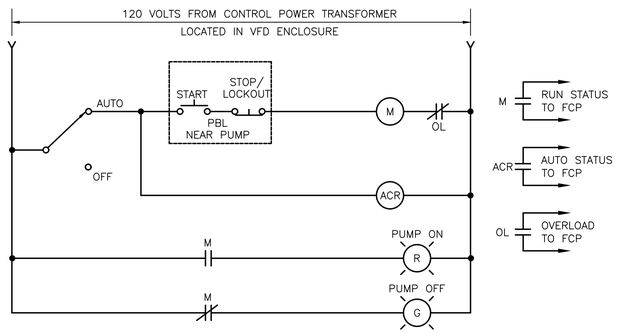
CONTROL WIRING DIAGRAM
WELL PUMP

NOT TO SCALE



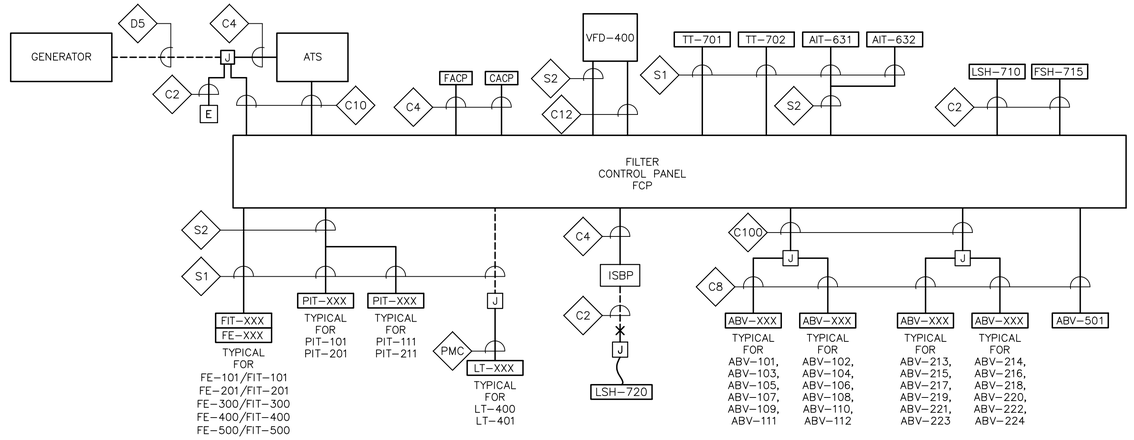
CONTROL WIRING DIAGRAM
RECYCLE PUMP

NOT TO SCALE



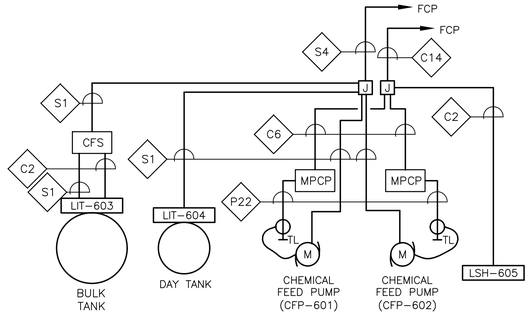
CONTROL WIRING DIAGRAM
CHEMICAL TRANSFER PUMPS

NOT TO SCALE



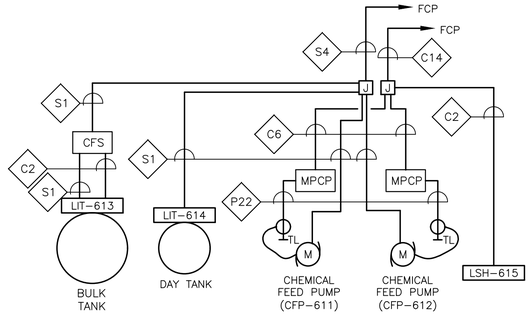
FILTER CONTROL BLOCK DIAGRAM

NOT TO SCALE



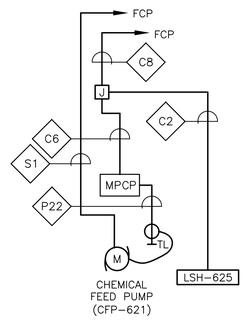
CONTROL WIRING DIAGRAM
NaOCL CHEMICAL FEED SYSTEM

NOT TO SCALE



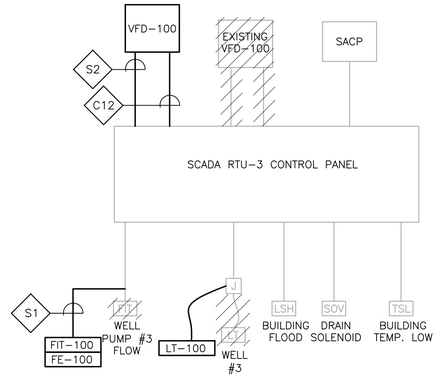
CONTROL WIRING DIAGRAM
NaOH CHEMICAL FEED SYSTEM

NOT TO SCALE



CONTROL WIRING DIAGRAM
FLUORIDE CHEMICAL FEED SYSTEM

NOT TO SCALE



WELL #3
CONTROL BLOCK DIAGRAM

NOT TO SCALE

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL DIAGRAMS I

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

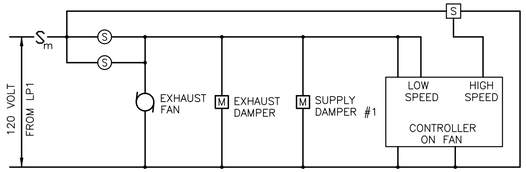
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	MC
DRAWN BY	RLB
CHECKED BY	MC
APPROVED BY	ABB

E-400

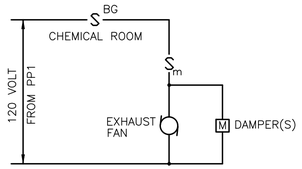
SHEET 44 of 59



– PROVIDE ALL INTERCONNECTING CONDUIT/CABLE

EF-1 EXHAUST FAN WIRING DIAGRAM

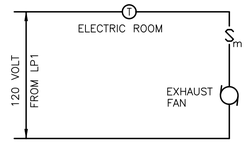
NOT TO SCALE



– PROVIDE ALL INTERCONNECTING CONDUIT/CABLE

EF-2 EXHAUST FAN WIRING DIAGRAM

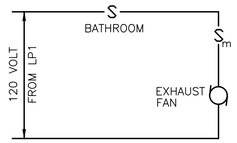
NOT TO SCALE



– PROVIDE ALL INTERCONNECTING CONDUIT/CABLE

EF-3 EXHAUST FAN WIRING DIAGRAM

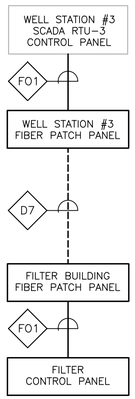
NOT TO SCALE



– PROVIDE ALL INTERCONNECTING CONDUIT/CABLE

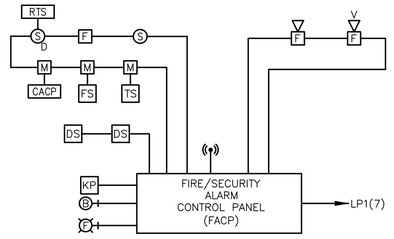
EF-4 EXHAUST FAN WIRING DIAGRAM

NOT TO SCALE



SCADA COMMUNICATION RISER DIAGRAM

NOT TO SCALE

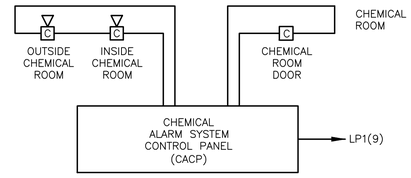


FIRE/SECURITY NOTES:

1. RISER DIAGRAM ONLY REPRESENTS TYPE OF DEVICES AND DOES NOT REPRESENT ACTUAL QUANTITIES. REFER TO PLAN DRAWINGS QUANTITIES AND LOCATIONS OF DEVICES.
2. MINIMUM SIZE CONDUIT SHALL BE 3/4" UNLESS NOTED OTHERWISE.
3. SYSTEM CONDUIT/CABLING SHALL BE INSTALLED IN ACCORDANCE WITH EQUIPMENT SUPPLIERS APPROVED SHOP DRAWINGS AND WIRING DIAGRAMS.
4. PROVIDE RED COLORED CIRCUIT BREAKER HANDLE LOCK ON POWER CIRCUIT. HANDLE LOCK SHALL ALLOW THE CIRCUIT BREAKER TO TRIP, BUT PREVENT SWITCHING OF THE CIRCUIT BREAKER TO THE "OFF" POSITION.
5. ALL COMPONENTS OF THE SYSTEM SHALL BE MOUNTED IN ACCORDANCE WITH ADA REQUIREMENTS.

FIRE/SECURITY SYSTEM RISER DIAGRAM

NOT TO SCALE



CHEMICAL ALARM RISER DIAGRAM

NOT TO SCALE

CHEMICAL ALARM NOTES:

1. RISER DIAGRAM ONLY REPRESENTS TYPE OF DEVICES WITHIN AN AREA AND DOES NOT REPRESENT ACTUAL QUANTITIES. REFER TO PLAN DRAWINGS FOR EXACT QUANTITIES AND LOCATIONS OF DEVICES.
2. MINIMUM SIZE CONDUIT SHALL BE 3/4" UNLESS NOTED OTHERWISE.
3. SYSTEM CONDUIT/CABLING SHALL BE INSTALLED IN ACCORDANCE WITH EQUIPMENT SUPPLIERS APPROVED SHOP DRAWINGS AND WIRING DIAGRAMS.
4. PROVIDE RED COLORED CIRCUIT BREAKER HANDLE LOCK ON POWER CIRCUIT. HANDLE LOCK SHALL ALLOW THE CIRCUIT BREAKER TO TRIP, BUT PREVENT SWITCHING OF THE CIRCUIT BREAKER TO THE "OFF" POSITION.
5. ALL COMPONENTS OF THE SYSTEM SHALL BE MOUNTED IN ACCORDANCE WITH ADA REQUIREMENTS.
6. THE CHEMICAL ALARM SYSTEM SHALL BE UL LISTED 4–ZONE CONVENTIONAL TYPE FIRE ALARM SYSTEM.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SAR ENGINEERING, INC.
Mechanical/Electrical Engineers
150 Grossman Drive, Suite 309
Braintree, Massachusetts 02184
617.221.9220
web: www.sar.com

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL DIAGRAMS II

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO. 20233667.002A	
ISSUE DATE SEPT. 2023	
CURRENT REVISION -	
DESIGNED BY MC	
DRAWN BY RLB	
CHECKED BY MC	
APPROVED BY ABB	

E-401

PANELBOARD SCHEDULE

NO. LP1 — LOCATION: 011 ELECTRIC ROOM

208/120 V, 3 PH, 4 W, — A MAIN, 100% SOLID NEUTRAL; — A MCB

22,000 AIC AT — V FULL GROUND BUS — A MLO SURFACE MOUNTING

CIRCUIT	DESCRIPTION OF LOAD	LOAD (KVA) Aø	Bø	Cø	BREAKER TRIP	BREAKER POLE
1	INTERIOR LIGHTING	0.94			20A	1
3	EXTERIOR LIGHTING		0.10		20A	1
5	EMERGENCY SHOWER			0.15	20A	1
7	FIRE ALARM CONTROL PANEL FACP	0.50			20A	1
9	CHEMICAL ALARM CONTROL PANEL CACP		0.50		20A	1
11	GAS UNIT HEATER GUH-1			1.10	20A	1
13	GAS UNIT HEATER GUH-2	1.10			20A	1
15	ELECTRIC WALL HEATER EWH-1		1.50		20A	1
17	CFP-601, CFP-611, CFP-621			0.75	20A	1
19	CFP-602, CFP-612, CFP-622	0.75			20A	1
21	CHEMICAL FILL STATIONS		0.20		20A	1
23	FLOW METERS			1.00	20A	1
25	GAS WATER HEATER TWH-1	0.50			20A	1
27	RECIRC. PUMP RP-1		0.10		20A	1
29	–			–	–	1
31	–	–			–	1
33	–		–		–	1
35	–			–	–	1
37	–	–			–	1
39	–		–		–	1
41	–			–	–	1
	SUB-TOTAL CONNECTED	–	–	–		

BREAKER POLE	BREAKER TRIP	LOAD (KVA) Aø	Bø	Cø	DESCRIPTION OF LOAD	CIRCUIT
1	20A	1.0			FILTER ROOM RECEPTACLES	2
1	20A		0.80		FILTER ROOM RECEPTACLES	4
1	20A			0.80	EXTERIOR RECEPTACLES	6 *
1	20A	0.40			ELECTRIC ROOM RECEPTACLES	8
1	20A		0.77		EXHAUST FAN EF-1	10
1	20A			0.20	EXHAUST FAN EF-2	12
1	20A	0.77			EXHAUST FAN EF-3	14
1	20A		0.10		EXHAUST FAN EF-4	16
1	20A			0.72	GAC UNIT 101 VALVES	18
1	20A	0.72			GAC UNIT 111 VALVES	20
1	20A		0.72		GAC UNIT 201 VALVES	22
1	20A			0.72	GAC UNIT 211 VALVES	24
1	20A	0.12			ABV-501	26
1	–		–		–	28
1	–			–	–	30
1	–	–			–	32
1	–		–		–	34
1	–			–	–	36
1	–	–			–	38
1	20A		0.50		GENERATOR BATTERY CHARGER & STATOR HEAT.	40
1	20A			1.50	GENERATOR BLOCK HEATER	42
		–	–	–	SUB-TOTAL CONNECTED	

* PROVIDE GFCI BREAKER

SUB-TOTAL CONNECTED KVA Aø = –

SUB-TOTAL CONNECTED KVA Bø = –

SUB-TOTAL CONNECTED KVA Cø = –

TOTAL CONNECTED KVA = –

LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER & CATALOG SERIES	LAMPS TYPE	LAMPS LUMENS	VOLTS	WATTS	MOUNTING TYPE	MOUNTING HEIGHT	REMARKS
F1	48" LED ENCLOSED AND GASKETED INDUSTRIAL LIGHTING FIXTURE.	LITHONIA FEM-L48-6000LM-IMAFL-MVOLT-35K-80CRI	LED 3500K	6000lm	120	45	PENDANT	20'-0"ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED	
F2	48" LED ENCLOSED AND GASKETED INDUSTRIAL LIGHTING FIXTURE.	LITHONIA FEM-L48-4000LM-IMAFL-MVOLT-35K-80CRI	LED 3500K	4000lm	120	31	SURFACE		
W1	EXTERIOR BUILDING MOUNTED LED WALL PACK LIGHT FIXTURE	LITHONIA TWP-LED-20C-700-50K-T3M-120-PE-DDXB	LED 5000K	4200lm	120	45	WALL	APPROXIMIATELY 9'-0" AFF	INTEGRAL PHOTOCELLL CONTROLLED
	SELF CONTAINED EMERGENCY LIGHTING BATTERY UNIT NEMA 4 WITH TWO LIGHTING HEADS	REFER TO SPECIFICATIONS			120	8W	WALL	APPROXIMIATELY 8'-6" AFF	INSTALL 3/4"C, 2#12, 1#12GND TO REMOTE HEADS
	SEALED-BEAM WEATHERPROOF REMOTE LIGHTING FIXTURE WITH TWO LIGHTING HEADS	REFER TO SPECIFICATIONS			120	8W	WALL	APPROXIMIATELY 8'-6" AFF	
	EMERGENCY EXIT SIGN LED TYPE WITH BATTERY BACK-UP NEMA 4X	REFER TO SPECIFICATIONS			120		WALL	APPROXIMIATELY 8'-6" AFF	

LIGHTING FIXTURE SCHEDULES NOTES:

1. THE CATALOG NUMBERS LISTED ARE GIVEN AS A GUIDE TO THE DESIGN AND QUALITY OF FIXTURE DESIRED. EQUIVALENT DESIGNS, MATERIALS, DIMENSIONS, COEFFICIENT OF UTILIZATIONS AND EQUAL QUALITY FIXTURES OF OTHER MANUFACTURERS WILL BE ACCEPTABLE.

POWER CABLE/CONDUIT SCHEDULE

SYMBOL	CONDUIT SIZE	CONDUCTORS*	GND*
P22	3/4"	(2)#12	(1)#12
P24	3/4"	(4)#12	(1)#12
P26	3/4"	(6)#12	(1)#12
P32	3/4"	(2)#10	(1)#10
P33	3/4"	(3)#10	(1)#10
P53	3/4"	(3)#8	(1)#10
P54	3/4"	(4)#8	(1)#10
P63	1"	(3)#6	(1)#8
P64	1"	(4)#6	(1)#8
P83	1 1/4"	(3)#4	(1)#8
P84	1 1/4"	(4)#4	(1)#8
P103	1 1/2"	(3)#3	(1)#6
P104	1 1/2"	(4)#3	(1)#6
P113	1 1/2"	(3)#2	(1)#6
P114	1 1/2"	(4)#2	(1)#6
P133	2"	(3)#1	(1)#6
P134	2"	(4)#1	(1)#6
P153	2"	(3)#1/0	(1)#6
P154	2"	(4)#1/0	(1)#6
P173	2 1/2"	(3)#2/0	(1)#6
P174	2 1/2"	(4)#2/0	(1)#6
P203	2 1/2"	(3)#3/0	(1)#4
P204	2 1/2"	(4)#3/0	(1)#4
P233	3"	(3)#4/0	(1)#4
P234	3"	(4)#4/0	(1)#4
P253	3"	(3)250KCMIL	(1)#4
P254	3"	(4)250KCMIL	(1)#4
P304	3"	(4)350KCMIL	(1)#4

TELE/DATA CABLE/CONDUIT SCHEDULE

SYMBOL	CONDUIT SIZE	CABLES
TD1	1"	1-CAT6
F01	1"	6-STRAND FIBER OPTIC CABLE

SIGNAL CABLE/CONDUIT SCHEDULE

SYMBOL	CONDUIT SIZE	CONDUCTORS
S	1"	VENDER PROVIDED
S1	3/4"	1-2/C#16 TSP
S13	3/4"	1-3/C#16 TSP
S2	3/4"	2-2/C#16 TSP
S23	3/4"	2-3/C#16 TSP
S3	1"	3-2/C#16 TSP
S33	1"	3-3/C#16 TSP
S4	1"	4-2/C#16 TSP
S5	1"	5-2/C#16 TSP
S6	1 1/2"	6-2/C#16 TSP
S7	1 1/2"	7-2/C#16 TSP
S8	1 1/2"	8-2/C#16 TSP
S9	1 1/2"	9-2/C#16 TSP
S10	2"	10-2/C#16 TSP
TC1	3/4"	8/C#18

CONTROL CABLE/CONDUIT SCHEDULE

SYMBOL	CONDUIT SIZE	CONDUCTORS
C2	3/4"	2#14
C4	3/4"	4#14
C5	3/4"	5#14
C6	3/4"	6#14
C7	3/4"	7#14
C8	3/4"	8#14
C9	3/4"	9#14
C10	3/4"	10#14
C12	3/4"	12#14
C16	1"	16#14
C20	1"	20#14
C30	1"	30#14
C60	2"	60#14
C64	2"	64#14
C100	2 1/2"	100#14

NOTE: CONDUIT AND CONDUCTOR SIZES ARE TO BE PER THE ABOVE SCHEDULES UNLESS OTHERWISE NOTED.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL SCHEDULES

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

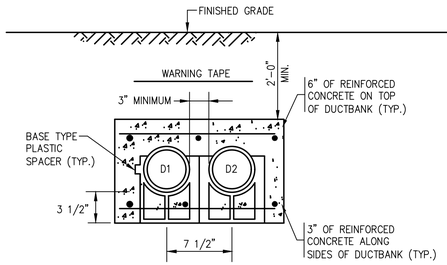
PROJECT NO. 20233667.002A	
ISSUE DATE SEPT. 2023	
CURRENT REVISION -	
DESIGNED BY MC	
DRAWN BY RLB	
CHECKED BY MC	
APPROVED BY ABB	

E-402

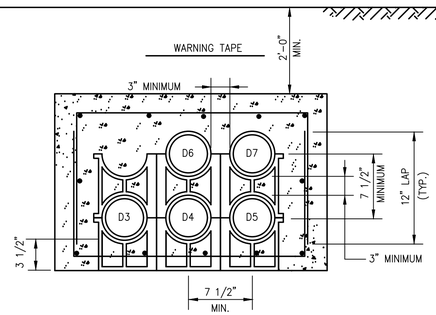
SHEET 46 of 59

DUCT / CABLE SCHEDULE

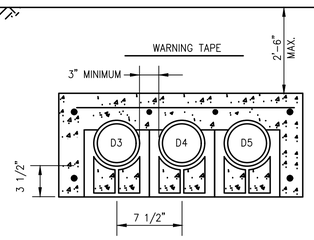
DUCT NO.	SIZE	CONDUCTORS	FROM	TO
D1	3"	(4) 350KCMIL	UTILITY POLE	MCB
D2	3"	PULL STRING	UTILITY POLE	STUB UP BELOW MCB
D3	3"	(4) 350KCMIL, #4 GND	GENERATOR	GENERATOR DISCONNECT SWITCH
D4	1"	(4) #12, #12GND	LP3 PANELBOARD	GENERATOR AUXILLARY SYSTEMS
D5	1"	(12) #14	GENERATOR	ATS, EMERGENCY STOP, SCADA RTU PANEL
D6	2"	(4) #4/0, #6 GND	MDP	WELL STATION #3 DP1
D7	3"	12 STRAND FIBER OPTIC CABLE	FILTER BUILIDING FIBER OPTIC PATCH PANEL	WELL STATION #3 FIBER OPTIC PATCH PANEL



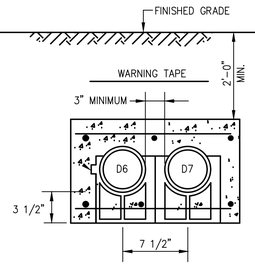
SECTION A-A



SECTION B-B



SECTION C-C



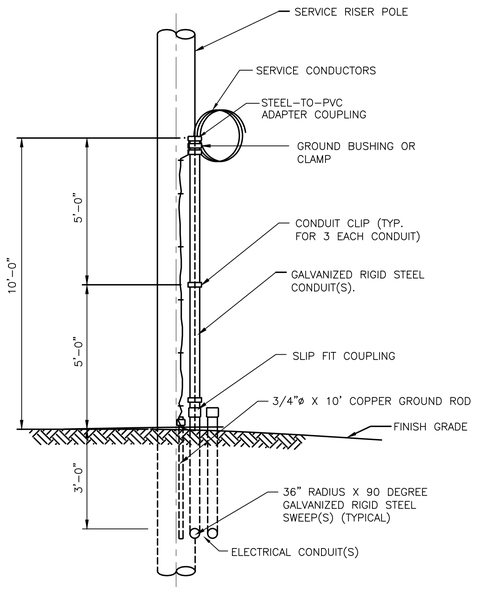
SECTION D-D

NOTES:

1. BACKFILL DUCT BANK IN LAYERS AND MANUALLY TAMP OR "PUDDLE" CONCRETE FILL. PROVIDE RED DUCT BANK MARKER TAPES, READING "CAUTION – ELECTRICAL LINES BELOW", OVER ENTIRE LENGTH OF DUCTLINE. LOCATE TAPES 12 INCHES BELOW GRADE. PROVIDE A TAPE FOR EVERY 12 INCHES OF WIDTH OF DUCTLINE.
2. A MINIMUM OF 12" SEPARATION SHALL BE KEPT BETWEEN DUCT BANK SECTIONS WITHIN SAME TRENCH.
3. REINFORCING STEEL SHALL BE #5 REBAR WITH CROSS SECTION SPACED EVERY 24". CONCRETE TO BE RATED FOR 3000 PSI AFTER 28 DAYS.

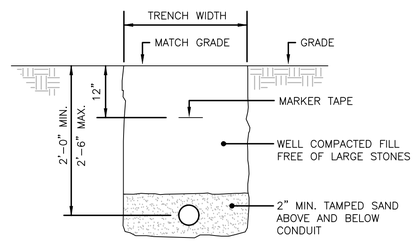
DUCTBANK SECTIONS

NO SCALE



UTILITY POLE SERVICE RISER DETAIL

NOT TO SCALE



NOTES:

1. BACKFILL IN LAYERS AND MANUALLY TAMP. PROVIDE RED DUCT BANK MARKER TAPE, READING "CAUTION – ELECTRICAL LINES BELOW", OVER ENTIRE LENGTH OF DUCTLINE. LOCATE TAPE 12 INCHES BELOW GRADE. PROVIDE A TAPE FOR EVERY 12 INCHES OF WIDTH OF DUCTLINE.
2. TRENCHING AND BACKFILLING SHALL BE PERFORMED UNDER DIVISION 2 OF THIS CONTRACT.

SINGLE UNDERGROUND CONDUIT SECTION

NOT TO SCALE

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL SITE DETAILS

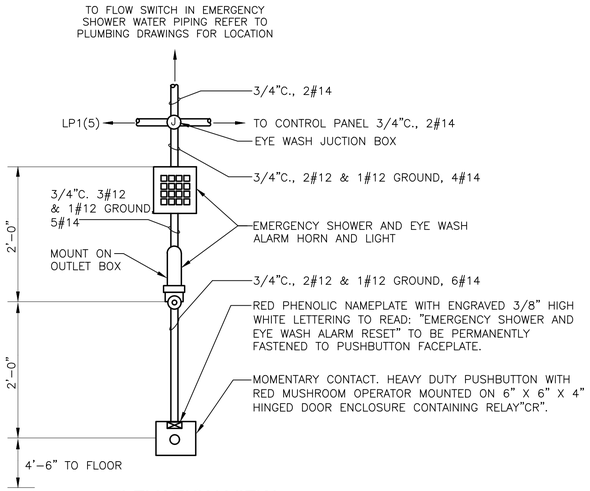
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

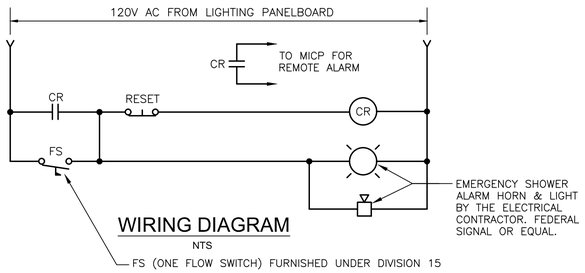
PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	MC
DRAWN BY	RLB
CHECKED BY	MC
APPROVED BY	ABB

E-403



ELEVATION VIEW

NOT TO SCALE



WIRING DIAGRAM

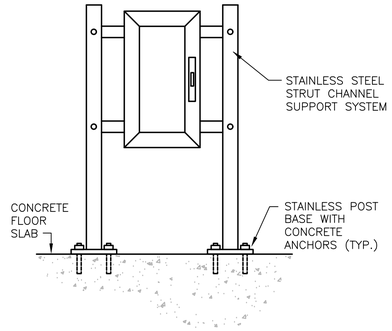
NTS

NOTE:
1. ALL EXPOSED SURFACES OF COMPONENTS SHALL HAVE A YELLOW ENAMEL FINISH, INCLUDING CONDUIT (WITHIN 10'-0" RADIUS OF THE STATION, BOXES, ENCLOSURE AND HORN GRILLE.

2. ALARM STATION TO BE MOUNTED OUTSIDE OF EACH CHEMICAL ROOM CONTAINING A EMERGENCY SHOWER. REFER TO PLAN DRAWINGS FOR EYEWASH JUNCTION BOX LOCATIONS.

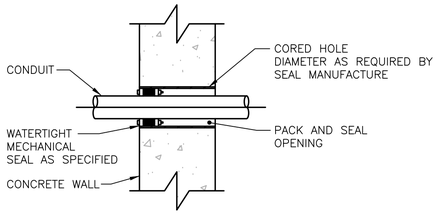
EMERGENCY EYE WASH ALARM STATION

NOT TO SCALE



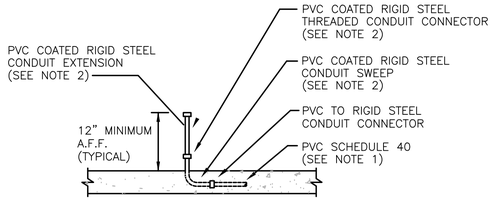
ELECTRICAL EQUIPMENT STANCHION MOUNTING DETAIL

NOT TO SCALE



CONDUIT PENETRATION EXISTING CONCRETE WALL

NOT TO SCALE



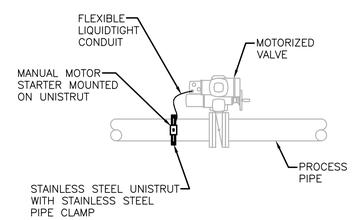
CONDUIT STUB-UP

NOT TO SCALE

NOTES:

1. ALL CONDUIT INSTALLED IN SLAB SHALL BE PVC SCHEDULE 40 EXCEPT ALL SIGNALS CONDUITS AND VFD MOTOR FEEDERS SHALL BE RIGID STEEL.

2. ALL PVC COATED RIGID STEEL CONDUIT WHICH HAS BEEN FIELD CUT OR DAMAGED SHALL BE SPRAYED OR PAINTED WITH A PVC COATING ACCEPTABLE FOR USE TO REPAIR OR SEAL PVC COATED RIGID STEEL CONDUIT. ONLY MANUFACTURER APPROVED PVC COATING SEALANT SHALL BE ACCEPTABLE.



MOTORIZED VALVE MANUAL MOTOR STARTER MOUNTING

NOT TO SCALE

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

ELECTRICAL DETAILS

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO. 20233667.002A	
ISSUE DATE SEPT. 2023	
CURRENT REVISION -	
DESIGNED BY MC	
DRAWN BY RLB	
CHECKED BY MC	
APPROVED BY ABB	

E-404

FIRE PROTECTION NOTES

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

FIRE PROTECTION DESIGN CRITERIA

1. FIRE SUPPRESSION CRITERIA
   - A. THE FIRE PROTECTION FSB SHALL MAKE PROVISIONS FOR OBTAINING UPDATED HYDRANT FLOW TEST INFORMATION FOR THIS PROJECT. ANY FLOW TEST INFORMATION NOTED IN THE CONTRACT DOCUMENTS ARE CONSIDERED PRELIMINARY. A NEW FLOW TEST SHALL BE REQUIRED AT THIS CONTRACTOR'S EXPENSE.
   - B. THE FOLLOWING SPRINKLER DESIGN DENSITIES SHALL BE USED FOR SPRINKLER SYSTEM PIPE SIZING:

     ORDINARY HAZARD OCCUPANCIES GROUP 1

     DESIGNED FOR 0.15 GPM OVER THE MOST REMOTE 1500 SQUARE FEET. MAXIMUM SPACING OF 130 SQUARE FEET PER SPRINKLER, UNLESS NOTED OTHERWISE. INCLUDE 250 GPM FOR INSIDE HOSE STREAM ALLOWANCE AS PART OF THE CALCULATION. MAXIMUM VELOCITIES SHALL NOT EXCEED 20 FEET PER SECOND.
   - C. FIRE PROTECTION SIGNALING SYSTEMS CONTROL EQUIPMENT AND ANNUNCIATOR PANEL ARE SHOWN ON THE ELECTRICAL DRAWINGS.
   - D. THE SPRINKLER LAYOUT SHOWN ON THESE DRAWINGS SHALL BE HYDRAULICALLY CALCULATED. THE RESULTS OF THE HYDRAULIC CALCULATION SHALL SHOW THAT THERE IS SUFFICIENT PRESSURE TO OPERATE THE REQUIRED NUMBER OF SPRINKLERS AT THE MOST REMOTE DESIGN AREAS. PIPE SIZES AND NODE LOCATIONS HAVE BEEN SHOWN ON THE DRAWINGS TO INDICATE DESIGN INTENT.
   - E. THE SPRINKLER CONTRACTOR SHALL FOLLOW THE DESIGN CRITERIA INDICATED ON THE DRAWINGS, BUT WILL BE ALLOWED TO VARY THE PIPE SIZES TO ALLOW FOR COORDINATION AND MINOR CHANGES IN THE PREPARATION.
2. SEQUENCE OF OPERATION
   - A. WET SPRINKLER SYSTEM: THE WET PIPE SYSTEM EMPLOYS AUTOMATIC (CLOSED FUSIBLE LINK) SPRINKLERS ATTACHED TO PIPING CONTAINING WATER UNDER PRESSURE AT ALL TIMES. WHEN A FIRE OCCURS, INDIVIDUAL SPRINKLERS ARE ACTIVATED BY HEAT AND WATER FLOWS IMMEDIATELY. THE FLOW OF WATER RAISES THE ALARM CHECK VALVE CLAPPER FROM ITS SEAT, THIS ALLOWS WATER TO ENTER THE ALARM LINE. THE FLOW SWITCH ON THE ALARM LINE ACTIVATES A LOCAL AUDIBLE ALARM PROVIDING AN ELECTRIC SIGNAL, WHICH IS SENT TO THE FIRE ALARM CONTROL PANEL. THIS SIGNAL IS FORWARDED TO THE LOCAL FIRE DEPARTMENT. A FIRE DEPARTMENT CONNECTION IS CONNECTED TO THE SUPPLY SIDE OF THE SYSTEM FOR USE BY THE LOCAL FIRE DEPARTMENT PUMPER TRUCK.
3. TESTING CRITERIA FOR FINAL ACCEPTANCE
   - A. APPROVAL OF SPRINKLER SYSTEM: THE INSTALLING SPRINKLER CONTRACTOR SHALL:
     - a. NOTIFY THE AUTHORITY HAVING JURISDICTION AND OWNER'S REPRESENTATIVE OF THE TIME AND DATE TESTING WILL BE PERFORMED.
     - b. PERFORM ALL REQUIRED ACCEPTANCE REQUIREMENTS LISTED IN NFPA 13 (2013) HYDROSTATIC TESTS.
     - c. COMPLETE AND SIGN THE APPROPRIATE CONTRACTOR'S MATERIAL AND TEST CERTIFICATES.
   - B. COMPLETE AS-BUILT DRAWINGS AS SPECIFIED.

FIRE PROTECTION LEGEND

SYMBOL	ABBREVIATION	DESCRIPTION
		ABOVE FLOOR PIPING (INDICATED AS SINGLE LINEWORK)
		BELOW FLOOR PIPING (INDICATED AS DOUBLE LINEWORK)
		NEW WORK (INDICATED AS HEAVY LINEWORK)
F	F	FIRE PROTECTION SERVICE MAIN
WS	WS	WET SPRINKLER SYSTEM
	UP	UP (PENETRATES LEVEL ABOVE)
		RISE (BUT DOES NOT PENETRATE LEVEL ABOVE)
	DN	DOWN (PENETRATES LEVEL BELOW)
		DROP (BUT DOES NOT PNETRATE LEVEL BELOW)
		DIRECTION OF FLOW
SS		SHUTOFF VALVE (OUTSIDE SCREW AND YOKE WITH SUPERVISORY SWITCH)
	FDC	FIRE DEPARTMENT CONNECTION
	CV	CHECK VALVE
	DV	DRAIN VALVE WITH HOSE THREADS
	TS	TAMPER SWITCH
	FS	FLOW SWITCH
	PS	PRESSURE SWITCH
	PG	PRESSURE GAUGE
	NIFPC	NOT IN FIRE PROTECTION CONTRACT
	FPC	FIRE PROTECTION CONTRACTOR
	VIV	VALVE IN VERTICAL
	RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
	WACV	WET ALARM CHECK VALVE
		ISOLATION VALVE W/ TAMPER SWITCH
	CONCEALED	CONCEALED SPRINKLER
	PENDENT	PENDENT SPRINKLER
	UPRIGHT	UPRIGHT SPRINKLER
G	UPRIGHT	UPRIGHT SPRINKLER W/ PROTECTIVE GUARD
XXX / X		HYDRAULIC CALCULATION NODES

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SAR ENGINEERING, INC.
Mechanical/Electrical Engineers
150 Grossman Drive, Suite 309
Braintree, Massachusetts 02184
617.221.9220
web: www.sar.com

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 — 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

PLUMBING
LEGEND AND GENERAL NOTES

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

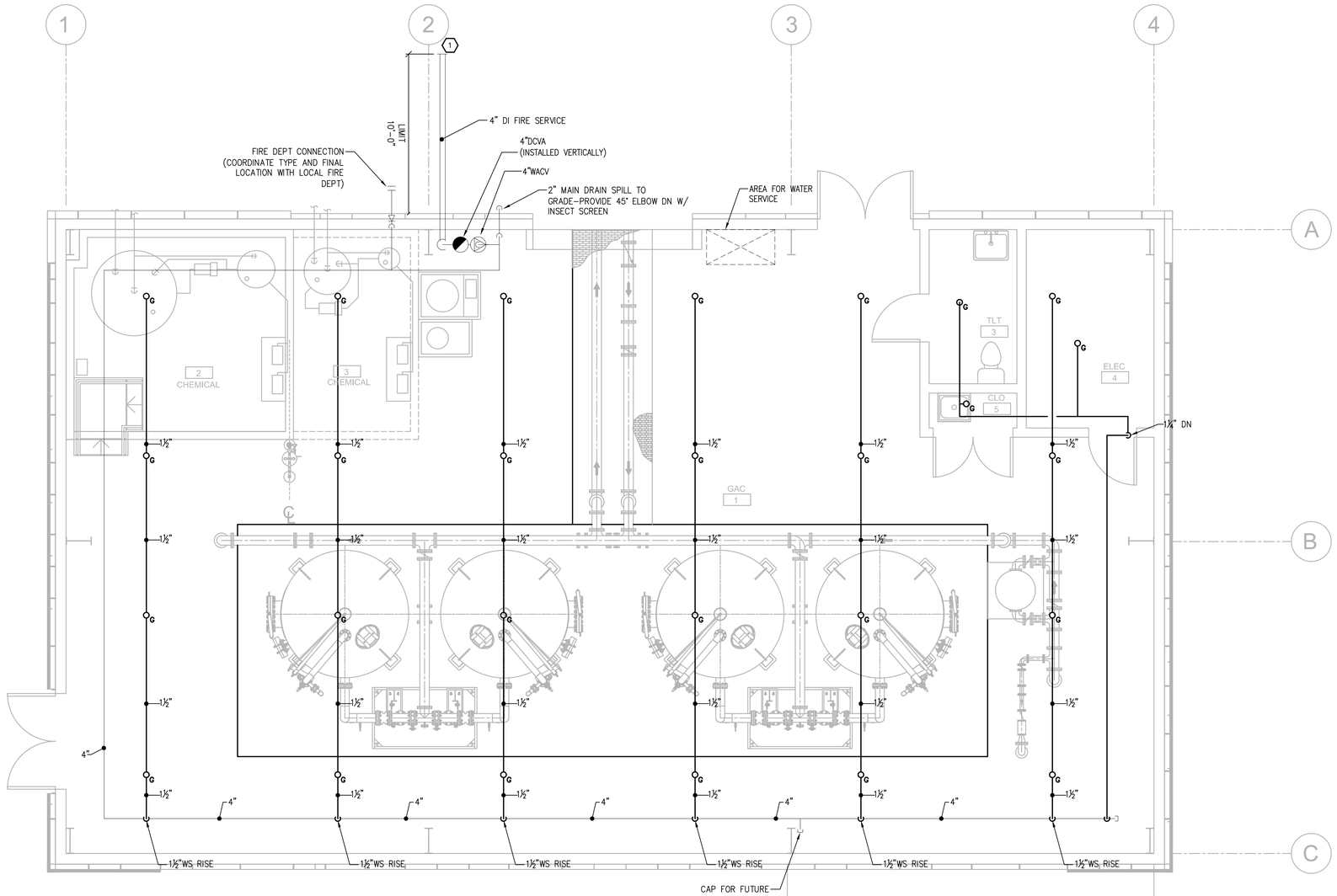
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	RLB
DRAWN BY	RLB
CHECKED BY	JL
APPROVED BY	ABB

P-001

SHEET 49 of 59



NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4' 8'

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

ORIGINAL DRAWING SIZE IS 22 x 34

FIRE PROTECTION FLOOR PLAN

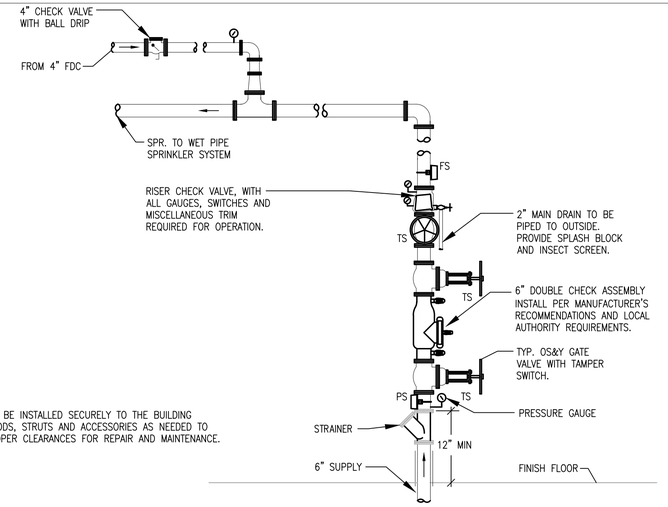
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	RLB
DRAWN BY	RLB
CHECKED BY	JL
APPROVED BY	ABB

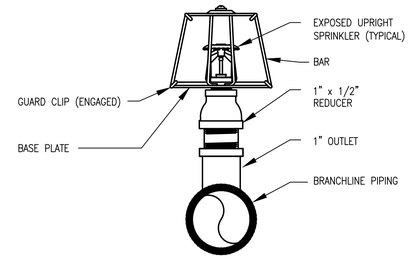
FP-101



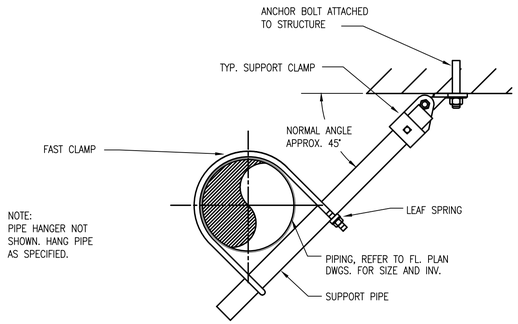
NOTES:

PIPING AND EQUIPMENT SHALL BE INSTALLED SECURELY TO THE BUILDING STRUCTURE USING CLAMPS, RODS, STRUTS AND ACCESSORIES AS NEEDED TO ALLOW FULL ACCESS AND PROPER CLEARANCES FOR REPAIR AND MAINTENANCE.

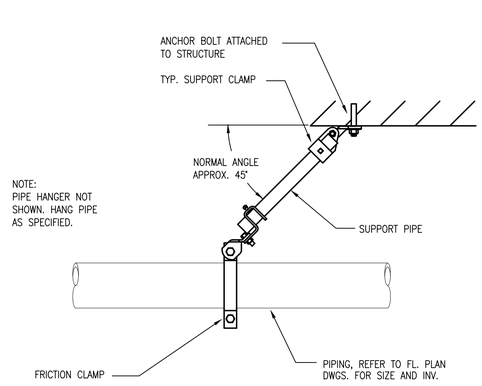
1 WET SPRINKLER RISER ASSEMBLY DIAGRAM NTS



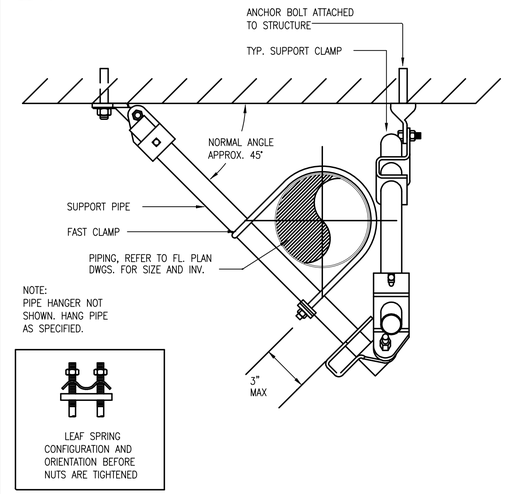
2 UPRIGHT SPRINKLER W/ GUARD NTS



3 LATERAL SEISMIC BRACING DIAGRAM NTS



4 LONGITUDINAL SEISMIC BRACING DIAGRAM NTS



5 4-WAY LONGITUDINAL SEISMIC BRACING NTS

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

FIRE PROTECTION DETAILS

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	RLB
DRAWN BY	RLB
CHECKED BY	JL
APPROVED BY	ABB

FP-200

SHEET 51 of 59

ABBREVIATIONS

AFG	ABOVE FINISH GROUND
ACD	AUTOMATIC CONTROL DAMPER
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AP	ACCESS PANEL
ARCH	ARCHITECT
ATC	AUTOMATIC TEMPERATURE CONTROL
BDD	BACKDRAFT DAMPER
BTU	BRITISH THERMAL UNIT
BTUH	BTU PER HOUR
BOD	BOTTOM OF DUCT
CAP	CAPACITY
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CO	CLEANOUT
CP	CONTROL PANEL
DIA	DIAMETER
DB	DRY BULB TEMPERATURE
DDC	DIRECT DIGITAL CONTROL
DN	DOWN
DWG	DRAWING
DX	DIRECT EXPANSION
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EFF	EFFICIENCY
ELV	ELEVATION
ER	EXHAUST REGISTER
ESP	EXTERNAL STATIC PRESSURE
EWT	ENTERING WATER TEMPERATURE
EXH	EXHAUST
FA	FREE AREA
FD	FIRE DAMPER
FLA	FULL LOAD AMPS
FPI	FINS PER INCH
FPM	FEET PER MINUTE
FT	FEET
FTR	FINNED TUBE RADIATION
GAL	GALLONS
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GPM	GALLONS PER MINUTE
HP	HORSEPOWER
HVAC	HEATING, VENTILATING AND AIR CONDITIONING
HZ	HERTZ
IN	INCHES
KE	KITCHEN EXHAUST
KW	KILOWATTS
LAT	LEAVING AIR TEMPERATURE
LD	LINEAR DIFFUSER
LF	LINEAR FEET
LWT	LEAVING WATER TEMPERATURE
MBH	THOUSANDS OF BTU'S PER HOUR
MCC	MOTOR CONTROL CENTER
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAT	OUTSIDE AIR TEMPERATURE
OBD	OPPOSED BLADE DAMPER
OD	OUTSIDE DIAMETER
ø	PHASE
PD	PRESSURE DROP
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH (GAUGE)
R	RETURN
RA	RETURN AIR
RG	RETURN GRILLE
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
RR	RETURN REGISTER
S	SUPPLY
SA	SUPPLY AIR
SAT	SUPPLY AIR TEMPERATURE
SCT	SATURATED CONDENSING TEMPERATURE
SD	SMOKE DAMPER
SF	SQUARE FEET
SFD	SMOKE/FIRE DAMPER
SP	STATIC PRESSURE
SQ	SQUARE
SR	SUPPLY REGISTER
SST	SATURATED SUCTION TEMPERATURE
STL	STEEL
TYP	TYPICAL
UC	UNDERCUT DOOR
V	VOLTS
VD	VOLUME DAMPER
VFD	VARIABLE FREQUENCY DRIVE
VP	VANDAL PROOF
W/	WITH
W/O	WITHOUT
WB	WET BULB TEMPERATURE
WG	WATER GAUGE
WMS	WIRE MESH SCREEN

EQUIPMENT TAG SYMBOLS & ABBREVIATIONS

ACC	AIR COOLED CONDENSER
DHU	DEHUMIDIFIER
EF	EXHAUST FAN
SF	SUPPLY FAN
UH	UNIT HEATER

INSTRUMENTATION

T	HEATING/COOLING THERMOSTAT
SDE	DUCT SMOKE DETECTOR
S	SWITCH
S BG	SWITCH WITH BREAK GLASS

LEGEND/SYMBOLS

12x10	RECTANGULAR DUCTWORK – FIRST DIMENSION IS SIDE SHOWN (IN.) FREE AREA
12ø	ROUND DUCT DIAMETER (IN.)
	SUPPLY/OUTSIDE AIR DUCTWORK UP
	RETURN/EXHAUST AIR DUCTWORK UP
	FLEXIBLE CONNECTION
	ROUND DUCT UP
	RETURN AIR GRILLE OR REGISTER
MD	AUTOMATIC CONTROL DAMPER (MOTORIZED)
	SUPPLY AIR BLOW DIRECTION
	EXHAUST / RETURN / OR INTAKE
	REMOVE EXISTING WORK
	EXITING WORK (OUT–OF–FUNCTION)
	NEW WORK (IN–FUNCTION)
	VOLUME DAMPER
	CONNECT TO EXISTING

GENERAL NOTES

1. HVAC WORK IS INDICATED DIAGRAMMATICALLY. EXACT LOCATIONS OF ALL COMPONENTS ARE TO BE DETERMINED IN THE FIELD AND BY THE ACTUAL BUILDING CONDITIONS. DUCTS, PIPING OR EQUIPMENT INTERFERING WITH OTHER INSTALLATIONS SHALL BE RELOCATED AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER. EXACT LOCATIONS MUST HAVE THE APPROVAL OF THE ARCHITECT.
2. ALL WORK SHALL BE COORDINATED WITH ALL OTHER TRADES BEFORE ANY INSTALLATION IS MADE.
3. ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH STATE CODES, MANUFACTURER'S APPROVED PUBLISHED LITERATURE, AND AUTHORITIES HAVING JURISDICTION.
4. INSTALLATION OF EQUIPMENT SHALL PERMIT ACCESSIBILITY FOR SERVICE AND/ REPAIR OR REPLACEMENT.
5. ALL CEILING MOUNTED EQUIPMENT SHALL BE INSTALLED IN SUCH A WAY THAT LIGHTS, PIPING, AND DUCTWORK DO NOT BLOCK ACCESS TO UNITS AND RELATED ACCESSORIES.
6. HVAC CONTRACTOR SHALL COORDINATE ALL WALL, CEILING, FLOOR, ROOF AND BEAM PENETRATIONS WITH ARCHITECT AND STRUCTURAL ENGINEER.
7. ALL DUCT SIZES SHOWN ARE NET INSIDE CLEAR DIMENSIONS.
8. PROVIDE INSTRUMENT TEST HOLES WITH CAPS IN AIR DISTRIBUTION SYSTEMS AS REQUIRED TO BALANCE SYSTEM.
9. HVAC CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SHEETMETAL TRANSITIONS AT FANS, COILS, AND OTHER SIMILAR HVAC EQUIPMENT.
10. ALL MISCELLANEOUS SUPPORTS REQUIRED FOR HVAC EQUIPMENT INSTALLATION SHALL BE PROVIDED BY HVAC SUBCONTRACTOR.
11. EXACT LOCATION OF THERMOSTAT TO BE COORDINATED WITH FINAL LOCATION OF WALL MOUNTED ARCHITECTURAL AND ELECTRICAL EQUIPMENT.
12. PROVIDE FLEXIBLE DUCT CONNECTIONS ON INTAKES AND DISCHARGES OF ALL AIR HANDLING UNITS.
13. COORDINATE DUCT MOUNTED SMOKE DETECTORS WITH ELECTRICAL CONTRACTOR AND –FURNISHED AND WIRED BY THE ELECTRICAL CONTRACTOR, INSTALLED BY THE HVAC CONTRACTOR.
14. ALL DUCT AND PIPE PENETRATIONS THROUGH WALLS AND FLOORS SHALL BE SEALED WITH FIRE–STOP PENETRATION SEAL IN ACCORDANCE WITH UL 1479.
15. COORDINATE THE DIMENSIONS AND EXACT LOCATION OF THE SUSPENDED STRUCTURAL FRAME WITH THE SUPPORT REQUIREMENTS AND SERVICE ACCESS FOR DH–1.

SEQUENCE OF OPERATION

1. EF–1 AND IL–1

   INTAKE LOUVER IL–1 SHALL HAVE A DIRECT CONNECTED ACTUATOR. ACTUATOR SHALL BE CONTROLLED AS FOLLOWS:

   a. IL–1 LOUVER SHALL OPEN WHEN EF–1 IS SWITCHED ON. WHEN EF–1 IS SWITCHED OF, THE IL–1 DAMPER SHALL CLOSE.

2. EF–1:

   a. WHEN THE REFRIGERATION MONITOR ENTERS AN ALARM STATE, THE FAN MOTOR OPERATED DAMPER SHALL OPEN , THE DAN MOTOR SHALL START AND RUN AND IL–1 MOTOR OPERATED DAMPER SHALL OPEN. WHEN THE REFRIGERATION MONITOR LEAVES THE ALARM STATE. THE FAN MOTOR SHALL BE STOPPED AND THE FAN MOTOR OPERATED DAMPER AND IL–1 MOTOR OPERATED DAMPER SHALL CLOSE.

   b, WHEN A MANUAL WALL SWITCH IS PLACED IN THE "ON" POSITION. THE FAN MOTOR OPERATED DAMPER SHALL OPEN, THE FAN MOTOR SHALL START AND RUN AND IL–1 MOTOR OPERATED DAMPER SHALL OPEN; UNLESS EF–2 BREAKGLASS SWITCH IS ACTIVATED, IN WHICH CASE THE FAN SHALL NOT START AND THE FAN MOTOR OPERATED AND IL–1 MOTOR OPERATED DAMPER SHALL REMAIN CLOSED. WHEN THE MANUAL WALL SWITCH IS PLACED IN THE "OFF" POSITION. THE FAN MOTOR SHALL BE STOPPED AND THE FAN MOTOR OPERATED DAMPER AND IL–1 MOTOR OPERATED DAMPER SHALL CLOSE.

3. EF–2:

   FAN SHALL RUN CONTINUOUSLY AND ASSOCIATED MOTOR OPERATED DAMPER SHALL BE OPEN. WALL CAP WITH GRAVITY DAMPER SHALL ALLOW MAKE–UP INTO THE SPACE. WHEN A BREAK GLASS SWITCH IS MOVED TO THE "OFF" POSITION. THE FAN SHALL BE STOPPED. THE MOTOR OPERATED DAMPER SHALL CLOSE AND EF–1/IL–1 SHALL BE STOPPED AND THE ASSOCIATED MOTOR OPERATED DAMPER SHALL CLOSE UNLESS OVERRIDDEN BY THE REFRIGERATION MONITOR. SIGNAGE AT FAN EF–2 SHALL NOTE " FAN EF–2 EMERGENCY STOP"

4. EF–3:

   ELECTRICAL ROOM EXHAUST FAN SHALL BE STARTED AND STOPPED BY A WALL MOUNTED THERMOSTAT. ASSOCIATED MOTOR OPERATED DAMPER SHALL CYCLE OPEN AND CLOSED AS APPROPRIATE. A WALL CAP WITH GRAVITY DAMPER SHALL ALLOW AIR INTO THE ROOM TO MAKE–UP THE AIR EXHAUSTED.

5. EF–4:

   FAN SHALL BE STARTED AND STOPPED BY ROOM LIGHT SWITCH. A WALL CAP WITH GRAVITY DAMPER SHALL ALLOW AIR INTO THE ROOM TO MAKE–UP THE AIR EXHAUSTED.

6. DHU–1 AND ACC–1:

   DEHUMIDIFIER SHALL OPERATE BASED ON INTERGRAL CONTROL SEQUENCES AND TEMPERATURE AND HUMIDITY SENSORS WITHIN THE UNIT CABINET. THE SEQUENCES SHALL MAINTAIN A SPACE TEMPERATURE OF 75ºF DRY BULB AND 40% RELATIVE HUMIDITY. DEW POINT TEMPERATURE SHALL BE CONTINUOUSLY MAINTAINED AT 50ºF. UPON A RISE IN DRY BULB SPACE TEMPERATURE OVER THE SETPOINT OF 75ºF (ADJ) THE UNIT SHALL SWITCH INTO COOLING MODE AND ENERGIZE THE REMOTE CONDENSING TO MAINTAIN DRY BULB SPACE TEMPERATURE SETPOINT. UPON DETECTION OF SMOKE VIA A DUCT MOUNTED SMOKE DETECTOR, THE DH SYSTEM SHALL DEENERGIZE AND A SIGNAL SHALL BE SENT TO THE FACP.

7. EWH–1:

   ELECTRIC WALL HEATER SHALL BY CYCLE FROM AN INTEGRAL THERMOSTAT TO MAINTAIN SPACE TEMPERATURE SETPOINT.

8. EUH–1:

   ELECTRIC UNIT HEATER SHALL BY CYCLE FROM THE THERMOSTAT TO MAINTAIN SPACE TEMPERATURE SETPOINT.

9. GUH–1 AND GUH–2:

   UNIT HEATERS SHALL FIRE ON LOW STAGE OR HIGH STAGE AS DETERMINED BY A WALL MOUNTED SPACE THERMOSTAT TO MAINTAIN A SPACE TEMPERATURE SETPOINT OF 65ºF (ADJ) THE UNIT HEATERS SHALL INCLUDE THE CAPABILITY TO RUN THE UNIT FAN FOR SUMMER VENTILATION WITH NO HEAT.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

HVAC
LEGEND AND GENERAL NOTES

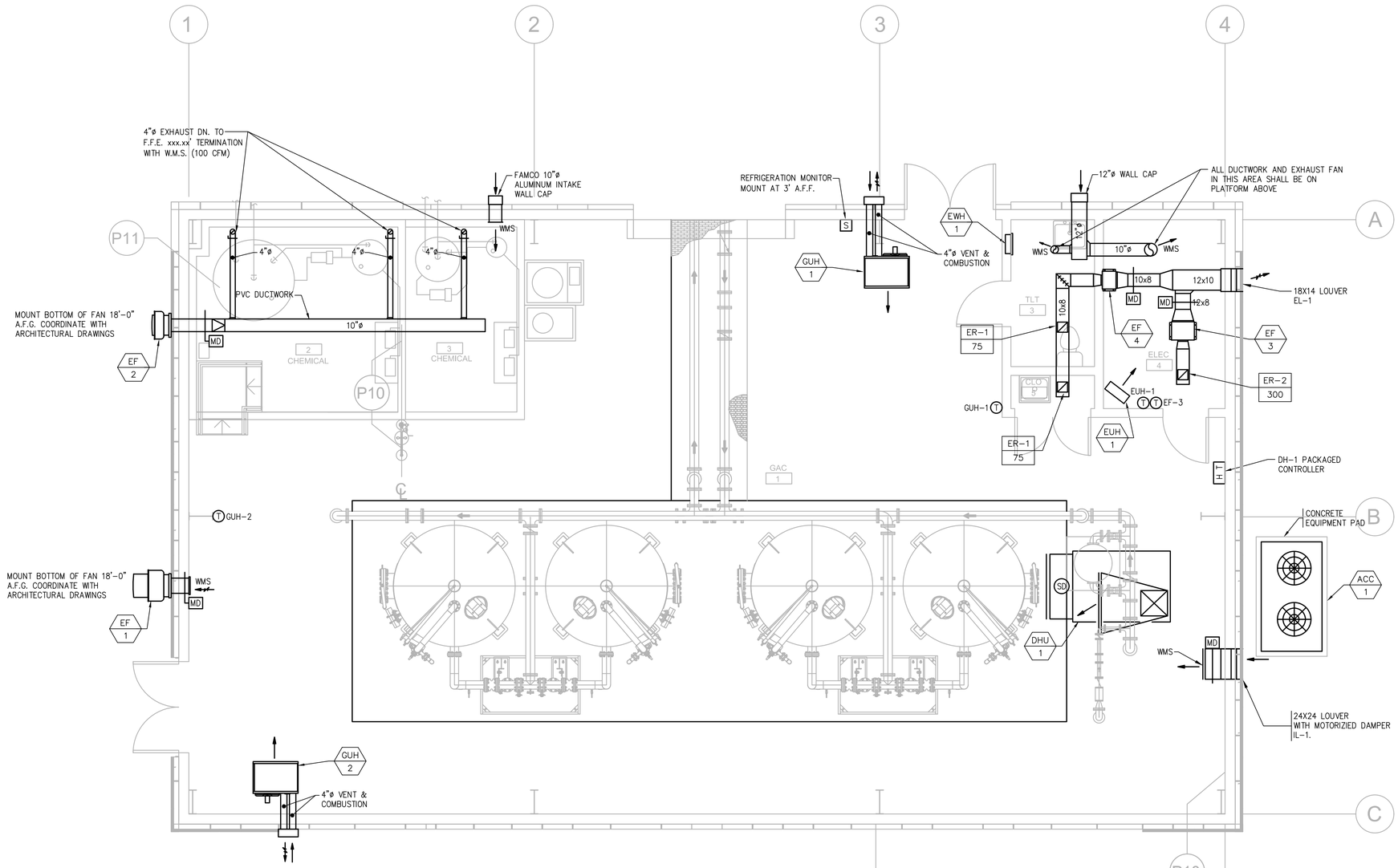
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	RLB
DRAWN BY	RLB
CHECKED BY	RHB
APPROVED BY	ABB

H-001



NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4' 8'

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

ORIGINAL DRAWING SIZE IS 22 x 34

HVAC
FLOOR PLAN

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	RLB
DRAWN BY	RLB
CHECKED BY	RHB
APPROVED BY	ABB

H-101

SHEET 53 of 59

DEHUMIDIFIER SCHEDULE

TAG NO.	MANUFACTURER MODEL NO. OR EQUAL	AREA SERVED	TYPE	MOISTURE REMOVAL (LBS/HR)	SENSIBLE COOLING (MBH)	TOTAL COOLING (MBH)	AIRFLOW (CFM)	ELECTRICAL DATA				REMARKS
								MCA	MAX FUSE	VOLT	PHASE	
DHU-1	DESERT AIRE LW-10	FILTER ROOM	CEILING	18.6	80.10	100	6,900	26	40	480	3	1

1. PROVIDE HUMIDITY AND TEMPERATURE CONTROLLER TYPICAL TO DESERT AIRE MODEL CA2500 AND R-407C REFRIGERANT.

UH UNIT HEATER SCHEDULE

TAG NO.	LOCATION	AIR					MOUNT HEIGHT (FT.)	GAS (PROPANE)		ELECTRICAL DATA			MANUFACTURER MODEL NUMBER	REMARKS
		CFM	HP	THROW (FT)	EAT (°F)	LAT (°F)		INPUT (MBH)	OUTPUT (MBH)	V	PH	HZ		
GUH-1	FILTER ROOM	1,090	1/3	40	50	110	–	75	61.5	120	1	60	MODINE HDC-75	1 2 3
GUH-2	FILTER ROOM	1,090	1/3	40	50	110	–	75	61.5	120	1	60	MODINE HDC-75	1 2 3

1. PROVIDE TWO STAGE GAS VALVE WITH INTERMITTENT PILOT CONTROL, 100% SHUTOFF WITH CONTINUOUS RETRY.
2. PROVIDE NATURAL GAS TO PROPANE GAS CONVERSION KIT.
3. PROVIDE WITH SIDEWALL TERMINATION KIT

EUH ELECTRIC HEATER SCHEDULE

TAG NO.	LOCATION	CAPACITY	FAN DATA				MANUFACTURER MODEL NUMBER	REMARKS
		KW	CFM	V	PH	HZ		
EUH-1	ELECTRIC ROOM	3.0	350	480	3	60	QMARK MUH0341	
EWH-1	BATHROOM	1.5	–	120	1	60	QMARK CWH1151DSF	

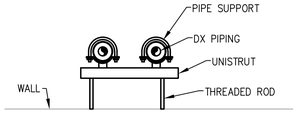
REMOTE CONDENSER SCHEDULE

TAG NO.	MANUFACTURER MODEL NO. OR EQUAL	REFRIG TYPE	AMBIENT TEMP. (°F)	FANS	ELECTRICAL DATA				REMARKS
				QTY	MCA	MOPD	VOLTS	PHASE	
ACC-1	DESERT AIRE RCSS079	R-407C	95	3	–	15	480	3	

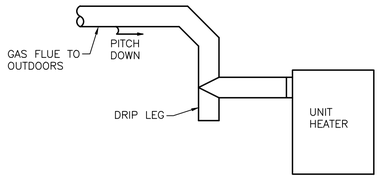
EF FAN SCHEDULE

TAG NO.	SERVICE	FAN TYPE	CFM	ESP (IN WC)	SPEED (RPM)		ELECTRICAL DATA				MANUFACTURER & MODEL NUMBER	REMARKS
					FAN	MOTOR	HP	V	PH	HZ		
EF-1	PFAS AREA	WALL MOUNTED DOME	1400	0.50	1411	1725	1/2	120	1	60	GREENHECK CUE-120-VG	1 2 3
EF-2	CHEMICAL AREA	WALL MOUNTED DOME	300	0.50	1662	1725	1/10	120	1	60	GREENHECK CUE-80-VG	1 2 3
EF-3	ELECTRICAL ROOM	INLINE CABINET	500	0.50	1411	1725	1/2	120	1	60	GREENHECK CSP-A510-VG	1 2 3
EF-4	BATHROOM/JANITOR	INLINE CABINET	150	0.50	1221	1350	32W	120	1	60	GREENHECK CSP-A360-VG	1 2 3

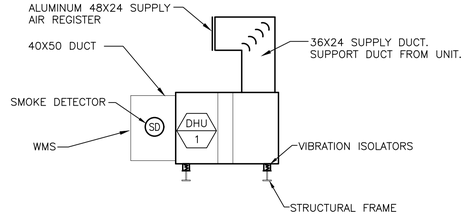
1. PROVIDE THERMAL OVERLOAD MOTOR AND STAINLESS STEEL BIRDSCREEN.
2. PROVIDE MOTOR COVER/BELT GUARD, TEFC FAN MOTOR, INLET FLEX DUCT CONNECTION, AND OUTLET WIRE MESH SCREEN.
3. ECM MOTOR



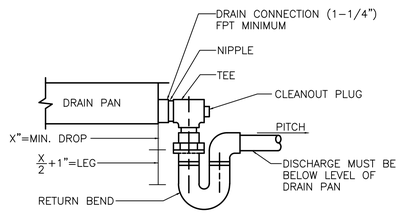
6 DX PIPE SUPPORT DETAIL
NO SCALE



5 GAS VENT DETAIL
NO SCALE



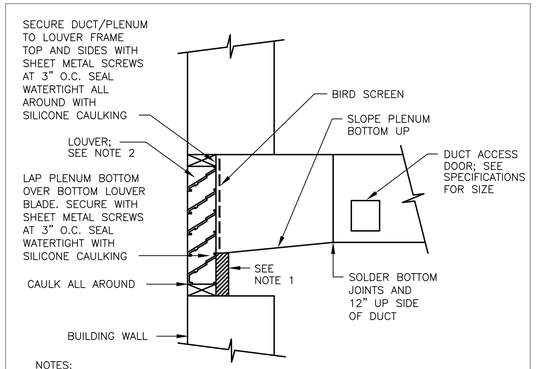
4 SECTION A
NO SCALE



X=NEGATIVE INTERNAL STATIC PRESSURE AT FAN INLET

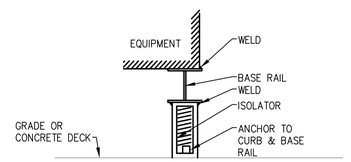
NOTES:
1. ALLOW SUFFICIENT SPACE BELOW DRAIN PAN FOR TRAP
2. PITCH DRAIN FOR PROPER RUN-OFF
3. MANUALLY, PRIME FILL TRAP BEFORE START-UP TO FORM INITIAL DRAIN SEAL
4. SUPPORT LENGTHY DRAIN LINES TO PREVENT SAG AND CONDENSATE OVERFLOW

1 DRAIN PAN WATER SEAL PIPING DETAIL
NO SCALE



NOTES:
1. BLOCK UNUSED PORTION OF LOUVER WITH 4" THICK INSULATED METAL PANEL.
2. SEE ARCHITECTURAL PLANS FOR LOUVER INSTALLATION DETAIL.

2 LOUVER/PLENUM CONNECTION DETAIL
NO SCALE



3 ACCU MOUNTING DETAIL
NO SCALE

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

HVAC
SCHEDULES AND DETAILS

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO. 20233667.002A	
ISSUE DATE SEPT. 2023	
CURRENT REVISION -	
DESIGNED BY RLB	
DRAWN BY RLB	
CHECKED BY RHB	
APPROVED BY ABB	

H-200

PLUMBING NOTES:

1. THE WORK COVERED CONSISTS OF FURNISHING ALL LABOR AND MATERIALS NECESSARY TO INSTALL, COMPLETE AND READY FOR CONTINUOUS OPERATION, THE PLUMBING SYSTEMS, APPARATUS AND EQUIPMENT FOR THIS PROJECT.

2. ALL EQUIPMENT AND MATERIALS FURNISHED UNDER THE PLUMBING SUB-CONTRACT, LABOR AND TESTING PERFORMED HEREIN SHALL BE IN COMPLETE ACCORDANCE WITH THE STATE BUILDING CODE, LOCAL FUEL GAS AND PLUMBING CODES, ALL LOCAL CODES AND REGULATIONS, NATIONAL FIRE PROTECTION ASSOCIATION, INSURANCE REGULATIONS AND REQUIREMENTS GOVERNING SUCH WORK.

3. ANY AND ALL PERMITS REQUIRED FOR INSTALLATION OF ANY MATERIAL SHALL BE OBTAINED AS PART OF THE WORK OF THE SPECIFICATION INCLUDING ALL FEES OR EXPENSES INCURED.

4. WHERE WATER PIPING IS SHOWN DROPPING INTO PLUMBING CHASES WITH SIZES NOTED, THAT SIZE SHALL BE BE CARRIED FULL LENGTH THROUGH THE CHASE. REFER TO PLUMBING FIXTURE SCHEDULE ON THIS DRAWING FOR INDIVIDUAL FIXTURE CONNECTION SIZES.

5. UNLESS OTHERWISE NOTED, ALL HORIZONTAL DRAINAGE PIPING WHICH IS 3" OR LESS IN DIAMETER SHALL PITCH OF NOT LESS THAN 1/4" PER FOOT AND ALL HORIZONTAL DRAINAGE PIPING WHICH IS 4" OR LARGER IN DIAMETER SHALL PITCH OF NOT LESS THAN 1/8" PER FOOT.

6. ALL BELOW FLOOR PIPING THAT INTERSECTS A GRADE BEAM REQUIRES COORDINATION WITH STRUCTURAL. FOR STRUCTURAL DETAILS, REFER TO STRUCTURAL DRAWINGS.

7. PROVIDE ALL FLOOR CLEANOUTS WITH HUB AND SPIGOT; LEAD AND OAKUM JOINTS FROM CLEANOUT TO AND INCLUDING CONNECTION TO SANITARY OR STORM DRAIN.

8. REFER TO ARCHITECTURAL PLANS FOR EXACT LOCATION OF ALL PLUMBING FIXTURES AND EQUIPMENT.

9. ALL BURIED DOMESTIC WATER PIPING, TEMPERED WATER PIPING OR AIR PIPING SHALL BE SOFT ROLLED "K" COPPER COIL AND BE PROTECTED WITH A HIGH DENSITY RUBBER INSULATION. FITTINGS SHALL NOT BE PERMITTED IN OR UNDER SLAB. PROVIDE SLAB PENETRATIONS WITH SLEEVE AND FIRE STOPPING.

10. INTERIOR PLUMBING AND HVAC EQUIPMENT REQUIRING A LP GAS CONNECTION SHALL BE PROVIDED WITH AN EMERGENCY GAS RELIEF VENT AT EACH GAS TRAIN IN ACCORDANCE WITH THE MASSACHUSETTS FUEL GAS CODE AND AS INDICATED WITH THE FOLLOWING CHART:

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

11. MISCELLANEOUS DISCREPANCIES OR OMMISSIONS WHICH MIGHT APPEAR ON THE PLANS OR SPECIFICATIONS WILL NOT RELIEVE THE PLUMBING SUB-CONTRACTOR OF CODE COMPLIANCE.

12. ALL FLOOR DRAINS SHALL BE PROVIDED WITH A TRAP PRIMER CONNECTION. THIS CONTRACTOR SHALL PROVIDE ALL ASSOCIATED EQUIPMENT NECESSARY TO PROVIDE A COMPLETE SYSTEM INCLUDING AN ELECTRONICALLY OPERATED PRIMING MANIFOLD AND ALL ASSOCIATED PIPING REQUIRED.

13. GAS FIRED EQUIPMENT - PROVIDE FULL SIZE SOV AND DRIP LEG IN ACCESSIBLE LOCATION. MAKE FINAL CONNECTION TO EQUIPMENT WITH NECESSARY REDUCER AND UNION CONNECTION. PC TO COORDINATE EXACT CONNECTION SIZE, LOAD, LOCATION, AND EQUIPMENT ACCESS NEEDS PRIOR TO GAS INSTALLATION.

PLUMBING FIXTURE SCHEDULE

DESIGNATION	FIXTURE DESCRIPTION	CONNECTION SIZE					REMARKS
		CW	HW	TW	S/W	V	
ES-1	EMERGENCY SHOWER/EYEWASH	-	-	1-1/4"	-	-	GUARDIAN G1950 – SEE NOTE 1 – SEE NOTE 7
WC-1	WATER CLOSET - FLOOR MTD.	1"	-	-	4"	2"	SEE SPECIFICATION
LAV-1	LAVATORY	1/2"	1/2"	-	2"	2"	SEE SPECIFICATION
JS-1	JANITOR SINK	3/4"	3/4"	-	3"	2"	SEE SPECIFICATION
TMV	THERMOSTATIC MIXING VALVE	-	-	1-1/4"	-	-	LAWLER MODEL 911E - SEE NOTE 3
HB	HOSE BIBB	1/2"	-	-	-	-	INTEGRAL VACUUM BREAKER W/ VANDAL RESISTANT "T" HANDLE KEY - SEE NOTE 2
WH	WALL HYDRANT	1/2"	-	-	-	-	NON-FREEZE, QUARTER TURN, INTEGRAL VACUUM BREAKER W/ VANDAL RESISTANT "T" HANDLE KEY - SEE NOTE 2
FD	FLOOR DRAIN	-	-	-	2"	2"	SEE SPECIFICATION. PROVIDE WITH TRAP PRIMER.

NOTES:
1. PROVIDE FLOW SWITCH WITH SINGLE POLE, DOUBLE THROW CONTACTS, AND 20 GPM BALANCING REGULATOR (G6040).
2. MOUNT FIXTURE 4–0" AFF
3. PROVIDE DIAL THERMOMETER ON INLETS.
5. ALL EXPOSED VALVES, PIPING AND FITTINGS SHALL BE CHROME PLATED.
6. PLUMBING CONTRACTOR SHALL PROVIDE EACH CONNECTION TO EACH SINK OR PIECE OF EQUIPMENT WITH ITS OWN INDIVIDUAL SHUTOFF VALVE
7. PROVIDE 90° ELBOW FOR EYEWASH DRAIN OUTLET TO DRAIN DIRECT ON FLOOR.

GAS FIRED TANKLESS WATER HEATER SCHEDULE

TAG NO.	MANUFACTURER AND MODEL NO.	MAX INPUT (MBH)	CONTINUOUS FLOW RATE (GPM) AT 80° RISE	FLUE SIZE (IN.)	OUTLET TEMP SETTING (° F)	REMARKS
TWH-1	NORITZ MODEL NC380	380	7.8	6	120	LP GAS, INSTALL PER MANUFACTURER'S INSTRUCTIONS FOR MULTI-UNIT INSTALLATION

PLUMBING LEGEND

SYMBOL	ABBREVIATION	DESCRIPTION
		ABOVE FLOOR PIPING (INDICATED AS SINGLE LINEWORK)
		BELOW FLOOR PIPING (INDICATED AS DOUBLE LINEWORK)
		NEW WORK (INDICATED AS HEAVY LINEWORK)
	CW	COLD WATER
	HW	HOT WATER
	HWR	HOT WATER RECIRCULATION
TW	TW	TEMPERED WATER
	S/W	SANITARY DRAINAGE (SOIL/WASTE)
	FLUE	FLUE EXHAUST
G	G	GAS (LIQUID PROPANE)
	UP	UP (PENETRATES LEVEL ABOVE)
		RISE (BUT DOES NOT PENETRATE LEVEL ABOVE)
	DN	DOWN (PENETRATES LEVEL BELOW)
	DP	DROP (BUT DOES NOT PENETRATE LEVEL BELOW)
		DIRECTION OF FLOW
.01		DIRECTION & DESIGNATION OF SLOPE (IN FT/FT)
		SHUTOFF VALVE
	BVA	BALANCING VALVE ASSEMBLY
	CV	CHECK VALVE
	PRV	PRESSURE REDUCING VALVE
	DV	DRAIN VALVE WITH HOSE THREADS
		GAS SHUTOFF VALVE
	PG	PRESSURE GAUGE
	SA	SHOCK ABSORBER
	CO	CLEANOUT
	WCO	WALL CLEANOUT
	FCO	FLOOR CLEANOUT
	FD	FLOOR DRAIN
	HB	HOSE BIBB
	WH	WALL HYDRANT
	NIPC	NOT IN PLUMBING CONTRACT
	PC	PLUMBING CONTRACTOR
	NO	NORMALLY OPEN
	NC	NORMALLY CLOSED
	INV	INVERT ELEVATION
	CFH	CUBIC FEET PER HOUR
	W&T	WASTE & TRAP
	VIV	VALVE IN VERTICAL
	OED	OPEN END DRAIN
	VTR	VENT THRU ROOF
	CC	CAPPED CONNECTION
	UN	UNION
	ST	STRAINER
	WTS	WATER TIGHT SLEEVE
	P–	PLUMBING FIXTURE DESIGNATION
OR	WM	WATER METER
	RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
	TWH	TANKLESS WATER HEATER
	FFE	FINISHED FLOOR ELEVATION
	LPC	LIMIT PLUMBING CONTRACT
	TDL	TOTAL DEVELOPED LENGTH
		EMERGENCY SHOWER/EYE WASH STATION
		EMERGENCY SHOWER STATION

SHOCK ABSORBER SCHEDULE*

PDI RATING SYMBOL	A	B	C	D	E
PRECISION PLUMBING PRODUCTS	SC-500	SC-750	SC-1000	SC-1250	SC-1500
WATTS REGULATOR COMPANY	0750030	0750053	0750060	0750070	0750090
WADE	5-P	10-P	20-P	50-P	75-P

* MANUFACTURERS NAMES AND MODEL NUMBERS ARE SHOWN ONLY TO REPRESENT TYPE, STYLE AND LEVEL OF QUALITY EXPECTED, SIMILAR PRODUCTS BY OTHER MANUFACTURERS WILL BE ACCEPTABLE.

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

PLUMBING
LEGEND AND GENERAL NOTES

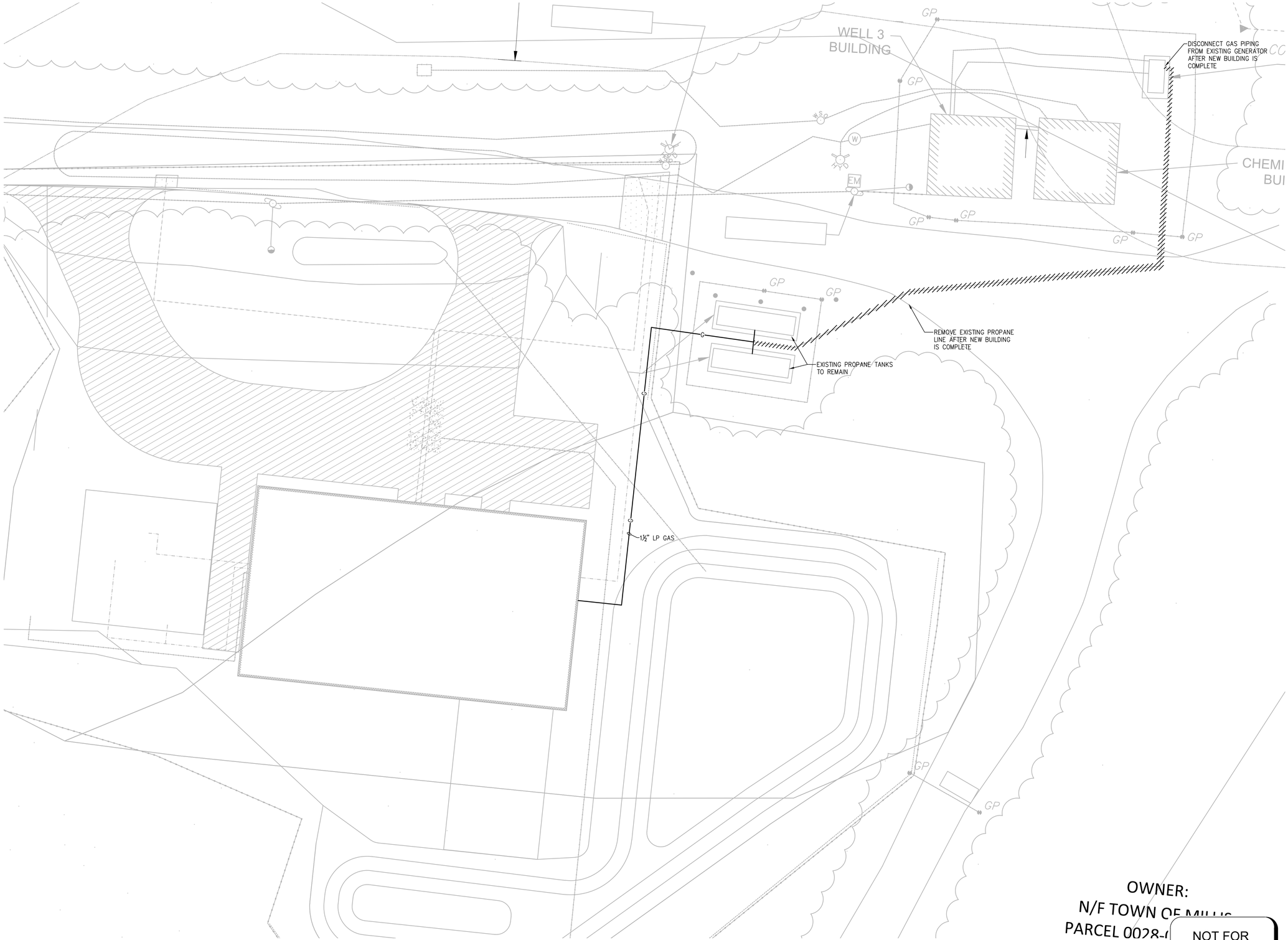
TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	RLB
DRAWN BY	RLB
CHECKED BY	JL
APPROVED BY	ABB

P-001



SITE PLAN:
SCALE: 1" = 10'

OWNER:
N/F TOWN OF MILLIS
PARCEL 0028-(

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4' 8'
SCALE: 1/4" = 1'-0"SCALE IN FEET

ORIGINAL DRAWING SIZE IS 22 x 34

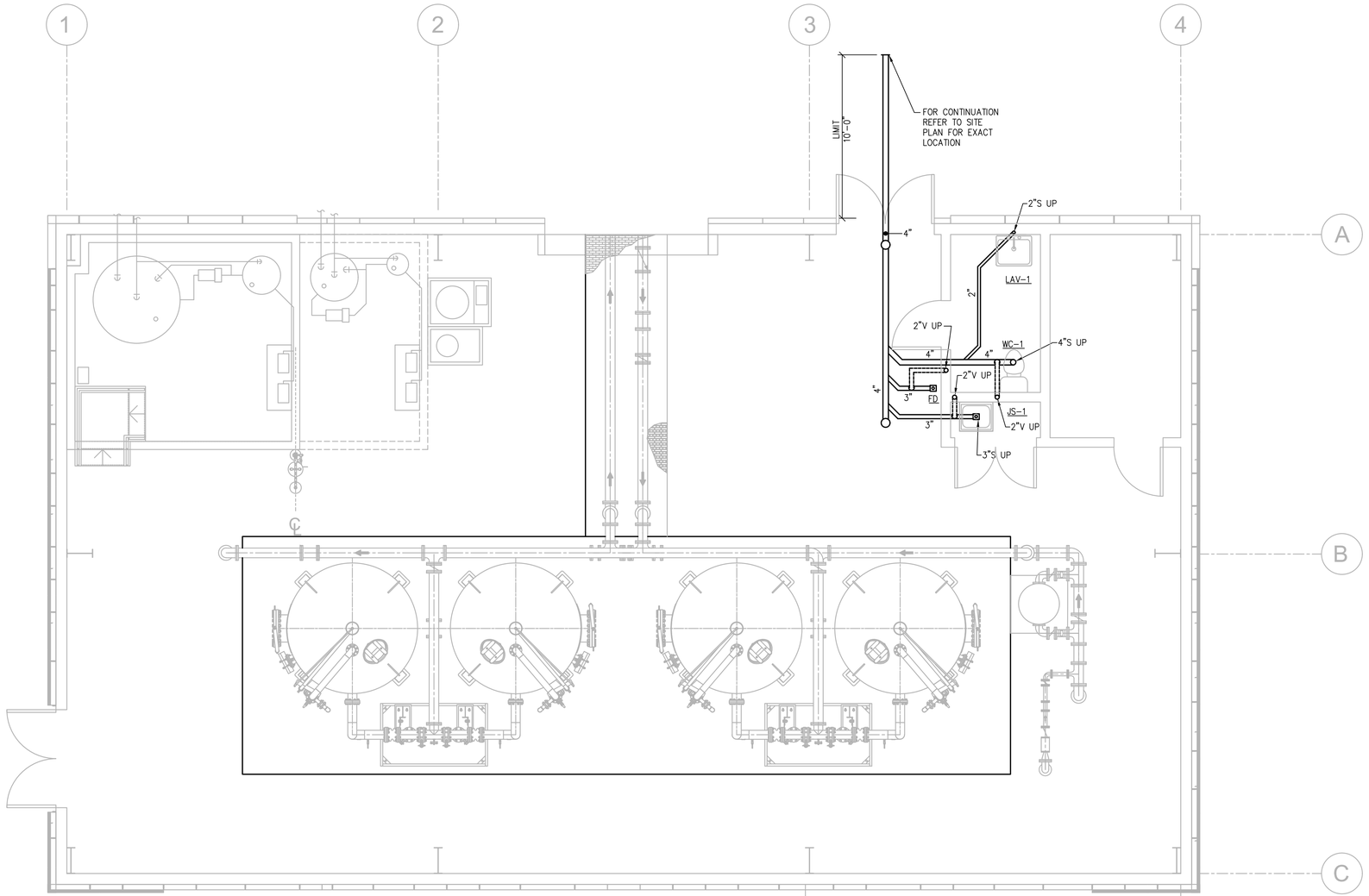
PLUMBING
SITE PLAN

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO. 20233667.002A	
ISSUE DATE SEPT. 2023	
CURRENT REVISION -	
DESIGNED BY RLB	P-002
DRAWN BY RLB	
CHECKED BY JL	
APPROVED BY ABB	SHEET 56 of 59



NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4' 8'

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

ORIGINAL DRAWING SIZE IS 22 x 34

PLUMBING
UNDERGROUND FLOOR PLAN

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

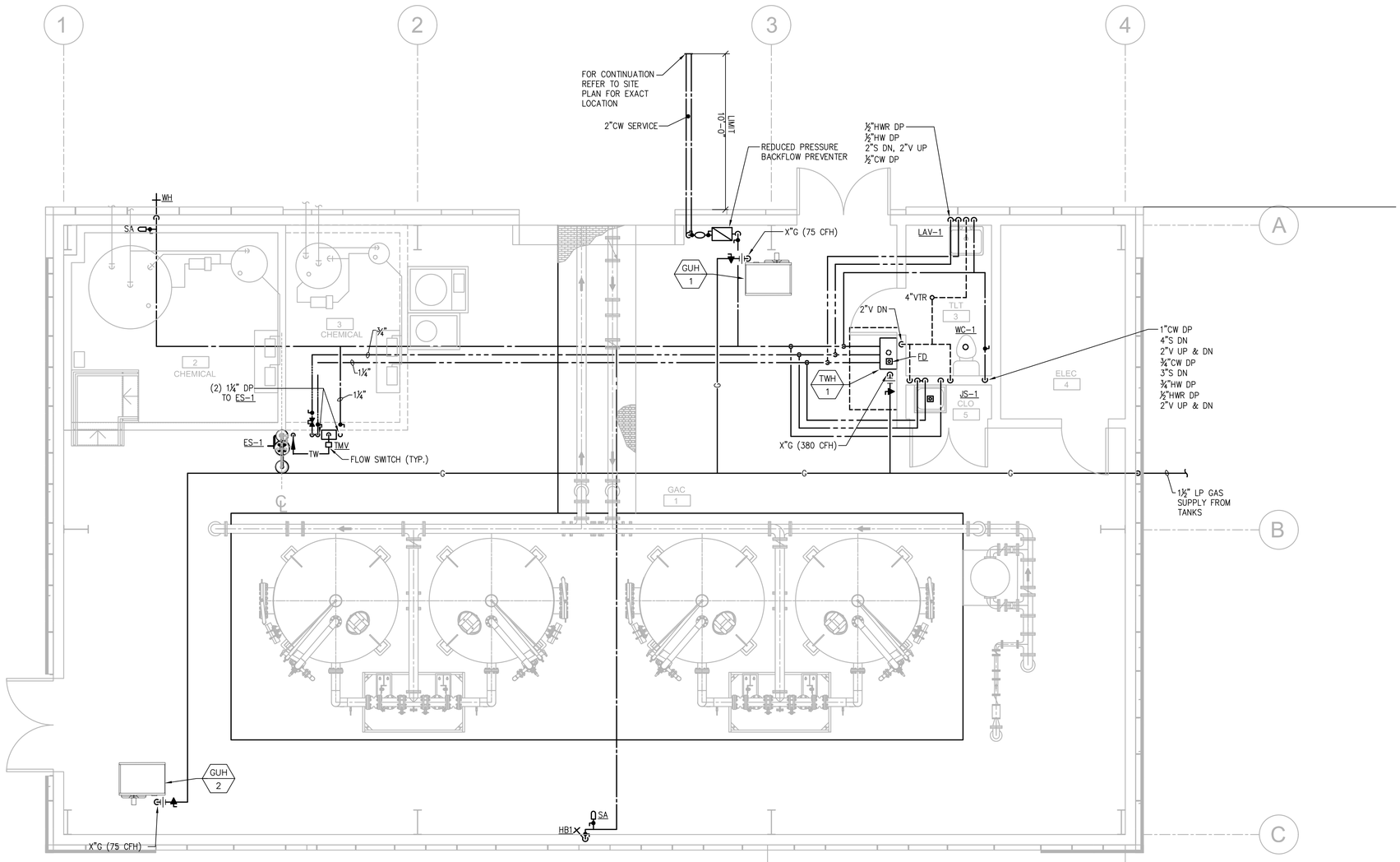
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	RLB
DRAWN BY	RLB
CHECKED BY	JL
APPROVED BY	ABB

P-101

SHEET 57 of 59



NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

0 4' 8'

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

ORIGINAL DRAWING SIZE IS 22 x 34

PLUMBING FLOOR PLAN

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

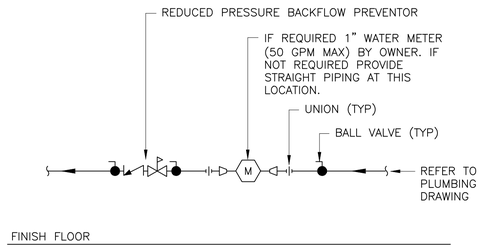
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	RLB
DRAWN BY	RLB
CHECKED BY	JL
APPROVED BY	ABB

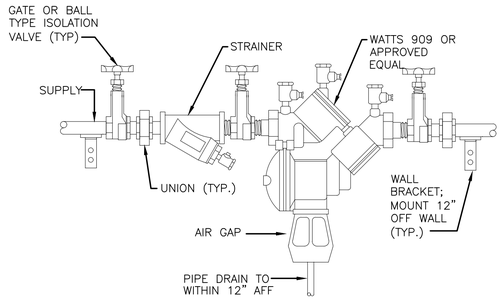
P-101

SHEET 58 of 59



1 WATER METER ASSEMBLY DIAGRAM

NOT TO SCALE



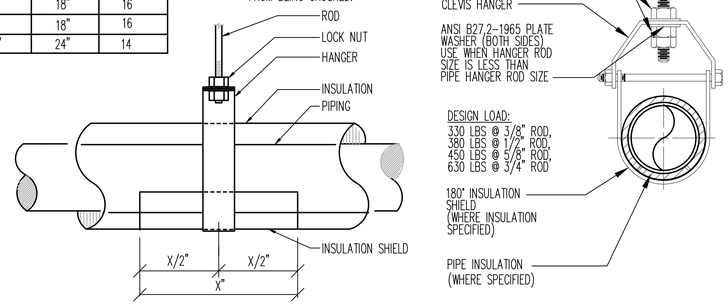
2 REDUCED PRESSURE BACKFLOW PREVENTER

NOT TO SCALE

PIPE SIZE	INSULATION SHIELD LENGTH (X") INSULATION THICKNESS 1/2""	3/4"	1"	GAUGE
1/2" TO 3"	12"	12"	12"	18
4"	12"	12"	12"	16
5"	18"	18"	18"	16
6"	18"	18"	18"	16
8" TO 14"	24"	24"	24"	14

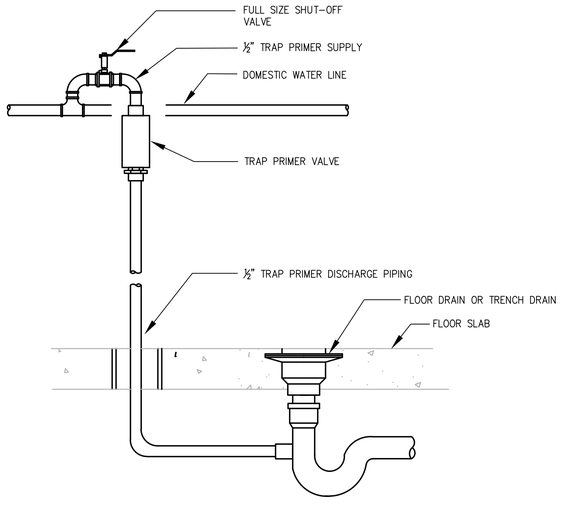
NOTES: 1. HANGER SHIELD IS TYPICAL FOR INSULATED PIPING

2. CORK, WOOD OR CALCIUM SILICATE INSERTS SHALL BE INSTALLED BETWEEN THE PIPE AND THE INSULATION SHIELD TO SUPPORT THE PIPE AND PREVENT THE PIPE INSULATION FROM BEING CRUSHED.

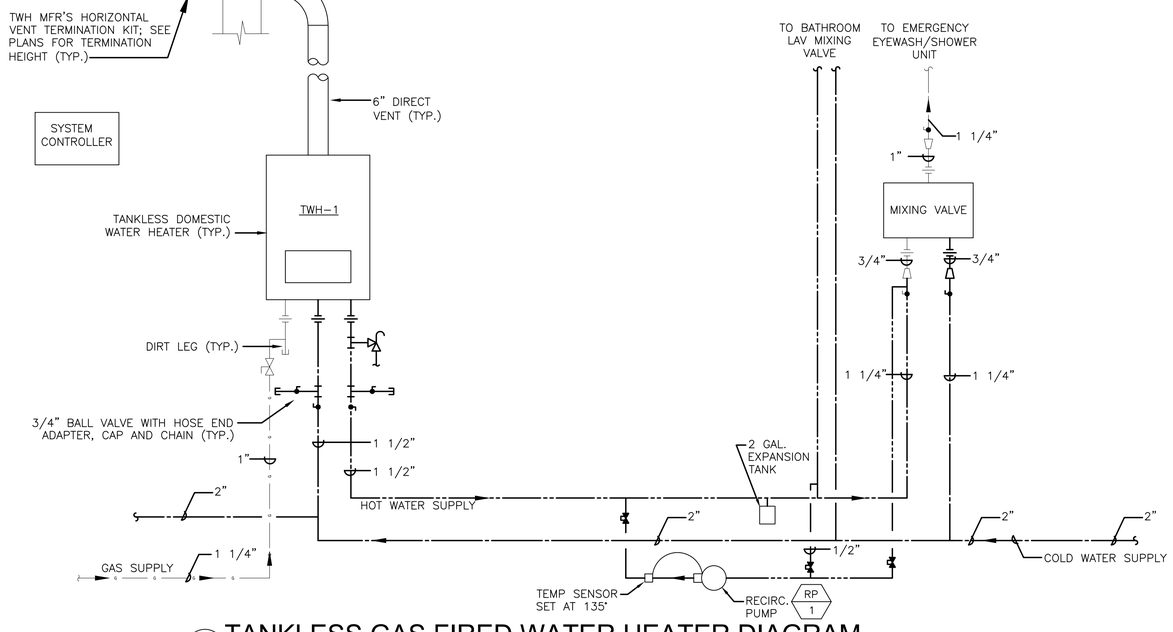


3 PIPE AND HANGER SHIELD DETAIL

NOT TO SCALE



4 TRAP PRIMER DETAIL



5 TANKLESS GAS FIRED WATER HEATER DIAGRAM

NOT TO SCALE

NOT FOR CONSTRUCTION

KLEINFELDER
Bright People. Right Solutions.

Signed By: ---- # 12345

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

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

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

ORIGINAL DRAWING SIZE IS 22 x 34

PLUMBING DETAILS

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 PFAS WTP FINAL DESIGN

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION
900 MAIN ST, MILLIS, MA 02054

PERMIT REVIEW SET

PROJECT NO.	20233667.002A
ISSUE DATE	SEPT. 2023
CURRENT REVISION	-
DESIGNED BY	RLB
DRAWN BY	RLB
CHECKED BY	JL
APPROVED BY	ABB

P-200

SHEET 59 of 59

KLEINFELDER
Bright People. Right Solutions.

ATTACHMENT E

Stormwater Report

MEMORANDUM

TO:	Town of Millis Conservation Commission
FROM:	Greg Avenia, P.E., Kleinfelder
DATE :	October 2023
SUBJECT:	Millis Well 3 PFAS Treatment Facility Design, Village Street, Millis, MA 02054
CC:	Tyler Bernier, P.E., Kleinfelder

This Stormwater Management Report has been prepared to show compliance with the Massachusetts Stormwater Management Standards to support the Project's Notice of Intent Application.

The Town of Millis is proposing the installation of a 70' x 45' PFAS treatment facility to support Well 3 off Village Street in Millis, MA. The proposed development will also include the installation of above-ground backwash storage tanks, associated utilities including a tight tank sewer system, a paved driveway and an infiltration basin.

1 EXISTING DRAINAGE CONDITIONS

The proposed site is adjacent to the existing Well 3 facilities, southwest along the existing gravel driveway. The intersection of the gravel driveway and Birch Street is approximately 1,500 feet to the southwest. Under existing conditions, the proposed 31,581 square-foot site is mostly wooded. Wooded area borders the site to the south, the gravel driveway and wetland to the west, existing Well 3 infrastructure to the north, and a grassed field to the east past a loop in the gravel driveway.

The entirety of the site is within the Charles River watershed. Stormwater drains in two directions from a high point to the southeast of the proposed site. Approximately half of the site drains to the wetlands to the northwest, with the rest draining towards Maple Swamp located to the east. Both wetlands ultimately connect to the Charles River.

2 PROPOSED DRAINAGE CONDITIONS

Stormwater flows will emulate existing drainage conditions to the maximum extent possible, however a portion of the site that currently drains to the wetlands west of the site has been rerouted to the east to maximize water quality and quantity treatment via the proposed infiltration basin. Kleinfelder estimates that the proposed development will create approximately 7,510 square feet of new impervious area, comprised of the proposed treatment building, paved driveway, and concrete pad for above-ground backwash storage tanks. The existing chemical feed building will be demolished down to existing grade and the equipment will

KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630

be relocated to the new treatment facility. The working area of the site will be graded to emulate existing drainage patterns in slopes ranging from 1% to approximately 5%. Proposed grades will be tied into existing grade at a maximum of 3:1 H:V slopes.

A stormwater swale along the existing gravel drive will capture the majority of runoff coming from the proposed building roof, the paved access drive, and concrete pad. The swale will direct stormwater to the proposed infiltration basin to the north of the site via an 8-inch pipe. Stormwater from the rear of the building will be directed to the proposed basin by a berm. The project site has been located and designed so that the impact within the 100-foot wetland buffer and 100-year flood zone are minimized to the maximum extent possible.

3 HYDROLOGIC ANALYSIS

A HydroCAD hydrologic analysis was performed under both existing and proposed conditions. Each model was analyzed for the 1, 2, 5, 10, 25, and 100-year storm events. Rainfall data was acquired from the Precipitation Frequency Data Server maintained by NOAA. The total watershed for the site was measured to be approximately 0.65 acres. Stormwater flow comes from an existing high point southeast of the project site and flows to the wetland to the west or to Maple Swamp to the east.

The soil data used for this analysis was acquired via the Web Soil Survey, provided by NRCS. Within the project site, areas not classified as water or impervious areas are generally hydrologic soil group A. Soils on the site are classified as very sandy loams and loamy sands.

For analysis of existing conditions, the site was divided into two main sub-watershed areas separated by a natural high point that extends across the project area, effectively dividing the site in half.

- SC-1 is approximately 24,786 square feet in area. It represents the western portion of the site and is comprised of woods in good conditions, unconnected impervious area, such as building roofs and tank concrete pads, and gravel access road. Stormwater drains across the access drive to the wetland west of the site.
- SC-2 is approximately 19,349 square feet in area. It encompasses the easter portion of the site and drains to the east toward Maple Swamp. Ground cover in this area is entirely woods in good condition.

Under proposed conditions, the site was separated into five sub-watershed areas based on proposed drainage features and grading.

- SC-1 is approximately 3,356 square feet in area. It represents a portion of the site driveway the drains to the west before being captured by the proposed stormwater system. Ground cover in this area includes paved surfaces, gravel access drive, and grassed area.
- SC-2 is approximately 11,864 square feet in area. It encompasses most of the developed area of the site that flows to the west. Ground cover includes paved surface, concrete pads, building roofs, and

KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630

grassed area. Stormwater from this area is captured by the proposed stormwater system and routed to an infiltration basin.

- SC-3 is approximately 9,595 square feet in area. This subcatchment area includes areas of direct flow from the north and east sides of the site into the infiltration basin. Ground cover includes grassed areas and the area of the infiltration basin, classified as water surface area.
- SC-4 is approximately 7,531 square feet in area. This encompasses the backside of the berm on the east side of the proposed infiltration basin, pressure relief outlet, and woods extending to the gravel road surrounding the site. Ground cover in this area is classified as a wood/grass combination.
- SC-5 is approximately 11,789 square feet in area. This represents the area on the west side of the site that is not captured by the stormwater system and flows directly to the western wetland. The ground cover in this area includes the existing well 3 building, the existing gravel access drive, and grassed area.

The watershed area has been standardized between the two analyses to allow direct comparison of the impact of the proposed development. Both models include two design points that are used to analyze and compare stormwater flow rates and volumes.

- Design Point 1, or "DP-1" represents the wetlands to the west of the project site.
- Design Point 2, or "DP-2" represents outflow from the project site to the east, ultimately into Maple Swamp.

4 MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION (MASSDEP) – STORMWATER MANAGEMENT STANDARDS

As demonstrated below, the proposed Project complies with the MassDEP Stormwater Management Standards (the Standards) to the maximum extent practicable. Under the Stormwater Management Standards, the Project is considered a new develop project because it involves the construction of a new drinking water treatment facility. The Project has been designed to meet the Stormwater Management Standards to the maximum extent practicable and to improve upon existing conditions.

4.1 STANDARD 1: NO NEW UNTREATED DISCHARGES

No new stormwater conveyance (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

No change:

The Project has been designed to comply with Standard 1. Under existing conditions, there are no existing outfalls within the project area and no best management practices in place; runoff currently flows overland directly from the site to the wetlands to the west, or to Maple Swamp to the east. Under proposed conditions, a portion of the stormwater originally destined to flow from the site to the western wetlands will be intercepted by a proposed swale and rerouted to the proposed infiltration basin. On the eastern portion of the site, a berm will redirect runoff toward the proposed basin. No untreated discharges are proposed.

- A stone gabion basket weir is proposed to create a sediment forebay within the proposed infiltration basin to provide the required pretreatment.
- The infiltration basin will provide primary water quality treatment for this development. The basin has been sized to accommodate the 100-year 24-hour storm event for areas that drain to it. An emergency overflow weir with riprap erosion protection is proposed as a precautionary measure.

4.2 STANDARD 2: PEAK RATE ATTENUATION

Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

Standard Met:
The Project has been designed to comply with Standard 2. The infiltration basin on the north side of the site will receive all the runoff from the impervious area added as a result of the development. The existing access road will be regraded near the proposed stormwater swale on the western side of the site to capture the maximum amount of runoff practicable. Areas that are not paved will be loamed and seeded at the end of construction.
A HydroCAD analysis was performed on both existing and proposed conditions, attached under **Appendix C**. A summary of this analysis in relation to standard 2 is below:

TABLE 1: PEAK FLOWS AT DESIGN POINT 1

Design Storm	Existing Peak Flow (cfs)	Proposed Peak Flow (cfs)
1-Year	0.62	0.41
2-Year	0.77	0.51
5-Year	1.02	0.67
10-Year	1.23	0.81
25-Year	1.51	1.01
100-Year	1.95	1.38

TABLE 2: PEAK FLOWS AT DESIGN POINT 2

Design Storm	Existing Peak Flow (cfs)	Proposed Peak Flow (cfs)
1-Year	0.00	0.00
2-Year	0.00	0.00
5-Year	0.00	0.00
10-Year	0.00	0.00
25-Year	0.01	0.00
100-Year	0.07	0.05

The post-development peak rates are equal to or less than the peak rates under existing conditions for all the analyzed storm events.

4.3 STANDARD 3: STORMWATER RECHARGE

Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater management practices and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil types. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Standard Met:

The Project has been designed to comply with Standard 3. The proposed infiltration basin has 5,937 cubic feet of storage and can infiltrate the 100-year storm event for most of the project site. The required recharge volume calculation is included below.

TABLE 3: IMPERVIOUS AREA SUMMARY FOR STANDARD 3

Existing Impervious Area (sq. ft)	Proposed Impervious Area (sq. ft)	Change (sq. ft)
894	8,404	+7,510

The project site is surrounded by Hydrologic Soil Group A soils. Per the Massachusetts Stormwater Handbook, a recharge rate of 0.6 inches (0.05 feet) shall be used for all impervious area in areas with Hydrologic Soil Group A, the highest recharge rate outlined in the definition of Standard 3. When this rate is applied to the proposed additional impervious area of 0.18 acres or 7,753 square feet, the required recharge volume associated with this impervious area is calculated to 646 cubic feet. The proposed stormwater management system can store and infiltrate more than this required volume. See Appendix **E** for stormwater storage calculations.

4.4 STANDARD 4: WATER QUALITY

Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

- *a) Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained.*
- *b) Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
- *c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

Standard Met:

The Project has been designed to comply with Standard 4. The project ultimately discharges to the Charles River (MA 72-05), a class 5 waterbody per Massachusetts 2022 Integrated List of Waters.

Table 3 shows the stormwater treatment provided for the proposed development. Water Quality Volumes were calculated for the first 1.0" of runoff per the Massachusetts Stormwater Handbook new development standards.

TABLE 4: REQUIRED WATER QUALITY VOLUME (WQV) AT DESIGN POINT 1

Watershed	Area	Required WQV	Provided WQV
Existing Total Impervious Area	894 sf	0 cf*	0 cf
Proposed New Impervious Area (in addition to existing)	-354 sf	0 cf	

*To Max. Extent Practicable

TABLE 5: REQUIRED WATER QUALITY VOLUME (WQV) AT DESIGN POINT 2

Watershed	Area	Required WQV	Provided WQV
Existing Total Impervious Area	0 sf	0 cf*	3,348 cf
Proposed New Impervious Area (in addition to existing)	7,864 sf	655 cf	

*To Max. Extent Practicable

A Long-Term Pollution Prevention Plan (LTPPP) and Operation & Maintenance Plan is included in Appendix D.

4.5 STANDARD 5: LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS (LUHPPLS)

For Land Uses with Higher Potential Pollutant Loads (LUHPPLs), source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all LUHPPLs cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from LUHPPLs shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

No change:

Standard 5 does not apply to the Project. There are no Land Uses with Higher Potential Pollutant Loads within the project area.

4.6 STANDARD 6: CRITICAL AREAS

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "stormwater discharge" as defined in 314 CMR 3.04(2)(a)1 or (b), to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

Standard Met:

The project is within a Zone I Wellhead Protection Area. However, the proposed infiltration basin is sized to accommodate the 100-year 24-hour storm event without discharging to the surrounding area. An emergency overflow weir is provided as a precautionary measure but is not anticipated to see flow up to and including the 100-year storm event. Additionally, the project proposed is essential to the operation of a public water supply. Thus, Standard 6 is met.

4.7 STANDARD 7: REDEVELOPMENTS AND OTHER PROJECTS SUBJECT TO THE STANDARDS ONLY TO THE MAXIMUM EXTENT PRACTICABLE

A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

No substantive change:

The Project is considered a new development and is subject to all Standards 1 through 10.

4.8 STANDARD 8: CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROLS

A plan to control construction-related impacts, including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

Standard Met:

The site plans call for the installation of sediment control barriers around the perimeter of the site to prevent off-site sediment transport. A construction exit will be provided to reduce transport of sediment off-site via construction traffic. All stockpiles will be surrounded with straw wattle during the earthwork phase of construction. A SWPPP will be prepared by the contractor prior to the onset of construction.

During construction, the contractor will be required to address any erosion issues that appear as a result of land disturbance. This may include the installation of additional sediment barrier, temporary erosion control matting, or temporary seeding. Erosion control measures will be repaired as necessary during construction. The contractor will be required to install and maintain all erosion control measures in accordance with the Massachusetts Stormwater Handbook.

Stormwater controls must be maintained in good operating condition until all disturbed soils are permanently stabilized. To ensure this, the following areas will be inspected by the Contractor every week and after every rainfall event of 0.5 inches or greater:

The following standard maintenance practices will apply to the erosion and sedimentation controls for the project:

- All erosion and sediment control measures will be properly maintained. If repairs or other maintenance is necessary, it will be initiated by the Contractor within 24 hours of report;
- Straw Wattles will be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground;
- Built up sediment will be removed from straw wattles when it has reached one-half the height of the fence and at end of the job;
- Erosion control measures will be maintained for disturbed areas of the site that have not been stabilized;
- Erosion control measures will be installed and maintained for the construction staging area, stockpiles, and material storage areas until those areas have been stabilized after construction; and,
- Temporary and permanent seeding and planting will be inspected for bare spots, washouts, and healthy growth.

If the inspections reveal the need for additional control devices to prevent erosion and sedimentation, the Contractor will promptly install additional protection devices as required. Control devices in need of repair will be repaired promptly after identification. A stockpile of 100 linear feet of straw wattles will be maintained on the site and under cover for emergency repairs and routine maintenance.

The Owner (or their representative) will be responsible for preparing an inspection and maintenance report following each inspection and filing completed reports after maintenance action has taken place by the Contractor. The Contractor's superintendent will be responsible for maintenance and repair activities and completing and signing the maintenance action portion of inspection and maintenance reports.

4.9 STANDARD 9: OPERATION AND MAINTENANCE PLAN

A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

Standard Met:

An Operation & Maintenance Plan is referenced as Appendix D and is provided under separate cover.

4.10 STANDARD 10: PROHIBITION OF ILLICIT DISCHARGES

All illicit discharges to the stormwater management system are prohibited.

No change

Illicit Discharge Statement The project's stormwater management system, as shown on the plans submitted with this report, have been designed in full compliance with Standard 10. The project area does not have any known illicit connections.

KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630

Attachments:

Appendix A – Stormwater Checklist

Appendix B – Drainage Figures

Appendix C – HydroCAD Analysis
C.1 – Existing Conditions
C.2 – Proposed Conditions

Appendix D – Stormwater Operation and Maintenance Plan

Appendix E – Water Quality Calculation

Appendix F – Project Data: NOAA Rainfall and NRCS Web Soil Survey

Appendix G – Boring Log

KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630

Appendix A
Stormwater Checklist Stormwater Checklist

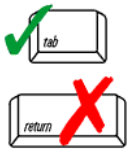
KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

---

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☒ Other (describe): Infiltration Basin

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

---

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☒ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

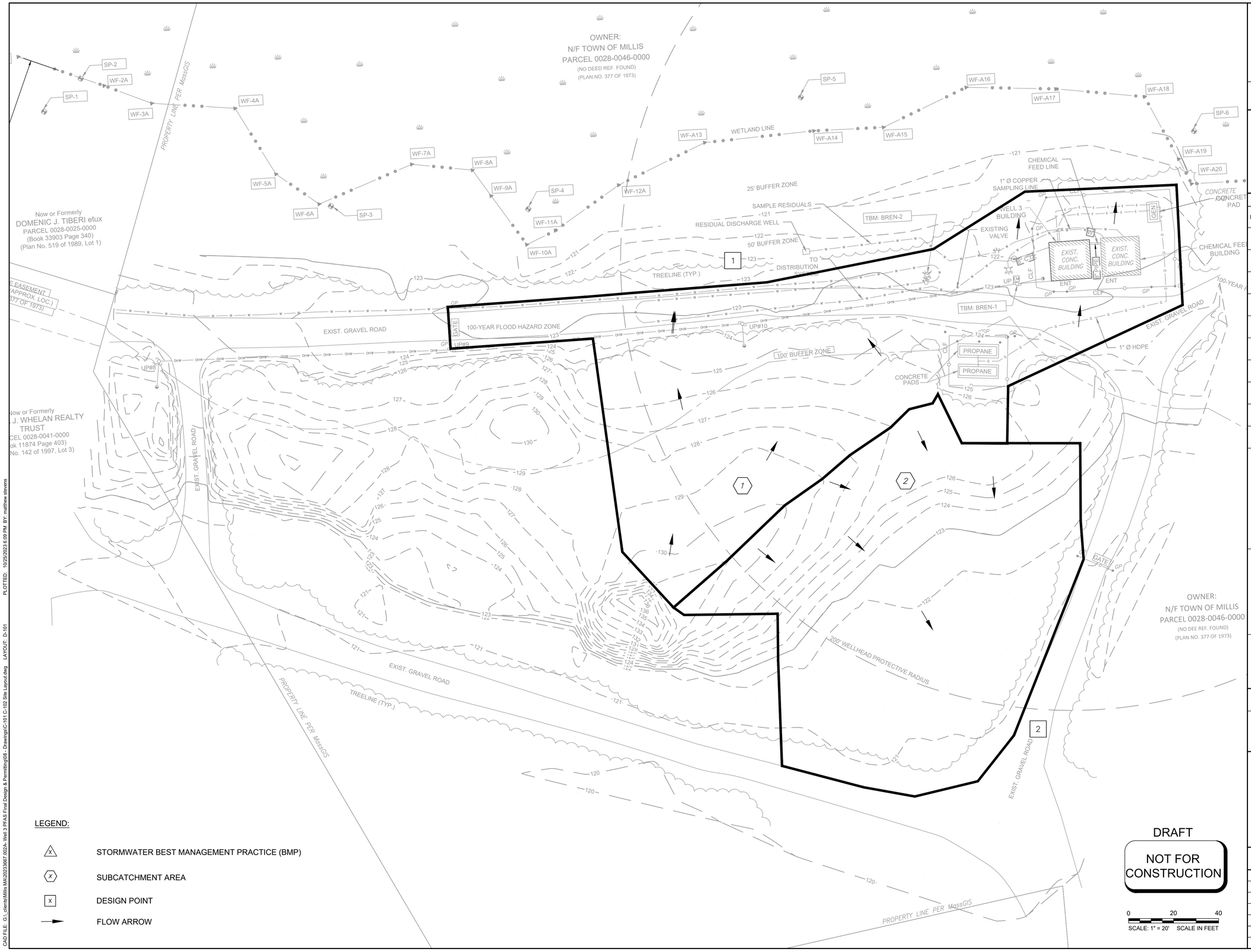
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Appendix B
Drainage Figures

KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630



CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\C-101 C-102 Site Layout.dwg LAYOUT: D-101 PLOTTED: 10/25/2023 6:09 PM BY: matthew stevens

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

Signed By: ---- # 12345

REVISIONS

REV	DESCRIPTION	DSN / DWN	CHK / APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

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

ORIGINAL DRAWING SIZE IS 22 x 34

EXISTING DRAINAGE FIGURE

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

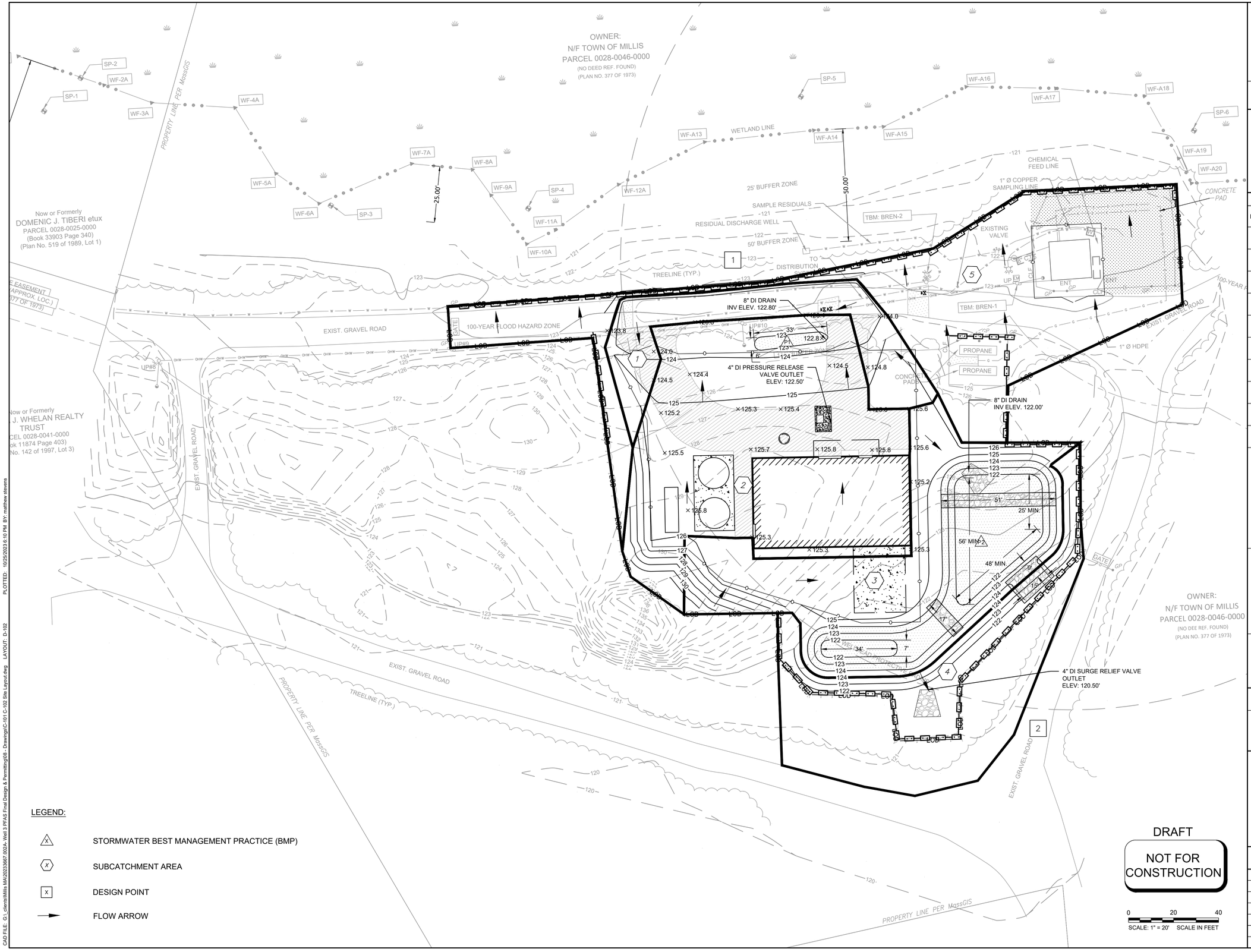
TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

DRAINAGE DESIGN

PROJECT NO.	20233667.002A
ISSUE DATE	OCTOBER 2023
CURRENT REVISION	DRAFT
DESIGNED BY	MPS
DRAWN BY	MPS
CHECKED BY	GAA
APPROVED BY	GAA

D-101

SHEET 1 of 2



LEGEND:

- STORMWATER BEST MANAGEMENT PRACTICE (BMP)
- SUBCATCHMENT AREA
- DESIGN POINT
- FLOW ARROW

DRAFT

NOT FOR CONSTRUCTION

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

CAD FILE: G:_clients\Millis MA\20233667.002A- Well 3 PFAS Final Design & Permitting\08 - Drawings\C-101 C-102 Site Layout.dwg LAYOUT: D-102 PLOTTED: 10/25/2023 6:10 PM BY: matthew stevens

KLEINFELDER
Bright People. Right Solutions.
One Beacon Street, Suite 8100
Boston, MA 02108
Phone: 617-497-7800
www.kleinfelder.com

Signed By: ----- # 12345

REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

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

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

ORIGINAL DRAWING SIZE IS 22 x 34

PROPOSED DRAINAGE FIGURE

TOWN OF MILLIS, MASSACHUSETTS
WELL 3 WATER TREATMENT FACILITY

TOWN OF MILLIS
DEPARTMENT OF PUBLIC WORKS
900 MAIN ST, MILLIS, MA 02054

DRAINAGE DESIGN

PROJECT NO. 20233667.002A	
ISSUE DATE OCTOBER 2023	
CURRENT REVISION DRAFT	D-102
DESIGNED BY MPS	
DRAWN BY MPS	
CHECKED BY GAA	
APPROVED BY GAA	SHEET 2 of 2

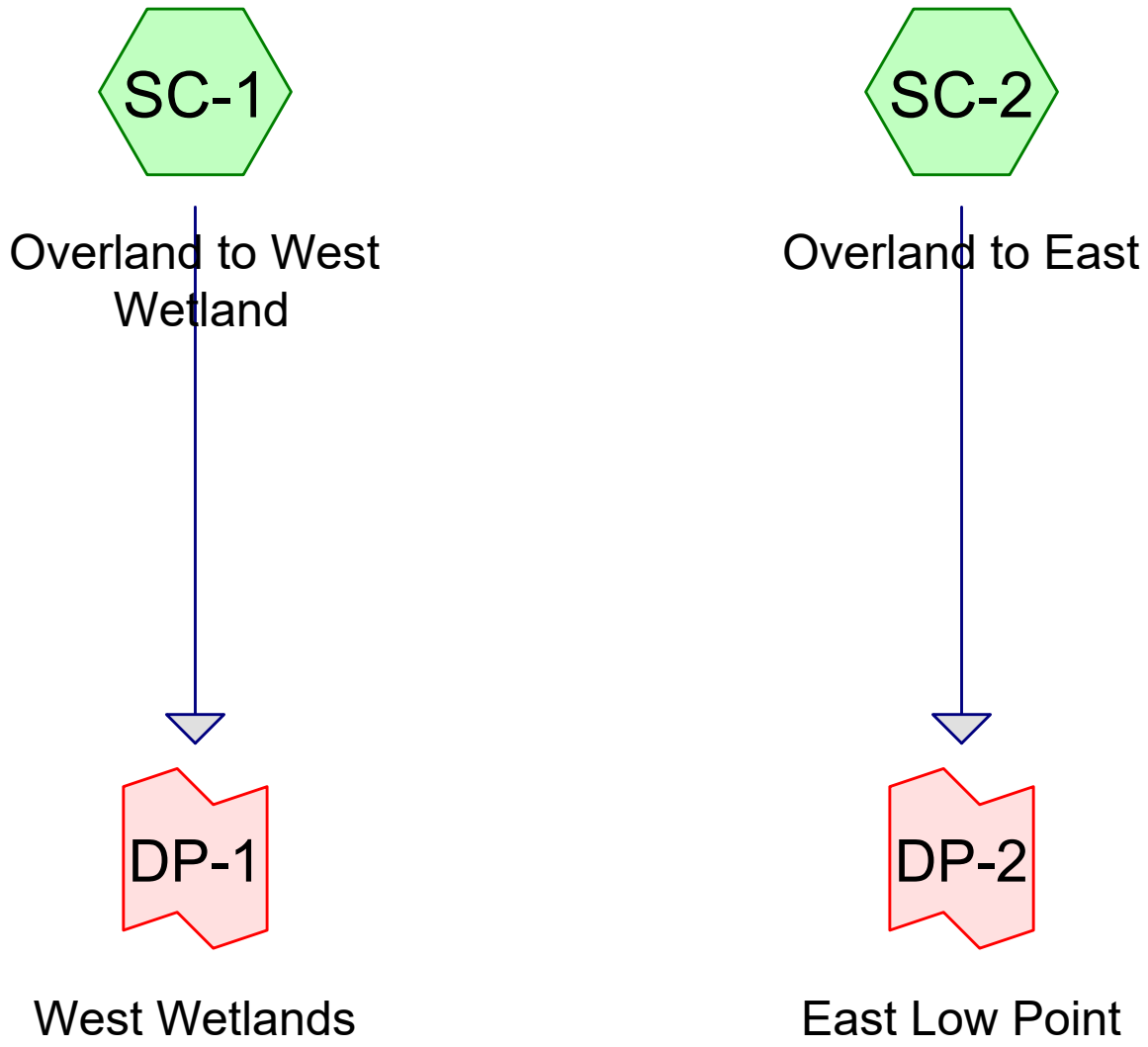
Appendix C
HydroCAD Analysis

KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630

Appendix C.1
Existing Conditions

KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630

Millis Well 3 Existing Conditions



Subcat Reach Pond Link

Routing Diagram for Millis Well 3 Existing
Prepared by Kleinfelder, Printed 10/25/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	Type III 24-hr		Default	24.00	1	2.76	2
2	2-Year	Type III 24-hr		Default	24.00	1	3.39	2
3	5-Year	Type III 24-hr		Default	24.00	1	4.42	2
4	10-Year	Type III 24-hr		Default	24.00	1	5.28	2
5	25-Year	Type III 24-hr		Default	24.00	1	6.45	2
6	100-Year	Type III 24-hr		Default	24.00	1	8.27	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.226	96	Gravel surface, HSG A (SC-1)
0.021	98	Impervious, HSG A (SC-1)
0.766	30	Woods, Good, HSG A (SC-1, SC-2)
1.013	**46**	**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment SC-1: Overland to West Runoff Area=24,786 sf 3.61% Impervious Runoff Depth=1.01"
Tc=6.0 min CN=WQ Runoff=0.62 cfs 0.048 af

Subcatchment SC-2: Overland to East Runoff Area=19,349 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Link DP-1: West Wetlands Inflow=0.62 cfs 0.048 af
Primary=0.62 cfs 0.048 af

Link DP-2: East Low Point Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 1.013 ac Runoff Volume = 0.048 af Average Runoff Depth = 0.57"
97.97% Pervious = 0.993 ac 2.03% Impervious = 0.021 ac

Summary for Subcatchment SC-1: Overland to West Wetland

Runoff = 0.62 cfs @ 12.09 hrs, Volume= 0.048 af, Depth= 1.01"
Routed to Link DP-1 : West Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.76"

	Area (sf)	CN	Description
	14,031	30	Woods, Good, HSG A
	9,861	96	Gravel surface, HSG A
*	894	98	Impervious, HSG A
	24,786		Weighted Average
	23,892	57	96.39% Pervious Area
	894	98	3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-2: Overland to East

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DP-2 : East Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.76"

Area (sf)	CN	Description
19,349	30	Woods, Good, HSG A
19,349	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Link DP-1: West Wetlands

Inflow Area = 0.569 ac, 3.61% Impervious, Inflow Depth = 1.01" for 1-Year event
Inflow = 0.62 cfs @ 12.09 hrs, Volume= 0.048 af
Primary = 0.62 cfs @ 12.09 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East Low Point

Inflow Area = 0.444 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment SC-1: Overland to West Runoff Area=24,786 sf 3.61% Impervious Runoff Depth=1.28"
Tc=6.0 min CN=WQ Runoff=0.77 cfs 0.061 af

Subcatchment SC-2: Overland to East Runoff Area=19,349 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Link DP-1: West Wetlands Inflow=0.77 cfs 0.061 af
Primary=0.77 cfs 0.061 af

Link DP-2: East Low Point Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 1.013 ac Runoff Volume = 0.061 af Average Runoff Depth = 0.72"
97.97% Pervious = 0.993 ac 2.03% Impervious = 0.021 ac

Summary for Subcatchment SC-1: Overland to West Wetland

Runoff = 0.77 cfs @ 12.09 hrs, Volume= 0.061 af, Depth= 1.28"
Routed to Link DP-1 : West Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.39"

	Area (sf)	CN	Description
	14,031	30	Woods, Good, HSG A
	9,861	96	Gravel surface, HSG A
*	894	98	Impervious, HSG A
	24,786		Weighted Average
	23,892	57	96.39% Pervious Area
	894	98	3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-2: Overland to East

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DP-2 : East Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.39"

Area (sf)	CN	Description
19,349	30	Woods, Good, HSG A
19,349	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Link DP-1: West Wetlands

Inflow Area = 0.569 ac, 3.61% Impervious, Inflow Depth = 1.28" for 2-Year event
Inflow = 0.77 cfs @ 12.09 hrs, Volume= 0.061 af
Primary = 0.77 cfs @ 12.09 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East Low Point

Inflow Area = 0.444 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment SC-1: Overland to West Runoff Area=24,786 sf 3.61% Impervious Runoff Depth=1.73"
Tc=6.0 min CN=WQ Runoff=1.02 cfs 0.082 af

Subcatchment SC-2: Overland to East Runoff Area=19,349 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Link DP-1: West Wetlands Inflow=1.02 cfs 0.082 af
Primary=1.02 cfs 0.082 af

Link DP-2: East Low Point Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 1.013 ac Runoff Volume = 0.082 af Average Runoff Depth = 0.97"
97.97% Pervious = 0.993 ac 2.03% Impervious = 0.021 ac

Summary for Subcatchment SC-1: Overland to West Wetland

Runoff = 1.02 cfs @ 12.09 hrs, Volume= 0.082 af, Depth= 1.73"
Routed to Link DP-1 : West Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=4.42"

	Area (sf)	CN	Description
	14,031	30	Woods, Good, HSG A
	9,861	96	Gravel surface, HSG A
*	894	98	Impervious, HSG A
	24,786		Weighted Average
	23,892	57	96.39% Pervious Area
	894	98	3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-2: Overland to East

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DP-2 : East Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=4.42"

Area (sf)	CN	Description
19,349	30	Woods, Good, HSG A
19,349	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Link DP-1: West Wetlands

Inflow Area = 0.569 ac, 3.61% Impervious, Inflow Depth = 1.73" for 5-Year event
Inflow = 1.02 cfs @ 12.09 hrs, Volume= 0.082 af
Primary = 1.02 cfs @ 12.09 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East Low Point

Inflow Area = 0.444 ac, 0.00% Impervious, Inflow Depth = 0.00" for 5-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment SC-1: Overland to West Runoff Area=24,786 sf 3.61% Impervious Runoff Depth=2.10"
Tc=6.0 min CN=WQ Runoff=1.23 cfs 0.100 af

Subcatchment SC-2: Overland to East Runoff Area=19,349 sf 0.00% Impervious Runoff Depth=0.02"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.001 af

Link DP-1: West Wetlands Inflow=1.23 cfs 0.100 af
Primary=1.23 cfs 0.100 af

Link DP-2: East Low Point Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

Total Runoff Area = 1.013 ac Runoff Volume = 0.100 af Average Runoff Depth = 1.19"
97.97% Pervious = 0.993 ac 2.03% Impervious = 0.021 ac

Summary for Subcatchment SC-1: Overland to West Wetland

Runoff = 1.23 cfs @ 12.09 hrs, Volume= 0.100 af, Depth= 2.10"
Routed to Link DP-1 : West Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.28"

	Area (sf)	CN	Description
	14,031	30	Woods, Good, HSG A
	9,861	96	Gravel surface, HSG A
*	894	98	Impervious, HSG A
	24,786		Weighted Average
	23,892	57	96.39% Pervious Area
	894	98	3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-2: Overland to East

Runoff = 0.00 cfs @ 22.19 hrs, Volume= 0.001 af, Depth= 0.02"
Routed to Link DP-2 : East Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.28"

Area (sf)	CN	Description
19,349	30	Woods, Good, HSG A
19,349	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Link DP-1: West Wetlands

Inflow Area = 0.569 ac, 3.61% Impervious, Inflow Depth = 2.10" for 10-Year event
Inflow = 1.23 cfs @ 12.09 hrs, Volume= 0.100 af
Primary = 1.23 cfs @ 12.09 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East Low Point

Inflow Area = 0.444 ac, 0.00% Impervious, Inflow Depth = 0.02" for 10-Year event
Inflow = 0.00 cfs @ 22.19 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 22.19 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment SC-1: Overland to West Runoff Area=24,786 sf 3.61% Impervious Runoff Depth=2.67"
Tc=6.0 min CN=WQ Runoff=1.51 cfs 0.127 af

Subcatchment SC-2: Overland to East Runoff Area=19,349 sf 0.00% Impervious Runoff Depth=0.13"
Tc=6.0 min CN=30 Runoff=0.01 cfs 0.005 af

Link DP-1: West Wetlands Inflow=1.51 cfs 0.127 af
Primary=1.51 cfs 0.127 af

Link DP-2: East Low Point Inflow=0.01 cfs 0.005 af
Primary=0.01 cfs 0.005 af

Total Runoff Area = 1.013 ac Runoff Volume = 0.131 af Average Runoff Depth = 1.56"
97.97% Pervious = 0.993 ac 2.03% Impervious = 0.021 ac

Summary for Subcatchment SC-1: Overland to West Wetland

Runoff = 1.51 cfs @ 12.09 hrs, Volume= 0.127 af, Depth= 2.67"
Routed to Link DP-1 : West Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.45"

	Area (sf)	CN	Description
	14,031	30	Woods, Good, HSG A
	9,861	96	Gravel surface, HSG A
*	894	98	Impervious, HSG A
	24,786		Weighted Average
	23,892	57	96.39% Pervious Area
	894	98	3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-2: Overland to East

Runoff = 0.01 cfs @ 14.96 hrs, Volume= 0.005 af, Depth= 0.13"
Routed to Link DP-2 : East Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.45"

Area (sf)	CN	Description
19,349	30	Woods, Good, HSG A
19,349	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Link DP-1: West Wetlands

Inflow Area = 0.569 ac, 3.61% Impervious, Inflow Depth = 2.67" for 25-Year event
Inflow = 1.51 cfs @ 12.09 hrs, Volume= 0.127 af
Primary = 1.51 cfs @ 12.09 hrs, Volume= 0.127 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East Low Point

Inflow Area = 0.444 ac, 0.00% Impervious, Inflow Depth = 0.13" for 25-Year event
Inflow = 0.01 cfs @ 14.96 hrs, Volume= 0.005 af
Primary = 0.01 cfs @ 14.96 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment SC-1: Overland to West Runoff Area=24,786 sf 3.61% Impervious Runoff Depth=3.66"
Tc=6.0 min CN=WQ Runoff=1.95 cfs 0.174 af

Subcatchment SC-2: Overland to East Runoff Area=19,349 sf 0.00% Impervious Runoff Depth=0.48"
Tc=6.0 min CN=30 Runoff=0.07 cfs 0.018 af

Link DP-1: West Wetlands Inflow=1.95 cfs 0.174 af
Primary=1.95 cfs 0.174 af

Link DP-2: East Low Point Inflow=0.07 cfs 0.018 af
Primary=0.07 cfs 0.018 af

Total Runoff Area = 1.013 ac Runoff Volume = 0.191 af Average Runoff Depth = 2.27"
97.97% Pervious = 0.993 ac 2.03% Impervious = 0.021 ac

Summary for Subcatchment SC-1: Overland to West Wetland

Runoff = 1.95 cfs @ 12.09 hrs, Volume= 0.174 af, Depth= 3.66"
Routed to Link DP-1 : West Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.27"

	Area (sf)	CN	Description
	14,031	30	Woods, Good, HSG A
	9,861	96	Gravel surface, HSG A
*	894	98	Impervious, HSG A
	24,786		Weighted Average
	23,892	57	96.39% Pervious Area
	894	98	3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-2: Overland to East

Runoff = 0.07 cfs @ 12.40 hrs, Volume= 0.018 af, Depth= 0.48"
Routed to Link DP-2 : East Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.27"

Area (sf)	CN	Description
19,349	30	Woods, Good, HSG A
19,349	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Link DP-1: West Wetlands

Inflow Area = 0.569 ac, 3.61% Impervious, Inflow Depth = 3.66" for 100-Year event
Inflow = 1.95 cfs @ 12.09 hrs, Volume= 0.174 af
Primary = 1.95 cfs @ 12.09 hrs, Volume= 0.174 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East Low Point

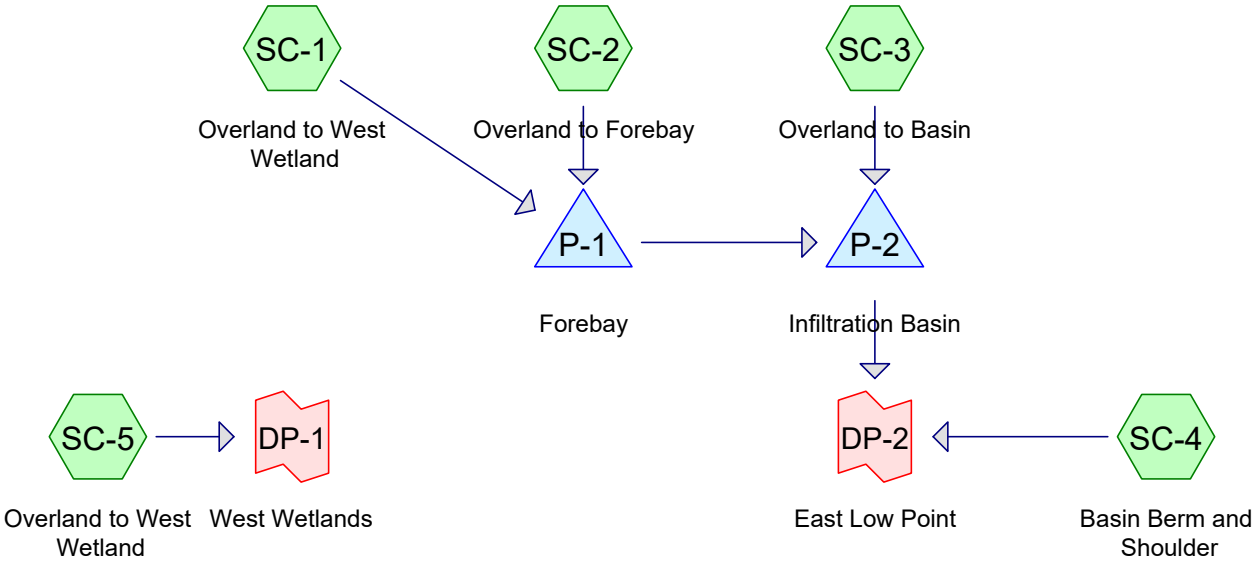
Inflow Area = 0.444 ac, 0.00% Impervious, Inflow Depth = 0.48" for 100-Year event
Inflow = 0.07 cfs @ 12.40 hrs, Volume= 0.018 af
Primary = 0.07 cfs @ 12.40 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Appendix C.2
Proposed Conditions

KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630

Millis Well 3 Proposed Conditions



Subcat Reach Pond Link

Routing Diagram for Millis Well 3 Proposed
Prepared by Kleinfelder, Printed 10/25/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	Type III 24-hr		Default	24.00	1	2.76	2
2	2-Year	Type III 24-hr		Default	24.00	1	3.39	2
3	5-Year	Type III 24-hr		Default	24.00	1	4.42	2
4	10-Year	Type III 24-hr		Default	24.00	1	5.28	2
5	25-Year	Type III 24-hr		Default	24.00	1	6.45	2
6	100-Year	Type III 24-hr		Default	24.00	1	8.27	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.186	96	Gravel surface, HSG A (SC-1, SC-5)
0.012	98	Impervious, HSG A (SC-5)
0.404	39	Pasture/grassland/range, Good, HSG A (SC-1, SC-2, SC-3, SC-5)
0.183	98	Paved parking, HSG A (SC-1, SC-2)
0.055	98	Water Surface, 0% imp, HSG A (SC-3)
0.173	32	Woods/grass comb., Good, HSG A (SC-4)
1.013	**63**	**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment SC-1: Overland to West Runoff Area=3,356 sf 15.85% Impervious Runoff Depth=1.48"
Tc=6.0 min CN=WQ Runoff=0.12 cfs 0.010 af

Subcatchment SC-2: Overland to Forebay Runoff Area=11,864 sf 62.53% Impervious Runoff Depth=1.58"
Tc=6.0 min CN=WQ Runoff=0.44 cfs 0.036 af

Subcatchment SC-3: Overland to Basin Runoff Area=9,595 sf 0.00% Impervious Runoff Depth=0.63"
Tc=6.0 min CN=WQ Runoff=0.14 cfs 0.012 af

Subcatchment SC-4: Basin Berm and Runoff Area=7,531 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=32 Runoff=0.00 cfs 0.000 af

Subcatchment SC-5: Overland to West Runoff Area=11,789 sf 4.58% Impervious Runoff Depth=1.40"
Tc=6.0 min CN=WQ Runoff=0.41 cfs 0.032 af

Pond P-1: Forebay Peak Elev=123.38' Storage=107 cf Inflow=0.57 cfs 0.045 af
Discarded=0.02 cfs 0.016 af Primary=0.49 cfs 0.029 af Outflow=0.51 cfs 0.045 af

Pond P-2: Infiltration Basin Peak Elev=122.28' Storage=594 cf Inflow=0.62 cfs 0.041 af
Discarded=0.12 cfs 0.041 af Primary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.041 af

Link DP-1: West Wetlands Inflow=0.41 cfs 0.032 af
Primary=0.41 cfs 0.032 af

Link DP-2: East Low Point Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 1.013 ac Runoff Volume = 0.089 af Average Runoff Depth = 1.05"
80.76% Pervious = 0.818 ac 19.24% Impervious = 0.195 ac

Summary for Subcatchment SC-1: Overland to West Wetland

Runoff = 0.12 cfs @ 12.09 hrs, Volume= 0.010 af, Depth= 1.48"
Routed to Pond P-1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.76"

Area (sf)	CN	Description
532	98	Paved parking, HSG A
1,256	39	Pasture/grassland/range, Good, HSG A
1,568	96	Gravel surface, HSG A
3,356		Weighted Average
2,824	71	84.15% Pervious Area
532	98	15.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-2: Overland to Forebay

Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.036 af, Depth= 1.58"
Routed to Pond P-1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.76"

Area (sf)	CN	Description
7,418	98	Paved parking, HSG A
4,446	39	Pasture/grassland/range, Good, HSG A
11,864		Weighted Average
4,446	39	37.47% Pervious Area
7,418	98	62.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-3: Overland to Basin

Runoff = 0.14 cfs @ 12.09 hrs, Volume= 0.012 af, Depth= 0.63"
Routed to Pond P-2 : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.76"

Area (sf)	CN	Description
2,407	98	Water Surface, 0% imp, HSG A
7,188	39	Pasture/grassland/range, Good, HSG A
9,595		Weighted Average
9,595	54	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-4: Basin Berm and Shoulder

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DP-2 : East Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.76"

Area (sf)	CN	Description
7,531	32	Woods/grass comb., Good, HSG A
7,531	32	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-5: Overland to West Wetland

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.032 af, Depth= 1.40"
Routed to Link DP-1 : West Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.76"

	Area (sf)	CN	Description
*	540	98	Impervious, HSG A
	4,724	39	Pasture/grassland/range, Good, HSG A
	6,525	96	Gravel surface, HSG A
	11,789		Weighted Average
	11,249	72	95.42% Pervious Area
	540	98	4.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Pond P-1: Forebay

Inflow Area = 0.349 ac, 52.23% Impervious, Inflow Depth = 1.56" for 1-Year event
Inflow = 0.57 cfs @ 12.09 hrs, Volume= 0.045 af
Outflow = 0.51 cfs @ 12.13 hrs, Volume= 0.045 af, Atten= 10%, Lag= 2.4 min
Discarded = 0.02 cfs @ 12.13 hrs, Volume= 0.016 af
Primary = 0.49 cfs @ 12.13 hrs, Volume= 0.029 af
Routed to Pond P-2 : Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.38' @ 12.13 hrs Surf.Area= 399 sf Storage= 107 cf

Plug-Flow detention time= 5.1 min calculated for 0.045 af (100% of inflow)
Center-of-Mass det. time= 5.1 min (767.5 - 762.5)

Volume	Invert	Avail.Storage	Storage Description
#1	123.00'	472 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
123.00	165	0	0
124.00	779	472	472

Device	Routing	Invert	Outlet Devices
#1	Primary	123.00'	**12.0" Round Culvert** L= 69.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 123.00' / 122.50' S= 0.0072 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	123.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.13 hrs HW=123.38' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.48 cfs @ 12.13 hrs HW=123.38' TW=122.15' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.48 cfs @ 2.62 fps)

Summary for Pond P-2: Infiltration Basin

Inflow Area = 0.570 ac, 32.04% Impervious, Inflow Depth = 0.86" for 1-Year event
Inflow = 0.62 cfs @ 12.11 hrs, Volume= 0.041 af
Outflow = 0.12 cfs @ 12.57 hrs, Volume= 0.041 af, Atten= 80%, Lag= 27.1 min
Discarded = 0.12 cfs @ 12.57 hrs, Volume= 0.041 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-2 : East Low Point

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 122.28' @ 12.57 hrs Surf.Area= 2,235 sf Storage= 594 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 32.6 min (777.7 - 745.2)

Volume	Invert	Avail.Storage	Storage Description
#1	122.00'	5,937 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.00	1,944	0	0
124.00	3,993	5,937	5,937

Device	Routing	Invert	Outlet Devices
#1	Primary	123.99'	**15.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	122.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.12 cfs @ 12.57 hrs HW=122.28' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=122.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: West Wetlands

Inflow Area = 0.271 ac, 4.58% Impervious, Inflow Depth = 1.40" for 1-Year event
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 0.032 af
Primary = 0.41 cfs @ 12.09 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East Low Point

Inflow Area = 0.743 ac, 24.58% Impervious, Inflow Depth = 0.00" for 1-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment SC-1: Overland to West Runoff Area=3,356 sf 15.85% Impervious Runoff Depth=1.87"
Tc=6.0 min CN=WQ Runoff=0.15 cfs 0.012 af

Subcatchment SC-2: Overland to Forebay Runoff Area=11,864 sf 62.53% Impervious Runoff Depth=1.98"
Tc=6.0 min CN=WQ Runoff=0.55 cfs 0.045 af

Subcatchment SC-3: Overland to Basin Runoff Area=9,595 sf 0.00% Impervious Runoff Depth=0.80"
Tc=6.0 min CN=WQ Runoff=0.18 cfs 0.015 af

Subcatchment SC-4: Basin Berm and Runoff Area=7,531 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=32 Runoff=0.00 cfs 0.000 af

Subcatchment SC-5: Overland to West Runoff Area=11,789 sf 4.58% Impervious Runoff Depth=1.77"
Tc=6.0 min CN=WQ Runoff=0.51 cfs 0.040 af

Pond P-1: Forebay Peak Elev=123.43' Storage=127 cf Inflow=0.70 cfs 0.057 af
Discarded=0.02 cfs 0.018 af Primary=0.61 cfs 0.039 af Outflow=0.63 cfs 0.057 af

Pond P-2: Infiltration Basin Peak Elev=122.39' Storage=829 cf Inflow=0.78 cfs 0.054 af
Discarded=0.13 cfs 0.054 af Primary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.054 af

Link DP-1: West Wetlands Inflow=0.51 cfs 0.040 af
Primary=0.51 cfs 0.040 af

Link DP-2: East Low Point Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 1.013 ac Runoff Volume = 0.111 af Average Runoff Depth = 1.32"
80.76% Pervious = 0.818 ac 19.24% Impervious = 0.195 ac

Summary for Subcatchment SC-1: Overland to West Wetland

Runoff = 0.15 cfs @ 12.09 hrs, Volume= 0.012 af, Depth= 1.87"
Routed to Pond P-1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.39"

Area (sf)	CN	Description
532	98	Paved parking, HSG A
1,256	39	Pasture/grassland/range, Good, HSG A
1,568	96	Gravel surface, HSG A
3,356		Weighted Average
2,824	71	84.15% Pervious Area
532	98	15.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-2: Overland to Forebay

Runoff = 0.55 cfs @ 12.09 hrs, Volume= 0.045 af, Depth= 1.98"
Routed to Pond P-1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.39"

Area (sf)	CN	Description
7,418	98	Paved parking, HSG A
4,446	39	Pasture/grassland/range, Good, HSG A
11,864		Weighted Average
4,446	39	37.47% Pervious Area
7,418	98	62.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-3: Overland to Basin

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 0.015 af, Depth= 0.80"
Routed to Pond P-2 : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.39"

Area (sf)	CN	Description
2,407	98	Water Surface, 0% imp, HSG A
7,188	39	Pasture/grassland/range, Good, HSG A
9,595		Weighted Average
9,595	54	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-4: Basin Berm and Shoulder

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DP-2 : East Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.39"

Area (sf)	CN	Description
7,531	32	Woods/grass comb., Good, HSG A
7,531	32	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-5: Overland to West Wetland

Runoff = 0.51 cfs @ 12.09 hrs, Volume= 0.040 af, Depth= 1.77"
Routed to Link DP-1 : West Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.39"

	Area (sf)	CN	Description
*	540	98	Impervious, HSG A
	4,724	39	Pasture/grassland/range, Good, HSG A
	6,525	96	Gravel surface, HSG A
	11,789		Weighted Average
	11,249	72	95.42% Pervious Area
	540	98	4.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Pond P-1: Forebay

Inflow Area = 0.349 ac, 52.23% Impervious, Inflow Depth = 1.95" for 2-Year event
Inflow = 0.70 cfs @ 12.09 hrs, Volume= 0.057 af
Outflow = 0.63 cfs @ 12.13 hrs, Volume= 0.057 af, Atten= 10%, Lag= 2.3 min
Discarded = 0.02 cfs @ 12.13 hrs, Volume= 0.018 af
Primary = 0.61 cfs @ 12.13 hrs, Volume= 0.039 af
Routed to Pond P-2 : Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.43' @ 12.13 hrs Surf.Area= 428 sf Storage= 127 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 5.1 min (763.5 - 758.3)

Volume	Invert	Avail.Storage	Storage Description
#1	123.00'	472 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
123.00	165	0	0
124.00	779	472	472

Device	Routing	Invert	Outlet Devices
#1	Primary	123.00'	**12.0" Round Culvert** L= 69.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 123.00' / 122.50' S= 0.0072 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	123.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.13 hrs HW=123.42' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.60 cfs @ 12.13 hrs HW=123.42' TW=122.20' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.60 cfs @ 2.77 fps)

Summary for Pond P-2: Infiltration Basin

Inflow Area = 0.570 ac, 32.04% Impervious, Inflow Depth = 1.13" for 2-Year event
Inflow = 0.78 cfs @ 12.11 hrs, Volume= 0.054 af
Outflow = 0.13 cfs @ 12.61 hrs, Volume= 0.054 af, Atten= 83%, Lag= 29.8 min
Discarded = 0.13 cfs @ 12.61 hrs, Volume= 0.054 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-2 : East Low Point

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 122.39' @ 12.61 hrs Surf.Area= 2,340 sf Storage= 829 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 45.2 min (790.0 - 744.8)

Volume	Invert	Avail.Storage	Storage Description
#1	122.00'	5,937 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.00	1,944	0	0
124.00	3,993	5,937	5,937

Device	Routing	Invert	Outlet Devices
#1	Primary	123.99'	**15.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	122.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.13 cfs @ 12.61 hrs HW=122.39' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=122.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: West Wetlands

Inflow Area = 0.271 ac, 4.58% Impervious, Inflow Depth = 1.77" for 2-Year event
Inflow = 0.51 cfs @ 12.09 hrs, Volume= 0.040 af
Primary = 0.51 cfs @ 12.09 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East Low Point

Inflow Area = 0.743 ac, 24.58% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment SC-1: Overland to West Runoff Area=3,356 sf 15.85% Impervious Runoff Depth=2.55"
Tc=6.0 min CN=WQ Runoff=0.20 cfs 0.016 af

Subcatchment SC-2: Overland to Forebay Runoff Area=11,864 sf 62.53% Impervious Runoff Depth=2.65"
Tc=6.0 min CN=WQ Runoff=0.72 cfs 0.060 af

Subcatchment SC-3: Overland to Basin Runoff Area=9,595 sf 0.00% Impervious Runoff Depth=1.12"
Tc=6.0 min CN=WQ Runoff=0.23 cfs 0.021 af

Subcatchment SC-4: Basin Berm and Runoff Area=7,531 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=32 Runoff=0.00 cfs 0.000 af

Subcatchment SC-5: Overland to West Runoff Area=11,789 sf 4.58% Impervious Runoff Depth=2.42"
Tc=6.0 min CN=WQ Runoff=0.67 cfs 0.055 af

Pond P-1: Forebay Peak Elev=123.50' Storage=160 cf Inflow=0.92 cfs 0.077 af
Discarded=0.03 cfs 0.020 af Primary=0.81 cfs 0.056 af Outflow=0.83 cfs 0.077 af

Pond P-2: Infiltration Basin Peak Elev=122.55' Storage=1,229 cf Inflow=1.03 cfs 0.077 af
Discarded=0.14 cfs 0.077 af Primary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.077 af

Link DP-1: West Wetlands Inflow=0.67 cfs 0.055 af
Primary=0.67 cfs 0.055 af

Link DP-2: East Low Point Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 1.013 ac Runoff Volume = 0.152 af Average Runoff Depth = 1.80"
80.76% Pervious = 0.818 ac 19.24% Impervious = 0.195 ac

Summary for Subcatchment SC-1: Overland to West Wetland

Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.016 af, Depth= 2.55"
Routed to Pond P-1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=4.42"

Area (sf)	CN	Description
532	98	Paved parking, HSG A
1,256	39	Pasture/grassland/range, Good, HSG A
1,568	96	Gravel surface, HSG A
3,356		Weighted Average
2,824	71	84.15% Pervious Area
532	98	15.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-2: Overland to Forebay

Runoff = 0.72 cfs @ 12.09 hrs, Volume= 0.060 af, Depth= 2.65"
Routed to Pond P-1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=4.42"

Area (sf)	CN	Description
7,418	98	Paved parking, HSG A
4,446	39	Pasture/grassland/range, Good, HSG A
11,864		Weighted Average
4,446	39	37.47% Pervious Area
7,418	98	62.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-3: Overland to Basin

Runoff = 0.23 cfs @ 12.09 hrs, Volume= 0.021 af, Depth= 1.12"
Routed to Pond P-2 : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=4.42"

Area (sf)	CN	Description
2,407	98	Water Surface, 0% imp, HSG A
7,188	39	Pasture/grassland/range, Good, HSG A
9,595		Weighted Average
9,595	54	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-4: Basin Berm and Shoulder

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DP-2 : East Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=4.42"

Area (sf)	CN	Description
7,531	32	Woods/grass comb., Good, HSG A
7,531	32	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-5: Overland to West Wetland

Runoff = 0.67 cfs @ 12.09 hrs, Volume= 0.055 af, Depth= 2.42"
Routed to Link DP-1 : West Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=4.42"

	Area (sf)	CN	Description
*	540	98	Impervious, HSG A
	4,724	39	Pasture/grassland/range, Good, HSG A
	6,525	96	Gravel surface, HSG A
	11,789		Weighted Average
	11,249	72	95.42% Pervious Area
	540	98	4.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Pond P-1: Forebay

Inflow Area = 0.349 ac, 52.23% Impervious, Inflow Depth = 2.63" for 5-Year event
Inflow = 0.92 cfs @ 12.09 hrs, Volume= 0.077 af
Outflow = 0.83 cfs @ 12.12 hrs, Volume= 0.077 af, Atten= 9%, Lag= 2.3 min
Discarded = 0.03 cfs @ 12.12 hrs, Volume= 0.020 af
Primary = 0.81 cfs @ 12.12 hrs, Volume= 0.056 af
Routed to Pond P-2 : Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.50' @ 12.12 hrs Surf.Area= 473 sf Storage= 160 cf

Plug-Flow detention time= 5.3 min calculated for 0.077 af (100% of inflow)
Center-of-Mass det. time= 5.3 min (762.2 - 756.9)

Volume	Invert	Avail.Storage	Storage Description
#1	123.00'	472 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
123.00	165	0	0
124.00	779	472	472

Device	Routing	Invert	Outlet Devices
#1	Primary	123.00'	**12.0" Round Culvert** L= 69.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 123.00' / 122.50' S= 0.0072 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	123.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.12 hrs HW=123.49' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.79 cfs @ 12.12 hrs HW=123.49' TW=122.30' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.79 cfs @ 2.97 fps)

Summary for Pond P-2: Infiltration Basin

Inflow Area = 0.570 ac, 32.04% Impervious, Inflow Depth = 1.62" for 5-Year event
Inflow = 1.03 cfs @ 12.11 hrs, Volume= 0.077 af
Outflow = 0.14 cfs @ 12.68 hrs, Volume= 0.077 af, Atten= 86%, Lag= 33.8 min
Discarded = 0.14 cfs @ 12.68 hrs, Volume= 0.077 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-2 : East Low Point

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 122.55' @ 12.68 hrs Surf.Area= 2,510 sf Storage= 1,229 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 65.4 min (819.0 - 753.6)

Volume	Invert	Avail.Storage	Storage Description
#1	122.00'	5,937 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.00	1,944	0	0
124.00	3,993	5,937	5,937

Device	Routing	Invert	Outlet Devices
#1	Primary	123.99'	**15.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	122.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.14 cfs @ 12.68 hrs HW=122.55' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=122.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: West Wetlands

Inflow Area = 0.271 ac, 4.58% Impervious, Inflow Depth = 2.42" for 5-Year event
Inflow = 0.67 cfs @ 12.09 hrs, Volume= 0.055 af
Primary = 0.67 cfs @ 12.09 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East Low Point

Inflow Area = 0.743 ac, 24.58% Impervious, Inflow Depth = 0.00" for 5-Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment SC-1: Overland to West Runoff Area=3,356 sf 15.85% Impervious Runoff Depth=3.14"
Tc=6.0 min CN=WQ Runoff=0.24 cfs 0.020 af

Subcatchment SC-2: Overland to Forebay Runoff Area=11,864 sf 62.53% Impervious Runoff Depth=3.25"
Tc=6.0 min CN=WQ Runoff=0.86 cfs 0.074 af

Subcatchment SC-3: Overland to Basin Runoff Area=9,595 sf 0.00% Impervious Runoff Depth=1.46"
Tc=6.0 min CN=WQ Runoff=0.28 cfs 0.027 af

Subcatchment SC-4: Basin Berm and Runoff Area=7,531 sf 0.00% Impervious Runoff Depth=0.05"
Tc=6.0 min CN=32 Runoff=0.00 cfs 0.001 af

Subcatchment SC-5: Overland to West Runoff Area=11,789 sf 4.58% Impervious Runoff Depth=3.00"
Tc=6.0 min CN=WQ Runoff=0.81 cfs 0.068 af

Pond P-1: Forebay Peak Elev=123.56' Storage=188 cf Inflow=1.10 cfs 0.094 af
Discarded=0.03 cfs 0.022 af Primary=0.97 cfs 0.072 af Outflow=1.00 cfs 0.094 af

Pond P-2: Infiltration Basin Peak Elev=122.70' Storage=1,612 cf Inflow=1.23 cfs 0.099 af
Discarded=0.15 cfs 0.099 af Primary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.099 af

Link DP-1: West Wetlands Inflow=0.81 cfs 0.068 af
Primary=0.81 cfs 0.068 af

Link DP-2: East Low Point Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

Total Runoff Area = 1.013 ac Runoff Volume = 0.189 af Average Runoff Depth = 2.24"
80.76% Pervious = 0.818 ac 19.24% Impervious = 0.195 ac

Summary for Subcatchment SC-1: Overland to West Wetland

Runoff = 0.24 cfs @ 12.09 hrs, Volume= 0.020 af, Depth= 3.14"
Routed to Pond P-1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.28"

Area (sf)	CN	Description
532	98	Paved parking, HSG A
1,256	39	Pasture/grassland/range, Good, HSG A
1,568	96	Gravel surface, HSG A
3,356		Weighted Average
2,824	71	84.15% Pervious Area
532	98	15.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-2: Overland to Forebay

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.074 af, Depth= 3.25"
Routed to Pond P-1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.28"

Area (sf)	CN	Description
7,418	98	Paved parking, HSG A
4,446	39	Pasture/grassland/range, Good, HSG A
11,864		Weighted Average
4,446	39	37.47% Pervious Area
7,418	98	62.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-3: Overland to Basin

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.027 af, Depth= 1.46"
Routed to Pond P-2 : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.28"

Area (sf)	CN	Description
2,407	98	Water Surface, 0% imp, HSG A
7,188	39	Pasture/grassland/range, Good, HSG A
9,595		Weighted Average
9,595	54	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-4: Basin Berm and Shoulder

Runoff = 0.00 cfs @ 16.79 hrs, Volume= 0.001 af, Depth= 0.05"
Routed to Link DP-2 : East Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.28"

Area (sf)	CN	Description
7,531	32	Woods/grass comb., Good, HSG A
7,531	32	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-5: Overland to West Wetland

Runoff = 0.81 cfs @ 12.09 hrs, Volume= 0.068 af, Depth= 3.00"
Routed to Link DP-1 : West Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.28"

	Area (sf)	CN	Description
*	540	98	Impervious, HSG A
	4,724	39	Pasture/grassland/range, Good, HSG A
	6,525	96	Gravel surface, HSG A
	11,789		Weighted Average
	11,249	72	95.42% Pervious Area
	540	98	4.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Pond P-1: Forebay

Inflow Area = 0.349 ac, 52.23% Impervious, Inflow Depth = 3.23" for 10-Year event
Inflow = 1.10 cfs @ 12.09 hrs, Volume= 0.094 af
Outflow = 1.00 cfs @ 12.12 hrs, Volume= 0.094 af, Atten= 9%, Lag= 2.3 min
Discarded = 0.03 cfs @ 12.12 hrs, Volume= 0.022 af
Primary = 0.97 cfs @ 12.12 hrs, Volume= 0.072 af
Routed to Pond P-2 : Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.56' @ 12.12 hrs Surf.Area= 508 sf Storage= 188 cf

Plug-Flow detention time= 5.3 min calculated for 0.094 af (100% of inflow)
Center-of-Mass det. time= 5.4 min (762.1 - 756.7)

Volume	Invert	Avail.Storage	Storage Description
#1	123.00'	472 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
123.00	165	0	0
124.00	779	472	472

Device	Routing	Invert	Outlet Devices
#1	Primary	123.00'	**12.0" Round Culvert** L= 69.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 123.00' / 122.50' S= 0.0072 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	123.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.12 hrs HW=123.55' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.95 cfs @ 12.12 hrs HW=123.55' TW=122.38' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.95 cfs @ 3.10 fps)

Summary for Pond P-2: Infiltration Basin

Inflow Area = 0.570 ac, 32.04% Impervious, Inflow Depth = 2.09" for 10-Year event
Inflow = 1.23 cfs @ 12.11 hrs, Volume= 0.099 af
Outflow = 0.15 cfs @ 12.81 hrs, Volume= 0.099 af, Atten= 88%, Lag= 41.9 min
Discarded = 0.15 cfs @ 12.81 hrs, Volume= 0.099 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-2 : East Low Point

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 122.70' @ 12.81 hrs Surf.Area= 2,661 sf Storage= 1,612 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 85.2 min (845.4 - 760.2)

Volume	Invert	Avail.Storage	Storage Description
#1	122.00'	5,937 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.00	1,944	0	0
124.00	3,993	5,937	5,937

Device	Routing	Invert	Outlet Devices
#1	Primary	123.99'	**15.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	122.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.15 cfs @ 12.81 hrs HW=122.70' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=122.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: West Wetlands

Inflow Area = 0.271 ac, 4.58% Impervious, Inflow Depth = 3.00" for 10-Year event
Inflow = 0.81 cfs @ 12.09 hrs, Volume= 0.068 af
Primary = 0.81 cfs @ 12.09 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East Low Point

Inflow Area = 0.743 ac, 24.58% Impervious, Inflow Depth = 0.01" for 10-Year event
Inflow = 0.00 cfs @ 16.79 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 16.79 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment SC-1: Overland to West Runoff Area=3,356 sf 15.85% Impervious Runoff Depth=3.99"
Tc=6.0 min CN=WQ Runoff=0.30 cfs 0.026 af

Subcatchment SC-2: Overland to Forebay Runoff Area=11,864 sf 62.53% Impervious Runoff Depth=4.10"
Tc=6.0 min CN=WQ Runoff=1.06 cfs 0.093 af

Subcatchment SC-3: Overland to Basin Runoff Area=9,595 sf 0.00% Impervious Runoff Depth=1.99"
Tc=6.0 min CN=WQ Runoff=0.36 cfs 0.037 af

Subcatchment SC-4: Basin Berm and Runoff Area=7,531 sf 0.00% Impervious Runoff Depth=0.21"
Tc=6.0 min CN=32 Runoff=0.00 cfs 0.003 af

Subcatchment SC-5: Overland to West Runoff Area=11,789 sf 4.58% Impervious Runoff Depth=3.83"
Tc=6.0 min CN=WQ Runoff=1.01 cfs 0.086 af

Pond P-1: Forebay Peak Elev=123.63' Storage=227 cf Inflow=1.36 cfs 0.119 af
Discarded=0.03 cfs 0.023 af Primary=1.20 cfs 0.095 af Outflow=1.23 cfs 0.119 af

Pond P-2: Infiltration Basin Peak Elev=122.93' Storage=2,241 cf Inflow=1.55 cfs 0.132 af
Discarded=0.16 cfs 0.132 af Primary=0.00 cfs 0.000 af Outflow=0.16 cfs 0.132 af

Link DP-1: West Wetlands Inflow=1.01 cfs 0.086 af
Primary=1.01 cfs 0.086 af

Link DP-2: East Low Point Inflow=0.00 cfs 0.003 af
Primary=0.00 cfs 0.003 af

Total Runoff Area = 1.013 ac Runoff Volume = 0.245 af Average Runoff Depth = 2.90"
80.76% Pervious = 0.818 ac 19.24% Impervious = 0.195 ac

Summary for Subcatchment SC-1: Overland to West Wetland

Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.026 af, Depth= 3.99"
Routed to Pond P-1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.45"

Area (sf)	CN	Description
532	98	Paved parking, HSG A
1,256	39	Pasture/grassland/range, Good, HSG A
1,568	96	Gravel surface, HSG A
3,356		Weighted Average
2,824	71	84.15% Pervious Area
532	98	15.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-2: Overland to Forebay

Runoff = 1.06 cfs @ 12.09 hrs, Volume= 0.093 af, Depth= 4.10"
Routed to Pond P-1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.45"

Area (sf)	CN	Description
7,418	98	Paved parking, HSG A
4,446	39	Pasture/grassland/range, Good, HSG A
11,864		Weighted Average
4,446	39	37.47% Pervious Area
7,418	98	62.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-3: Overland to Basin

Runoff = 0.36 cfs @ 12.10 hrs, Volume= 0.037 af, Depth= 1.99"
Routed to Pond P-2 : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.45"

Area (sf)	CN	Description
2,407	98	Water Surface, 0% imp, HSG A
7,188	39	Pasture/grassland/range, Good, HSG A
9,595		Weighted Average
9,595	54	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-4: Basin Berm and Shoulder

Runoff = 0.00 cfs @ 13.72 hrs, Volume= 0.003 af, Depth= 0.21"
Routed to Link DP-2 : East Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.45"

Area (sf)	CN	Description
7,531	32	Woods/grass comb., Good, HSG A
7,531	32	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-5: Overland to West Wetland

Runoff = 1.01 cfs @ 12.09 hrs, Volume= 0.086 af, Depth= 3.83"
Routed to Link DP-1 : West Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.45"

	Area (sf)	CN	Description
*	540	98	Impervious, HSG A
	4,724	39	Pasture/grassland/range, Good, HSG A
	6,525	96	Gravel surface, HSG A
	11,789		Weighted Average
	11,249	72	95.42% Pervious Area
	540	98	4.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Pond P-1: Forebay

Inflow Area = 0.349 ac, 52.23% Impervious, Inflow Depth = 4.08" for 25-Year event
Inflow = 1.36 cfs @ 12.09 hrs, Volume= 0.119 af
Outflow = 1.23 cfs @ 12.13 hrs, Volume= 0.119 af, Atten= 10%, Lag= 2.4 min
Discarded = 0.03 cfs @ 12.13 hrs, Volume= 0.023 af
Primary = 1.20 cfs @ 12.13 hrs, Volume= 0.095 af
Routed to Pond P-2 : Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.63' @ 12.13 hrs Surf.Area= 553 sf Storage= 227 cf

Plug-Flow detention time= 5.4 min calculated for 0.119 af (100% of inflow)
Center-of-Mass det. time= 5.5 min (762.2 - 756.7)

Volume	Invert	Avail.Storage	Storage Description
#1	123.00'	472 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
123.00	165	0	0
124.00	779	472	472

Device	Routing	Invert	Outlet Devices
#1	Primary	123.00'	**12.0" Round Culvert** L= 69.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 123.00' / 122.50' S= 0.0072 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	123.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.13 hrs HW=123.62' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.17 cfs @ 12.13 hrs HW=123.62' TW=122.51' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.17 cfs @ 3.25 fps)

Summary for Pond P-2: Infiltration Basin

Inflow Area = 0.570 ac, 32.04% Impervious, Inflow Depth = 2.78" for 25-Year event
Inflow = 1.55 cfs @ 12.12 hrs, Volume= 0.132 af
Outflow = 0.16 cfs @ 13.02 hrs, Volume= 0.132 af, Atten= 90%, Lag= 54.2 min
Discarded = 0.16 cfs @ 13.02 hrs, Volume= 0.132 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-2 : East Low Point

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 122.93' @ 13.02 hrs Surf.Area= 2,893 sf Storage= 2,241 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 117.0 min (882.8 - 765.8)

Volume	Invert	Avail.Storage	Storage Description
#1	122.00'	5,937 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.00	1,944	0	0
124.00	3,993	5,937	5,937

Device	Routing	Invert	Outlet Devices
#1	Primary	123.99'	**15.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	122.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.16 cfs @ 13.02 hrs HW=122.93' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=122.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: West Wetlands

Inflow Area = 0.271 ac, 4.58% Impervious, Inflow Depth = 3.83" for 25-Year event
Inflow = 1.01 cfs @ 12.09 hrs, Volume= 0.086 af
Primary = 1.01 cfs @ 12.09 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East Low Point

Inflow Area = 0.743 ac, 24.58% Impervious, Inflow Depth = 0.05" for 25-Year event
Inflow = 0.00 cfs @ 13.72 hrs, Volume= 0.003 af
Primary = 0.00 cfs @ 13.72 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment SC-1: Overland to West Runoff Area=3,356 sf 15.85% Impervious Runoff Depth=5.39"
Tc=6.0 min CN=WQ Runoff=0.41 cfs 0.035 af

Subcatchment SC-2: Overland to Forebay Runoff Area=11,864 sf 62.53% Impervious Runoff Depth=5.50"
Tc=6.0 min CN=WQ Runoff=1.45 cfs 0.125 af

Subcatchment SC-3: Overland to Basin Runoff Area=9,595 sf 0.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=WQ Runoff=0.60 cfs 0.054 af

Subcatchment SC-4: Basin Berm and Runoff Area=7,531 sf 0.00% Impervious Runoff Depth=0.64"
Tc=6.0 min CN=32 Runoff=0.05 cfs 0.009 af

Subcatchment SC-5: Overland to West Runoff Area=11,789 sf 4.58% Impervious Runoff Depth=5.19"
Tc=6.0 min CN=WQ Runoff=1.38 cfs 0.117 af

Pond P-1: Forebay Peak Elev=123.76' Storage=304 cf Inflow=1.85 cfs 0.159 af
Discarded=0.04 cfs 0.027 af Primary=1.62 cfs 0.133 af Outflow=1.66 cfs 0.159 af

Pond P-2: Infiltration Basin Peak Elev=123.31' Storage=3,415 cf Inflow=2.19 cfs 0.187 af
Discarded=0.18 cfs 0.187 af Primary=0.00 cfs 0.000 af Outflow=0.18 cfs 0.187 af

Link DP-1: West Wetlands Inflow=1.38 cfs 0.117 af
Primary=1.38 cfs 0.117 af

Link DP-2: East Low Point Inflow=0.05 cfs 0.009 af
Primary=0.05 cfs 0.009 af

Total Runoff Area = 1.013 ac Runoff Volume = 0.340 af Average Runoff Depth = 4.03"
80.76% Pervious = 0.818 ac 19.24% Impervious = 0.195 ac

Summary for Subcatchment SC-1: Overland to West Wetland

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.035 af, Depth= 5.39"
Routed to Pond P-1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.27"

Area (sf)	CN	Description
532	98	Paved parking, HSG A
1,256	39	Pasture/grassland/range, Good, HSG A
1,568	96	Gravel surface, HSG A
3,356		Weighted Average
2,824	71	84.15% Pervious Area
532	98	15.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-2: Overland to Forebay

Runoff = 1.45 cfs @ 12.09 hrs, Volume= 0.125 af, Depth= 5.50"
Routed to Pond P-1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.27"

Area (sf)	CN	Description
7,418	98	Paved parking, HSG A
4,446	39	Pasture/grassland/range, Good, HSG A
11,864		Weighted Average
4,446	39	37.47% Pervious Area
7,418	98	62.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-3: Overland to Basin

Runoff = 0.60 cfs @ 12.10 hrs, Volume= 0.054 af, Depth= 2.97"
Routed to Pond P-2 : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.27"

Area (sf)	CN	Description
2,407	98	Water Surface, 0% imp, HSG A
7,188	39	Pasture/grassland/range, Good, HSG A
9,595		Weighted Average
9,595	54	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-4: Basin Berm and Shoulder

Runoff = 0.05 cfs @ 12.34 hrs, Volume= 0.009 af, Depth= 0.64"
Routed to Link DP-2 : East Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.27"

Area (sf)	CN	Description
7,531	32	Woods/grass comb., Good, HSG A
7,531	32	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Subcatchment SC-5: Overland to West Wetland

Runoff = 1.38 cfs @ 12.09 hrs, Volume= 0.117 af, Depth= 5.19"
Routed to Link DP-1 : West Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.27"

	Area (sf)	CN	Description
*	540	98	Impervious, HSG A
	4,724	39	Pasture/grassland/range, Good, HSG A
	6,525	96	Gravel surface, HSG A
	11,789		Weighted Average
	11,249	72	95.42% Pervious Area
	540	98	4.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min**

Summary for Pond P-1: Forebay

Inflow Area = 0.349 ac, 52.23% Impervious, Inflow Depth = 5.47" for 100-Year event
Inflow = 1.85 cfs @ 12.09 hrs, Volume= 0.159 af
Outflow = 1.66 cfs @ 12.13 hrs, Volume= 0.159 af, Atten= 11%, Lag= 2.5 min
Discarded = 0.04 cfs @ 12.13 hrs, Volume= 0.027 af
Primary = 1.62 cfs @ 12.13 hrs, Volume= 0.133 af
Routed to Pond P-2 : Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.76' @ 12.13 hrs Surf.Area= 633 sf Storage= 304 cf

Plug-Flow detention time= 6.5 min calculated for 0.159 af (100% of inflow)
Center-of-Mass det. time= 6.6 min (763.5 - 757.0)

Volume	Invert	Avail.Storage	Storage Description
#1	123.00'	472 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
123.00	165	0	0
124.00	779	472	472

Device	Routing	Invert	Outlet Devices
#1	Primary	123.00'	**12.0" Round Culvert** L= 69.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 123.00' / 122.50' S= 0.0072 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	123.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.13 hrs HW=123.75' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.59 cfs @ 12.13 hrs HW=123.75' TW=122.74' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.59 cfs @ 3.48 fps)

Summary for Pond P-2: Infiltration Basin

Inflow Area = 0.570 ac, 32.04% Impervious, Inflow Depth = 3.95" for 100-Year event
Inflow = 2.19 cfs @ 12.12 hrs, Volume= 0.187 af
Outflow = 0.18 cfs @ 13.37 hrs, Volume= 0.187 af, Atten= 92%, Lag= 75.3 min
Discarded = 0.18 cfs @ 13.37 hrs, Volume= 0.187 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-2 : East Low Point

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.31' @ 13.37 hrs Surf.Area= 3,283 sf Storage= 3,415 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 171.8 min (942.3 - 770.5)

Volume	Invert	Avail.Storage	Storage Description
#1	122.00'	5,937 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.00	1,944	0	0
124.00	3,993	5,937	5,937

Device	Routing	Invert	Outlet Devices
#1	Primary	123.99'	**15.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	122.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.18 cfs @ 13.37 hrs HW=123.31' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=122.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: West Wetlands

Inflow Area = 0.271 ac, 4.58% Impervious, Inflow Depth = 5.19" for 100-Year event
Inflow = 1.38 cfs @ 12.09 hrs, Volume= 0.117 af
Primary = 1.38 cfs @ 12.09 hrs, Volume= 0.117 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East Low Point

Inflow Area = 0.743 ac, 24.58% Impervious, Inflow Depth = 0.15" for 100-Year event
Inflow = 0.05 cfs @ 12.34 hrs, Volume= 0.009 af
Primary = 0.05 cfs @ 12.34 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Appendix D
Stormwater Operation and Maintenance Plan

KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630

STORMWATER OPERATION AND MAINTANENCE PLAN (O&M)

Owner/
Operator: Town of Millis
Public Works/ Highway Department
900 Main Street, Room 204
Millis, MA 02054

Prepared by: Kleinfelder
1 Beacon Street, Suite 8100
Boston, MA 02118

The following operation and maintenance practices will be performed on the proposed stormwater system by the Owner (Town of Millis).

Table OM-1 Summary of Stormwater System Operation & Maintenance Tasks Listed By Item

Item ***location on site***	**Frequency**	**What to do**
Infiltration Basin	1st & 2nd Year Post Construction Every 6 months, and after a major storm Inspection frequency can be reduced to annual following 2nd year post-construction monitoring.	Inspections should focus on: Checking the infiltration basin surface for standing water or accumulated sediments. Checking the sedimentation chamber or forebay for sediment accumulation, trash, and debris. Inspect to be certain the sedimentation forebay drains within 24 to 72 hrs. Checking inlets, outlets, and overflow spillway for blockage, structural integrity, and evidence of erosion. Removal of decaying vegetation, litter, and debris.
Paved surfaces	Every Six Months or as needed	Sweep and remove sediment from paved wearing surfaces at the site.

Table OM-1 – Continued

Riprap Apron at Pressure Relief Outlet and Overflow Weir	Every Six Months, and after major storms	Inspect apron for excessive sediment accumulation, eroding slopes, rilling or gullying, repair and clean as necessary.
	Once every 4 years	The apron should be cleaned of vegetation.
Rip rap aprons *At pipe outlets*	Annually, and after major storms	Inspect aprons after major storm events or at a minimum annually. Repair as necessary.
	Annually	Cleaning and remove debris from apron. Repair as necessary.
Water Conveyance Swales	Semi-annually, and after major storms	Inspect swales after major storm event. Clean debris, and repair as necessary
	Annually	Cleaning and remove debris from swales. Repair as necessary.

Table OM-2 Annual Checklist of Stormwater System Operation & Maintenance Tasks Listed By Frequency.

Frequency	**Item** ***location on site***	**What to do**	**Date completed**	**Notes**
Every Six Months	Paved surfaces	Sweep and remove sediment from paved surfaces on a semi-annual basis.		
	Riprap Aprons at Pressure Relief Outlet, Drain Outlet, and Overflow Weir	Inspect riprap aprons and Overflow Weir for excessive sediment accumulation, eroding slopes, rilling or gullying, repair and clean as necessary		
	Water Conveyance Swale	Inspect and remove all accumulated sediment and debris.		

♦♦♦ These inspections should also be performed after all major storms (more than 3.5 inches of rain in a 24-hour period).

Table OM-2 - Continued

Frequency	Item location on site	What to do	Date completed	Notes
Every six months	Infiltration Basin	♦♦♦ <u>1st & 2nd Year Post Construction</u> Every 6 months, and after a major storm Inspection frequency can be reduced to annual following 1st and 2nd year post-construction monitoring. Remove any accumulated sediment deposits. Use light equipment to remove top layer without compacting underlying area. Mow the area around the detention basin. Remove all clippings after mowing.		Inspections should focus on: Checking the detention basin surface for standing water and accumulated sediments. Checking the sedimentation chamber or forebay for sediment accumulation, trash, and debris. Inspect to be certain the sedimentation forebay drains within 24 to 72 hrs. Checking inlets, outlets, and overflow spillway for blockage, structural integrity, and evidence of erosion. Removal of decaying vegetation, litter, and debris.

♦♦♦ These inspections should also be performed after all major storms (more than 3.5 inches of rain in a 24-hour period).

STORMWATER MANAGEMENT
LONG TERM POLLUTION PREVENTION PLAN (LTPPP)

Owner/
Operators: Town of Millis Public Works/Highway Department
900 Main Street, Room 204
Millis, MA 02054

Prepared by: Kleinfelder
1 Beacon Street, Suite 8100
Boston, MA 02118

A. MATERIALS MANAGEMENT PRACTICES

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff. The Owner and Operator will be responsible for ensuring that these procedures are followed:

1. Good Housekeeping

The following good housekeeping practices will be followed onsite:

a) An effort will be made to store only enough products required to do the job.
b) All materials stored onsite will be stored in a neat, orderly manner and, if possible, under a roof or in a containment area. At a minimum, all containers will be stored with their lids on when not in use. Drip pans shall be provided under all dispensers.
c) Products will be kept in their original containers with the original manufacturer's label in legible condition.
d) Substances will not be mixed with one another unless recommended by the manufacturer.
e) Whenever possible, all of a product will be used up before disposing of the container.
f) Manufacturer’s recommendations for proper use and disposal will be followed.
g) The Operator will be responsible for daily inspections for windblown litter and to ensure proper use and disposal of materials. Collection of all windblown litter will be deposited in an appropriate solid waste container.
h) The Operator will be responsible for periodic street sweeping on an as need basis for all paved wearing surfaces on site. At a minimum sweeping shall be performed on a quarterly basis.

2. Hazardous Substances

These practices will be used to reduce the risks associated with Hazardous Substances. Material Safety Data Sheets (MSDS's) for each product with hazardous properties that is used at the Site will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such product is stored and/or used and another copy of each MSDS will be maintained in the operations office at the Site. Each employee who must handle a Hazardous Substance will be instructed on the use of MSDS sheets for the product he/she is using, particularly regarding spill control techniques.

a) Products will be kept in original containers with the original labels in legible condition.
b) Original labels and MSDS's will be procured and used for each product.
c) If surplus product must be disposed manufacturer's and local/state/federal required methods for proper disposal must be followed.

3. Hazardous Waste

It is imperative that all Hazardous Waste be properly identified and handled in accordance with all applicable Hazardous Waste Standards, including the storage, transport and disposal of the Hazardous Wastes. There are significant penalties for the improper handling of Hazardous Wastes. It is important that the Owner/Operator seeks appropriate assistance in making the determination of whether a substance or material is a Hazardous Waste. For example, Hazardous Waste may include certain Hazardous Substances, as well as pesticides, paints, paint solvents, cleaning solvents, pesticides, contaminated soils, and other materials, substances or chemicals that have been discarded (or are to be discarded) as being out-of-date, contaminated, or otherwise unusable, and can include the containers for those substances; other materials and substances can also be or become Hazardous Wastes, however. The Owner/Operator is also responsible for ensuring that all site personnel are instructed as to these Hazardous Waste requirements and also that the requirements are being followed.

4. Product Specific Practices

The following product specific practices will be followed on the site:

Petroleum Products

All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Drip pans shall be provided for all dispensers. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

Fertilizers

Fertilizers will be applied only in the minimum amounts recommended by the manufacturer. Fertilizer will not be stored on-site on a long-term basis. All temporary storage of fertilizer will be in a covered container. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints, Paint Solvents, and Cleaning Solvents.

All containers will be tightly sealed and stored when not in use. Excess paint and solvents will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or federal, state, and local regulations.

5. Solid Wastes

All waste materials will be collected and stored in a covered or enclosed containers and/or securely contained metal dumpsters or compactors. The containers will comply with all local and state solid waste management regulations.

B. SPILL PREVENTION

The Owner will train all personnel in the proper handling and cleanup of spilled Hazardous Substances or Oil. No spilled Hazardous Substances or Oil will be allowed to come in contact with stormwater discharges. If such contact occurs, the storm water discharge will be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated stormwater. It shall be the responsibility of the Owner to be properly trained, and to train all personnel in spill prevention and clean up procedures.

In order to prevent or minimize the potential for a spill of Hazardous Substances or Oil to come into contact with stormwater, the following steps will be implemented:

a) All Hazardous Substances or Oil (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, and cleaning solvents, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.
b) The minimum practical quantity of all such materials will be kept at the site.
c) A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.
d) Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.
e) It is the Operators responsibility to ensure that all Hazardous Waste discovered or generated at the site is disposed of properly by a licensed hazardous material disposal company. The Operator is responsible for not exceeding Hazardous Waste storage requirements mandated by the EPA or state and local authority.

C. SNOW MANAGEMENT

Snow management will be performed by the Millis Public Works/Highway Department. Snow will be placed and mounded on the side of River Road, as necessary. Melting snow will be allowed to percolate through the vegetated surface. In the spring, when all the snow has melted, all accumulated sediment, and debris remaining shall be cleaned and removed from the site.

Appendix E
Water Quality Calculations

KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630

Stage-Area-Storage for Pond P-1: Forebay

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
123.00	165	0
123.01	171	2
123.02	177	3
123.03	183	5
123.04	190	7
123.05	196	9
123.06	202	11
123.07	208	13
123.08	214	15
123.09	220	17
123.10	226	20
123.11	233	22
123.12	239	24
123.13	245	27
123.14	251	29
123.15	257	32
123.16	263	34
123.17	269	37
123.18	276	40
123.19	282	42
123.20	288	45
123.21	294	48
123.22	300	51
123.23	306	54
123.24	312	57
123.25	319	60
123.26	325	64
123.27	331	67
123.28	337	70
123.29	343	74
123.30	349	77
123.31	355	81
123.32	361	84
123.33	368	88
123.34	374	92
123.35	380	95
123.36	386	99
123.37	392	103
123.38	398	107
123.39	404	111
123.40	411	115
123.41	417	119
123.42	423	123
123.43	429	128
123.44	435	132
123.45	441	136
123.46	447	141
123.47	454	145
123.48	460	150
123.49	466	155
123.50	472	159
123.51	478	164
123.52	484	169
123.53	490	174
123.54	497	179
123.55	503	184
123.56	509	189
123.57	515	194
123.58	521	199
123.59	527	204
123.60	533	210
123.61	540	215
123.62	546	220
123.63	552	226
123.64	558	231
123.65	564	237
123.66	570	243
123.67	576	248
123.68	583	254
123.69	589	260
123.70	595	266
123.71	601	272
123.72	607	278
123.73	613	284
123.74	619	290
123.75	626	296
123.76	632	303
123.77	638	309
123.78	644	315
123.79	650	322
123.80	656	328
123.81	662	335
123.82	668	342
123.83	675	348
123.84	681	355
123.85	687	362
123.86	693	369
123.87	699	376
123.88	705	383
123.89	711	390
123.90	718	397
123.91	724	404
123.92	730	412
123.93	736	419
123.94	742	426
123.95	748	434
123.96	754	441
123.97	761	449
123.98	767	457
123.99	773	464
124.00	**779**	**472**

WQV requirement of 655 cf storage is met

Stage-Area-Storage for Pond P-2: Infiltration Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
122.00	1,944	0	122.52	2,477	1,149
122.01	1,954	19	122.53	2,487	1,174
122.02	1,964	39	122.54	2,497	1,199
122.03	1,975	59	122.55	2,507	1,224
122.04	1,985	79	122.56	2,518	1,249
122.05	1,995	98	122.57	2,528	1,275
122.06	2,005	118	122.58	2,538	1,300
122.07	2,016	139	122.59	2,548	1,325
122.08	2,026	159	122.60	2,559	1,351
122.09	2,036	179	122.61	2,569	1,376
122.10	2,046	200	122.62	2,579	1,402
122.11	2,057	220	122.63	2,589	1,428
122.12	2,067	241	122.64	2,600	1,454
122.13	2,077	261	122.65	2,610	1,480
122.14	2,087	282	122.66	2,620	1,506
122.15	2,098	303	122.67	2,630	1,532
122.16	2,108	324	122.68	2,641	1,559
122.17	2,118	345	122.69	2,651	1,585
122.18	2,128	367	122.70	2,661	1,612
122.19	2,139	388	122.71	2,671	1,638
122.20	2,149	409	122.72	2,682	1,665
122.21	2,159	431	122.73	2,692	1,692
122.22	2,169	452	122.74	2,702	1,719
122.23	2,180	474	122.75	2,712	1,746
122.24	2,190	496	122.76	2,723	1,773
122.25	2,200	518	122.77	2,733	1,801
122.26	2,210	540	122.78	2,743	1,828
122.27	2,221	562	122.79	2,753	1,855
122.28	2,231	584	122.80	2,764	1,883
122.29	2,241	607	122.81	2,774	1,911
122.30	2,251	629	122.82	2,784	1,939
122.31	2,262	652	122.83	2,794	1,966
122.32	2,272	675	122.84	2,805	1,994
122.33	2,282	697	122.85	2,815	2,023
122.34	2,292	720	122.86	2,825	2,051
122.35	2,303	743	122.87	2,835	2,079
122.36	2,313	766	122.88	2,846	2,107
122.37	2,323	789	122.89	2,856	2,136
122.38	2,333	813	122.90	2,866	2,165
122.39	2,344	836	122.91	2,876	2,193
122.40	2,354	860	122.92	2,887	2,222
122.41	2,364	883	122.93	2,897	2,251
122.42	2,374	907	122.94	2,907	2,280
122.43	2,385	931	122.95	2,917	2,309
122.44	2,395	955	122.96	2,928	2,338
122.45	2,405	979	122.97	2,938	2,368
122.46	2,415	1,003	122.98	2,948	2,397
122.47	2,426	1,027	122.99	2,958	2,427
122.48	2,436	1,051	123.00	2,969	2,456
122.49	2,446	1,076	123.01	2,979	2,486
122.50	2,456	1,100	123.02	2,989	2,516
122.51	2,466	1,125	123.03	2,999	2,546

Stage-Area-Storage for Pond P-2: Infiltration Basin (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
123.04	3,009	2,576
123.05	3,020	2,606
123.06	3,030	2,636
123.07	3,040	2,667
123.08	3,050	2,697
123.09	3,061	2,728
123.10	3,071	2,758
123.11	3,081	2,789
123.12	3,091	2,820
123.13	3,102	2,851
123.14	3,112	2,882
123.15	3,122	2,913
123.16	3,132	2,944
123.17	3,143	2,976
123.18	3,153	3,007
123.19	3,163	3,039
123.20	3,173	3,070
123.21	3,184	3,102
123.22	3,194	3,134
123.23	3,204	3,166
123.24	3,214	3,198
123.25	3,225	3,230
123.26	3,235	3,263
123.27	3,245	3,295
123.28	3,255	3,328
123.29	3,266	3,360
123.30	3,276	3,393
123.31	3,286	3,426
123.32	3,296	3,459
123.33	3,307	3,492
123.34	3,317	3,525
123.35	3,327	3,558
123.36	3,337	3,591
123.37	3,348	3,625
123.38	3,358	3,658
123.39	3,368	3,692
123.40	3,378	3,726
123.41	3,389	3,759
123.42	3,399	3,793
123.43	3,409	3,827
123.44	3,419	3,862
123.45	3,430	3,896
123.46	3,440	3,930
123.47	3,450	3,965
123.48	3,460	3,999
123.49	3,471	4,034
123.50	3,481	4,069
123.51	3,491	4,103
123.52	3,501	4,138
123.53	3,511	4,173
123.54	3,522	4,209
123.55	3,532	4,244
123.56	3,542	4,279
123.57	3,552	4,315
123.58	3,563	4,350
123.59	3,573	4,386
123.60	3,583	4,422
123.61	3,593	4,458
123.62	3,604	4,494
123.63	3,614	4,530
123.64	3,624	4,566
123.65	3,634	4,602
123.66	3,645	4,639
123.67	3,655	4,675
123.68	3,665	4,712
123.69	3,675	4,748
123.70	3,686	4,785
123.71	3,696	4,822
123.72	3,706	4,859
123.73	3,716	4,896
123.74	3,727	4,933
123.75	3,737	4,971
123.76	3,747	5,008
123.77	3,757	5,046
123.78	3,768	5,083
123.79	3,778	5,121
123.80	3,788	5,159
123.81	3,798	5,197
123.82	3,809	5,235
123.83	3,819	5,273
123.84	3,829	5,311
123.85	3,839	5,350
123.86	3,850	5,388
123.87	3,860	5,427
123.88	3,870	5,465
123.89	3,880	5,504
123.90	3,891	5,543
123.91	3,901	5,582
123.92	3,911	5,621
123.93	3,921	5,660
123.94	3,932	5,699
123.95	3,942	5,739
123.96	3,952	5,778
123.97	3,962	5,818
123.98	3,973	5,857
123.99	3,983	5,897
124.00	**3,993**	**5,937**

Elevation 123.50 is the top elevation of the overflow spillway. Water stored below this elevation will be infiltrated.

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Village Street Millis, MA

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Sediment Forebay	0.25	1.00	0.25	0.75
Infiltration Basin	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Total TSS Removal = 85%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Millis Well 3 PFAS Treatment Facility
Prepared By: MPS
Date: 10/25/2023

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Appendix F
Project Data: NOAA Rainfall and NRCS Web Soil Survey

KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630

NOAA Atlas 14, Volume 10, Version 3
Location name: Millis, Massachusetts, USA*
Latitude: 42.1662°, Longitude: -71.3406°
Elevation: 122 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.323** (0.250-0.413)	**0.392** (0.303-0.502)	**0.505** (0.389-0.649)	**0.599** (0.459-0.774)	**0.728** (0.541-0.987)	**0.825** (0.601-1.14)	**0.927** (0.658-1.34)	**1.04** (0.701-1.54)	**1.21** (0.786-1.86)	**1.36** (0.858-2.12)
10-min	**0.458** (0.354-0.585)	**0.556** (0.429-0.712)	**0.716** (0.551-0.920)	**0.849** (0.650-1.10)	**1.03** (0.767-1.40)	**1.17** (0.852-1.62)	**1.31** (0.932-1.90)	**1.48** (0.993-2.18)	**1.72** (1.11-2.63)	**1.92** (1.22-3.00)
15-min	**0.539** (0.417-0.689)	**0.654** (0.505-0.837)	**0.842** (0.649-1.08)	**0.999** (0.765-1.29)	**1.21** (0.902-1.65)	**1.38** (1.00-1.91)	**1.54** (1.10-2.23)	**1.74** (1.17-2.57)	**2.02** (1.31-3.10)	**2.26** (1.43-3.53)
30-min	**0.738** (0.571-0.944)	**0.898** (0.694-1.15)	**1.16** (0.892-1.49)	**1.38** (1.06-1.78)	**1.67** (1.24-2.27)	**1.90** (1.38-2.63)	**2.13** (1.51-3.08)	**2.40** (1.61-3.55)	**2.80** (1.81-4.28)	**3.12** (1.98-4.88)
60-min	**0.937** (0.725-1.20)	**1.14** (0.882-1.46)	**1.48** (1.14-1.90)	**1.75** (1.34-2.27)	**2.13** (1.59-2.89)	**2.42** (1.76-3.36)	**2.72** (1.93-3.93)	**3.07** (2.06-4.53)	**3.57** (2.31-5.47)	**3.98** (2.52-6.23)
2-hr	**1.20** (0.931-1.52)	**1.47** (1.14-1.87)	**1.92** (1.49-2.46)	**2.30** (1.77-2.96)	**2.82** (2.11-3.81)	**3.20** (2.35-4.43)	**3.61** (2.59-5.23)	**4.11** (2.77-6.03)	**4.86** (3.16-7.40)	**5.51** (3.50-8.55)
3-hr	**1.38** (1.08-1.75)	**1.71** (1.33-2.16)	**2.24** (1.74-2.85)	**2.68** (2.07-3.42)	**3.28** (2.47-4.43)	**3.73** (2.75-5.16)	**4.22** (3.04-6.09)	**4.81** (3.25-7.03)	**5.73** (3.72-8.67)	**6.52** (4.14-10.1)
6-hr	**1.79** (1.40-2.25)	**2.20** (1.72-2.77)	**2.87** (2.24-3.62)	**3.43** (2.66-4.35)	**4.19** (3.17-5.62)	**4.76** (3.53-6.54)	**5.38** (3.90-7.72)	**6.14** (4.16-8.90)	**7.31** (4.77-11.0)	**8.33** (5.31-12.8)
12-hr	**2.29** (1.81-2.86)	**2.79** (2.20-3.49)	**3.62** (2.85-4.54)	**4.30** (3.37-5.43)	**5.25** (3.99-6.97)	**5.94** (4.43-8.09)	**6.70** (4.88-9.53)	**7.62** (5.19-11.0)	**9.04** (5.92-13.5)	**10.3** (6.56-15.6)
24-hr	**2.76** (2.19-3.42)	**3.39** (2.69-4.20)	**4.42** (3.50-5.51)	**5.28** (4.15-6.61)	**6.45** (4.93-8.52)	**7.32** (5.49-9.91)	**8.27** (6.06-11.7)	**9.44** (6.45-13.5)	**11.3** (7.39-16.6)	**12.8** (8.23-19.3)
2-day	**3.13** (2.50-3.85)	**3.91** (3.13-4.82)	**5.20** (4.14-6.43)	**6.26** (4.96-7.80)	**7.73** (5.95-10.2)	**8.80** (6.66-11.9)	**9.99** (7.39-14.1)	**11.5** (7.88-16.3)	**13.9** (9.17-20.4)	**16.1** (10.3-24.0)
3-day	**3.41** (2.74-4.19)	**4.26** (3.42-5.23)	**5.64** (4.51-6.96)	**6.79** (5.40-8.42)	**8.38** (6.47-11.0)	**9.53** (7.23-12.8)	**10.8** (8.03-15.2)	**12.5** (8.55-17.6)	**15.1** (9.96-22.1)	**17.4** (11.2-25.9)
4-day	**3.68** (2.96-4.50)	**4.56** (3.66-5.58)	**5.99** (4.80-7.36)	**7.18** (5.72-8.87)	**8.82** (6.82-11.5)	**10.0** (7.61-13.4)	**11.3** (8.43-15.9)	**13.0** (8.97-18.3)	**15.8** (10.4-22.9)	**18.2** (11.7-26.9)
7-day	**4.43** (3.58-5.39)	**5.35** (4.32-6.52)	**6.86** (5.52-8.38)	**8.10** (6.48-9.96)	**9.82** (7.62-12.7)	**11.1** (8.44-14.7)	**12.5** (9.26-17.3)	**14.2** (9.81-19.8)	**17.0** (11.2-24.5)	**19.3** (12.5-28.5)
10-day	**5.14** (4.17-6.23)	**6.09** (4.93-7.39)	**7.63** (6.16-9.30)	**8.92** (7.16-10.9)	**10.7** (8.31-13.7)	**12.0** (9.14-15.8)	**13.4** (9.94-18.4)	**15.1** (10.5-21.0)	**17.8** (11.8-25.6)	**20.1** (13.1-29.5)
20-day	**7.23** (5.90-8.71)	**8.25** (6.72-9.94)	**9.91** (8.05-12.0)	**11.3** (9.11-13.7)	**13.2** (10.3-16.7)	**14.6** (11.1-18.9)	**16.1** (11.9-21.6)	**17.8** (12.4-24.5)	**20.2** (13.5-28.7)	**22.1** (14.4-32.2)
30-day	**8.96** (7.34-10.7)	**10.0** (8.21-12.0)	**11.8** (9.59-14.2)	**13.2** (10.7-16.0)	**15.2** (11.9-19.1)	**16.7** (12.7-21.4)	**18.3** (13.4-24.2)	**19.9** (13.9-27.2)	**22.0** (14.8-31.2)	**23.7** (15.5-34.3)
45-day	**11.1** (9.14-13.3)	**12.2** (10.0-14.6)	**14.1** (11.5-16.9)	**15.6** (12.7-18.8)	**17.7** (13.8-22.0)	**19.3** (14.7-24.5)	**20.9** (15.3-27.3)	**22.4** (15.7-30.4)	**24.3** (16.3-34.2)	**25.7** (16.8-37.0)
60-day	**12.9** (10.7-15.4)	**14.1** (11.6-16.8)	**16.0** (13.1-19.1)	**17.5** (14.3-21.1)	**19.7** (15.4-24.4)	**21.4** (16.3-27.0)	**23.0** (16.8-29.8)	**24.5** (17.2-33.1)	**26.2** (17.6-36.7)	**27.3** (17.9-39.2)

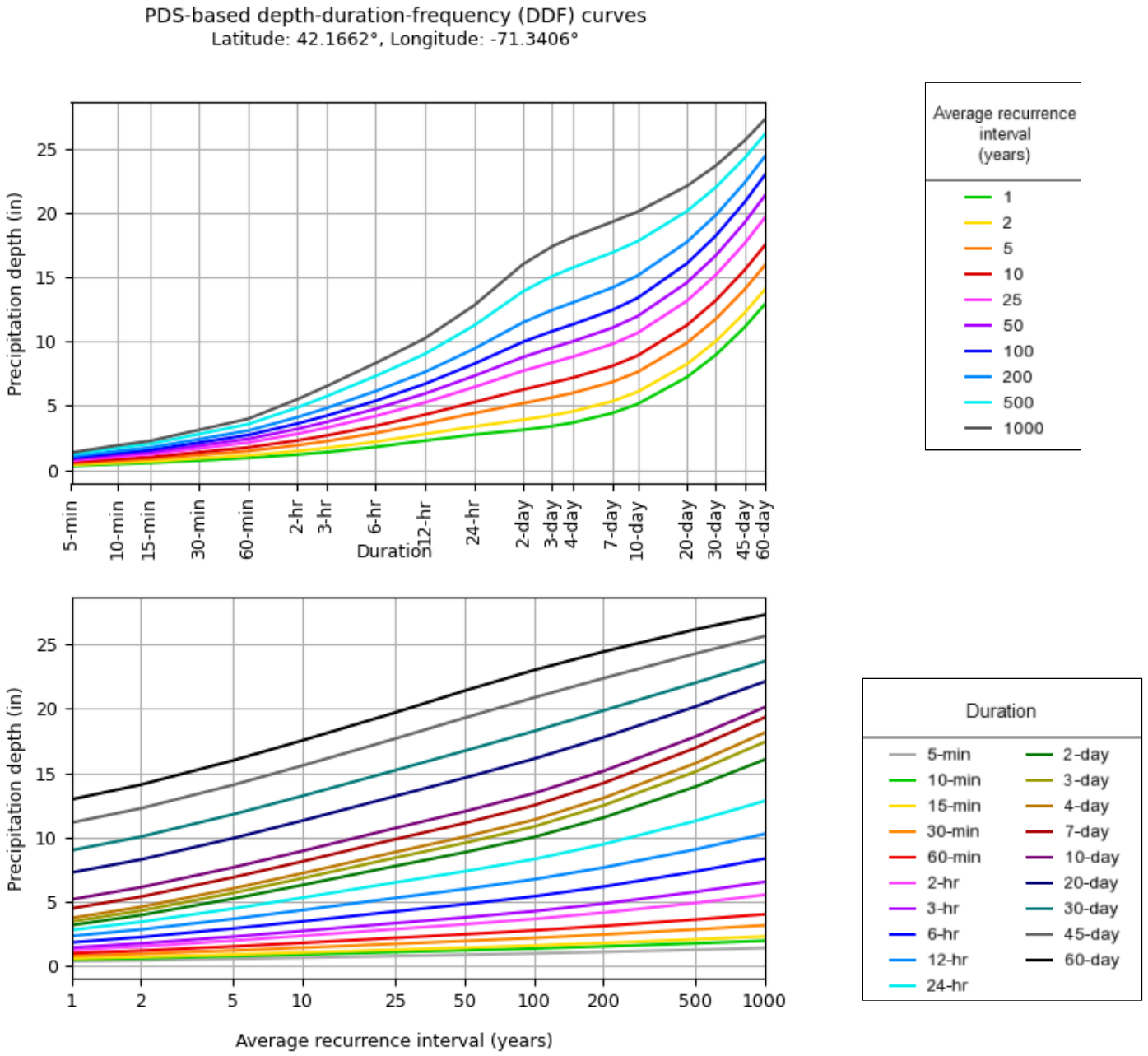
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



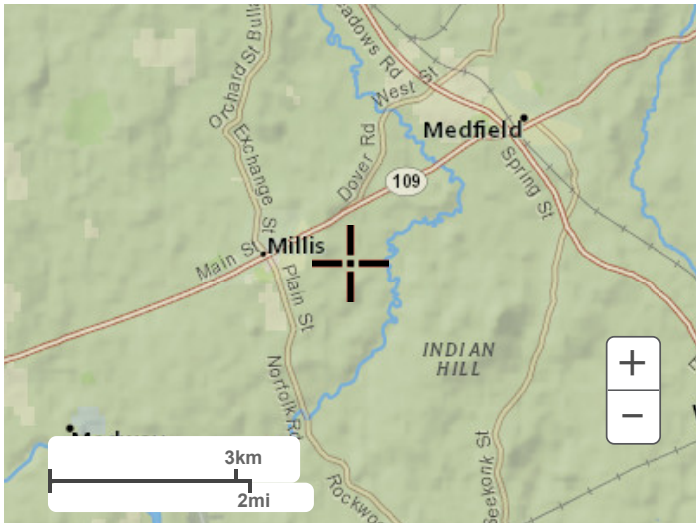
NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Thu Aug 10 21:55:19 2023

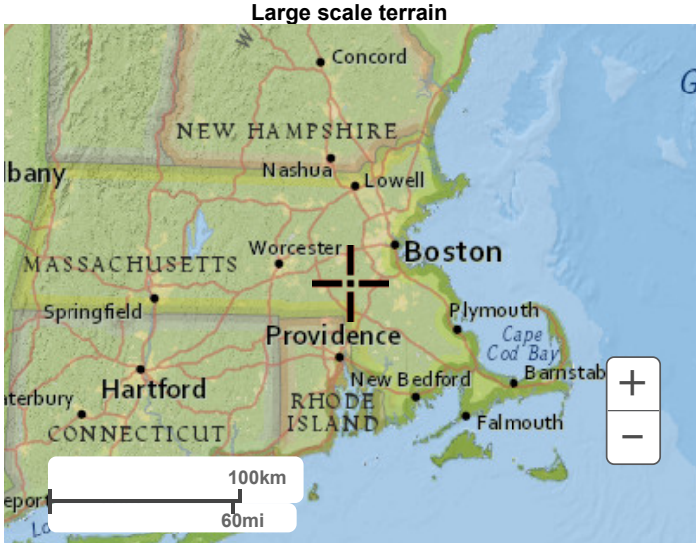
Back to Top

Maps & aerials

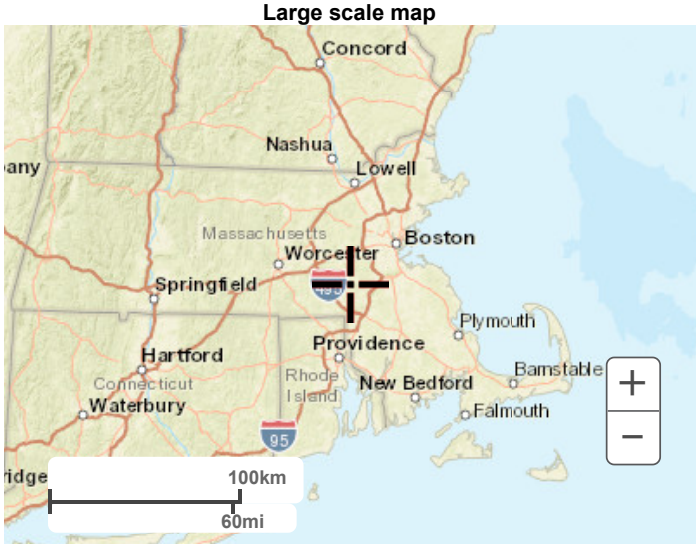
Small scale terrain



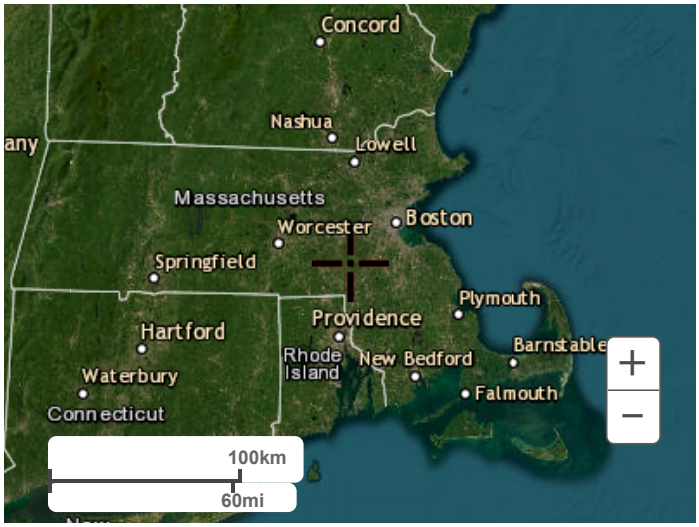
Large scale terrain



Large scale map



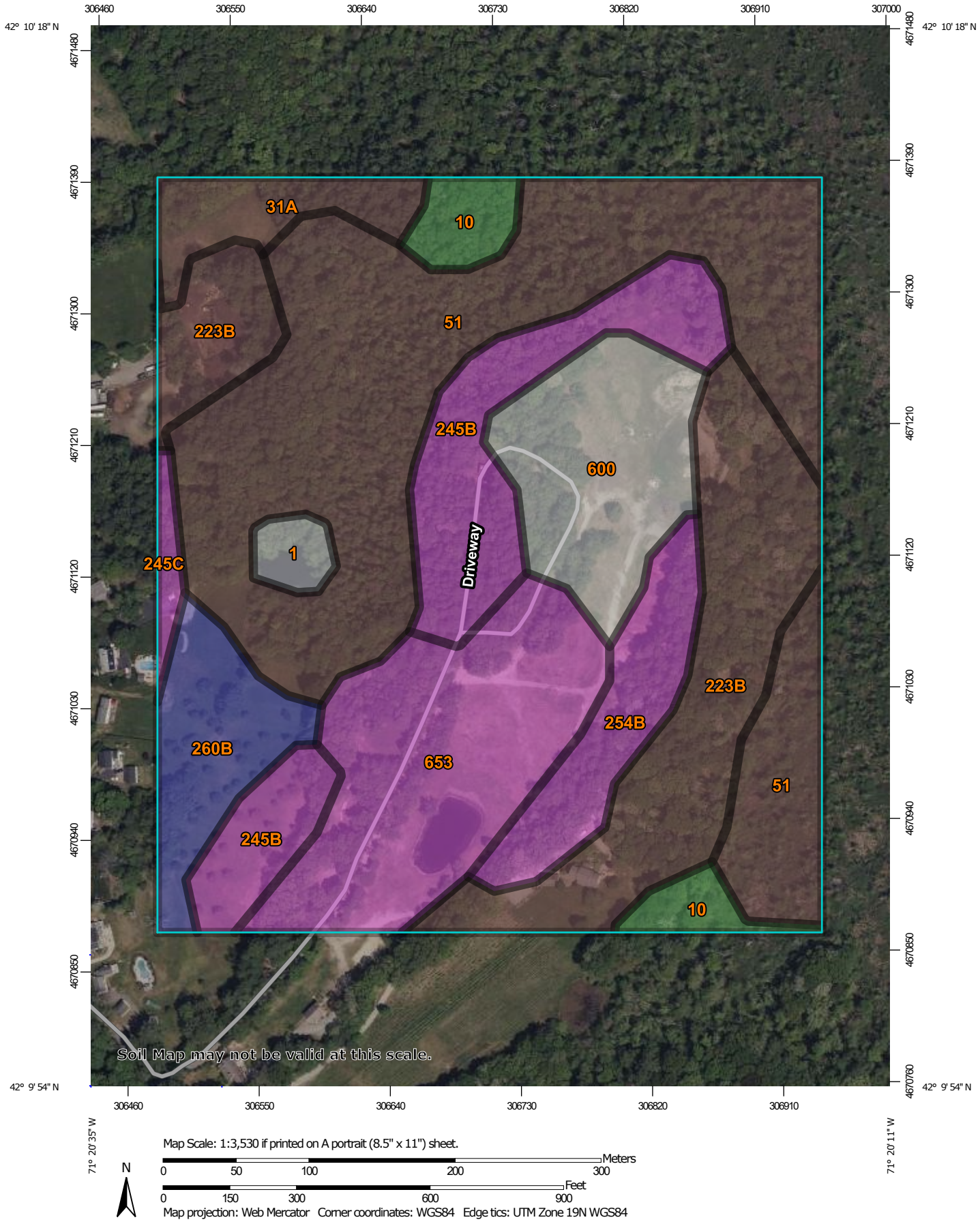
Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Hydrologic Soil Group—Norfolk and Suffolk Counties, Massachusetts
(Millis Well 3 HSG Map)



Map Scale: 1:3,530 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 18, Sep 9, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		0.6	1.1%
10	Scarboro and Birdsall soils, 0 to 3 percent slopes	A/D	1.8	3.0%
31A	Walpole sandy loam, 0 to 3 percent slopes	B/D	2.0	3.4%
51	Swansea muck, 0 to 1 percent slopes	B/D	19.0	32.5%
223B	Scio very fine sandy loam, 2 to 5 percent slopes	B/D	9.3	15.9%
245B	Hinckley loamy sand, 3 to 8 percent slopes	A	6.2	10.6%
245C	Hinckley loamy sand, 8 to 15 percent slopes	A	0.5	0.9%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	3.1	5.2%
260B	Sudbury fine sandy loam, 2 to 8 percent slopes	B	3.1	5.3%
600	Pits, sand and gravel		4.9	8.5%
653	Udorthents, sandy	A	8.0	13.7%
Totals for Area of Interest			**58.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix G
Boring Logs

KLEINFELDER One Beacon Street, Suite 8100, Boston, MA 02108 p | 617.497.7800 f | 617.498.4630

DRILLING METHOD/SAMPLER TYPE GRAPHICS

STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after stabilizing period)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Solid lines separating strata on the logs represent approximate boundaries only, dashed lines are inferred or extrapolated boundaries. Actual transitions may be gradual or differ from those represented.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System (ASTM D2488/D2487) designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., CL-ML, GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS

WOH - Weight of Hammer
WOR - Weight of Rod

REFERENCES

1. American Society for Materials and Testing (ASTM), 2011, ASTM D2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System).

UNIFIED SOIL CLASSIFICATION SYSTEM[1]

COARSE GRAINED SOILS (More than 50% retained on No. 200 Sieve)	**GRAVELS** (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVEL WITH <5% FINES	**GW**	WELL-GRADED GRAVEL, WELL-GRADED GRAVEL WITH SAND
			GP	POORLY GRADED GRAVEL, POORLY GRADED GRAVEL WITH SAND
		GRAVELS WITH 5% TO 12% FINES	**GW-GM**	WELL-GRADED GRAVEL WITH SILT, WELL-GRADED GRAVEL WITH SILT AND SAND
			GW-GC	WELL-GRADED GRAVEL WITH CLAY (OR SILTY CLAY), WELL-GRADED GRAVEL WITH CLAY AND SAND (OR SILT CLAY AND SAND)
			GP-GM	POORLY GRADED GRAVEL WITH SILT, POORLY GRADED GRAVEL WITH SILT AND SAND
			GP-GC	POORLY GRADED GRAVEL WITH CLAY (OR SILTY CLAY), POORLY GRADED GRAVEL WITH CLAY AND (OR SILTY CLAY AND SAND)
		GRAVELS WITH > 12% FINES	**GM**	SILTY GRAVEL, SILTY GRAVEL WITH SAND
			GC	CLAYEY GRAVEL, CLAYEY GRAVEL WITH SAND
			GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL WITH SAND
	SANDS (50% or more of coarse fraction passes the No. 4 Sieve)	CLEAN SANDS WITH <5% FINES	**SW**	WELL-GRADED SAND, WELL-GRADED SAND WITH GRAVEL
			SP	POORLY GRADED SAND, POORLY GRADED SAND WITH GRAVEL
		SANDS WITH 5% TO 12% FINES	**SW-SM**	WELL-GRADED SAND WITH SILT, WELL-GRADED SAND WITH SILT AND GRAVEL
			SW-SC	WELL-GRADED SAND WITH CLAY (OR SILTY CLAY), WELL-GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)
			SP-SM	POORLY GRADED SAND WITH SILT, POORLY GRADED SAND WITH SILT AND GRAVEL
			SP-SC	POORLY GRADED SAND WITH CLAY, POORLY GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)
		SANDS WITH > 12% FINES	**SM**	SILTY SAND, SILTY SAND WITH GRAVEL
			SC	CLAYEY SAND, CLAYEY SAND WITH GRAVEL
			SC-SM	SILTY, CLAYEY SAND, SILTY, CLAYEY SAND WITH GRAVEL
FINE GRAINED SOILS (50% or more passes the No. #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		**ML**	SILT, SILT WITH SAND, SILT WITH GRAVEL
			CL	LEAN CLAY, LEAN CLAY WITH SAND, LEAN CLAY WITH GRAVEL
			CL-ML	SILTY CLAY, SILTY CLAY WITH SAND, SILTY CLAY WITH GRAVEL
			OL	ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL
	SILTS AND CLAYS (Liquid Limit 50 or greater)		**MH**	ELASTIC SILT. ELASTIC SILT WITH SAND, ELASTIC SILT WITH GRAVEL
			CH	FAT CLAY, FAT CLAY WITH SAND, FAT CLAY WITH GRAVEL
			OH	ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL

NOTE: USE MATERIAL DESCRIPTION ON THE LOG TO DEFINE A GRAPHIC THAT MAY NOT BE PROVIDED ON THIS LEGEND.

KLEINFELDER
Bright People. Right Solutions.

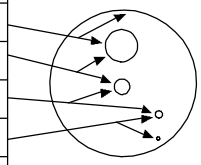
PROJECT NO.: 20233667.001A
DRAWN BY: AD
CHECKED BY MR
DATE: 3/17/2023

GRAPHICS KEY

Well 3 PFAS Piloting and Preliminary Design
25 Birch Street
Millis, MA

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3 in. (19 - 76.2 mm.)	3/4 -3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



SECONDARY CONSTITUENT

	AMOUNT	
Term of Use	Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	TCP VALUES	FIELD IDENTIFICATION
Very Soft	0 - 8	Core (height twice diameter) sags under own weight
Soft	8 - 20	Core can be pinched or imprinted easilty with finger
Stiff	20 - 40	Core can be imprinted with considerable pressure
Very Stiff	40 - 80	Core can be imprinted only slightly with fingers
Hard	80 - 5 in./100	Core cannot be imprinted with fingers but can be penetrated with pencil
Very Hard	0 in. - 5 in. /100	Core cannot be penetrated with pencil

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	TCP VALUES
Very Loose	0 - 8
Loose	8 - 20
Slightly Compact	20 - 40
Compact	40 - 80
Dense	80 - 5 in. /100
Very Dense	0 in. / 5 in. 100

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness.
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.: 20233667.001A

DRAWN BY: AD

CHECKED BY MR

DATE: 3/17/2023

SOIL DESCRIPTION KEY

Well 3 PFAS Piloting and Preliminary Design
25 Birch Street
Millis, MA

Date Begin - End: 1/26/2023 **Drilling Company:** New England Boring Contractors **BORING LOG B-W3-101**

Logged By: A. Darajat **Drill Crew:** M. Misiaszek

Hor.-Vert. Datum: NAD83 - NAVD88 **Drilling Equipment:** D-53 **Hammer Type - Drop:** 140 lb. Auto - 30 in.

Plunge: -90 degrees **Drilling Method:** Drive and Wash with Casing

Weather: Cloudy 40s **Exploration Diameter:** 4 in. I.D.

Ground Surface Elevation (ft.): 126.90
Surface Condition: Bare Earth and Grass

Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			6" Topsoil	S-1		BC=1 1 1 1	12"								
126.4			Brown, very loose, fine to coarse SAND, little silt, trace gravel, trace roots (subsoil)												
125			Top (A): Brown, fine to coarse SAND, little silt, trace gravel (subsoil)	S-2A		BC=WOH 1	12"								
123.9			Bottom (B): Gray/brown, fine to coarse SAND, some gravel, little silt	S-2B		BC=3 12	8"								
	5		Gray/brown, very dense, fine to coarse SAND, some gravel, little silt	S-3		BC=4 20 42 45	17"				77	10			
120			Gray/brown, very dense, fine to coarse SAND and GRAVEL, trace silt	S-4		BC=30 29 32 40	10"								Hard casing penetration from 4.5 to 8 ft bgs. 300 lb hammer was introduced to drive casing.
	10		Brown, dense, fine to coarse SAND and GRAVEL, trace silt	S-5		BC=16 17 17 22	12"								
115															
	15		Brown, dense, GRAVEL, some fine to coarse SAND, little clayey silt	S-6		BC=15 20 18 18	10"				46	12			
110															
	20		Brown/gray, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-7		BC=8 9 10 13	8"								
105															
			Brown, medium dense, fine to coarse SAND, some gravel, trace silt	S-8		BC=11 10	4"								

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.: 20233667.001A

DRAWN BY: AD

CHECKED BY: MR

DATE: 3/17/2023

BORING LOG B-W3-101

Well 3 PFAS Piloting and Preliminary Design
25 Birch Street
Millis, MA

Date Begin - End: 1/26/2023 **Drilling Company:** New England Boring Contractors **BORING LOG B-W3-101**

Logged By: A. Darajat **Drill Crew:** M. Misiaszek

Hor.-Vert. Datum: NAD83 - NAVD88 **Drilling Equipment:** D-53 **Hammer Type - Drop:** 140 lb. Auto - 30 in.

Plunge: -90 degrees **Drilling Method:** Drive and Wash with Casing

Weather: Cloudy 40s **Exploration Diameter:** 4 in. I.D.

Elevation (feet) / Depth (feet)	Graphical Log	Ground Surface Elevation (ft.): 126.90 Surface Condition: Bare Earth and Grass Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			S-8 *(cont.)*		8 15	4" *(cont.)*								
100														
		Brown, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-9		BC=9 8 8 8	6"								
30														
95														
		Gray/brown, medium dense, fine to coarse SAND, trace gravel, trace silt	S-10		BC=8 7 7 9	7"				91	7.6			
35														
90														
		Gray/brown, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-11		BC=7 9 8 6	6"								
40														
85														
		Gray/brown, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-12		BC=6 5 6 5	5"								
45														
80														
		Gray/brown, medium dense, fine to coarse SAND and GRAVEL, trace silt	S-13		BC=11 10	6"				53	5.1			

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.: 20233667.001A

DRAWN BY: AD

CHECKED BY: MR

DATE: 3/17/2023

BORING LOG B-W3-101

Well 3 PFAS Piloting and Preliminary Design
25 Birch Street
Millis, MA

BORING LOG B-W3-101

Date Begin - End:	1/26/2023	**Drilling Company:**	New England Boring Contractors		
Logged By:	A. Darajat	**Drill Crew:**	M. Misiaszek		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	D-53	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Drive and Wash with Casing		
Weather:	Cloudy 40s	**Exploration Diameter:**	4 in. I.D.		

Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION: Ground Surface Elevation (ft.): 126.90 Surface Condition: Bare Earth and Grass Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	LABORATORY RESULTS: USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
				S-13 *(cont.)*		14 14	6" *(cont.)*								
75			75.9 The boring was terminated at approximately 51 ft. below ground surface. The boring was backfilled with drill cuttings on January 26, 2023.												
	55														
70															
	60														
65															
	65														
60															
	70														
55															

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 8.5 ft. below ground surface during drilling.

GENERAL NOTES:
1. Ground Surface Elevation based on drawing titled "Well 3 site plan" prepared by Kleinfelder, dated October 2022.
2. Where strata breaks are not observed in the split spoon samples, strata breaks are inferred based on observation of drill rig behavior (rig bouncing and chattering), change in auger/rollerbit penetration resistance, drill cuttings and changes in drilling water color.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.: 20233667.001A
DRAWN BY: AD
CHECKED BY: MR
DATE: 3/17/2023

BORING LOG B-W3-101

Well 3 PFAS Piloting and Preliminary Design
25 Birch Street
Millis, MA